

D1647-30001



บทคัดย่อ ABSTRACTS

การประชุมวิชาการ
วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 30
19-21 ตุลาคม 2547
ณ ศูนย์แสดงสินค้าและการประชุมอิมแพ็ค เมืองทองธานี

30th Congress on Science and Technology of Thailand
19-21 October 2004
Exhibition and Convention Center , Muang Thong Thani



สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
THE SCIENCE SOCIETY OF THAILAND
UNDER THE PATRONAGE OF HIS MAJESTY THE KING



คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ
FACULTY OF SCIENCE
SRINAKARINWIROT UNIVERSITY



บทคัดย่อ ABSTRACTS

**การประชุมวิชาการ
วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 30**
19-21 ตุลาคม 2547
ณ ศูนย์แสดงสินค้าและการประชุมอิมแพ็ค เมืองทองธานี

30th Congress on Science and Technology of Thailand
19-21 October 2004
Impact Exhibition and Convention Center , Muang Thong Thani



สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์
THE SCIENCE SOCIETY OF THAILAND
UNDER THE PATRONAGE OF HIS MAJESTY THE KING



คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ
FACULTY OF SCIENCE
SRINAKARINWIROT UNIVERSITY

บทคัดย่อ

การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 30

เลขมาตรฐานสากลประจำหนังสือ 974-92553-5-6

จัดทำโดย สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

และคณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ

พิมพ์ครั้งแรก ตุลาคม พ.ศ.2547

สงวนลิขสิทธิ์ ©พ.ศ.2547 โดยสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

ไม่อนุญาตให้คัดลอกส่วนใดส่วนหนึ่งของหนังสือเล่มนี้

นอกจากได้รับอนุญาตจากเจ้าของลิขสิทธิ์ก่อนเท่านั้น

สารบัญ

สารจากนายกสมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์	5
Message of President of The Science Society of Thailand under The Patronage of His Majesty The King	
สารจากอธิการบดีมหาวิทยาลัยศรีนครินทรวิโรฒ	6
Message of President, Srinakharinwirot University	
สารจากคณบดีคณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ	7
Message of Dean of Faculty of Science, Srinakharinwirot University	
รายงานของประธานจัดการประชุมวิชาการ วทท.30	8
Report of Chairman of STT30 Organizing Committee	
รายนามคณะกรรมการจัดการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 30	9
Organizing Committee of 30 th Congress on Science and Technology of Thailand	
ประวัติการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย	14
History of the Congress on Science and Technology of Thailand	
รายชื่อผู้เข้าร่วมประชุมจากต่างประเทศ (List of oversea participants (Plenary and Invited Speakers)	16
รายการอภิปรายและเสวนาพิเศษ (Special Sessions and Panel Discussion)	17
บทคัดย่อการบรรยายนำและบรรยายรับเชิญ (Abstracts of Plenary Lectures and Invited Speakers)	19
บทคัดย่อการเสนอผลงานทางวิชาการ (Abstracts of Contributed Papers).....	33
● หมวด ก. คณิตศาสตร์ วิทยาการคอมพิวเตอร์และสารสนเทศ.....	37
(Section A. Mathematics, Computing and Information Technology)	
● คณิตศาสตร์และสถิติ (Mathematics and Statistics)	
● วิทยาการคอมพิวเตอร์และเทคโนโลยีสารสนเทศ (Computer Science and Information Technology)	
● หมวด ข. วิทยาศาสตร์ชีวภาพ (Section B. Biological Science).....	43
● ชีววิทยา (Biology)	
● เทคโนโลยีชีวภาพ (Biotechnology)	
● จุลชีววิทยา (Microbiology)	
● วิทยาศาสตร์สัตว์น้ำ (Aquatic Science)	
● พันธุศาสตร์ (Genetics)	
● หมวด ค. เคมี (Section C. Chemistry).....	83
● เคมีวิเคราะห์ (Analytical Chemistry)	
● เคมีอนินทรีย์ (Inorganic Chemistry)	
● เคมีอินทรีย์ (Organic Chemistry)	
● เคมีเชิงฟิสิกส์ (Physical Chemistry)	
● ชีวเคมี (Biochemistry)	
● หมวด ง. ฟิสิกส์ (Section D. Physics).....	139
● ชีวฟิสิกส์ (Biophysics)	
● ธรณีฟิสิกส์ (Geophysics)	
● นิวเคลียร์ฟิสิกส์ (Nuclear Physics)	
● ฟิสิกส์ของแข็ง (Solid State Physics)	
● หมวด จ. วัสดุศาสตร์ (Section E. Materials Science).....	160
● โพลีเมอร์และวัสดุผสม (Polymer & Composites)	
● เซรามิกส์และวัสดุฟิสิกส์ (Ceramics and Materials Physics)	
● หมวด ฉ. วิทยาศาสตร์เกษตร และอาหาร (Section F. Agricultural & Food Science)	185

- วิทยาศาสตร์เกษตร (Agricultural Science)
- วิทยาศาสตร์อาหาร (Food Science)

• หมวด ข. ธรณีวิทยา (Section G. Geology).....	193
• หมวด ข. วิทยาศาสตร์การแพทย์ (Section H. Medical Science).....	195
• หมวด ค. วิทยาศาสตร์และเทคโนโลยีสิ่งแวดล้อม (Section I. Environmental Science & Technology).....	208
• หมวด ฉ. วิศวกรรมและเทคโนโลยี (Section J. Engineering & Technology).....	220
• หมวด จ. วิทยาศาสตร์สื่อสารและการศึกษา (Section K. Science Communication & Education).....	229
• หมวด ง. ไคตินและไคโตซาน (Section L. Chitin and Chitosan).....	234
ดัชนีชื่อผู้บรรยายรับเชิญ (Invited Speaker Index) ..	247
ดัชนีชื่อผู้วิจัย (Author Index). ..	249
หน่วยงานภาคเอกชนที่ร่วมแสดงนิทรรศการ (List of Exhibitors).....	277
คำขอบคุณหน่วยงานที่สนับสนุนการจัดงาน วทท.30 (Acknowledgement of the Sponsors)	279



สภานายกสมาคมวิทยาศาสตร์แห่งประเทศไทย

ในพระบรมราชูปถัมภ์

ในศตวรรษที่ 21 ทั่วโลกมีการเปลี่ยนแปลงอย่างรวดเร็ว สังคมต้องการความรู้เป็นฐานสร้างเศรษฐกิจ (Knowledge - based economy) ที่มุ่งเน้นการใช้ความรู้และนวัตกรรมเป็นปัจจัยหลักในการพัฒนามากกว่าการพัฒนาวัตถุ เศรษฐกิจฐานความรู้เป็นเศรษฐกิจที่อาศัยการผลิต การแพร่กระจาย และการใช้ความรู้ทั้งชนิดที่เป็น Explicit knowledge และ Tacit knowledge เพื่อเป็นตัวขับเคลื่อนหลักในการสร้างงานในทุกภาคการผลิตเพื่อให้อยู่ในระดับที่สามารถแข่งขันได้ในตลาดโลก

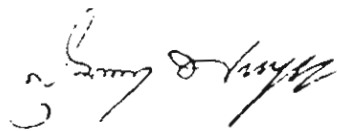
เศรษฐกิจฐานความรู้ปรากฏผลให้เห็นได้ชัดเจน ในระบบเศรษฐกิจของกลุ่มประเทศ OECD ที่มีการผลิต การส่งออกสินค้า และการบริการที่ใช้เทคโนโลยีขั้นสูง ซึ่งในปัจจุบันเศรษฐกิจฐานความรู้ของประเทศกลุ่ม OECD มีสัดส่วนมากกว่า 50% ของ GDP และการแข่งขันเพื่อการค้า ได้ถูกกำหนดโดยความสามารถทางวิทยาศาสตร์และเทคโนโลยี จึงเป็นความจำเป็นที่ประเทศไทยจะต้องเร่งปรับเปลี่ยนสังคมไทยให้เป็นสังคมการเรียนรู้ และอาศัยความรู้ทางวิทยาศาสตร์ และเทคโนโลยีเพื่อเร่งสร้างนวัตกรรมที่จะนำไปสู่ระบบเศรษฐกิจฐานความรู้อย่างรวดเร็วทันต่อการเปลี่ยนแปลงของโลก

หากจะพิจารณาถึงข้อมูลดัชนีของ IMD ในเรื่องการจัดอันดับความสามารถในการแข่งขันด้านโครงสร้างพื้นฐานทางวิทยาศาสตร์ และโครงสร้างพื้นฐานทางเทคโนโลยี ในปี พ.ศ. 2546 อันดับของประเทศไทย ถึงแม้จะขยับขึ้นมาสู่อันดับที่ดีขึ้นก็จริง แต่ก็ยังอยู่ในระดับกลุ่มหลัง คือ ความสามารถในการแข่งขันด้านโครงสร้างพื้นฐานทางวิทยาศาสตร์อยู่อันดับ 26 จาก จำนวน 30 ประเทศ โครงสร้างพื้นฐานทางเทคโนโลยี อยู่อันดับ 20 จากจำนวนเดียวกัน จึงยังต้องทำให้ทุกฝ่ายที่รับผิดชอบในเรื่องการกำหนดนโยบายและยุทธศาสตร์ เร่งพัฒนาทรัพยากรมนุษย์ให้มีคุณภาพ เพื่อทำให้สังคมไทยเป็นสังคมที่มีพื้นฐานความรู้ทางวิทยาศาสตร์ และเทคโนโลยี สามารถสร้างนวัตกรรม ที่จะช่วยสร้างเศรษฐกิจฐานความรู้ได้มากขึ้นอย่างยั่งยืน

สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์ ได้ทำกิจกรรมส่งเสริมการพัฒนาวิทยาศาสตร์และเทคโนโลยีของประเทศมาอย่างต่อเนื่อง การจัดประชุมวิชาการครั้งนี้ เป็นครั้งที่ 30 ซึ่งประจวบกับเป็นปีที่ครบรอบ 200 ปี แห่งการพระบรมราชสมภพ พระบาทสมเด็จพระจอมเกล้าเจ้าอยู่หัว สมาคมฯ จึงประสงค์ให้งานนี้ยิ่งใหญ่ เพื่อเป็นการเทอดพระเกียรติพระบิดาแห่งวิทยาศาสตร์ไทย โดยได้จัดให้มีนักวิจัยที่มีชื่อเสียงทั้งในประเทศและต่างประเทศมาบรรยายและอภิปราย งานนี้เป็นแหล่งของการแพร่กระจายความรู้ที่ดียิ่ง ไปยังกลุ่มผู้สนใจและผู้ที่จะสามารถนำความรู้ไปขยายผล เพื่อให้เกิดการศึกษาวิจัย ที่จะมีผลนำไปสู่การสร้างนวัตกรรมใหม่ๆ ในประเทศไทย

การประชุมวิชาการครั้งนี้ ได้รับพระมหากรุณาธิคุณจาก สมเด็จพระเทพรัตนราชสุดาฯ สยามบรมราชกุมารี เสด็จพระราชดำเนินทรงเป็นประธานในพิธีเปิดการสัมมนาวิชาการ ควรที่สมาคมฯ และผู้เข้าร่วมประชุมทุกท่านจะสำนึกในพระมหากรุณาธิคุณเป็นล้นพ้นหาที่สุดมิได้

สุดท้ายนี้ สมาคมฯ ขอขอบคุณท่านอธิการบดี คณะบดีคณะวิทยาศาสตร์ นุศลกร และนิสิตของมหาวิทยาลัยศรีนครินทรวิโรฒที่กรุณาเป็นเจ้าภาพร่วมในการจัดงานครั้งนี้ จนประสบผลสำเร็จอย่างดียิ่ง ขอขอบคุณ Professor Douglas D.Osheroff และวิทยากรทุกท่าน ทั้งภายในประเทศและต่างประเทศ ขอขอบคุณประธานจัดการประชุมวิชาการ วทท.30 คณะกรรมการดำเนินงาน ตลอดจนหน่วยงานภาครัฐ ภาคเอกชน และผู้มีส่วนเกี่ยวข้องที่สนับสนุนในด้านต่างๆ เพื่อให้การประชุม วทท.30 ครั้งนี้ สำเร็จลุล่วงด้วยดี



(รองศาสตราจารย์ ดร. คุณหญิงสุมนหา พรหมบุญ)

นายกสมาคมวิทยาศาสตร์แห่งประเทศไทย

ในพระบรมราชูปถัมภ์

สารอธิการบดี
มหาวิทยาลัยศรีนครินทรวิโรฒ

ความก้าวหน้าทางวิทยาศาสตร์และเทคโนโลยี ได้ช่วยพัฒนาระบบเศรษฐกิจ และสังคมโลกให้เจริญรุดหน้าไปได้อย่างรวดเร็วจากยุคเศรษฐกิจอุตสาหกรรม (Industrial Economy) สู่ยุค เศรษฐกิจข่าวสาร (Information Economy) ซึ่งอาศัยเทคโนโลยีสารสนเทศเป็นปัจจัยสำคัญในการผลักดันการเจริญเติบโตของเศรษฐกิจ จนถึงปัจจุบันได้เข้าสู่ยุคเศรษฐกิจโมเลกุล (Molecular economy) ซึ่งขับเคลื่อนระบบเศรษฐกิจด้วยเทคโนโลยีชีวภาพ นาโนเทคโนโลยี และเทคโนโลยีด้านวัสดุ การที่สังคม และเศรษฐกิจของประเทศไทยจะเข้าสู่เศรษฐกิจยุคปัจจุบันได้ จำเป็นต้องตื่นตัวและร่วมมือกันทุกฝ่าย ทั้งหน่วยงานที่กำหนดนโยบายระดับชาติด้านวิทยาศาสตร์และเทคโนโลยี สถาบันการศึกษาที่ให้การศึกษาการวิจัย รวมทั้งภาคเอกชนที่เป็นผู้ผลิตที่จะต้องใช้วิทยาศาสตร์และเทคโนโลยีเป็นฐานความรู้ในการพัฒนาระบบเศรษฐกิจของประเทศ สำหรับเศรษฐกิจในภาคเกษตรกรรม อุตสาหกรรม ขนาดกลาง ขนาดย่อม รวมทั้งด้านการบริการ ก็จำเป็นต้องนำความรู้และเทคโนโลยีระดับสูง มาปรับและผสมผสานกับภูมิปัญญาท้องถิ่นที่มีอยู่เดิม เพื่อให้เกิดองค์ความรู้ใหม่และนวัตกรรมที่จะพัฒนาเศรษฐกิจและสังคมของชาติที่ยั่งยืน

มหาวิทยาลัยศรีนครินทรวิโรฒ ถือเป็นเกียรติอย่างยิ่งที่ได้ร่วมจัดการประชุมวิชาการวิทยาศาสตร์ และเทคโนโลยีแห่งประเทศไทยครั้งที่ 30 ในเรื่อง “วิทยาศาสตร์และเทคโนโลยีเพื่อสังคมและเศรษฐกิจฐานความรู้” ระหว่างวันที่ 19-21 ตุลาคม 2547 ณ ศูนย์แสดงสินค้า และการประชุมอิมแพ็ค เมืองทองธานี โดยมีวัตถุประสงค์เพื่อเฉลิมฉลองสมโภช 200 ปี แห่งพระบรมราชสมภพ พระบาทสมเด็จพระจอมเกล้าเจ้าอยู่หัว เพื่อให้ นักวิทยาศาสตร์และนักวิชาการทั้งในประเทศ และต่างประเทศเสนอผลงานวิจัยทางวิทยาศาสตร์และเทคโนโลยี มีโอกาสแลกเปลี่ยนความรู้ ประสบการณ์ และสามารถนำความรู้ด้านวิทยาศาสตร์และเทคโนโลยีที่ได้จากการประชุมครั้งนี้ไปใช้ประโยชน์ในงานที่ทุกท่านรับผิดชอบเพื่อเป็นส่วนหนึ่งของการพัฒนาสังคม และเศรษฐกิจยุคใหม่

การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทยครั้งที่ 30 นี้ จึงมีความสำคัญอย่างยิ่ง เพราะเป็นกิจกรรมส่งเสริมสังคมฐานความรู้ เพื่อการพัฒนาอย่างยั่งยืน และสามารถเพิ่มศักยภาพการแข่งขัน ในเศรษฐกิจและสังคมโลกได้ในระยะยาว ในโอกาสสำคัญนี้ มหาวิทยาลัยศรีนครินทรวิโรฒ มีความยินดีเป็นอย่างยิ่งที่ได้ต้อนรับทุกท่าน กระผมในนามของมหาวิทยาลัยศรีนครินทรวิโรฒ ขอขอบคุณบุคคลและองค์กรต่างๆที่เกี่ยวข้องจากทั้งภาครัฐและภาคเอกชนที่ได้ให้ความร่วมมือและสนับสนุนกิจกรรมครั้งนี้จนสำเร็จเป็นอย่างดี และหวังเป็นอย่างยิ่งที่ผู้เข้าร่วมประชุมทุกท่านจะได้รับประโยชน์ และนำไปใช้ในด้านการศึกษา การวิจัย ตลอดจนประยุกต์ใช้ในงานอุตสาหกรรมเพื่อช่วยให้เกิดการพัฒนาสังคม และเศรษฐกิจของประเทศชาติต่อไป



(ศาสตราจารย์ ดร.วิรุณ ดังเจริญ)

อธิการบดี

**สภาคณะบดีคณะวิทยาศาสตร์
มหาวิทยาลัยศรีนครินทรวิโรฒ**

คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ มีความภาคภูมิใจเป็นอย่างยิ่งที่ได้รับเกียรติจาก สภาคณะบดีคณะวิทยาศาสตร์แห่งประเทศไทย ในพระบรมราชูปถัมภ์ ให้เป็นเจ้าภาพร่วมในการจัดประชุมวิชาการ วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 30 (วทท.30) โดยมีชื่อเรื่อง “วิทยาศาสตร์และเทคโนโลยีเพื่อสังคมและเศรษฐกิจฐานความรู้” ณ ศูนย์แสดงสินค้าและการประชุมอิมแพ็ค เมืองทองธานี ระหว่างวันที่ 19 - 21 ตุลาคม 2547

การเป็นเจ้าภาพร่วมในการจัดประชุมวิชาการ วทท.30 นับเป็นครั้งที่ 2 ของคณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ได้มีการเตรียมการโดยเริ่มจากเข้าสัมมนาการพิจารณาการประชุมวิชาการ วทท. 29 ซึ่งจัดที่มหาวิทยาลัยขอนแก่น ในเดือนตุลาคม 2546 และวางแผนดำเนินงานของฝ่ายต่างๆ ที่คณะวิทยาศาสตร์ต้องรับผิดชอบให้ประสานกับงานที่เป็นส่วนของสภาคณะบดีคณะวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์ เพื่อที่จะให้งานประชุมวิชาการ วทท. 30 นี้ เป็นไปโดยเรียบร้อย ยิ่งใหญ่ เป็นการเทิดพระเกียรติพระบาทสมเด็จพระจอมเกล้าเจ้าอยู่หัว พระบิดาแห่งวิทยาศาสตร์ไทย เนื่องในปีเฉลิมฉลองสมโภช 200 ปี แห่งการพระบรมราชสมภพ คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ซึ่งรับผิดชอบในด้านสถานที่ การจัดแสดงนิทรรศการ และการอำนวยความสะดวกต่างๆ ทั้งก่อนวันประชุม และในวันงานมีความมุ่งมั่นที่จะทำงานครั้งนี้เพื่อให้ผู้ร่วมการประชุมประมาณ 2,000 คน ได้รับความสะดวกและได้รับประโยชน์จากการประชุมวิชาการ วทท. 30 นี้มากที่สุด อย่างไรก็ตามหากมีสิ่งใด ขาดตกบกพร่อง คณะวิทยาศาสตร์ ใคร่ขออภัยเป็นอย่างยิ่ง

คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ใคร่ขอบพระคุณหน่วยงานต่างๆ ทั้งภาครัฐ และภาคเอกชนที่ให้การสนับสนุนการดำเนินงานของคณะวิทยาศาสตร์ เพื่อจัดประชุมวิชาการครั้งนี้ และขอขอบพระคุณสภาคณะบดีคณะวิทยาศาสตร์แห่งประเทศไทย ในพระบรมราชูปถัมภ์ ที่ได้ให้โอกาส คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ เป็นเจ้าภาพร่วม และสุดท้ายขอขอบพระคุณวิทยากร ผู้เข้าร่วมประชุมวิชาการ คณะกรรมการดำเนินงานทุกท่าน เป็นอย่างสูง ที่ได้มีส่วนร่วมในการจัดประชุมวิชาการครั้งนี้จนประสบผลสำเร็จตามวัตถุประสงค์ได้เป็นอย่างดี



(รศ. ดร.ยุวดี นาคะผดุงรัตน์)

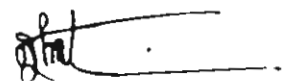
คณบดีคณะวิทยาศาสตร์

**รายงานประธานจัดการประชุมวิชาการ
วิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 30**

การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย ครั้งที่ 30 (วทท.30) โดยสมาคมวิทยาศาสตร์แห่งประเทศไทย ในพระบรมราชูปถัมภ์ ได้รับเกียรติจาก คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ เป็นเจ้าภาพร่วมในการจัดการประชุมในครั้งนี้ ณ ศูนย์แสดงสินค้าและการประชุมอิมแพ็ค เมืองทองธานี ภายใต้ชื่อการประชุม “วิทยาศาสตร์และเทคโนโลยีเพื่อสังคมและเศรษฐกิจฐานความรู้” การประชุมวิชาการในครั้งนี้ 30 นั้นนอกจากจะให้นักวิทยาศาสตร์และนักเทคโนโลยีได้มีโอกาสเผยแพร่ผลงานและแลกเปลี่ยนประสบการณ์ระหว่างกันแล้ว ยังร่วมมือกับกระทรวงวิทยาศาสตร์และหน่วยงานอื่นที่เกี่ยวข้องร่วมจัดงานยิ่งใหญ่ เพื่อร่วมฉลองครบรอบ 200 ปี วันพระบรมราชสมภพพระบาทสมเด็จพระจอมเกล้าเจ้าอยู่หัว พระบิดาแห่งวิทยาศาสตร์ไทย จึงมีกิจกรรมที่ยิ่งใหญ่มากมาย สำหรับการประชุมวิชาการ วทท.30 มีกิจกรรมสำคัญที่ร่วมจัดในช่วงเวลาเดียวกันตั้งแต่วันที่ 19-21 ตุลาคม 2547 ได้แก่ การประชุมวิชาการด้านวิทยาศาสตร์และเทคโนโลยี การแสดงโครงงานวิทยาศาสตร์ของนักเรียน การแสดงนิทรรศการเครื่องมือวิทยาศาสตร์

ในการประชุม วทท.30 คณะกรรมการจัดการประชุมนอกจากจะได้เชิญนักวิทยาศาสตร์ดีเด่น นักเทคโนโลยีดีเด่น นักวิทยาศาสตร์และนักเทคโนโลยีรุ่นใหม่ตามที่ได้ปฏิบัติเป็นประจำทุกปีแล้ว ในปี 2547 ยังได้เชิญ Professor Douglas D. Osheroff นักวิทยาศาสตร์จาก Stanford University ผู้ซึ่งได้รับรางวัลโนเบลสาขาฟิสิกส์ ประจำปี 2539 ซึ่งจะมาบรรยายในหัวข้อเรื่อง “The Columbia Accident Investigation and Its Impact on the Future of Human Spaceflight” พร้อมกันนี้ได้เชิญ Professor Hwang Woo-Suk และ Professor Sung Keun-Kang นักวิทยาศาสตร์ที่มีชื่อเสียงจาก Seoul National University มาบรรยายในหัวข้อเรื่อง “Human Embryo Cloning” นอกจากนี้ยังได้จัดให้มีการบรรยายพิเศษในหัวต่าง ๆ จากนักวิทยาศาสตร์ที่มีชื่อเสียง สำหรับ วทท.30 นี้ได้แบ่งหมวดสาขาวิชาเป็น 12 สาขา และมีผลงานที่ผ่านการพิจารณาทั้งสิ้น 825 เรื่อง คณะกรรมการหวังว่านักวิชาการ นักอุตสาหกรรม และผู้ที่สนใจจะได้รับความรู้และแนวคิดที่เป็นประโยชน์จากนักวิทยาศาสตร์แนวหน้าเหล่านี้

สุดท้ายนี้ใคร่ขอขอบคุณผู้สนับสนุนการจัดงานในครั้งนี้ ได้แก่ สกว. มูลนิธิส่งเสริมวิทยาศาสตร์ฯ และบริษัทแลนด์มาร์เก็ตติ้งฯ บุคลากรของเจ้าภาพ มหาวิทยาลัยศรีนครินทรวิโรฒ กระทรวงวิทยาศาสตร์ฯ ตลอดจนคณะกรรมการฝ่ายต่างๆ และผู้ที่เกี่ยวข้องที่สนับสนุนทำให้งานครั้งนี้สำเร็จลงด้วยดี



(รองศาสตราจารย์ ดร. สุรินทร์ เหล่าสุขสถิตย์)
ภาควิชาเคมีอุตสาหกรรม คณะวิทยาศาสตร์ประยุกต์
สถาบันเทคโนโลยีพระจอมเกล้าพระนครเหนือ

19. อาจารย์วราภรณ์ วิทยานนท์ อนุกรรมการและเลขานุการ

คณะอนุกรรมการฝ่ายจัดเอกสารและดำเนินการประชุมวิชาการ

1. รองศาสตราจารย์อรุณย์ อินทธร	ประธานอนุกรรมการ
2. ผู้ช่วยศาสตราจารย์สุนันท์ ชัยชนะกุล	รองประธานอนุกรรมการ
3. ผู้ช่วยศาสตราจารย์สุภาพร ศรีบุรินทร์	อนุกรรมการ
4. ผู้ช่วยศาสตราจารย์นริศรา จุฑินรา	อนุกรรมการ
5. อาจารย์อภิญา ชัยวิสุทธิทางกูร	อนุกรรมการ
6. อาจารย์จินดา แท้มบรรจง	อนุกรรมการ
7. อาจารย์ปรีนทร์ ชัยวิสุทธิทางกูร	อนุกรรมการ
8. อาจารย์ศิริลักษณ์ เรืองรุ่งโรจน์	อนุกรรมการ
9. อาจารย์สุพจน์ มุศิริ	อนุกรรมการ
10. อาจารย์ฉัฐพงศ์ พินิจคำ	อนุกรรมการ
11. รองศาสตราจารย์สมใจ ศิริโชค	อนุกรรมการ
12. ผู้ช่วยศาสตราจารย์จินาญ โพธิ์เวชกุล	อนุกรรมการ
13. อาจารย์ประวิติ อังประภาพรชัย	อนุกรรมการ
14. ผู้ช่วยศาสตราจารย์รุ่งระพี กรานคำยี่	อนุกรรมการ
15. ผู้ช่วยศาสตราจารย์สุวณิจ พรหมสุทธีรักษ์	อนุกรรมการ
16. อาจารย์นงลักษณ์ สกฤตยานนท์วิทยา	อนุกรรมการ
17. ผู้ช่วยศาสตราจารย์พูนสุข รัตนภุมมะ	อนุกรรมการ
18. อาจารย์สุพิชชา สุพรรณสมบูรณ์	อนุกรรมการและเลขานุการ
19. นายเศรษฐวัฒน์ เพ็ญกระโทก	อนุกรรมการและผู้ช่วยเลขานุการ
20. นางสาววรรธน์ นกแก้ว	อนุกรรมการและผู้ช่วยเลขานุการ
21. นางสาวอาทิตล จันทรหอม	อนุกรรมการและผู้ช่วยเลขานุการ

คณะอนุกรรมการฝ่ายโปสเตอร์และวิเทศสัมพันธ์

1. อาจารย์นิรันดร์ พงษ์พันธุ์	ประธานอนุกรรมการ
2. รองศาสตราจารย์ไพศาล สิทธีกรกุล	อนุกรรมการ
3. รองศาสตราจารย์ณรงค์ ปิ่นนัม	อนุกรรมการ
4. รองศาสตราจารย์สุนิตย์ สุขสำราญ	อนุกรรมการ
5. รองศาสตราจารย์พนิตี รัตนานุกูล	อนุกรรมการ
6. รองศาสตราจารย์ธารรัตน์ สุกศิริ	อนุกรรมการ
7. รองศาสตราจารย์เสรีวัฒน์ สมินทร์ปัญญา	อนุกรรมการ
8. อาจารย์ละออ อัมพรพรรคี	อนุกรรมการ
9. อาจารย์อริญา มิ่งเมือง	อนุกรรมการ
10. อาจารย์อังคณา รังษิรุจิ	อนุกรรมการ
11. อาจารย์อมรมาศ กิตติสิน	อนุกรรมการ
12. อาจารย์วราภรณ์ แสนพลพัฒน์	อนุกรรมการ
13. อาจารย์ดวงมณี ลออรอดพงศ์	อนุกรรมการ
14. อาจารย์มะยุธิ์ ภูโน	อนุกรรมการ
15. อาจารย์ขจีพร วงศ์ปรีดี	อนุกรรมการ
16. นายบุญรอด ขาดิยานนท์	อนุกรรมการ
17. นายทองศักดิ์ จักบุประเสริฐ	อนุกรรมการ
18. นายเสริมสุข รัตเร่ง	อนุกรรมการ

19. นายชุมพร เทียมจันทร์

20. นายเอกพล อุดมกิจพัฒน์

21. อาจารย์ธีรยุทธ ลีพรเจริญวงศ์

อนุกรรมการ

อนุกรรมการ

อนุกรรมการและเลขานุการ

คณะอนุกรรมการฝ่ายโสตทัศนูปกรณ์

1. หัวหน้าภาควิชาฟิสิกส์	ประธานอนุกรรมการ
2. ผู้ช่วยศาสตราจารย์ปัญญา ศิลปสกุลสุข	อนุกรรมการ
3. ผู้ช่วยศาสตราจารย์ปรีดา เพชรศรี	อนุกรรมการ
4. ผู้ช่วยศาสตราจารย์ปราโมทย์ ฉลุกลี	อนุกรรมการ
5. ผู้ช่วยศาสตราจารย์นรมล ปิตะนิละผิน	อนุกรรมการ
6. ผู้ช่วยศาสตราจารย์ศิริกุล รัตนธรรมพันธ์	อนุกรรมการ
7. ผู้ช่วยศาสตราจารย์ถนอมสิน คีตภาพร	อนุกรรมการ
8. อาจารย์จักรชัย ถัสานนท์	อนุกรรมการ
9. อาจารย์สมศักดิ์ มณีรัตนกุล	อนุกรรมการ
10. อาจารย์พงษ์แก้ว อุดมสมุทรศิริ	อนุกรรมการ
11. อาจารย์วิบูลย์ สุบรรณ	อนุกรรมการ
12. นายอรรถ อัฐเมือง	อนุกรรมการ
13. นายธัญนพ นิลกำจร	อนุกรรมการ
14. นายเสริมสุข รัตเร่ง	อนุกรรมการ
15. นายวิวัฒน์ เครือวงศ์	อนุกรรมการ
16. นายโกวิท ผดุงกิจ	อนุกรรมการ
17. นายปริญญ์ เจาะล้ำลึก	อนุกรรมการ

คณะอนุกรรมการฝ่ายหารายได้

1. ผู้ช่วยศาสตราจารย์สันติ เรืองมณีไพฑูรย์	ประธานอนุกรรมการ
2. หัวหน้าภาควิชาเคมี	รองประธานอนุกรรมการ
3. หัวหน้าภาควิชาคหกรรมศาสตร์	อนุกรรมการ
4. หัวหน้าภาควิชาคณิตศาสตร์	อนุกรรมการ
5. หัวหน้าภาควิชาชีววิทยา	อนุกรรมการ
6. หัวหน้าภาควิชาฟิสิกส์	อนุกรรมการ
7. หัวหน้าภาควิชาวิทยาศาสตร์ทั่วไป	อนุกรรมการ
8. ผู้ช่วยศาสตราจารย์สุณี รักษาเกียรติศักดิ์	อนุกรรมการ
9. นางสาวเกศณี ขยาวิพัฒน์วงศ์	อนุกรรมการ
10. นางสาวชญัญภักดิ์ แผ่นคำ	อนุกรรมการ
11. นางสาวกัญญา พลศักดิ์	อนุกรรมการ
12. นางสาววาริชนันท์ เหมันท์	อนุกรรมการ

คณะอนุกรรมการฝ่ายการเงิน

1. นางสาวเกศณี ขยาวิพัฒน์วงศ์	ประธานอนุกรรมการ
2. นางสาวอัญชลีรัตน์ บุญจินาภูมิกุล	อนุกรรมการ
3. นางวริณี จันทานนท์	อนุกรรมการ
4. นางธนัญญา เต็มวงศ์ ๗ อุษยา	อนุกรรมการ
5. นางวัลย์ลิกา สวัสดิ์นฤเดช	อนุกรรมการ

6. นางสุพิชชา ฤกษ์หิรัญโชติ	อนุกรรมการ
7. นางสาวขวัญญ์ณกัณณ์ แผ่นคำ	อนุกรรมการ
8. นางสาวกษิษา พลศักดิ์	อนุกรรมการ
9. นางสาววาริชนันท์ เหมันภัย	อนุกรรมการ
10. นางสาวเนียง พุกกลิ่น	อนุกรรมการ
11. นางสาวจุฑารัตน์ กิตติขมากร	อนุกรรมการ
12. นางจิรวรรณ ทศศิริวัฒน์	เลขานุการ

คณะอนุกรรมการฝ่ายสวัสดิการ

1. อาจารย์พนอ อัครจวนนท์	ประธานอนุกรรมการ
2. อาจารย์อมรมาศ กิริติสิน	อนุกรรมการ
3. อาจารย์เอนก จันทรวงุญ	อนุกรรมการ
4. อาจารย์สวน ปฎิเวธวิฑูร	อนุกรรมการ
5. นายลิขิต ขาวงาม	อนุกรรมการ
6. นายสังคม อุดสัย	อนุกรรมการ
7. นายสมพล วิเศษ	อนุกรรมการ
8. นางสาวจันทร์จิรา อินทนาคม	อนุกรรมการ
9. นางสาวสมพร ตียะศรี	อนุกรรมการ

คณะอนุกรรมการฝ่ายต้อนรับและประสานนิสิต

1. อาจารย์ภัททิยา ไชยสุข	ประธานอนุกรรมการ
2. อาจารย์สมปรารถนา วงศ์บุญหนัก	อนุกรรมการ
3. รองศาสตราจารย์สุภาพร ทุกสีเหลือง	อนุกรรมการ
4. ผู้ช่วยศาสตราจารย์รัตนา สัมพันธ์จิต	อนุกรรมการ
5. รองศาสตราจารย์จริยา สีนเคิมสุข	อนุกรรมการ
6. อาจารย์อณัญญา ไตรบำรุงสุข	อนุกรรมการ
7. รองศาสตราจารย์ภาณี วัฒนโอหาร	อนุกรรมการ
8. อาจารย์อาทิตย์ ลิ้มพงษา	อนุกรรมการ
9. อาจารย์เอนก จันทรวงุญ	อนุกรรมการ
10. อาจารย์จิรา ถ้าวานหอม	อนุกรรมการ
11. อาจารย์แพน ทองเรือง	อนุกรรมการ
12. อาจารย์สุกัญญา วงษ์ศรีรักษา	อนุกรรมการ
13. อาจารย์อภิศักดิ์ ตั้งปนิชานติ	อนุกรรมการ
14. อาจารย์รุ่งฟ้า จันทร์จรรย์	อนุกรรมการ
15. นางสาวบรรจง พันธุ์ท่วง	อนุกรรมการ
16. นางชลลดา สารทสมัย	อนุกรรมการ
17. นายไชยเชษฐ์ เกตุโชติ	อนุกรรมการ
18. นายวิรัช วงศ์ภักดี	อนุกรรมการ
19. นางสุจิตรา พรหมประสิทธิ์	อนุกรรมการ
20. นางสาวจันทร์แรม เปตังสาร	อนุกรรมการ
21. นางสุพิน เงินสูงเนิน	อนุกรรมการ
22. นายทศสิน กสิกรรม	อนุกรรมการ
23. อาจารย์อานันท์ กองทิพย์	อนุกรรมการและเลขานุการ

คณะอนุกรรมการฝ่ายจัดเลี้ยงและพิธีการ

1. ผู้ช่วยศาสตราจารย์รัชณี ลาขโรจน์	ทำพิธีการ
2. รองศาสตราจารย์มณฑา โกสง	ประธานอนุกรรมการ
3. รองศาสตราจารย์จิระพี ขาวลาวัณย์	อนุกรรมการ
4. รองศาสตราจารย์เรณู ศรีสำราญ	อนุกรรมการ
5. รองศาสตราจารย์ทรรศนียา ศักดิ์ดี	อนุกรรมการ
6. ผู้ช่วยศาสตราจารย์ทศณัฏฐา ภู่อารีย์	อนุกรรมการ
7. อาจารย์สุภาลักษณ์ โกสงกุล	อนุกรรมการ
8. อาจารย์อุบลรัตน์ ศิลาพวง	อนุกรรมการ
9. อาจารย์อรุณา เชาวณลิขิต	อนุกรรมการ
10. อาจารย์สมชาย สุริยะศิริบุตร	อนุกรรมการ
11. อาจารย์เสาวภาภย์ วัฒนพานุ	อนุกรรมการ
12. นายธีระวัฒน์ กันลิ้ว	อนุกรรมการ
13. นายสุริย เกิดสินธุ์	อนุกรรมการ
14. นายขยพุทศ ศักดิ์ประชากรานนท์	อนุกรรมการ
15. นางบุญเรือง แควไทย	อนุกรรมการ
16. อาจารย์อัสพร นิธิรัตน์	อนุกรรมการและเลขานุการ
17. อาจารย์ศรีวิวัฒน์ คำภูมุนโพธิ์	อนุกรรมการและผู้ช่วยเลขานุการ

คณะอนุกรรมการฝ่ายประสานงานกลาง

1. อาจารย์ศิริลักษณ์ เรืองรุ่งโรจน์	ประธานอนุกรรมการ
2. อาจารย์ณัฐพงศ์ หิณห์คำ	อนุกรรมการ
3. อาจารย์อาทิตย์ ลิ้มพงษา	อนุกรรมการ
4. อาจารย์ณัฏฐ์ จินตไธสง	อนุกรรมการ
5. อาจารย์ชัยพร วงศ์วิโรจน์	อนุกรรมการ
6. อาจารย์รุ่งฟ้า จันทร์จรรย์	อนุกรรมการ
7. อาจารย์จามรี อมรโกศลพันธ์	อนุกรรมการ
8. นางสาวชนนรรณ ใสมน้อย	อนุกรรมการ
9. นายสมนึก กสิกรรม	อนุกรรมการ

คณะอนุกรรมการฝ่ายประเมินผล

1. หัวหน้าภาควิชาวิทยาศาสตร์ทั่วไป	ประธานอนุกรรมการ
2. อาจารย์สมปรารถนา วงศ์บุญหนัก	อนุกรรมการ
3. อาจารย์ณัฏฐ์ จินตไธสง	อนุกรรมการ
4. ผู้ช่วยศาสตราจารย์วิระพงศ์ เกียรติสุนทร	อนุกรรมการ
5. รองศาสตราจารย์ศรีวิทย์ม จักรใจ	อนุกรรมการ
6. อาจารย์สุภาลักษณ์ พงษ์สุธรรม	อนุกรรมการ
7. ผู้ช่วยศาสตราจารย์วรวรรณ รามสันติกุล	อนุกรรมการ
8. อาจารย์สมชาย สุริยะศิริบุตร	อนุกรรมการ
9. อาจารย์พนอ อัครจวนนท์	อนุกรรมการ
10. ผู้ช่วยศาสตราจารย์นิรมล ปิยะนิละผิน	อนุกรรมการ
11. อาจารย์สุกัญญา วงษ์ศรีรักษา	อนุกรรมการและเลขานุการ

คณะกรรมการฝ่ายเลขานุการ

1. รองศาสตราจารย์ ดร. สุรินทร์ เหล่าสุขสถิตย์ ประธานกรรมการ
2. Dr. Elvin James Moore รองประธานกรรมการ
3. รองศาสตราจารย์ อรุณีย์ อินทพร รองประธานกรรมการ
4. ศาสตราจารย์ ดร. ละออศรี เสนาะเมือง กรรมการ
5. รองศาสตราจารย์ ดร. งามผ่อง คงคาทิพย์ กรรมการ
6. รองศาสตราจารย์ ดร. ชารัตน์ ศุภศิริ กรรมการ
7. รองศาสตราจารย์ ดร. เกตุ กรุดพันธ์ กรรมการ
8. รองศาสตราจารย์ ดร. ณสรวรค์ ผลโลก กรรมการ
9. รองศาสตราจารย์ ดร. นิสันต์ สัตยาชัย กรรมการ
10. รองศาสตราจารย์ ดร. ปราณี ภิญโญชีพ กรรมการ
11. ผู้ช่วยศาสตราจารย์ ดร. สมชาย นาคะผดุงรัตน์ กรรมการ
12. ผู้ช่วยศาสตราจารย์ ดร. กิตติ โพธิ์ไพฑูริย์ กรรมการ
13. ผู้ช่วยศาสตราจารย์ ดร. สมโภชน์ น้อยจิรา กรรมการ
14. ผู้ช่วยศาสตราจารย์ ดร. พิชญ์ พุกผล กรรมการ
15. อาจารย์ ดร. ประวิตร จันทราภาพ กรรมการ
16. อาจารย์ ดร. มโหสถ ปิ่นโกษา กรรมการ
17. อาจารย์ ดร. สุกิจ ลิมปิจำนงค์ กรรมการ
18. อาจารย์ นิรันดร์ พงษ์พันธุ์ กรรมการ
19. อาจารย์ จารุวรรณ ตาหวัดน์ กรรมการ
20. อาจารย์ สาโรช เมลาณนท์ กรรมการ
21. อาจารย์ ดร. พัฒนพงษ์ อ่ำพันธุ์ กรรมการและเลขานุการ
22. อาจารย์ ดร. สุภาภรณ์ ชัยวิทย์ กรรมการและผู้ช่วยเลขานุการ

คณะกรรมการฝ่ายวิชาการ

1. รศ. ดร. สุรินทร์ เหล่าสุขสถิตย์
2. ศ. ดร. ถิรพัฒน์ วิลัยทอง
3. ศ. ดร. ประนอม จันทโรทัย
4. ศ. ดร. พรสวรรค์ วิสุทธิวิเศษ
5. ศ. ดร. ละออศรี เสนาะเมือง
6. ศ. ดร. สายชล เกตุษา
7. ศ. ดร. สุทัศน์ ยกส้าน
8. Professor Dr. I-Ming Tang
9. รศ. ดร. เกตุ กรุดพันธ์
10. รศ. ดร. งามผ่อง คงคาทิพย์
11. รศ. ดร. จำรัส ลิ้มตระกูล
12. รศ. ดร. ชุตินา หาญจวนิช
13. รศ. ดร. ณรงค์ ปิ่นนัม
14. รศ. ดร. ณสรวรค์ ผลโลก
15. รศ. ดร. คีวง พุทธกร
16. รศ. ดร. ธนวัฒน์ จารุพงษ์สกุล

17. รศ. ดร. ชารัตน์ ศุภศิริ
18. รศ. ดร. นवलพรรณ จันทศิริ
19. รศ. ดร. นิสันต์ สัตยาชัย
20. รศ. ดร. บุญส่ง คงคาทิพย์
21. รศ. ดร. ปทุมรัตน์ ตู้จินดา
22. รศ. ดร. ประเสริฐ ภาวสันต์
23. รศ. ดร. ปราณี ภิญโญชีพ
24. รศ. ดร. เปี่ยมสุข พงษ์สวัสดิ์
25. รศ. ดร. พรทิพย์ ชัยมณี
26. รศ. ดร. พงษ์รัตน์ ยวงนิชัย
27. รศ. ดร. พิเชษฐ ลัมสุวรรณ
28. รศ. ดร. พินิติ รตะนานุกูล
29. รศ. ดร. เพรศพิชญ์ คณาธารณา
30. รศ. ดร. ไพศาล สิทธิกรกุล
31. รศ. ดร. ภควดี สุทธิไวยกิจ
32. รศ. ดร. ยุติ เชี่ยววัฒนา
33. รศ. ดร. รศนา วงศ์รัตนชีวิน
34. รศ. ดร. รัชนิกร กัลลภ์ประวิทย์
35. รศ. ดร. ฤดี สุราฤทธิ์
36. รศ. ดร. วรุณี จุฬาลักษณ์านุกูล
37. รศ. ดร. วัชรินทร์ รุทขัยศิริกุล
38. รศ. ดร. วิจิตรา ทัศนียกุล
39. รศ. ดร. วิโรจน์ บุญอำนวยวิทยา
40. รศ. ดร. วิสุทธิ พิสุทธิอรานนท์
41. รศ. ดร. ศุภลักษณ์ ศรีจรรย์
42. รศ. ดร. สมยศ สุทธิไวยกิจ
43. รศ. ดร. ศิริพร สิทธิประณีต
44. รศ. ดร. สุทธิชัย อัสสะบำรุงรัตน์
45. รศ. ดร. สุนันทา รัตนโก
46. รศ. ดร. สุนันทา เองรัมย์
47. รศ. ดร. สุนิตย์ สุขสำราญ
48. รศ. ดร. สุศักดิ์ วงศ์รัตนชีวิน
49. รศ. ดร. สุวบุญ จิระชาญชัย
50. รศ. ดร. เสรีวัฒน์ สมินทร์ปัญญา
51. รศ. ดร. เสาวภา อังสุภาณิช
52. รศ. ดร. โสพิศ วงศ์คำ
53. รศ. ดร. อัญชลี ทัศนากจร

คณะกรรมการฝ่ายเลขานุการ

1. รองศาสตราจารย์ ดร. สุรินทร์ เหล่าสุขสถิตย์ ประธานกรรมการ
2. Dr. Elvin James Moore รองประธานกรรมการ
3. รองศาสตราจารย์ อรุณย์ อินทพร รองประธานกรรมการ
4. ศาสตราจารย์ ดร. ละออศรี เสนาะเมือง กรรมการ
5. รองศาสตราจารย์ ดร. งามผ่อง คงคาทิพย์ กรรมการ
6. รองศาสตราจารย์ ดร. ชารัตน์ ศุกศิริ กรรมการ
7. รองศาสตราจารย์ ดร. เกตุ กฤตพันธ์ กรรมการ
8. รองศาสตราจารย์ ดร. ฌสรวรค์ ผลโกศ กรรมการ
9. รองศาสตราจารย์ ดร. นิสันต์ สัตยาชัย กรรมการ
10. รองศาสตราจารย์ ดร. ปราณี ภิญโญชีพ กรรมการ
11. ผู้ช่วยศาสตราจารย์ ดร. สมชาย นาคะผดุงรัตน์ กรรมการ
12. ผู้ช่วยศาสตราจารย์ ดร. กิตติ โพธิ์ปัทมะ กรรมการ
13. ผู้ช่วยศาสตราจารย์ ดร. สมโภชน์ น้อยจิตา กรรมการ
14. ผู้ช่วยศาสตราจารย์ ดร. พิชญ์ ศุภผล กรรมการ
15. อาจารย์ ดร. ประวิตร จันทวานุกาฬ กรรมการ
16. อาจารย์ ดร. มโหสถ ปิ่นโกษา กรรมการ
17. อาจารย์ ดร. สุกิจ ลิ้มปิฉานงค์ กรรมการ
18. อาจารย์ นิรันดร์ พงษ์พันธุ์ กรรมการ
19. อาจารย์ จารุวรรณ คาฬวัฒน์ กรรมการ
20. อาจารย์ สาโรช เมลาณนท์ กรรมการ
21. อาจารย์ ดร. พัฒนพงษ์ อ่ำพันธุ์ กรรมการและเลขานุการ
22. อาจารย์ ดร. ศุภบัณฑิต ยังวิสัย กรรมการและผู้ช่วยเลขานุการ

คณะกรรมการฝ่ายวิชาการ

1. รศ. ดร. สุรินทร์ เหล่าสุขสถิตย์
2. ศ. ดร. ธีรพัฒน์ วิสัยทอง
3. ศ. ดร. ประนอม จันทโรทัย
4. ศ. ดร. พรสวรรค์ วิสุทธิวิเศษ
5. ศ. ดร. ละออศรี เสนาะเมือง
6. ศ. ดร. สายชล เกตุษา
7. ศ. ดร. สุทัศน์ ยกส้าน
8. Professor Dr. I-Ming Tang
9. รศ. ดร. เกตุ กฤตพันธ์
10. รศ. ดร. งามผ่อง คงคาทิพย์
11. รศ. ดร. จำรัส ลิ้มตระกูล
12. รศ. ดร. ชุติมา หาญจวนิช
13. รศ. ดร. ฌรรงค์ ปิ่นน้อม
14. รศ. ดร. ฌสรวรค์ ผลโกศ
15. รศ. ดร. ศังว พุทธสุกร
16. รศ. ดร. ธนวัฒน์ จารุพงษ์สกุล

17. รศ. ดร. ชารัตน์ ศุกศิริ
18. รศ. ดร. นवलพรรณ จันทศิริ
19. รศ. ดร. นิสันต์ สัตยาชัย
20. รศ. ดร. บุญส่ง คงคาทิพย์
21. รศ. ดร. ปทุมรัตน์ ตู้จินดา
22. รศ. ดร. ประเสริฐ ภาสันต์
23. รศ. ดร. ปราณี ภิญโญชีพ
24. รศ. ดร. เปี่ยมสุข พงษ์สวัสดิ์
25. รศ. ดร. พรทิพย์ ชัยมณี
26. รศ. ดร. พงษ์รัตน์ ยวงนิษฐ์
27. รศ. ดร. พิเชษฐ ลิ้มสุวรรณ
28. รศ. ดร. พินิติ รตะนาบุญ
29. รศ. ดร. เพรศพิชญ์ คณาธารณา
30. รศ. ดร. ไพศาล สิทธิกรกุล
31. รศ. ดร. ภควดี สุทธิไวยกิจ
32. รศ. ดร. บุตรี เขียววัฒนา
33. รศ. ดร. รศนา วงศ์รัตนชีวิน
34. รศ. ดร. รัชนิกร กัลลประวิทย์
35. รศ. ดร. ฤดี สุราฤทธิ์
36. รศ. ดร. วรภูมิ จุฬาลักษณ์านุกูล
37. รศ. ดร. วัชรินทร์ รุกชไชยศิริกุล
38. รศ. ดร. วิจิตรา ทศนียกุล
39. รศ. ดร. วิโรจน์ บุญอำนวยวิทยา
40. รศ. ดร. วิสุทธิ พิสุทธิอนนท์
41. รศ. ดร. ศุภลักษณ์ ศรีจรรย์
42. รศ. ดร. สมยศ สุทธิไวยกิจ
43. รศ. ดร. ศิริพร สิทธิประณีต
44. รศ. ดร. สุทธิชัย อัสสะบำรุงรัตน์
45. รศ. ดร. สุนันทา รัตนาก
46. รศ. ดร. สุนันทา เสงี่ยม
47. รศ. ดร. สุนิตย์ สุขสำราญ
48. รศ. ดร. สุศักดิ์ วงศ์รัตนชีวิน
49. รศ. ดร. สุวบุญ จิราญชัย
50. รศ. ดร. เสรีวัฒน์ สนิมพันธ์ปัญญา
51. รศ. ดร. เสาวภา อังสุพานิช
52. รศ. ดร. ไสพิศ วงศ์ดำ
53. รศ. ดร. อัญชลี ทศนาจอ

คณะกรรมการฝ่ายเลขานุการ

1. รองศาสตราจารย์ ดร. สุรินทร์ เหล่าสุขสถิตย์ ประธานกรรมการ
2. Dr. Elvin James Moore รองประธานกรรมการ
3. รองศาสตราจารย์ อรุณีย์ อินทพร รองประธานกรรมการ
4. ศาสตราจารย์ ดร. ละออศรี เสนาะเมือง กรรมการ
5. รองศาสตราจารย์ ดร. งามผ่อง คงคาพิภย์ กรรมการ
6. รองศาสตราจารย์ ดร. ชารัตน์ ศุภศิริ กรรมการ
7. รองศาสตราจารย์ ดร. เกตุ กรุดพันธ์ กรรมการ
8. รองศาสตราจารย์ ดร. ณสรณ์ ผลโลก กรรมการ
9. รองศาสตราจารย์ ดร. นิรันดร์ สัตยาชัย กรรมการ
10. รองศาสตราจารย์ ดร. ปราณี ภิญโญชีพ กรรมการ
11. ผู้ช่วยศาสตราจารย์ ดร. สมชาย นาคะผดุงรัตน์ กรรมการ
12. ผู้ช่วยศาสตราจารย์ ดร. กิตติ โพธิ์ไพฑูริ์ กรรมการ
13. ผู้ช่วยศาสตราจารย์ ดร. สมโภชน์ น้อยจิตา กรรมการ
14. ผู้ช่วยศาสตราจารย์ ดร. พิชญ์ ศุภผล กรรมการ
15. อาจารย์ ดร. ประวิตร จันทรานุกาฬ กรรมการ
16. อาจารย์ ดร. มโหสถ ปิ่นโกษา กรรมการ
17. อาจารย์ ดร. สุกิจ ลิ้มปิ๋จันท์ กรรมการ
18. อาจารย์ นิรันดร์ พงษ์พันธุ์ กรรมการ
19. อาจารย์ จารุวรรณ ตาพวัฒน์ กรรมการ
20. อาจารย์ สาโรช เมลาณนท์ กรรมการ
21. อาจารย์ ดร. พัฒนพงษ์ อ่ำพันธุ์ กรรมการและเลขานุการ
22. อาจารย์ ดร. ศุภวัฒน์ อดังวิสัย กรรมการและผู้ช่วยเลขานุการ

คณะกรรมการฝ่ายวิชาการ

1. รศ. ดร. สุรินทร์ เหล่าสุขสถิตย์
2. ศ. ดร. ถิรพัฒน์ วิลัยทอง
3. ศ. ดร. ประนอม จันทโรทัย
4. ศ. ดร. พรสวรรค์ วิสุทธิวิเศษ
5. ศ. ดร. ละออศรี เสนาะเมือง
6. ศ. ดร. สายชล เกตุษา
7. ศ. ดร. สุทัศน์ ยกส้าน
8. Professor Dr. I-Ming Tang
9. รศ. ดร. เกตุ กรุดพันธ์
10. รศ. ดร. งามผ่อง คงคาพิภย์
11. รศ. ดร. จำรัส ลิ้มตระกูล
12. รศ. ดร. ชุตินา หาญจวนิช
13. รศ. ดร. ณรงค์ ปิ่นนัม
14. รศ. ดร. ณสรณ์ ผลโลก
15. รศ. ดร. ดำรง พุทธศุภ
16. รศ. ดร. ธนวัฒน์ จารุพงษ์สกุล

17. รศ. ดร. ชารัตน์ ศุภศิริ
18. รศ. ดร. นวลพรรณ จันทศิริ
19. รศ. ดร. นิรันดร์ สัตยาชัย
20. รศ. ดร. บุญส่ง คงคาพิภย์
21. รศ. ดร. ปทุมรัตน์ ตูจินดา
22. รศ. ดร. ประเสริฐ ภวสันต์
23. รศ. ดร. ปราณี ภิญโญชีพ
24. รศ. ดร. เปี่ยมสุข พงษ์สวัสดิ์
25. รศ. ดร. พรทิพย์ ชัยมณี
26. รศ. ดร. พงษ์รัตน์ ยวงนิชัย
27. รศ. ดร. พิเชษฐ ลิ้มสุวรรณ
28. รศ. ดร. พินิติ ระตะนานุกุล
29. รศ. ดร. เพรศพิชญ์ คณาธารณา
30. รศ. ดร. ไพศาล สิทธิกรกุล
31. รศ. ดร. ภกวดิ์ สุทธิไวยกิจ
32. รศ. ดร. บุวดี เขียววัฒนา
33. รศ. ดร. รศนา วงศ์รัตนชีวิน
34. รศ. ดร. รัชนิกร กัลล์ประวิทย์
35. รศ. ดร. ฤดี สุราฤทธิ
36. รศ. ดร. วรวิมล จุฬาลักษณ์านุกุล
37. รศ. ดร. วชิรินทร์ รุขไชยศิริกุล
38. รศ. ดร. วิจิตร ทัศนียกุล
39. รศ. ดร. วิโรจน์ บุญอำนวยการ
40. รศ. ดร. วิสุทธิ พิสุทธิอานนท์
41. รศ. ดร. ศุภลักษณ์ ศรีจรรย์
42. รศ. ดร. สมยศ สุทธิไวยกิจ
43. รศ. ดร. ศิริพร สิทธิประณีต
44. รศ. ดร. สุทธิชัย อัสสะบำรุงรัตน์
45. รศ. ดร. สุนันทา รัตนโก
46. รศ. ดร. สุนันทา เสงี่ยม
47. รศ. ดร. สุนิตย์ สุขสำราญ
48. รศ. ดร. สุรศักดิ์ วงศ์รัตนชีวิน
49. รศ. ดร. สุวบุญ จิราญชัย
50. รศ. ดร. เสรีวัฒน์ สมินทร์ปัญญา
51. รศ. ดร. เสาวภา อังสุภาณิ
52. รศ. ดร. โสพิศ วงศ์คำ
53. รศ. ดร. อัญชลี ทัศนากจร

54. รศ. ดร. อธิพิณ แจ่มชัด
55. รศ. ดร. เอมอร เบญจวงศ์กุลชัย
56. Assoc. Prof. Yupeng Yan
57. รศ. บุญยืน กิจวิจารณ์
58. รศ. สุวดี จันทร์กระจำ
59. รศ. อรุณีย์ อินทรศร
60. ผศ. ดร. กัมปนาท ภักดีกุล
61. ผศ. ดร. กิตติ โพธิ์ปัทม
62. ผศ. ดร. ชันทอง สุนทรภา
63. ผศ. ดร. นัทรชนก กระลาสัย
64. ผศ. ดร. ณรงค์ ผังวิวัฒน์
65. ผศ. ดร. ดวงใจ นาคะปรีชา
66. ผศ. ดร. ดวงพร สุทธิพงษ์ชัย
67. ผศ. ดร. ธรรมรัตน์ อารีย์
68. ผศ. ดร. ธวัชชัย ดันจุลानी
69. ผศ. ดร. ชีรยุทธ วิลาลัย
70. ผศ. ดร. นฤมล แสงประดับ
71. ผศ. ดร. นุรัชต์ สันทยานนท์
72. ผศ. ดร. ประวิทย์ สุกแก้ว
73. ผศ. ดร. ปิตินันท์ ดันติโชค
74. ผศ. ดร. พิชญ์ สุขผล
75. ผศ. ดร. พิสิษฐ์ ประพันธ์วัฒนะ
76. ผศ. ดร. มงคล สุขวัฒนาสินธิ์
77. ผศ. ดร. รัตนา รุจิรวนิช
78. ผศ. ดร. วราวุฒิ ตั้งพสุธาคล
79. ผศ. ดร. วิทยา อมรกิจบำรุง
80. ผศ. ดร. วิภาวี ไชยวัน
81. ผศ. ดร. ศุภจิตรา ชัชวาลย์
82. ผศ. ดร. สมชาย นาคะผดุงรัตน์
83. ผศ. ดร. สมเดช กนกเมธากุล
84. ผศ. ดร. สมโภชน์ น้อยจินดา
85. ผศ. ดร. สวัสดิ์ วัฒนไพศาล
86. ผศ. ดร. สิทธิวัฒน์ เลิศศิริ
87. ผศ. ดร. สุกฤษ์ ดันตราวงศ์
88. ผศ. ดร. สุพร นุชคำรงค์
89. ผศ. ดร. สุภา หารหนองบัว
90. ผศ. ดร. อรรพรรณ ชัยลภากุล
91. ผศ. ดร. อรสา ปานเจริญ
92. ผศ. ดร. อุดมศิลป์ ปันสุข
93. ผศ. ศิริพร ดาวพิเศษ
94. ผศ. อัจฉนา วงศ์ชัยสุวรรณ
95. ผศ. อังฉรา ศิริมังคะลา
96. อ. ดร. กันยารัตน์ สุไพบุลย์วัฒน
97. อ. ดร. จรูญ จักรมณี
98. อ. ดร. ณัฐพงศ์ พินิจคำ
99. อ. ดร. เทียนทอง ทองพันธ์
100. อ. ดร. ธนะชัย พันธุ์เกษมสุข
101. อ. ดร. ชีรยุทธ ลีพรเจริญวงศ์
102. อ. ดร. นฤมล เผือกขาว
103. อ. ดร. ประวิตร จันทราภาพ
104. อ. ดร. ปรีณทร์ ชัยวิสุทธิทางกุล
105. อ. ดร. พรหมมาศ คูหากาญจน์
106. อ. ดร. พัฒนพงษ์ อำพันธุ์
107. อ. ดร. เพ็ญศรี บุญสวรรค์ส่ง
108. อ. ดร. มโหสถ ปันโกษา
109. อ. ดร. ยุทธนา ดันติรุ่งโรจน์ชัย
110. อ. ดร. รัฐ พิษณุางกูร
111. อ. ดร. วรศ วีระสัย
112. อ. ดร. ศุภบัณฑิต ชัยวิลัย
113. อ. ดร. สมชัย ลาภอนันต์คณกุล
114. อ. ดร. สาโรช รุจิวรรณ
115. อ. ดร. สุกิจ ลิมปิจำนงค์
116. อ. ดร. สุจินต์ อังกราวีรุทธิ์
117. อ. ดร. อรพันธ์ เขียวถาวร
118. อ. ดร. เอกสิทธิ์ สมสุข
119. อ. ดร. นันทิกา เบญจเทพานันท์
120. Dr. Elvin Jame Moore
121. Dr. Gareth Clayton
122. ดร. ปราณี เลิศสุทธีวงศ์
123. ดร. พูนศักดิ์ พลอยประดิษฐ์
124. ดร. ภาวดี เมธะคานนท์
125. ดร. ฐิติภา ทองพล
126. ดร. สิทธิสุนทร สุโพธิณะ
127. อ. จารุวรรณ ตาพวัฒน์
128. อ. นิรันดร์ พงษ์พันธุ์

สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

ประวัติการประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย

HISTORY OF THE CONGRESS ON SCIENCE AND TECHNOLOGY OF THAILAND

ครั้งที่ ปี / วันที่ เดือน	ชื่อการประชุม	สถาบันเจ้าภาพร่วม	ประธาน (จำนวนผลงานวิจัย)
1. พ.ศ. 2514 26-27 พฤศจิกายน	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2514	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	ศ.ดร.ประชุมสุข อาชาวำรุง (83 เรื่อง)
2. พ.ศ. 2516 30 พฤศจิกายน-2 ธันวาคม	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2516	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	ศ.ดร.ประชุมสุข อาชาวำรุง (219 เรื่อง)
3. พ.ศ. 2518 12-13 ธันวาคม	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2518	คณะวิทยาศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยมหิดล	ศ.ดร.กำจร มนูญปัจจุ (249 เรื่อง)
4. พ.ศ. 2520 16-17 ธันวาคม	การวิจัยทางวิทยาศาสตร์ กรุงเทพฯ 2520	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	รศ.ดร.กำจัด มงคลกุล (344 เรื่อง)
5. พ.ศ. 2521 22-24 ธันวาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาภาคเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	ศ.ดร.พรชัย มาตังคสมบัติ (232 เรื่อง)
6. พ.ศ. 2522 21-23 ธันวาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ บางแสน	ศ.ดร.พรชัย มาตังคสมบัติ (232 เรื่อง)
7. พ.ศ. 2523 4-6 ธันวาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยมหิดล	รศ.ดร.นัยพิจิต คชภักดี (233 เรื่อง)
8. พ.ศ. 2525 28-30 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	รศ.ดร.สัมฤทธิ์ พงษ์ขกุล (245 เรื่อง)
9. พ.ศ. 2526 27-29 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการ พัฒนาภาคตะวันออกเฉียงเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น	รศ.ดร.สัมฤทธิ์ พงษ์ขกุล (174 เรื่อง)
10. พ.ศ. 2527 25-27 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี แห่งประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	ศ.ดร.มนตรี จุฬาวินทล (280 เรื่อง)
11. พ.ศ. 2528 24-26 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี แห่ง ประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยเกษตรศาสตร์	ศ.ดร.มนตรี จุฬาวินทล (251 เรื่อง)
12. พ.ศ. 2529 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี แห่ง ประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ ประสานมิตร	รศ.ดร.กัญญา โพนิชพันธ์ (277 เรื่อง)
13. พ.ศ. 2530 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี แห่ง ประเทศไทย	คณะวิทยาศาสตร์ มหาวิทยาลัยสงขล นครินทร์ วิทยาเขตหาดใหญ่	รศ.ดร.กัญญา โพนิชพันธ์ (420 เรื่อง)
14. พ.ศ. 2531 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี แห่ง ประเทศไทย	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย	ศ.ดร.จริยา บรอกเคลแมน (259 เรื่อง)
15. พ.ศ. 2532 18-20 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการ พัฒนาทรัพยากรภาคเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่	ศ.ดร.จริยา บรอกเคลแมน (394 เรื่อง)
16. พ.ศ. 2533 25-27 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ สถาบันเทคโนโลยีพระ จอมเกล้า เจ้าคุณทหารลาดกระบัง	ศ.ดร.วิชัย ธีวระกุล (369 เรื่อง)
17. พ.ศ. 2534 24-26 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการ พัฒนาทรัพยากรภาคเหนือ	คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น	ศ.ดร.วิชัย ธีวระกุล (349 เรื่อง)
18. พ.ศ. 2535 27-29 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการพัฒนาประเทศ	คณะวิทยาศาสตร์ มหาวิทยาลัยเกษตร- ศาสตร์ ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	ศ.ดร.สุชาติ อุปลัมภ์ (297 เรื่อง)
19. พ.ศ. 2536 27-29 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อการ พัฒนาชายฝั่ง	คณะวิทยาศาสตร์ มหาวิทยาลัยสงขล นครินทร์ ณ โรงแรมดุสิต เอ.บี.หาดใหญ่	ศ.ดร.สุชาติ อุปลัมภ์ (438 เรื่อง)

20. พ.ศ. 2537 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อการ พัฒนาเศรษฐกิจ สังคม และสิ่งแวดล้อม	คณะวิทยาศาสตร์และเทคโนโลยี มหาวิทยาลัยธรรมศาสตร์ ณ เซ็นทรัลพลาซา	ศ.ดร.สมศักดิ์ พันธุ์วัฒนา (252 เรื่อง)
21. พ.ศ. 2538 25-27 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อการ พัฒนาอุตสาหกรรม	คณะวิทยาศาสตร์ มหาวิทยาลัยบูรพา ณ โรง แรมแอมบาสซาเดอร์ซิตี้	ศ.ดร.สมศักดิ์ พันธุ์วัฒนา (354 เรื่อง)
22. พ.ศ. 2539 16-18 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อ พัฒนาทรัพยากรมนุษย์	คณะวิทยาศาสตร์ มหาวิทยาลัยรามคำแหง	รศ.ดร.พิณทิพย์ รื่นวงษา (333 เรื่อง)
23. พ.ศ. 2540 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อ พัฒนาคุณภาพชีวิตในภูมิภาค	คณะวิทยาศาสตร์ มหาวิทยาลัยเชียงใหม่ ณ โรงแรมโลตัสปางสวนแก้ว	รศ.ดร.พิณทิพย์ รื่นวงษา (495 เรื่อง)
24. พ.ศ. 2541 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อการ พัฒนาเศรษฐกิจที่มั่นคง	คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	ผศ.ดร.ทิพาพร ลิ้มปเสนีย์ (463 เรื่อง)
25. พ.ศ. 2542 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อการ พัฒนาเพื่อการพัฒนา ทรัพยากรท้องถิ่น	คณะวิทยาศาสตร์ มหาวิทยาลัยเรศวร ณ โรงแรมอมรินทร์ลาคูณ พิชญ์โลก	ผศ.ดร.ทิพาพร ลิ้มปเสนีย์ (581 เรื่อง)
26. พ.ศ. 2543 18-20 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี คู่สห บรรณใหม่	คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	รศ.ดร.ศุภวรรณ ดันตยานนท์ (739 เรื่อง)
27. พ.ศ. 2544 16-18 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อการ ฟื้นฟูเศรษฐกิจไทย	มหาวิทยาลัยสงขลานครินทร์ โรงแรม ลิ การ์ เดนส์ พลาซ่า	รศ.ดร.ศุภวรรณ ดันตยานนท์ (921 เรื่อง)
28. พ.ศ. 2545 24-26 ตุลาคม	วิทยาศาสตร์และเทคโนโลยีเพื่อการ พัฒนาเศรษฐกิจที่ยั่งยืน	คณะวิทยาศาสตร์ประยุกต์ สถาบัน เทคโนโลยีพระจอมเกล้าพระนครเหนือ ณ ศูนย์การประชุมแห่งชาติสิริกิติ์	รศ.ดร.สุรินทร์ เหล่าสุขสถิตย์ (834 เรื่อง)
29. พ.ศ. 2546 20-22 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อก พัฒนาท้องถิ่น	คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น ณ ศูนย์ประชุมถนบกประสงค์กาญจนาภิเษก	รศ.ดร.สุรินทร์ เหล่าสุขสถิตย์ (1039 เรื่อง)
30. พ.ศ. 2547 19-21 ตุลาคม	วิทยาศาสตร์และเทคโนโลยี เพื่อ สังคมและเศรษฐกิจฐานความรู้	คณะวิทยาศาสตร์ มหาวิทยาลัยศรีนครินทรวิ โรฒ ณ ศูนย์แสดงสินค้าและการประชุมอิม แพ็ค เมืองทองธานี	รศ.ดร.สุรินทร์ เหล่าสุขสถิตย์ (825 เรื่อง)

**LIST OF OVERSEA PARTICIPANTS
(PLENARY AND INVITED SPEAKERS)**

STT	Year	Name	Field	Country
10	1984	Federic C. Robbin ¹	Medicine	U.S.A.
11	1985	Herbert C. Brown ¹	Chemistry	U.S.A.
12	1986	Howard M. Temin ¹	Virology	U.S.A.
13	1987	William N. Lipscomb ¹	Chemistry	U.S.A.
14	1988	Robert W. Wilson ¹	Physics	U.S.A.
15	1989	Thomas H. Weller ¹	Medicine	U.S.A.
16	1990	John B. Pendry ¹	Physics	U.K.
		Ivar Graeвер ¹	Physics	U.S.A.
		John E. Beringer ¹	Biology	U.K.
		Egon Diczfalusy ¹	Medicine	Sweden
		Geoffrey A. Cordell ⁴	Chemistry	U.S.A.
		Geoffrey M.H. Wailes ⁴	Physiology	Switzerland
		Norman B. Hecht ⁴	Biology	U.S.A.
		Anton J. Groeneweg ⁴	Biochemistry	Netherlands
		David W. Hamilton ⁴	Anatomy	U.S.A.
		Ebo Nieschlag ⁴	Endocrinology	Germany
		Gertrude Elion ¹	Medicine	U.S.A.
		John N.B. Bell ¹	Environment	U.K.
		Werner A.P. Luck ¹	Chemistry	Germany
		Pham V. Houn ¹	Chemistry	France
		Takehisa Nakamura ⁴	Biology	Japan
18	1992	Yasuyuki Tanaka ⁴	Polymer	Japan
		Frank Sedetz ⁴	Neuroscience	U.S.A.
		Leslie Fowden ¹	Chemistry	U.K.
		Roy Andeson ¹	Parasitology	U.K.
		David S. Woodruff ¹	Biodiversity	U.S.A.
		Prachuab Kwanyuen ¹	Biochemistry	U.S.A.
		Wolfgang Zimmerman ⁴	Biotechnology	Switzerland
		J.P. Ombregt ⁴	Biotechnology	Philippines
		Itaru Urabe ⁴	Biotechnology	Japan
		Bruno Werdelmann ⁴	Chemistry	Germany
		Surendra K. Manchanda ⁴	Neuroscience	India
		Frank J. Sedetz ⁴	Neuroscience	U.S.A.
		Gary H. Glover ¹	Medicine	U.S.A.
		Ronald M. Stagg ¹	Environment	U.K.
		Ian R. Falconer ¹	Toxicology	Australia
19	1993	Norman R. Farnsworth ¹	Chemistry	U.S.A.
		Allan H. White ⁴	Chemistry	Australia
		Kaoru Fuji ⁴	Chemistry	Japan
		Isao Horiuchi ⁴	Biotechnology	Japan
		J.B. Burch ¹	Biology	U.S.A.
		S.K. Bhattacharyya ¹	Industry	U.K.
		J.M.V. Blanshard ⁴	Food Science	U.K.
		Lynne Barratt ¹	Marine Science	U.K.
		Masao Ito ¹	Science Frontier	Japan
		David Ottoson ¹	Physiology	Sweden
		William S. Perriman ¹	Quality Management	Australia
		J.W. Suttie ¹	Vitamin Biochemistry	U.S.A.
		Luke G. Georgioud ¹	Science Policy	U.K.
		Kenneth Scurratt ⁴	Gemology	U.K.
		Ralf Kindervater ⁴	Biochem & Biotechnology	Germany
21	1995	Carola K. Thoma ⁴	Biology	Germany
		David M. Lee ¹	Low Temperature Physics	U.S.A.
		John Durant ¹	Interactive Science Museum	U.K.
		R.J. Doyle ¹	Microbiology	U.S.A.
		Lars Hillerstrom ⁴	Fire Fighting	Sweden
		Nicholas J. White ⁴	Tropical Medicine	U.K.
		William N. Lipscomb ¹	Chemistry	U.S.A.
		A.L. Webb ¹	Educational Science	U.K.
		Christophe Coutibeuf ⁴	Chemistry	France
		E.J. Harvey ⁴	Environmental Science	U.K.
		G.B. Randall ⁴	Chemistry	Australia
		Joselle Errera ⁴	Nuclear Physics	France
		Robert Peile ⁴	Chemistry	Australia
		Stephen Smalldcombe ⁴	Biochemistry	U.S.A.
		Susumu Hayashi ⁴	Chemistry	Japan
25	1997	Erwin Neher	Physics	Germany

26	2000	Robert William ³	Space Science	U.S.A.
		Robert Drahos ³	Commercial Laws	U.K.
		Anthony O'Donnell ⁴	Microbiology	U.K.
		Terry Thomson ⁴	Nuclear Technology	Canada
		Paul D. Boyer ¹	Biochemistry	U.S.A.
		William H. Daly ²	Polymer Science	U.S.A.
		Paul J. Worsfold ²	Chemistry	U.K.
		Stephen Thompson ⁴	Chemistry	U.S.A.
		Isao Ando ⁴	Polymer Science	Japan
		Seizo Miyata ⁴	Polymer Science	Japan
		Mitsuru Akashi ⁴	Polymer Science	Japan
		Frank W. Harris ⁴	Polymer Science	U.S.A.
		Kazuyuki Horie ⁴	Chemistry	Japan
		Yazuyuki Tanaka ⁴	Chemistry	Japan
		Masaki Tabata ⁴	Chemistry	Japan
		Luca Pini ⁴	Chemistry	The Netherland
		Paul Haddad ⁴	Chemistry	Australia
		Ron Beckelt ⁴	Chemistry	Australia
		Robert L. Lancione ⁴	Chemistry	Singapore
		Christophur Turner ⁴	Chemistry	N.S.A.
		Yuki Hashi ⁴	Polymer Science	Japan
		Eric B. Winter ⁴	Chemistry	U.S.A.
		Benjamin J. Hawkins ⁴	Chemistry	U.S.A.
		Haochuan Wang ⁴	Chemistry	U.S.A.
		Robert P. Glover ⁴	Chemistry	Singapore
27	2001	Yutaka Tokiwa ⁴	Polymer Science	Japan
		Mario J. Molina ¹	Chemistry	U.S.A.
		Jean-Claude Bross ²	Polymer Science	France
		Dusan Berek ²	Polymer Science	Slovakia
		Eitaro Wada ²	Chemistry	Japan
		Hans Mosback ⁴	Chemistry	Denmark
		Hong Yee Low ⁴	Polymer Science	Singapore
		James A. Kaufmann ⁴	Educational Science	U.S.A.
		James P. Runt ⁴	Polymer Science	U.S.A.
		Jens Christian Tjells ⁴	Chemistry	Denmark
		Richard G. Jones ²	Polymer Science	UK
		Kurt E. Geckeler ⁴	Polymer Science	South Korea
		Paul R. Haddad ²	Chemistry	Australia
		Ron Beckett ⁴	Chemistry	Australia
		Ron G. McLaren ⁴	Chemistry	New Zealand
		Shawn Heberling ⁴	Chemistry	U.S.A.
		Takahito Yoshioka ⁴	Chemistry	Japan
28	2002	Yukihiro Ozaki ⁴	Polymer Science	Japan
		Roald Hoffmann ¹	Chemistry	U.S.A.
		Teruyuki Nakajima ⁴	Environment Science	Japan
		Björn Vinnerås ⁴	Envir. Technology	Sweden
		Jacques Renard ⁴	Materials Science	France
		M.P. Courrouyan ⁴	Marine Science	Singapore
		Angeline S. Stefanovic ⁴	X-ray Powder Diffraction	Singapore
		Richard Venables ⁴	Polymer Processing	England
		Lloyd Anderson ³	Communication Science	England
		Jisnusun Svasti ⁵	Biochemistry	Mahidol University
		Suthat Fucharoen ⁵	Medical Science	Mahidol University
29	2003	Kajita Takaaki ¹	Physics	Japan
		Wolfgang Kiefer ²	Physical Chemistry	Germany
		Jeremy D. Glennon ⁴	Analytical Chemistry	Ireland
		Timothy L. Righetti ⁴	Agriculture	USA.
		Bernard Baroux ⁴	Electrochem.&Metallurgy	France
		P. Ramasamy ⁴	Solid State Physics	India
		Jumras Limtrakul ⁵	Physical Chemistry	Kasetsart University
		Supot Hannongbua ⁵	Inorganic Chemistry	Chulalongkorn Univ.
		Vichai Boonsaeng ⁶	Biochemistry	Mahidol University
		Sinrurg Songsivilai ⁶	Medical Science	Mahidol University
30	2004	Douglas D. Osheroff	Physics	StanfordS
		Hwang Woo-Suk	Biotechnology	Korea
		Sung Keun-Kang	Biotechnology	Korea
		K. B. R. Varma	Materials Science	India

¹Nobel Laureates, Plenary Speakers

⁴Invited Speakers

²Premier Lecturer, Plenary Speakers

⁵Outstanding Scientists

³Plenary Speakers

⁶Outstanding Technologists

รายการอภิปรายและเสวนาพิเศษ
(PANEL DISCUSSION AND SPECIAL LECTURE)

Special Session-1: Science Education “Physics for the Quality of Life”

Associate professor Dr. Preecha Yupapin
Associate professor Dr. Tipparat Wongcharoen and
Dr. Sarun Samritdetkajorn

Special Session-2: Young Scientist’s Seminar

Dr. Jintamai Suwanprateeb
Dr. Tienthon Thongpanchang
Assistant professor Dr. Pomsak Sriamornsak
Assistant professor Dr. Mullica Jaroensutasinee
Dr. Sarun Sumriddetchkajorn and
Assistant professor Dr. Supon Ananta

Special Session-3: Young Technologist’s Seminar

Special Session-4: Thailand Research Fund’s Seminar

Special Session-5: Chemical Society Seminar

“Silver Jubilee Anniversary of Federation of Asian Chemical Societies (FACS)”

Professor Dr. Kamchorn Manunapichu
Professor Dr. Yodhathai Thebtaranont
Associate Professor Dr. Theerawat Mongkolaussavarat

Special Session-6: TAST’s Outstanding Research Seminar “Kao-Mun-Kung”

ศ. ดร. มรกต ตันติเจริญ
อาจารย์จุลภาค คู่ณรงค์
ดร. ศิราวุธ กลิ่นหงา
รศ. ดร. กล้าณรงค์ ศรีรอด
ผศ. ดร. ชะลอ ลิ้มสุวรรณ
รศ. ศรัศักร วัลลิโกดม

**บทคัดย่อการบรรยายนำ
และบรรยายรับเชิญ**

**ABSTRACTS OF PLENARY LECTURES
AND
INVITED SPEAKERS**



'The Investigation of the Columbia Shuttle Accident and Its Impact on the Future of Human Spaceflight'

Douglas D. Osheroff

Department of Physics, Stanford University, Stanford, CA 94305-4060, U.S.A.

Abstract: On February 1, 2003, the NASA space shuttle Columbia broke apart over East Texas upon re-entry at an altitude of 60 km and a velocity of approximately 19,000 km/hr. All aboard perished. The speaker was a member of the 13 member board that investigated the origins of this accident, both physical and organizational. In his talk he will describe how the board was able to determine with almost absolute certainty that the physical cause of the disaster was a piece of thermally insulating foam, only 1/30th the density of water, that fell from the cryogenic fuel tank and struck the leading edge of the Columbia's left wing 82.9 seconds after launch. He will also consider the organizational origins of this accident. Why did NASA continue to fly missions, knowing that foam struck the orbiter on virtually every flight, and that it could cause serious damage. In response to the board's report, calling for a national dialogue on the future of human space flight, President Bush has charged NASA to return to the Moon as a stepping stone to a mission to Mars. This charge has generated considerable debate within the scientific community.



Pluripotent Human Embryonic Stem Cell Line Derived From a Cloned Blastocyst and Its Potential Applications

Woo Suk Hwang

Department of Theriogenology and Biotechnology, College of Veterinary Medicine, Seoul National University, Seoul 151-742, Korea

The isolation of pluripotent human embryonic stem (ES) cells and breakthroughs in somatic cell nuclear transfer (SCNT) in mammals have raised the possibility of performing human SCNT to generate potentially unlimited sources of undifferentiated cells for research, with potential applications in tissue repair and transplantation medicine. This concept, known as "therapeutic cloning," refers to the transfer of the nucleus of a somatic cell into an enucleated donor oocyte. In theory, the oocyte's cytoplasm would reprogram the transferred nucleus by silencing all the somatic cell genes and activating the embryonic ones. ES cells would be isolated from the inner cell mass (ICM) of the cloned preimplantation embryo. When applied in a therapeutic setting, these cells would carry the nuclear genome of the patient; therefore, it is proposed that following directed cell differentiation, the cells could be transplanted without immune rejection for treatment of degenerative disorders such as diabetes, osteoarthritis, and Parkinson's disease, among others. In this study, we report the derivation of a pluripotent embryonic stem cell line (SCNT-hES-1) from a cloned human blastocyst. The SCNT-hES-1 cells display typical ES cell morphology and cell surface markers and are capable of differentiating into embryoid bodies *in vitro* and of forming teratomas *in vivo* containing cell derivatives from all three embryonic germ layers in SCID mice. After continuous proliferation for >100 passages, SCNT-hES-1 cells maintain normal karyotypes and are genetically identical to the somatic nuclear donor cells. The DNA fingerprinting assay along with imprinted gene analysis provides support that cloned human ES cells was derived from somatic cell nuclear transfer of a donor cell.

Technical Aspects of Establishment of Pluripotent Human Embryonic Stem Cell Line Derived From a Cloned Blastocyst

Sung Keun Kang

Department of Theriogenology and Biotechnology, College of Veterinary Medicine, Seoul National University, Seoul 151-742, Korea.

The technical aspects of establishment of a pluripotent embryonic stem cell line (SCNT-hES-1) from a cloned human blastocyst were described. Autologous somatic cell nuclear transfer (SCNT) was performed, i.e. the donor's own cumulus cell, isolated from the cumulus-oocyte-complex, was transferred back into the donor's own enucleated oocyte. Absent any report of an efficient protocol for human SCNT, several critical steps had to be optimized, including reprogramming time, activation method and *in vitro* culture conditions. Reprogramming time, or the lapse of time between cell fusion and egg activation, returns the gene expression of the somatic cell to that needed for appropriate embryonic development. By allowing two hours for reprogramming, we were able to obtain ~25% of the reconstructed embryos to develop to the blastocyst stage. Since sperm-mediated activation is absent in SCNT, an artificial stimulus is needed to initiate development. Oocyte activation using the calcium ionophore A23187 (calcimycin) or ionomycin in combination with the protein synthesis inhibitor puromycin induces parthenogenetic development of human oocytes at different efficiencies. We found that incubation in 10^{-6} M A23187 for 5 min followed by incubation with 2.0 mM 6-dimethylaminopurine (DMAP) for 4 hrs resulted in an efficient chemical activation for human SCNT eggs. The human modified synthetic oviductal fluid (SOF) with amino acids (hmSOFaa) was prepared by supplementing mSOFaa with human serum albumin (10 mg/ml) and fructose (1.5 mM) instead of bovine serum albumin (8 mg/ml) and glucose (1.5 mM), respectively. Culture of human SCNT-derived embryos in G1.2 medium for the first 48 hrs followed by hmSOFaa medium produced more blastocysts, compared to G1.2 medium for the first 48 hrs followed by culture in G1.2 medium or in continuous hmSOFaa medium. A total of 30 SCNT-derived blastocysts were cultured, 20 ICMs were isolated by immunosurgical removal of the trophoblast, and one ES cell line (SCNT-hES-1) was derived. SCNT-hES-1 cells display typical ES cell morphology and cell surface markers and are capable of differentiating into embryoid bodies *in vitro* and of forming teratomas *in vivo* containing cell derivatives from all three embryonic germ layers in SCID mice. After continuous proliferation for >70 passages, SCNT-hES-1 cells maintain normal karyotypes and are genetically identical to the somatic nuclear donor cells.

Technical Aspects of Establishment of Pluripotent Human Embryonic Stem Cell Line Derived From a Cloned Blastocyst

Sung Keun Kang

Department of Theriogenology and Biotechnology, College of Veterinary Medicine, Seoul National University, Seoul 151-742, Korea.

The technical aspects of establishment of a pluripotent embryonic stem cell line (SCNT-hES-1) from a cloned human blastocyst were described. Autologous somatic cell nuclear transfer (SCNT) was performed, i.e. the donor's own cumulus cell, isolated from the cumulus-oocyte-complex, was transferred back into the donor's own enucleated oocyte. Absent any report of an efficient protocol for human SCNT, several critical steps had to be optimized, including reprogramming time, activation method and *in vitro* culture conditions. Reprogramming time, or the lapse of time between cell fusion and egg activation, returns the gene expression of the somatic cell to that needed for appropriate embryonic development. By allowing two hours for reprogramming, we were able to obtain ~25% of the reconstructed embryos to develop to the blastocyst stage. Since sperm-mediated activation is absent in SCNT, an artificial stimulus is needed to initiate development. Oocyte activation using the calcium ionophore A23187 (calcimycin) or ionomycin in combination with the protein synthesis inhibitor puromycin induces parthenogenetic development of human oocytes at different efficiencies. We found that incubation in 10 μ M A23187 for 5 min followed by incubation with 2.0 mM 6-dimethylaminopurine (DMAP) for 4 hrs resulted in an efficient chemical activation for human SCNT eggs. The human modified synthetic oviductal fluid (SOF) with amino acids (hmSOFaa) was prepared by supplementing mSOFaa with human serum albumin (10 mg/ml) and fructose (1.5 mM) instead of bovine serum albumin (8 mg/ml) and glucose (1.5 mM), respectively. Culture of human SCNT-derived embryos in G1.2 medium for the first 48 hrs followed by hmSOFaa medium produced more blastocysts, compared to G1.2 medium for the first 48 hrs followed by culture in G1.2 medium or in continuous hmSOFaa medium. A total of 30 SCNT-derived blastocysts were cultured, 20 ICMs were isolated by immunosurgical removal of the trophoblast, and one ES cell line (SCNT-hES-1) was derived. SCNT-hES-1 cells display typical ES cell morphology and cell surface markers and are capable of differentiating into embryoid bodies *in vitro* and of forming teratomas *in vivo* containing cell derivatives from all three embryonic germ layers in SCID mice. After continuous proliferation for >70 passages, SCNT-hES-1 cells maintain normal karyotypes and are genetically identical to the somatic nuclear donor cells.

Multifunctional Glassnanocomposites

K.B.R. Varma

Materials Research Centre, Indian Institute of science, Bangalore, India

Glasses embedded with non centro symmetric polar dispersoids form a new class of transparent composite materials. The fabrication details, structural characterization and physical properties of the Aurivillius family of oxides dispersed in borate based glass matrices will be highlighted apart from some important results obtained on an industrially important material Lithium Niobate in a reactive glass matrix. The multifunctionalities of the above glass nanocomposites will be demonstrated in the intended presentation.



Human rabies: a disease of complex neuropathogenetic mechanisms and diagnostic challenges

Thiravat Hemachudha

Neurology, Chulalongkorn University Hospital, Bangkok, Thailand

Email: th-cu@usa.net

Summary

Rabies is inevitably fatal and presents a horrifying clinical picture. Human rabies can manifest in either encephalitic (furious) or paralytic (dumb) forms. The brainstem is preferentially involved in both clinical forms, though there are no clinical signs of brainstem dysfunction. Differences in tropism at the inoculation site or the CNS, in the route of spread, or in the triggering of immune cascades in the brainstem may account for clinical variation. There are clinical, electrophysiological and pathological indications that peripheral nerve dysfunction is responsible for weakness in paralytic rabies. Mechanism responsible for weakness includes initiation of cellular dependent mechanisms. Whether they are directed against rabies virus or peripheral nerve antigen is not known. Rabies still poses diagnostic problems, particularly the paralytic form, which closely resembles Guillain-Barré syndrome, or when a patient is comatose and cardinal signs may be lacking. Molecular methods allow reliable detection of rabies-virus RNA in biological fluids or tissue before death. Deviations from the recommendations on prophylaxis of the World Health Organization lead to unnecessary loss of life. To date, attempts to treat human rabies have been unsuccessful.

Supported in part by grants from Thailand Research Fund, National Science and Technology Development and Thai Red Cross Society

Monoclonal antibody based assays for diagnosis of viral and bacterial infections in penaeid shrimp species

Paisarn Sithigorngul¹, Parin Chaivisuthangkura¹, Siwaporn Longyant¹, Sombat Rukpratanporn², Sirirat Rengpipat³, Wasana Sukhumsirichart⁴ and Weerawan Sithigorngul¹.

¹Department of Biology, Srinakharinwirot University, BKK 10110, Thailand.

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology at Chulalongkorn University, BKK 10330, Thailand.

³Department of Microbiology, Chulalongkorn University, BKK 10330, Thailand.

⁴Department of Biochemistry, Srinakharinwirot University, BKK 10110, Thailand.

Abstract: Monoclonal antibodies against various pathogenic viruses and bacteria were successfully produced for diagnosis of infections in penaeid shrimps. These antibodies are specific to gp116, gp64, and p20 proteins of yellow head virus (YHV), VP28 of white spot syndrome virus (WSSV), 54 kD protein of hepatopancreatic parvovirus (HPV) and 49, 37.32, and 8 kD proteins of *Vibrio harveyi*. Various immunological techniques have been applied for the diagnosis of viral and bacterial infections. All of these antibodies can be used to detect of infection in shrimp tissues by means of immunohistochemistry with high accuracy and sensitivity. Dot blot is also a convenient and quick method to detect pathogens in haemolymph and tissue homogenate. However, in most cases the sensitivity is insufficient for detection of asymptomatic infection and usually encounter with high background from nonspecific binding of antibodies to high concentration of shrimp proteins. Western blot analysis is more specific to detect pathogens with sensitivity comparable to that of dot blot. However, the time consuming and laborious processes are the major drawbacks for this technique. Indirect sandwich ELISA was developed successfully for YHV and WSSV due to the availability of antigens for production of polyclonal antibodies. The sensitivity of this method is close to one step RT-PCR or PCR, and as many as several hundreds of samples can be tested simultaneously at low cost. However, special equipments and skilled technician are the major requirements. Recently, a convenient test kit, the "strip test" was developed successfully for detection of virulent YHV infection. The sensitivity of this kit is higher than that of dot blot; however, no special equipment and skillful technician is needed. As the result can be obtained within a few minutes, this type of test kit is useful for pond site diagnosis. However, the cost per test is still high due to the small volume of production. The convenient kits for WSSV, gill associated virus (GAV) and *V. harveyi* are in progress and hope to be produced before the end of 2004. Monoclonal antibodies against taura syndrome virus, VP26 and VP19 of WSSV are being developed. Monoclonal antibodies against other pathogens such as infectious hypodermal and hemopoietic necrosis virus (IHHNV), monodon baculovirus (MBV) and other *Vibrio* spp. are under investigation.

Key words: dot blot, GAV, HPV, immunohistochemistry, sandwich ELISA, strip test, TSV, *Vibrio harveyi*, WSSV, Western blot, YHV

Research on Mangosteen Fruits: Future Prospect

Sunit Suksamram,¹ Pinit Ratananukul,¹ Narisara Suwannapoch,¹ Orapin Komutiban,¹ Soycom Kunchanawatta,¹ Nuntana Aroonrerk,² Saovaluk Vimuttipong,³ and Apichart Suksamram⁴

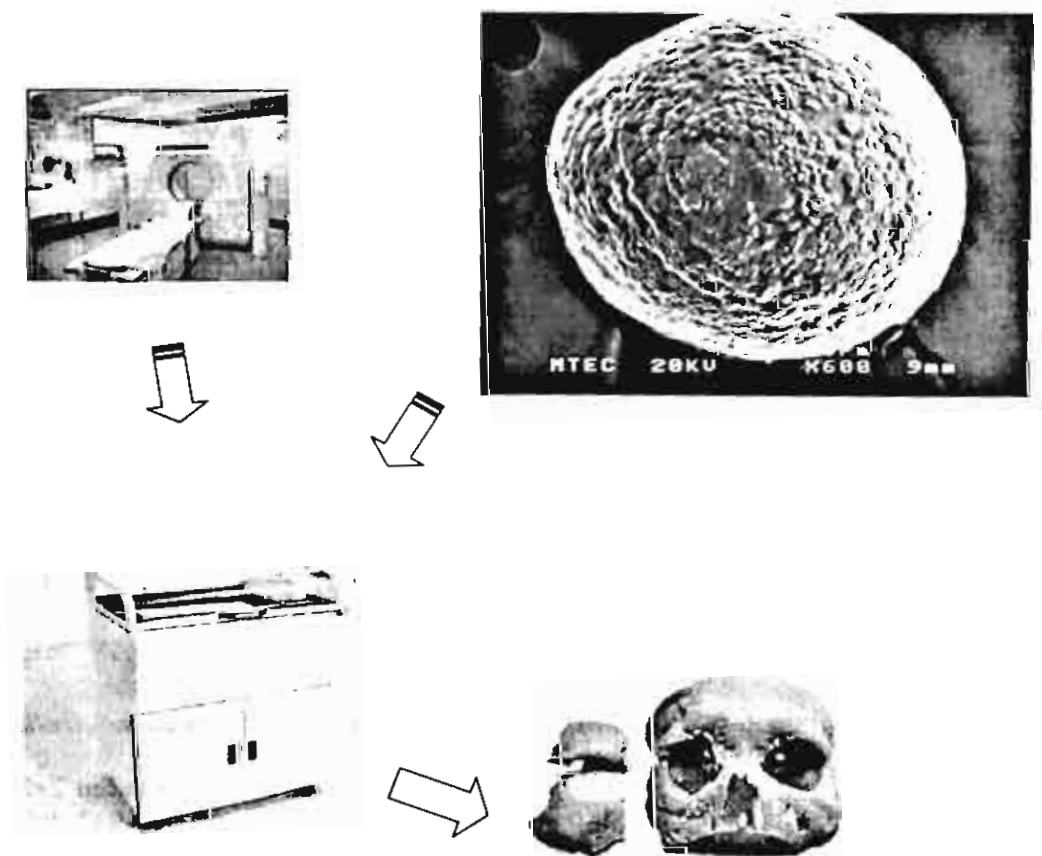
¹Department of Chemistry, Faculty of Science, Srinakharinwirot University; ²Department of Stomatology, Faculty of Dentistry, Srinakharinwirot University; ³Bioassay Laboratory, National Center for Genetic Engineering and Biotechnology; ⁴Department of Chemistry, Faculty of Science, Ramkhamhaeng University

Plants have been used worldwide in traditional medicines for the treatment of diseases. It is estimated that even today approximately two-thirds to three-quarters of the world's population rely only on medicinal plants as their primary source of medicines. Mangosteen, a tree fairly widespread in Thailand and in Southeast Asian countries, has long been known for its medicinal properties. The edible fruit is considered to be one of the best of all tropical fruits. Phytochemical studies on the fruits of this plant species have been increasing attention worldwide for their search on the various new drug leads. Our recent work in the search for bioactive compounds obtained from the fruits with structural diversity on the various stages of fruit ripening and its biological activities will be presented. Future prospect of the mangosteen fruits will also be discussed.

Our work has been supported by the Thailand Research Fund (TRF). Partial support from the Biodiversity Research and Training Program (BRT), Bioassay Research Facility of BIOTEC for bioactivity test, Chulabhorn Research Institute and Srinakharinwirot University are gratefully acknowledged.

National Metal and Materials Technology (MTEC) 114 Thailand Science Park, Paholyothin Road,
Klong 1, Klongluang, Pathumthani 12120 Thailand
e-mail: jintamai@mtec.or.th

Rapid prototyping is a technology for building three dimensional models from computer graphic image. Based on the layer-by-layer forming technology, a free form fabrication of complex model can be built rapidly using this technique. There have been interests to apply this technology compiled with medical image processing and materials science to build bone replacement implants which can be customized for each patients by designing in a computer. Ongoing research is focused on the development of suitable material formulations for such process.



ขั้นตอนการผลิตชิ้นส่วนกระดุกเทียมรูปร่างซับซ้อนด้วยเทคโนโลยีการสร้างต้นแบบรวดเร็ว

Photonics Applications: From Simple Optical Touch Switches and Fiber-Optic Switches, to Optical Sensing Systems.

Sarun Sumriddetchkajorn

Electro-Optics Section, National Electronics and Computer Technology Center, National Science and Technology Development Agency, Ministry of Science and Technology, 112 Thailand Science Park, Phahonyothin Rd., Klong 1, Klong Luang, Pathumthani 12120, Thailand. Phone: 66-2564-6900, Fax: 66-2564-6771. E-mail: sarun.sumriddetchkajorn@nectec.or.th

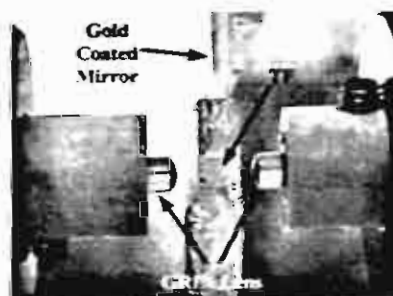
Abstract: This talk will highlight the exploitation of photonics for the implementations of optical touch switches [1], 2x2 fiber-optic switches [2], tunable contrast interferometers [3], and digitally controlled optical beam shapers [4]. Our optical touch switches are based on the use of total internal reflection concept that can prevent the leakage light perturbing the user eyes and the ability to adjust the sensitivity, thus making them suitable for use in control electrical appliances. For fiber-optic switches, we combine the inherent properties of the available thin film filter with the movable mirror so that wavelength selective switches are formed and when used in wavelength division multiplexed switching systems the overall cost is reduced. In addition, due to lack of controllability in common interferometers, we develop tunable contrast interferometers by controlling the polarization state in the polarization interferometer structure. As a result, the interference optical output signal can be easily adjusted. Furthermore, as there is a need for optical beam shaping technique in order to manipulate the intensity profile of the optical beam to fit the specified tasks, we demonstrate the digitally controlled optical beam shaper by using macro-pixel and binary pulsewidth modulation concepts, thus leading to ease of implementation and control.



Prototype of Optical Touch Switch



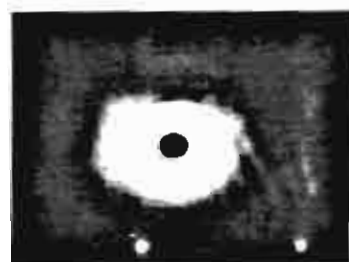
Tunable Fringe Contrast Polarization Interferometer



Close-up View of 2x2 Wavelength Selective Switch



Unchanged Optical Intensity Profile



Optical Intensity Profile with Hole at the Center

Acknowledgement

The author would like to thank Khunat Chaitavon, Ratthasart Amarit, and Sataporn Chanhorm for useful discussion and building the prototypes.

References

- [1] S. Sumriddetchkajorn, "Optical touch switch based on total internal reflection," *Optical Engineering*, Vol. 42, No. 3, pp. 787-791, March 2003.
- [2] S. Sumriddetchkajorn and K. Chaitavon, "A reconfigurable thin film filter-based 2x2 add-drop fiber-optic switch structure," *IEEE Photonics Technology Letters*, Vol. 15, No. 7, pp. 930-932, July 2003.
- [3] S. Sumriddetchkajorn, "Polarization-insensitive tunable-contrast fiber-optic polarization interferometers with a polarization controller," *Optics Communications*, Vol. 217, pp. 197-203, March 2003.
- [4] S. Sumriddetchkajorn, "Micromechanics-based digitally controlled tunable optical beam shaper," *Optics Letters*, Vol. 28, No. 9, pp. 737-739, May 2003.

Processing-Structure-Property Relationships in Smart Materials: The Complex Perovskite Ceramic System

Supon Ananta

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, 50200

E-mail address: supon@chiangmai.ac.th

Abstract: Ingenious developments in materials have coincided with major stages in the development of civilisations. Over this century, the electronic industry has grown exponentially and now has a pervasive influence on modern life with crucial implications for society. The rapid growth of this industry has created a huge requirement for better materials. Consequently, the wide range of applications of ceramics in the electronic industry has resulted in the development of a large number of materials [1]. In particular, the so-called **smart materials** [2] play a key role in their applications in intelligent systems with new developments predicted for the next century.

Novel approaches to preparation and processing, connected mainly with increased purity, together with new processing techniques and materials, have been developed. New markets have begun to open up in such areas as multilayer capacitors (MLCs), sensors, micro & nano-electromechanical systems (MEMs & NEMs), transducers, actuators, and nano-materials [3]. In this connection, complex perovskite ceramics, which are at the centre and also the cutting edge of existing and ongoing technologies, have become one of the most promising materials. They possess many properties or combinations of properties not achievable in other classes of materials. These properties are mainly dependent on the structure and composition of materials, which, in turn, depend on precursor purity, processing method, as well as the structural design. The need to understand and engineer them is paramount. A possible way of accomplishing this is to employ the insight gained from the concept of processing-structure-property relationships.

It is believed that the ideas and experimental approaches in this on-going work will help in gaining a deeper understanding of the complex perovskite ceramics. A better understanding of structure-property relationships and established design and processing techniques would allow the materials scientists to predict and control properties to a degree previously unachievable. With the goals mentioned above as the research target, the present work is divided into three main parts. The first of these is a study of processing design of high purity powders preparation. This section aims to understand the effects of processing parameters on the phase formation, morphology evolution and particle size of the perovskite powders. The second part of this work is devoted to a study of the ceramic fabrication via a combination of microstructural and firing cycle designs in order to achieve highly dense ceramics and to understand the effects of firing conditions on densification and microstructural development of the sintered products. Finally, a study of the properties (especially electrical responses) in connection with the chemical composition and structure of the materials with an interpretation given concerning the ability to design the processing and structure for particular desired properties will be carried out.

Acknowledgement: Financial support by The Thailand Research Fund and Faculty of Science, Chiang Mai University.

- References:** [1] Moulson, A.J. and Herbert, J.M., *Electroceramics*, 2nd ed., Wiley-Interscience, New York, 2003.
[2] Anun, A. and Newnham, R.E., *Chem. Tech.* 1999, 29, 38-46.
[3] Uchino, K., *Ferroelectric Devices*, Marcel Dekker, Inc., New York, 2000

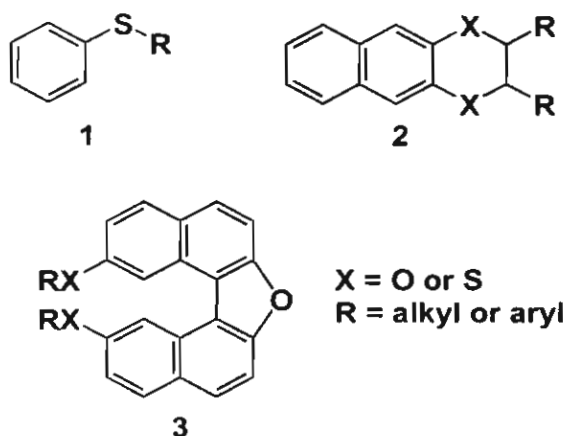
Acid Catalyzed Nucleophilic Substitution of Phenols

Jetsuda Areepong, Porntip Charoonniyomporn, Chakrapong Intaraudom, Chakrapan Nerungsi, Patcharee Preedasuriyachai, Nopporn Ruangsapapichart, Warapon Sinananwavich and Tienthong Thongpanchang

Department of Chemistry, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400 Thailand

Phenols are important precursors in the large scale synthesis of arylethers or arylsulfides which are key components in the design of new organic materials. However, displacement of the hydroxy group of phenols is, in general, not straightforward, and frequently requires special conditions.

By allowing phenols to tautomerize under acidic condition, nucleophiles such as alcohols or thiols can then undergo nucleophilic attack at the keto tautomer, which upon dehydration and rearomatization, yield the corresponding arylethers or arylsulfides respectively. This approach is very effective for the preparation of, for example, arylsulfides **1**, aryldioxins or aryldithiins **2** and helicenes **3**.



Keywords: Arylsulfides, Aryldioxins, Aryldithiins, Helicenes, Phenols and Tautomerization

Selected References:

1. Charoonniyomporn, P., Thongpanchang, T., Witayakran, S., Thebtaranonth, Y., Phillips, K. E. S., Katz, T. J. (2004) An Efficient One-Pot Synthesis of Bisalkylthioarenes. *Tetrahedron Lett.* 45, 457-459.
2. Preedasuriyachai, P., Charoonniyomporn, P., Karoonnirun, O., Thongpanchang, T., Thebtaranonth Y. (2004) A Novel One-Pot Synthesis of Derivatives of Aryldioxins and Aryldithiins. *Tetrahedron Lett.* 45, 1343-1346.
3. Areepong, J.; Ruangsapapichart, N.; Thongpanchang, T. (2004) A Concise Synthesis of Functionalized 7-Oxa-[5]-helicenes. *Tetrahedron Lett.* 45, 3067-3070.

USE OF CITRUS PECTIN IN PHARMACEUTICAL PRODUCTION AND DRUG DELIVERY

พรศักดิ์ ศรีอมรศักดิ์

Pornsak Sriamornsak

Department of Pharmaceutical Technology, Faculty of Pharmacy, Silpakorn University,
Nakhon Pathom 73000 Thailand

E-mail address: pornsak@email.pharm.su.ac.th

บทคัดย่อ: เพคตินเป็นพอลิเมอร์จากธรรมชาติที่ผลิตได้จากกากผลไม้ เช่น เปลือกส้ม ซึ่งเป็นของเหลือทิ้งจากอุตสาหกรรมเกษตร มีการนำเพคตินมาใช้ในอุตสาหกรรมอาหารและเครื่องสำอางมานาน ปัจจุบันมีการนำมาใช้ในอุตสาหกรรมทางเทคโนโลยีชีวภาพ ในเชิงเภสัชกรรมและการผลิตยาเพิ่มมากขึ้นเรื่อยๆ เพคตินมีคุณสมบัติเฉพาะที่ทำให้สามารถนำมาใช้เก็บกักหรือนำส่งยา โปรตีนหรือเปปไทด์ และเซลล์ บทความนี้ได้กล่าวถึงตัวอย่างงานวิจัยที่ใช้ประโยชน์จากเพคตินจากเปลือกส้มในการผลิตยาและเพื่อเป็นระบบนำส่งยา ที่มีการทำวิจัยในประเทศไทย เช่น การออกแบบขี้ผึ้งโดยใช้เพคตินเป็นสารก่อเจล เพื่อชะลอการปลดปล่อยด้วยวิธีให้โดยการรับประทาน การพัฒนาระบบขี้ผึ้งเคลือบฟิล์มชนิดคอมพอสิตระหว่างเพคตินกับพอลิเมอร์สังเคราะห์ที่ไม่ละลายน้ำเพื่อใช้ในการควบคุมการปลดปล่อยยาจากระบบนำส่งยาแบบนำวิถีไปสู่อวัยวะเป้าหมายที่ลำไส้ใหญ่ การพัฒนาเทคโนโลยีการเคลือบฟิล์มขี้ผึ้งโดยอาศัยหลักการเกิดปฏิกิริยาทางเคมีที่ผิวประจันขี้ผึ้งชนิดขี้ผึ้งเพคตินเกิดเป็นสารประกอบเชิงซ้อนเพื่อใช้ในการควบคุมการปลดปล่อยด้วยวิธีออกจากรูขี้ผึ้ง การออกแบบระบบเจลบีดเพื่อเก็บกักยาหรือยาโปรตีนสำหรับใช้ในการนำส่งยาที่ให้อาศัยการรับประทาน โดยอาศัยหลักการเกิดเจลระหว่างประจุ การพัฒนาเทคโนโลยีการควบคุมการปลดปล่อยยาจากเม็ดยาชนิดที่สามารถละลายได้เพื่อให้ระบบคงอยู่ในกระเพาะอาหารนานขึ้นเพื่อใช้สำหรับยาที่ต้องการให้ออกฤทธิ์เฉพาะที่ในกระเพาะอาหาร การศึกษาโครงสร้างภายในของเม็ดยาชนิดโดยใช้เทคนิคการเกิดภาพของอิเล็กตรอนชนิดกระจายกลับ เป็นต้น เนื่องจากงานวิจัยและพัฒนาทางด้านเภสัชกรรมและระบบนำส่งยาที่ใช้เพคตินยังคงมีการดำเนินการอย่างต่อเนื่อง จึงคาดหมายได้ว่าจะมีนวัตกรรมและการประยุกต์ใช้ที่น่าสนใจในอนาคต

Abstract: Pectin, a naturally occurring polysaccharide, is almost exclusively derived from citrus peel, by-product from agro-industry. It has been used successfully for many years in the food and beverage industry. Pectin is finding increasing applications in the biotechnology and pharmaceutical industry. Pectin also has several unique properties that have enabled it to be used as a matrix for the entrapment and/or delivery of a variety of drugs, proteins and cells. This paper reviews the research works on the pharmaceutical (including drug delivery) application of citrus pectin those have been done by research groups in Thailand. The research works include the tablet design using pectin as a gel forming agent to prolong the drug release; pectin-Eudragit® composite film coating for colon-specific drug delivery; development of a new method of using pectin gel as a coating to avoid the use of organic liquids or elevated temperature to dry the coats. The comprehensive evaluation of the properties of calcium pectinate gel beads that may be used as a delivery system for drugs or therapeutic proteins has also been reported. The possibility of using calcium pectinate gel beads containing edible oils or carbonate salts as an intragastric floating drug delivery system has been evaluated. The extensive works on back-scattered electron imaging revealed the microscopic structure of the gel beads and the drug distribution through the matrix structure of gel beads. As research and development continues with delivery system using pectin, we expect to see many innovative and exciting applications in the future.

Graph parameters and their values

Narong Punnim¹

Department of Mathematics, Srinakharinwirot University,
Sukhumvit 23, Bangkok 10110, Thailand
email: narongp@swu.ac.th

Abstract. The purpose of this paper is to summarize our work on graph parameters that we have done in the past three years and all publications during the past three years.

Let $\mathcal{G}$ be the class of all graphs and $\mathcal{J} \subseteq \mathcal{G}$. A graph parameter f is called an **interpolation graph parameter with respect to $\mathcal{J}$** if there exist integers a and b such that

$$\{f(G) : G \in \mathcal{J}\} = \{k \in \mathbb{Z} : a \leq k \leq b\}.$$

In the study of interpolation on graph parameter f with respect to $\mathcal{J}$, we may consider into two parts. First, it is to consider whether a given graph parameter f interpolates with respect to $\mathcal{J}$ or not. If it is, we shall consider the second part, that is to find

$$\min(f, \mathcal{J}) := \min\{f(G) : G \in \mathcal{J}\} \text{ and } \max(f, \mathcal{J}) := \max\{f(G) : G \in \mathcal{J}\}.$$

We discuss various kinds of graph parameters and answer the first part of interpolation theorem of graph parameter. Furthermore the second part of the theorem for graph parameters are also discussed. We close this paper with some related open problems.

¹Work supported by The Thailand Research Fund, under the grant number BRG/09/2545.

บทคัดย่อ
การเสนอผลงานทางวิชาการ

ABSTRACTS
OF
CONTRIBUTED PAPERS

**Section A - Mathematics, Computing and
Information Technology**

Mathematics and Statistics
Computer Science and Information Technology

A

Section B - Biological Science

Biology
Biotechnology
Microbiology
Aquatic Science
Genetics

B

Section C - Chemistry

Analytical Chemistry
Inorganic Chemistry
Organic Chemistry
Physical Chemistry

C

Section D - Physics

Biophysics
Astrophysics
Nuclear Physics
Solid State

D

Section E - Materials Science

Polymer & Composites
Ceramics and Materials Physics

E

Section F - Agricultural & Food Science

Agricultural Science
Food Science

F

Section G - Geology

G

Section H - Medical Science

H

Section I - Environmental Science & Technology

I

Section J - Engineering & Technology

J

Section K - Science Communication & Education

K

Section L – Chitin-Chitosan

L

A0001-The Enhancement of Password Security System Using Keystroke Verification

Taweetham Limpanuparb

Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400

Mahidol Wittayanusorn School, Salaya, Phuttamonthon, Nakhorn Pathom 73170

E-mail addresses: taweetham@acm.org, u4705075@student.mahidol.ac.th

Abstract: At present computer security is increasingly important as global access to information and resources becomes an integral part of many aspects of our lives. Reliable methods for user verification are needed to protect both privacy and important data. Password verification has been used for a long time. Due to its simplicity and affordability, this technique had been very successful. However, processing power of computers has increased dramatically which has made the use of password verification insufficient. Enhancement of security in password verification can simply be conducted by increasing password length, changing passwords more often, and/or using meaningless strings as passwords. Nonetheless these methods may not work efficiently because of human memory limitation. Keystroke verification, a biometric method, is based on user typing parameters which can be defined as key hold time and interkey time. These two parameters are collected while users type in their passwords. Novel statistical methods are proposed here to determine whether the keystroke data actually belong to the user.

A0002-An Evaluation of Teaching Foundation Courses at Kasetsart University, Kamphaengsean CampusTipanun Thepsri¹, Boonyaruch Wathanyu¹ and Pitsamai Hanmongkolpipat¹¹ Faculty of Liberal Arts and Science, Kasetsart University, Kamphaengsean Campus, Nakornpathom

E-mail address: b43160571@ku.ac.th, b43160639@ku.ac.th and faaspnh@ku.ac.th

Abstract: The purpose of this study is to evaluate the teaching of foundation courses run by the Faculty of Liberal Arts and Science for the academic year 2003 at Kasetsart University, Kamphaengsean Campus. They were more than 100 students in each lecture group. There were 3 courses: 720111 The Principles of Biology, 728111 General Chemistry and 733111 General Physics I. The instrument used was a questionnaire. It was used to collect the data and analyze the data by Descriptive Statistics. The results of the study were: Students had positive attitudes towards the three foundation courses. It was found that the number of students in each group was suitable. They understood the objectives of the courses and they could achieve the objectives set by the teachers. The content of the course was interesting. The exercises helped develop their learning and enrich their knowledge. The evaluation was suitable. The teachers were friendly and teaching methods were suitable.

A0003-THE CHARACTERISTIC IN THE FIRST FUNDAMENTAL THEOREM OF NEVANLINNAOrawan Kaewkanjana¹, Erwin Mues² and Ungsana Chundang³¹ Department of Mathematics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand.² the Institute of Mathematics, Technical University of Hannover, Germany³ Department of Mathematics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand.

E-mail address: mues@math.uni-hannover.de, iungdang@kmutt.ac.th and orawan@bunga.pn.psu.ac.th

Abstract: In this research mentions to the first fundamental theorem and the development of the basic properties of meromorphic functions related to their characteristic function. It is shown that $T(r, f)$ is an increasing convex function of $\log r$.

A0005-A DEVELOPMENT OF SCRABBLE GAMES ON INTERNET

Sittichai Bussaman, Sopak Chaichana, Chusak Sochara, Komin Piromchom, Sarawut Poltue

Department of Computer Science, Faculty of Science and Technology, Rajabhat Maha sarakham University, Mahasarakham 44000, Thailand;

E-mail address: Sittichai@rimhk.ac.th

Abstract: Currently, computer games play an important role in our society. This is because they can relax and entertain people. Scrabble game is the one of the most popular game. Not only enjoy players but also encourage players to think and player can practice english language. A purpose of Scrabble game development is to study how to develop interactive game program for entertainment. This game is apply B+ Tree structure for store and retrieve words in database. The result of the study is getting game that has a good interaction with users. During playing game, The mark will be calculated automatically. Users can play with computer or other player in case stand alone or internet environment.

A0006-EFFECTS OF SCAN DIRECTION ON ERROR DIFFUSION ALGORITHM

Sittichai Bussaman, Nawat Nantasen*

*Department of Computer Science, Faculty of Science and Technology, Rajabhat Maha sarakham University, Mahasarakham 44000, Thailand;

E-mail address: Nuntasen26@hotmail.com

Abstract: Digital halftoning is the process of breaking the continuous tones into patterns of black dots. Halftoning is an essential technique for binary display devices such as printers. This study presents a comparative study of halftoning

techniques using error diffusion algorithm. Each 8-bit input pixel will be compared with a fixed threshold to determine its corresponding output, either black or white. The resulting error is then diffused to its neighboring pixels with different weights. This study use Floyd and Steinberg filter. Furthermore, this algorithm could process in six directions yielding different effects. The results tested for each direction are on both synthetic images and natural images that show quality of binary image, black/white ratio advantages and this disadvantages of each method.

A0007-RealWP: A REALISTIC WEAVING PROTOTYPE FOR TEXTILE INDUSTRY

Chonvit Tholieng and Pavadee Sompagdee

Department of Computer Science, Faculty of Science & Technology, Thammasat University (Rangsit Campus), Patumthanee, Thailand

E-mail address: chonvit@hotmail.com and pavadee@cs.tu.ac.th

Abstract: Today, weaving software packages have played important roles in textile industry due to their capabilities in shortening the repeating processes of designing, making flat sketches and looming. With high demand, a lot of these software products are launched in the market. Unfortunately, standardization of weave pattern information has not achieved the uniformity. The lack of an agreed format is conspicuous with clear financial benefit to its vendor. To lessen the cost from vendor lock-in, open systems are required. Therefore, we developed a software prototype called RealWP as a demonstration for a weave design opened architecture. In our software, a user-interface, data specifications and basic weave operators are proposed. When compared to other weave design software packages in the market, the results have shown that RealWP significantly decreases the size of the data file while still served user's requirements. We also present a technique on how to apply weave pattern information obtained from the designed pattern to create a bump map in order to make a realistic weft and warp yarn 3D visualization of 2D fabrics. Finally, we apply a physical simulation of cloth method to provide a designer an integration scheme for the look and feel of the cloth.

A0008-RealWP: A REALISTIC WEAVING PROTOTYPE FOR TEXTILE INDUSTRY

Chonvit Tholieng and Pavadee Sompagdee

Department of Computer Science, Faculty of Science & Technology, Thammasat University (Rangsit Campus), Patumthanee, Thailand

E-mail address: chonvit@hotmail.com and pavadee@cs.tu.ac.th

Abstract: Today, weaving software packages have played important roles in textile industry due to their capabilities in shortening the repeating processes of designing, making flat sketches and looming. With high demand, a lot of these software products are launched in the market. Unfortunately, standardization of weave pattern information has not achieved the uniformity. The lack of an agreed format is conspicuous with clear financial benefit to its vendor. To lessen the cost from vendor lock-in, open systems are required. Therefore, we developed a software prototype called RealWP as a demonstration for a weave design opened architecture. In our software, a user-interface, data specifications and basic weave operators are proposed. When compared to other weave design software packages in the market, the results have shown that RealWP significantly decreases the size of the data file while still served user's requirements. We also present a technique on how to apply weave pattern information obtained from the designed pattern to create a bump map in order to make a realistic weft and warp yarn 3D visualization of 2D fabrics. Finally, we apply a physical simulation of cloth method to provide a designer an integration scheme for the look and feel of the cloth.

A0009-E-LEARNING FOR ELECTRONICS DATA PROCESSING COURSES ON INTERNET SYSTEM

Sakauwrat Jongpattanakorn*

Department of Mathematics Statistics and Computer Science, Faculty of Liberal Arts and Science, Kasetsart University, Kamphaengsaeen Campus, Nakornprathom 73140; e-mail address: faassak@ku.ac.th

Abstract: The purposes of this research were to construct an Electronic Learning (e-Learning) program about Electronic Data Processing on Internet System and students can learn about Information Technology ontime. This program was developed by Program Flash, JavaScript and PHP language. The sample groups were 20 students. They were divided into two sub groups of 10 persons, the control and the experimented group. The instruments of this research consisted of pre- and post tests, E-Learning about Electronic Data Processing, a questionnaire, mid semester and final tests, Data dictionary lesson and student data base, helping tool, news and web board, assignment system and encryption security system. The results obtained can be summarized as follows: 1) Pre- and post tests showed that there was statistically significant difference ($p < 0.05$) between the control and the experimented groups. Students obtained higher scores in the post test for all lessons. However the achievement test revealed no statistically significant difference ($p > 0.05$) between the control and the experimented groups. The average of the achievement test for the control group was 66.35 marks (from 90 marks) and the experimental group was 65 marks.

A0010-ON NUMERICAL METHOD FOR FLOWING - THROUGH PROBLEM OF IDEAL INVISIBLE FLUID WITHIN 2-D DOMAIN

Peiangpob Mounnumprang^{1*}, Nikolay Moshkin²

¹Program of Mathematics, Faculty of Science and Technology, Valaya-alongkorn Rajabhat University, 13180, Thailand;

²School of Mathematics, Institute of Science, Saranaree University of Technology, Nakorn Ratchasima, 30000, Thailand;

e-mail address: peiangpob@math.sut.ac.th

Abstract: A numerical algorithm to study the boundary value problem in which the governing equations are the steady Euler equations and the vorticity is given on the inflow parts of the domain boundary is developed. The Euler equations are implemented in terms of the stream function and vorticity. The convergence of the finite-difference equations to the exact solution is shown experimentally for the test problem by comparing the computational results with the exact solution on the sequence of grids. The numerical algorithm is illustrated with several examples of steady flow through a $2-D$ channel with two inflow and outflow parts of boundary. The analysis of calculations shows strong dependence of the flow structure on the vorticity given at the inflow parts of the boundary.

A0011-ONVERGENCE AND NOISE-TOLERANCE PROPERTIES OF SUPPORT VECTOR MACHINES

Nittaya Kerdprasop, Kittisak Kerdprasop, Parichat Rattanasaring, Laksamee Khomnotai and Thammajak Thanniwet
Data Engineering and Knowledge Discovery (DEKD) Research Unit, School of Computer Engineering, Suranaree University of Technology, Nakhon Ratchasima, Thailand
E-mail address: nittaya@ees.sut.ac.th, kerdpras@ees.sut.ac.th

Abstract: Real world data tend to be huge and noisy. Noise, or random error, in data can reduce learning performance in terms of learning accuracy. Learning concept model from a very large data also causes a performance problem even with the most efficient algorithm. It has been show in the previous studies that many learning algorithms can learn from a sample of data and produce as accurate model as dose learning from the whole population. We are interested in studying the convergence and noise-tolerance properties of the support vector machines, a statistical learning algorithm introduced recently and gained popularity rapidly. The experimental results reveal that support vector machines converge very fast with a sufficient sample of 300 – 500 instances. The noise tolerant level is quite high when noise occurs at various positions.

A0012-WRAPPER AND FILTER APPROACHES TO FEATURE SELECTION IN DATA MINING

Kittisak Kerdprasop, Nittaya Kerdprasop, Naris Minemora and Nurapon Wongprachanukul
Data Engineering and Knowledge Discovery (DEKD) Research Unit, School of Computer Engineering, Suranaree University of Technology, Nakhon Ratchasima, Thailand
E-mail address: nittaya@ees.sut.ac.th, kerdpras@ees.sut.ac.th

Abstract: The objectives of feature selection in data mining are three-fold, that is, to improve the prediction performance of the induced models, to induce faster and more cost-effective models, and to simplify the model representation. This paper presents a comparison of filter and wrapper approaches to feature selection. Results are reported for a selection of standard data sets tested on four induction algorithms: naive Bayes, voted perception, neural network, and 10 nearest neighbors.

A0013-BOOSTING THE BAYESIAN LEARNER WITH A TREE-BASED ATTRIBUTE SELECTION

Kittisak Kerdprasop, Nittaya Kerdprasop, Naris Minemora and Nurapon Wongprachanukul
Data Engineering and Knowledge Discovery (DEKD) Research Unit, School of Computer Engineering, Suranaree University of Technology, Nakhon Ratchasima, Thailand
E-mail address: Nittaya@ees.sut.ac.th, kerspras@ees.sut.ac.th

Abstract: We examine the Bayesian learner, a probabilistic method for model induction. We hypothesize that reduction of irrelevant attributes will improve the model accuracy induced by the Bayesian learning algorithm. We suggest the attribute selection technique based on the decision-tree induction. Experimental results on five natural domains are reported. The results seem promising and yet need further studies.

A0014-SUT MINER: A DATA MINING SYSTEM

Kittisak Kerdprasop and Nittaya Kerdprasop
Data Engineering and Knowledge Discovery (DEKD) Research Unit, School of Computer Engineering, Suranaree University of Technology, Nakhon Ratchasima, Thailand
E-mail address: nittaya@ees.sut.ac.th, kerdpras@ees.sut.ac.th

Abstract: Data mining system aim to discover patterns and extract useful information from facts recorded in databases. In this paper, we describe SUT Miner, a complete data mining system including pre- and post-mining systems. A pre-data miner system has been implemented and named SUT Filter. A mining part of knowledge evaluation and refinement will be implemented lastly in our four-year project.

A0015-Short-Term Electrical Load Forecasting Using Artificial Neural Network

Oranit Panprasitwech¹, Woranut Koetsinchar²
¹Graduate Programme in Applied Mathematics, Department of Mathematics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand, E-mail: s5402412@st.kmutt.ac.th
²Department of Mathematics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand, E-mail: iworchai@kmutt.ac.th

Abstract: Short-Term electrical load forecasting is important for daily operation planning of electricity generation facilities. In practice, accuracy forecasting is however a difficult task because of dynamic behavior of several exogenous factors, namely, seasonal factors, economic and social factors, day types and time. Traditional forecasting techniques are typically those without an error-correction learning process, resulting in forecasts with high errors. This paper thus introduces an artificial neural network with a multilayer perceptron architecture and a back-propagation training process for improving a

short-term electrical load forecasting. The output of the forecasting model is compared to that obtained by a traditional statistical technique, the Box-Jenkins model. The result of the comparison shows that the artificial neural network model produces a more satisfactory result than that obtained by the Box-Jenkins model.

A0016-SEGMENTATION OF OVERLAPPING CHROMOSOME IMAGES

Wacharapong Srisang*, Krisanadej Jaroensutasinee, Mullica Jaroensutasinee
CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, Nakhon Si Thammarat 80160, Thailand.
E-mail address: 45203247@wu.ac.th, jkrisana@wu.ac.th, jmullica@wu.ac.th

Abstract: The classification of human chromosomes is a common task in cytogenetic tests. Successful separation between overlapping chromosomes in a metaphase image is crucial for correct classification. Current systems for automatic chromosome classification are mostly interactive and require human intervention for correct separation between touching and overlapping chromosomes. Special separation methods are required to segregate chromosomes because they are non-rigid objects. In this study, we developed a new technique based on computational geometry to find the interesting points from the chromosome contour, use these points to generate separation lines and select the best ones.

A0017-VISUALIZATION OF NOGAPS WIND DATA

Warabhorn Preechaporn*, Krisanadej Jaroensutasinee
CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, Nakhon Si Thammarat 80160, Thailand;
E-mail address: pwarabho@wu.ac.th, jkrisana@wu.ac.th

Abstract: We develop a visualization technique to study wind direction and magnitude at various altitude level in Thailand. Wind velocity data (i.e. u and v components) are downloaded from the Navy Operational Global Atmospheric Prediction System (NOGAPS) website, then the data is transformed to binary files, imported into our program and visualized in various ways. We found that our technique can be used to visually detect boundaries of monsoons that lie across the Peninsula of Thailand.

A0018-Gasoline Dynamic Interfacial Pressure Profiles Data Analysis Program

Chalothorn Liamwirat¹, Narong Lenghor², Jeerayut Chaijaruwanich¹ and Kate Grudpan²
¹ Department of Computer Science, Faculty of Science, Chiang Mai University, Chiang Mai,
² Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.
E-mail address: chalothorn09@yahoo.com, kimengex@hotmail.com, jeerayut@science.cmu.ac.th and kate@chiangmai.ac.th

Abstract: Dynamic interfacial pressure or DIP values of gasoline from different gas stations were measured. In this research, we develop a gasoline DIP profiles data analysis program which is a tool that helps to analyze DIP profiles data and to detect if the gasoline is different from others of the same trade mark by using the computational and statistical methods. This program provides many methods including data clustering using k-means algorithm, principal components analysis (PCA), data classification using k-nearest neighbor classifiers and outlier detection using standard deviation. Furthermore, the results are shown in graphic pattern which are easy to view and understand, such as scatter plot and pattern line

A0019-COLLISION OF LUMP SOLITONS

Sarun Phibanchon and Michael A. Allen
Physics Department, Mahidol University, Rama 6 Road, Bangkok 10400

Abstract: It has recently been demonstrated that the positive dispersion Schamel-Kadomtsev-Petviashvili equation admits lump soliton solutions of similar form to those of the positive dispersion Kadomtsev-Petviashvili (KP') equation. We numerically investigate the collision of two SKP' lump solitons that are both travelling along the x -axis. For direct collisions, one or two lump solitons result, but for off-axis collisions two lump solitons are produced.

A0020-Theorem on Invertible Matrix

Nathnarong Khajohnsakumeth and Somsak Orankitjaroen
Department of Mathematics, Faculty of Science, Mahidol University

Abstract: From the Cayley-Hamilton Theorem which states that "Any square matrix satisfies its characteristic equation" Russell Euler examined conditions of a 2×2 matrix A such that its inverse also satisfies the characteristic equation. In this research, we extended his result from 2×2 to 3×3 square matrix and found that the condition for an inverse matrix, A^{-1} , to satisfy the characteristic equation of the matrix A is

$$\text{tr}A = \begin{cases} \frac{1}{2} (\text{tr}^2 A - \text{tr} A^2) \text{ if } \det A = 1, \\ -\frac{1}{2} (\text{tr}^2 A - \text{tr} A^2) \text{ if } \det A = -1. \end{cases}$$

A0021-SOLVING FUNCTIONAL EQUATIONSChanun Lewchalermvongs and Somsak Orankitjaroen¹¹Department of Mathematics, Faculty of Science, Mahidol University

E-mail address: cnlciv@hotmail.com.

Abstract: Functional equations arise often, in problems and elsewhere. Piotr Krysta solved the functional equation

$$f(4x) - f(3x) = 2x, \quad x \in \mathbb{R}$$

for monotone functions. In this research, we extended his result by seeking a solution in the class of bounded variation functions to more general functional equation

$$af(mx) + bf(kx) = x, \quad x \in \mathbb{R}$$

where m, k, a, b , are nonzero real numbers and $m > k > 0$. In additions, we began to consider the functional equation

$$f(mx) - f(kx) + f(nx) = x, \quad x \in \mathbb{R}$$

where m, k, n are positive real numbers and $m > k > n$, as well as the functional equation

$$f(mx) - f(kx) + f(nx) - f(lx) = x, \quad x \in \mathbb{R}$$

where m, k, n, l are positive real numbers and $m - k + n - l \neq 0$.**A0022-The Development of Test Analysis System in Open Source Learning Management System ATutor**

Sunee Raksakietisak

Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

e-mail address: sunee@swu.ac.th

Abstract: Srinakharinwirot University has been implementing the open source Learning Content Management System (LCMS) "ATutor" of the University of Toronto, Canada (<http://www.atutor.ca>) since the first semester of academic year 2546 in version 1.1^[1] and continue up to now in the first semester of academic year 2547 in version 1.4^[5] (<http://course.swu.ac.th/>). The system was found to have the complete Learning Management System (LMS) components^[4], easy to install, easy to use, and has high reliability. Testing is one of the important components of the LMS. The testing components that comes with most LMS generally have the modules of test construction, test taking, and test scoring but lack item banking module and test analysis module. The researcher has developed the online item banking and testing system^[2] but hasn't yet implemented and formally used at Srinakharinwirot University because many modules already have in ATutor system. In order to make the testing system in ATutor complete, the researcher has developed the test analysis module in ATutor. The test analysis module can analyze the test results both from the testing in ATutor itself and also from the result of traditional testing where the responses raw data have been put in a file. The analysis results have 2 parts, part 1 is the result of the test such as the statistics about the test and the test reliability, part 2 is the result of the item analysis such as item difficulty and item discrimination.

A0023-A Program for Thai Search Engine on Linux

Narisa Chutinara

Department of Mathematics, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand

E-mail address: narisac@swu.ac.th

Abstract: Sala Search is a tool developed to search information of faculties and departments in Srinakharinwirot University. It provides two options to search information by selecting menus or filling a question in both Thai and English in the given textbox. The question will be processed with indexed data which can be searched with all of the words or with at least one of the words.

A0024-Analysis and Development of Student Information Template with Microsoft Visual Basic Application

Waraporn Viyanon

Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

Email address: waraporn@swu.ac.th

Abstract: Student information system is a process that helps instructors understand what factors effect student's study development. The purpose of this study is to study, analyze and develop a template of storing student information. The information consists of academic record, health profile, family profile and further study information. The information will be used for developing students' potential further. The development of the template used existing basic application software with VBA programming for storing information and making statistical reports. The template has been used in schools of the department of Education Bangkok Metropolitan Administration since January 2004.

A0025-K-Hyperperfect NumbersKhwanjai Pasapan and Somsak Orankitjaroen¹¹Department of Mathematics, Faculty of Science, Mahidol University

E-mail Address: khwan1605@lemononline.com

Abstract: A number n is k -hyperperfect number for some integer k if $n = 1 + k \sum d_i$

where d_i is a proper divisor of n . The 1-hyperperfect numbers are the familiar perfect numbers. Many efforts have been invested among mathematicians to find a formula of k -hyperperfect numbers. Daniel Minoli and Robert Bear found one representation of

1-hyperperfect numbers and proved a theorem.

"If for some n , $n = 3^{t-1}(3^t - 2)$ is a second degree Mersenne number then n is 2-hyperperfect number"

It was generalized later to

"For a positive integer t and a prime number p , if $n = p^{t-1}(p^t - 1)$ is $(p - 1)^{th}$ degree Mersenne number then n is a $(p-1)$ -hyperperfect number"

In this research, we proved the converse of the above theorem, and studied some informations about a nonexistence of k -hyperperfect numbers for some k .

A0026-WATERSHED COMPUTATION FROM DIGITAL ELEVATION MODEL BY DETERMINISTIC 8 METHOD

Teechada Taxommas and Kinsanadej Jaroensutasinee*

Complex System Research Unit (CX-KURU.E), Computational Science Graduate Program, Institute of Science, Walailak University, Tasala, Nakhon Si Thammarat 80160 Thailand, email address: jkm-and@wvu.ac.th, t4200053@wvu.ac.th

ABSTRACT: We develop a method that can generate a theoretical watershed from a DEM. In this study, the DEM represents the elevations of Amphoe Phipun Nakhon Si Thammarat. Our method assigns every grid cell in the DEM with a "flow direction". It is the direction that the water would run or flow. The one common method is the Deterministic 8 (D8) algorithm which assigns a flow direction to the cell in the center by considering the direction of the largest drop in elevation. It was used to generate stream networks and watershed delineation.

A0028-Parallelization of Lattice Boltzmann method for Cavity Flow Simulation

Panich Munka and Kinsanadej Jaroensutasinee*

*Science and Technology, Nakhon Si Thammarat Rajabhat University Meung, Nakhon Si Thammarat 8000 Thailand

†Science, Walailak University, Tasala, Nakhon Si Thammarat 80160 Thailand

Abstract: This work presents a parallel computation of incompressible cavity flow in 2 dimensions by solving Navier-Stoke equations using the lattice Boltzmann method (LBM). The BGK model for collision of particles in 9 velocity directions is used. Parallelization is done by using horizontal domain decomposition with each decomposed domain being computed on a separate node of WACP4 Cluster. We get exactly the same result as for one node simulation. With our current tools, it is possible to model large scale problems while requiring less calculation time.

A0029-IMAGE CHANGE DETECTION USING GROUPING METHOD

Nat Piyapramote

Sarasin Panchayalai School, Ratchaburi, Thailand

E-mail address: admin@samdev.net

Abstract: Detection of image change is the most important step in processing moving images, e.g. in object tracking. These processes need a methodology that has the best accuracy to detect the change between two images. The standard image change detection method cannot identify noise arising from capturing methods such as a low-resolution camera or image which have different brightness because captured at different times. The method that is used for detecting the change between two images is to group the pixels on the difference map so that noise will separate on the difference map but data will arrange in groups on the difference map. This study shows that the threshold value (see Figure 2) which give the best efficiency is 24 with the value of least-member-of-group being 53 (0.05% of the image's size). The evaluation methods used are PCC, Jaccard and Yule. The results show that the accuracy of this image change detection method is 97.47%.

B0001-ANTIBACTERIAL ACTIVITY OF THE SEEDS OF *COMBRETUM QUADRANGULARE*, KURZ.Khesorn Nanthachit¹, Damrong Santriarvorn¹ and Banyong Khantawa²¹Department of Pharmaceutical Science, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand.²Microbiology Section, Central Laboratory, Maharaj Nakorn Chiang Mai Hospital, Chiang Mai, Thailand

Abstract : The seeds of *Combretum quadrangulare*, Kurz. were extracted with methanol. Purified crude methanolic extract by Reverse phase chromatography using Microcrystalline cellulose column chromatography 1 time and Microcrystalline cellulose preparative layer chromatography 2 times and using MeOH-H₂O (1 : 1) as eluting and developing solvents. It was found that crude methanolic extracts 2 samples (one sample was collected at 1997 and the other one was collected at 2001.). Purified column chromatographic residue and Preparative layer chromatographic residue showed antibacterial activity against gram positive cocci (e.g. Methicillin sensitive *Staphylococcus aureus*, MIC = 625-1250 µg/ml and Methicillin resistant *Staphylococcus aureus*, MIC = 312-625 µg/ml) and non-fermentative gram negative bacilli (e.g. *Pseudomonas aeruginosa*, MIC = 1250-2500 µg/ml and *Acinetobacter baumannii*, MIC = 625-1250 µg/ml) better than fermentative gram negative bacilli (e.g. *Escherichia coli*, MIC = 2500- >10000 µg/ml). MIC (Minimum inhibitory concentration) of four sample groups against sensitive bacteria were nearly the same. From spectroscopic data and chemical test, it was found that the isolated residue from PLC were steroid and flavonoid glycosides. From nearly the same MIC, we can use the seeds of *Combretum quadrangulare*, Kurz. directly without purification. The seeds can be kept close and dry to prevent mold growth for several years and can be taken without harmful because people have used them as anthelmintics for a long time.

B0002-Effects of temperature and salinity on heart rate of the blue swimming crabs, *Portunus pelagicus* (Linnaeus 1766)

Nongnud Tangkrook-olan, Ratsamee Ketpadung

Department of Aquatic Science, Faculty of Science, Burapha University, Chonburi, Thailand

Abstract: Blue swimming crab, *Portunus pelagicus* is a valuable commercial species in Thailand, however, relatively, little information is available on its environmental requirements. The present study undertook to measure heart rate as an indicator of stress in response to increasing temperature (20, 25 and 30°C) and decreasing salinity (25, 50, 75, 100 and 125‰SW). Adult male crabs were obtained from fishermen at Bangsaen, Chonburi, Thailand. Heart rate (beat min⁻¹) increased significantly (P < 0.05) with temperature and when salinity was lower or higher than 100‰SW.

B0003-MICROSTRUCTURE INVESTIGATIONS OF PORCINE AMPULLARY OVIDUCTAL EPITHELIAL CELLS BY SCANNING ELECTRON MICROSCOPE

Mayuva Areekijserree*, Renu Vejaratpimol and Nongnuch Gumlungpat

Department of Biology, Faculty of Science, Silpakorn University, Thailand.

E-mail address: Maiajackee@hotmail.com

Abstract: The mucosa surface in the porcine ampullary oviducts (PAO) at the follicular and luteal phases were examined under scanning electron microscope (SEM) to observe the cell types and cellular populations. At follicular phase, the porcine ampullary oviductal epithelial cells (PAOEC) contained the great number of high ciliated cells whereas, those at the luteal phase consisted of less number of them, but they were filled up with numerous of round shaped non-ciliated cells with short microvilli on the apical surface. It seem to be that, porcine ampullary oviductal epithelium (PAOE) changes their morphological features to suit for functioning in the reproductive processes.

B0004-Morphological studies and classification of cells in the lymphoid organ of giant black tiger prawn; *Penaeus monodon*.Prasert Meeratana¹, Kraijak Booncheun¹, Watchara Wongkerdsuk², Kun Anantasomboon², Kanokphan Wongprasert² and Boonserm Withyachumnankul²¹ Department of Medical Science, Faculty of Science, Burapha University, Chonburi.² Department of Anatomy, Faculty of Science, Mahidol University, Bangkok, Thailand.E-mail address: g3936465@yahoo.com

Abstract: This research is performed to study the definite site, general morphology, histology and classified cells in the lymphoid organ; LO, of giant black tiger prawn broodstocks. The prawns are collected from the fisherman at Angsila pier, seafood morning market, Chonburi. The healthy broodstocks of 150-200 gm in body weight are sampled and fixed by direct injection of Davidson's fixative for paraffin embedding and 4% glutaraldehyde in cacodylate buffer pH 7.4 for plastic, Araldite 502, infiltration. The routine and specific tissue processing, embedding, sectioning and staining for light microscope are performed. It is found that, the LO has two lobes of an ovoid shape organ, which capsule invested by the dense regular connective tissue and hemolymph sinuses. The LO locates dorso-anterior to the ventral hepatopancreas. It supplies by a single subgastric artery, which branches into left and right lymphoid arteries before they enter the organ and continue inside as the main tubules of each lobe. Histologically, the LO contains numerous unordered tubules, which classify as compound convoluted tubular gland. The glandular tissue could be divide into 3 compartments of luminal, tubular and intertubular compartments. The luminal compartment contains 4 types of immature and mature hemocytes, which are agranular, small granular, medium granular and lobular nuclear cells. The tubular compartment is subdivided into peritubular, intermediate and peripheral zones. The cellular compositions of tubular compartment are varies from zone to zone. They are including of luminal lining, epitheloid, peritubular giant, spheroid nuclear, U-shape nuclear, nucleochromatic and stromal cells. The intertubular compartment composes of agranulocytes and granulocytes, which are hemocytes that

B

become mature, which screened by the LO during migration from the luminal compartment. These histological findings suggest that, the LO is the organ that play an important roles in defense mechanisms of the crustacean either direct cytotoxicity or indirectly via unknown mediators. The contribution of LO on hemocytes maturation could not be exclude.

B0005-THE OPTIMAL CONDITIONS FOR THE CELLULOSE PRODUCTION FROM SUGAR PALM SYRUP-COCONUT JUICE

Tanussara Laochareonsuk* and Wiriya Khwancong

Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani 94000, Thailand

e-mail address : ltanus@bunga.pn.psu.ac.th

Abstract: Optimal conditions of cellulose production from the fermentation of sugar palm syrup-coconut juice by bacteria *Acetobacter xylinum* TISTR 107 was studied. The composition of sugar palm syrup and coconut juice, the amount of acetic acid, $\text{NH}_4\text{H}_2\text{PO}_4$, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, inoculum and fermentation period on cellulose's yield were investigated. The productivity of cellulose in each batch was compared and reported as its thickness and cellulose weight. The results showed that optimized production for a litre of culture medium composed of fresh sugar palm syrup and coconut juice with the ratio of 8 : 2. Sugar was used to adjust the sugar concentration of the medium to 15°Brix. Further, culture medium was added with 6 ml acetic acid, 3.0 g $\text{NH}_4\text{H}_2\text{PO}_4$, 0.08 g $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ with 7.5 % of bacterial inoculum and incubated at room temperature. The thickness of cellulose production reached 1.58 cm and cellulose weight was 57.74 g in 11 days. The sensory evaluation showed that there were no significant difference in order and texture between the cellulose from sugar palm syrup-coconut juice and the traditional cellulose production from coconut juice. However, there were significant differences in color and acceptability. Thus, the cellulose from sugar palm syrup-coconut juice gave significantly better result in its acceptability. Chemical analysis of the cellulose produced under these optimal culture conditions revealed 0.22 % protein, 0.03 % fat, 2.69 % fiber, 0.10 % ash and 95.88 % moisture content. The results suggest that cellulose production from sugar palm syrup-coconut juice can be used in food and confectionery.

B0006-Effect of light on carotenoids and chlorophylls in orchid leaves of two genera

Witayaporn Pornchuti¹, Kanchit Thammasiri¹ and Unchera Sookmark¹

¹ Department of Plant Science, Faculty of Science, Mahidol University, Rama VI Road, Bangkok, Thailand, 10400

Abstract: Carotenoids and Chlorophylls in leaves of *Brassavola nodosa* (L.) Lindl. and *Schomburgkia tibicinis* Bateman were examined by high-performance liquid chromatography (HPLC). Six carotenoids, neoxanthin, violaxanthin, antheraxanthin, lutein, zeaxanthin, and β -carotene, and chlorophyll *b* were identified. Differences in pigment composition were observed among orchids and light conditions. In high light intensity, a protective mechanism of plant for excessive radiant energy involves the interconversions among violaxanthin, antheraxanthin and zeaxanthin, known as the violaxanthin or xanthophyll cycle. This mechanism protects chlorophylls from high light intensity and transfer the energy to reaction center to make a photosystem. Zeaxanthin in high light intensity (full sunlight) is higher than in low light intensity (50% sunlight).

B0007-Monoclonal antibodies specific to *Vibrio harveyi*

Wannipa Phianphak¹, Sirirat Rengpipat¹, Sombat Rukpratanporn², Siwaporn Longyant¹,

Parin Charvisuthangkura³, Weerawan Sithigorngul¹ and Paisarn Sithigorngul^{3*}

¹Biotechnology program, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology, Ministry of Science and Technology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

³Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

Abstract : Monoclonal antibodies (MAbs) against *Vibrio harveyi* were produced from mice immunized with heat killed and SDS treated highly virulent strain of *V. harveyi* 639. Fourteen MAbs were selected and can be divided into 5 groups according to their specificities to various proteins range from 8-49 kDa. Most of the selected MAbs did not show cross reactivity to other *Vibrio* spp. and various Gram negative bacteria tested. Two groups of MAbs could be used to localize *V. harveyi* infection in the tissues of black tiger shrimp *Penaeus monodon* by means of immunohistochemistry. This study demonstrated the versatility of highly specific immunological tool for diagnosis of *Vibrio harveyi* in aquaculture and can be further developed to a convenient test kit.

B0008-PRELIMINARY SURVEY ON SOIL CILIATES PROTOZOA IN THAILAND

Pinich Wangsomnuk^{1*}

^{1*} Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

E-mail address: pinwan@kku.ac.th

Abstract: This is the first study of soil ciliate protozoa in Thailand. A very diverse ciliate community was found in ten soil samples from Amphor Muang, Khon Kaen Province, North East of Thailand. The ciliate respectively, their resting cysts, were reactivated from air-dried samples using the non-flooded Petri dish method. Species were determined from living ciliate and by silver impregnation. A total of 36 ciliate species was found in soil samples.

B0009- EFFECT THE CRUDE EXTRACT FROM MYCELIA OF HED MUEN PEE (*GANODERMA LUCIDUM*) AGAINST OF FUNGI GROWTH

Ratapol Somprasert and Kanchanee Tonak

Program of Biology, Faculty of Science and Technology, Chandrakasem Rajabhat University, Bangkok 10900, Thailand

Abstract : The effect of the crude extract from mushroom mycelia against fungi growth in five concentrates of crude extract found that the crude extract from ethanol 95 % and acetone at 80000 ppm was the best inhibited *Phytophthora palmivora* and *Colletotrichum gloeosporioides* following by 60000, 40000, 20000 and 0 ppm, respectively. The temperature and timing in stability of crude extract from mushroom mycelia found that the crude extract from ethanol 95 % and acetone at 4 °C, zero week was the best inhibited *P. palmivora* and *C. gloeosporioides*.

B0010-LOCALIZATION OF PRIMORDIAL GERM CELLS AND GONADAL DEVELOPMENT OF JAPANESE QUAIL *Coturnix japonica* EMBRYO

Sittipon Intarapat¹, Achariya Sailasuta² and Orawan Satayalai^{1*}

¹Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok.

²Department of Pathology, Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand.

E-mail address: 45725307@student.netserv.chula.ac.th and orawan.sa@chula.ac.th

Abstract: The objectives of this study are to localize the Primordial Germ Cells (PGCs) and to study anatomy and histology of gonadal development in Japanese quail embryo at various developmental stages. The PGCs of one day incubated embryo (stage 8, H&H) migrated passively from their extraembryonic origin by entering into the blood islands formed in area vasculosa. They are thus carried by the extraembryonic circulation into embryonic blood stream. On the second day of incubation these PGCs leaked from blood vessels, and migrated actively along the dorsal mesentery, and finally settled in the gonadal primordia which situated at the medioventral side of developing kidneys. Enzyme histochemistry technique was employed to detect both passive and active migrations of PGCs. Gonads of male embryo exhibited symmetrical development whereas those of female embryo revealed regression in the right gonad. PGCs can be distinguished from the somatic cells of the gonad by characters of a large cell with large nucleus, looser chromatin arrangement and clearer cytoplasm.

B0011-INFLUENCE OF ASCORBIC ACID AND OLEIC ACID ON GELATINIZATION AND RETROGRADATION OF STARCH

Ruchanok Cheotacha and Pensiri Sriburi*

Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: pensiri@chiangmai.ac.th

Abstract: Five starches, wheat, rice, glutinous rice, mungbean and cassava, have been investigated by gelatinization with a range of additives such as ascorbic acid and oleic acid. The experimental methods used included gravimetric assessment of water absorption, water solubility, and measurements of amylose content and intrinsic viscosity. All starches were gelatinized in the presence of additives by three heat-treated methods: boiling at 95°C with simultaneous agitation, and autoclaving at 105°C and 121°C without agitation. It was clearly demonstrated that boiling with agitation gave rise to greater starch conversion as measured by water absorption and solubility. Also, as would be expected, it was found to alter the amylose contents and intrinsic viscosities. All of the additives had significant effects on the physicochemical properties of gelatinized starch with ascorbic acid being more effective than oleic acid. Studies using typical storage conditions (-10°C, 4°C and ambient temperature) of the gelatinized starch indicated that addition of ascorbic and oleic acids caused both increases and decreases in the amounts of retrogradation depending on the starch sample. In contrast, mungbean starch gel seemed to be decreased by all additives.

B0012-A SURVEY OF SOME MEDICINAL NARROW LEAF WEEDS IN CHONBURI, THAILAND

Pragrom Prayoonrat

Department of Biology, Faculty of Science, Burapha University, Bangsaen, Chonburi 20131, Thailand

E-mail address: pragrom@buu.ac.th

Abstract: A survey was conducted to categorize medicinal narrow leaf weeds found in Chonburi Province, Thailand. Places sampled on 12 areas in 4 districts were residential areas, agricultural lands, plantations, uninhabited areas, along the sea shore and some aquatic habitats were also included. In total 23 species were cataloged belonging to 20 genera in 2 families. Of these weeds, 3 genera and 5 species were sedges, family Cyperaceae contrasted to 17 genera and 18 species for grasses, family Gramineae. The medicinal characteristics of each weed species were studied in collaboration with traditional herb medicine providers as well as from historical manuscripts. Frequency of occurrence and medicinal characteristics of the weeds are discussed.

B0013-CYTOTOXIC ACTIVITY OF THE ESSENTIAL OIL AND EXTRACTS FROM THAI MEDICINAL PLANTS ON P388, KB, B₁₆F₁₀ AND HeLa CELL LINES

Jiradej Manosroi^{1,2}, Pongsathorn Dhuntanom¹, and Aranya Manosroi^{1,2}

¹Pharmaceutical-Cosmetic Raw Materials and Natural Products Research and Development Center (PCRNC), Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai, Thailand

²Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand

E-mail address: pmpti006@chiangmai.ac.th, escher555@hotmail.com, pmpti005@chiangmai.ac.th

Abstract: The objective of this study was to screen the cytotoxic activity of eighty one samples of essential oil and extracts from Thai medicinal plants on P388 (murine leukemia), KB (human epidermoid carcinoma), B₁₆F₁₀ (mouse melanoma) and HeLa (human cervical adenocarcinoma) cell lines. Each cell line was seeded on 96-well tissue culture plates and the samples

B

(at the concentration range of 0.078-10.0 µg/ml) were exposed to the cells for 24 hrs. Numbers of the viable cells were detected by MTT assay. The cytotoxic activity, represented as IC_{50} (µg/ml) values, were evaluated from a plot of percent cytotoxicity against the sample concentrations. The medicinal plant extracts and essential oil samples that gave the highest cytotoxic activity (lowest IC_{50} values) on P388, KB, B₁₆F₁₀ and HeLa cell lines were Sweet Basil (*Ocimum basilicum* Linn.) oil at 36.20 µg/ml, Koi (*Strobilus asper* Lour.) extract at 32.50 µg/ml, Lemon Grass (*Cymbopogon citratus* (DC. Ex Nees.) Stapf) oil at 11.18 µg/ml and Citronella (*Cymbopogon nardus* (Linn.) Rendle.) oil at 39.49 µg/ml, respectively. The results from this study can be applied for the development of these extracts and oil samples for pharmaceutical or nutraceutical products.

B0014-Behaviour of Giant Panda (*Ailuropoda melanoleuca*) in captivity at Chiang Mai Zoo

Nattida Puenphasook¹, Narit Sitasuwan¹

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai

E-mail address: nattida414174@hotmail.com

Abstract: The general behaviour of giant pandas (*Ailuropoda melanoleuca*) in captivity at Chiang Mai Zoo was studied from November 2003 to January 2004 by observing and collecting behavioural patterns of the two pandas, one male and one female, using the measurement of qualitative and quantitative behaviour. With individual behaviour, it was found that they spent most of their time lying down. Their eating behaviour was seen all day and night. Resting and scratching behaviours were shown more by the male than the female. With social behaviour, the frequency of their playing behaviour is the same. The pandas had no individual distance and did not show territoriality. In captivity, they showed abnormal activities: aggressive behaviour such as aggressive playing, and stereotyped behaviour such as walking around, scratching and eating. Aggressive and stereotyped behaviours were shown by the male. Increasing frequency of eating and scratching behaviour was discovered in both pandas.

B0015-Isolation and screening of endophytic fungi producing antifungal antibiotic against *Pestalotiopsis* sp.

Nakhon Norkeaw.

Program of Applied Biology, Faculty of Science and Technology, University of Rajabhat Uttaradit, Uttaradit, Thailand

Email address: Nakhon046@yahoo.com

Abstract: The purpose of this study was to determine the antifungal antibiotic activity of endophytic fungi isolated from the leaves of *Dimocarpus longan* Lour. for inhibiting plant pathogenic *Pestalotiopsis* sp. Two hundred and eighty-three endophytic fungi were isolated from Longan leaves using triple-surface sterilization. Antifungal antibiotic production of the isolates had been tested with various production media and the crude extracts of the cultures were assayed for their antifungal antibiotic activities using paper disc diffusion assay against a test organism (*Pestalotiopsis* sp.). The nutritional requirements and cultural conditions for production of antifungal antibiotic by the isolated fungi under shake-flask conditions were determined. The results showed that crude extract from sabouraud broth of fungal strain T123 could effectively inhibit the growth of the test organism. Glucose, mannitol and fructose were determined to be the carbon source while sodium nitrate was preferred as the nitrogen source. Initial pH of culture media for antifungal production was 7.0.

B0016-BIOCHEMICAL ANALYSIS OF THE NS2B(H)-NS3(PRO) SERINE PROTEASES FROM FOUR DENGUE VIRUS SEROTYPES

Tawin Iempridee and Gerd Katzenmeier

Laboratory of Molecular virology, Institute of Molecular Biology and Genetics, Mahidol University, Salaya campus, Nakhon Pathom 73170, Thailand.

Email address: handsomenow@hotmail.com and frkgz@mahidol.ac.th

Abstract: Dengue virus-encoded NS2B-NS3 protease complex, together with host cell proteases specifically mediates processing of the viral polyprotein precursor, liberating the individual proteins from the precursor. Amino acid sequence analysis of the NS2B activation region and NS3 protease domain from dengue virus four serotypes reveals the relatively low percentage of sequence identity. The apparently low conservation has sparked interest to ascertain whether the biochemical and kinetic properties of proteases from different serotypes are disparate. The active form of protease complexes of four serotypes, NS2B(H)-NS3(pro), were expressed in *Escherichia coli* and purified on Ni²⁺ affinity followed by size-exclusion chromatography. The denatured precursors were refolded to yield active protease complexes by artificial chaperone-assisted refolding. Activity assays of DEN-2 to-4 proteases with the fluorogenic peptide substrate revealed similarities in binding affinity (K_m) whilst the catalytic rate (k_{cat}) was different. Thermal stability assays also demonstrated drastic differences in half-life at 50°C. Paradoxically, intrinsic fluorescence spectroscopy indicated a close similarity in tertiary structures of DEN-2 to-4 proteases. These novel findings suggest that dengue proteases from each type are the result of divergent evolution. Despite the similarities in the overall tertiary structures, they reflect the significant variability in enzymatic activities and stability, indicating the potential effect of genetic diversity on their biochemical properties.

B0017-TRICHOTOXIN A50: INDUCTION OF AN OXIDATIVE DEFENSE MECHANISM IN TOMATO AND ITS CELLULAR SITE OF ACTION

Suporn Nuchadomrong^{1*}, Panrithai Budthongsri¹, Sakda Daduang¹, Somdej Kanokmedhakul² and Kasem Soyong³

¹Department of Biochemistry, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand

²Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand

³Department of Plant Pest Management, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand.

*E-mail address: suporn@kku.ac.th

Abstract: The present study demonstrates the ability of trichothexin A50 (TA50) produced by *Trichoderma harzianum* PC01, in eliciting an oxidative defense mechanism in tomato seedlings by a simple treatment. Preliminary tests did not reveal significant accumulation of rushitin which is a kind of phytoalexins (antimicrobial substances arising from locally hypersensitive death after exposure to elicitors generating oxidative burst). However, TA50 caused changes in the activity of superoxide dismutase (SOD) throughout leaves and stems of the challenged seedlings. Two activity peaks appeared at 30 min and 6 hr after the exposure time. It indicated that TA50 came out systemic acquired resistance (SAR) via the generation of reactive oxygen species. The polyclonal anti-TA50 antibody was raised in mice and applied to immunolocalize the action site of TA50 by using tomato leaf protoplasts. The compound was detected abundantly within the protoplasts.

B0018-KARYOTYPES OF PUFFERFISHES (TETRAODONTIDAE) *MONOTRIACULATIL*, *M. TEIURUS*, *M. BIOCELLATUS* AND *CHONERHINUS NEBELI* FROM THAILAND

Thawat Domsakul¹ • Wichian Magnuson¹ • J. A. Acharya² Ramani² •

¹Department of Biology, Faculty of Science, Srinakharinwirot University,

Bangkok 10110, Thailand

Abstract: The purpose of this research was to determine karyotypes of pufferfishes including *Monotriaculatil*, *M. teiurus*, *M. biocellatus* and *Chonerhinus nebeli* from Thailand. A total 100 pieces of *M. teiurus* and 100 pieces of *Chonerhinus nebeli* of 40 while *Chonerhinus nebeli* had 42. The karyotypes are as follows: *M. teiurus* had 4 pairs of metacentric, 10 pairs of submetacentric, 3 pairs of subtelocentric and 3 pairs of acrocentric chromosomes. *M. biocellatus* had 4 pairs of metacentric, 10 pairs of submetacentric, 3 pairs of subtelocentric and 7 pairs of acrocentric chromosomes. *M. teiurus* and *M. biocellatus* had 7 pairs of metacentric, 5 pairs of submetacentric, 2 pairs of subtelocentric and 6 pairs of acrocentric chromosomes. *Chonerhinus nebeli* had 7 pairs of metacentric, 5 pairs of submetacentric and 2 pairs of acrocentric chromosomes. *Monotriaculatil* had 4 pairs of metacentric, 10 pairs of submetacentric, 3 pairs of subtelocentric and 7 pairs of acrocentric chromosomes. *Monotriaculatil* had 4 pairs of metacentric, 10 pairs of submetacentric, 3 pairs of subtelocentric and 7 pairs of acrocentric chromosomes. The karyotypes of *Monotriaculatil* and *Chonerhinus nebeli* were used for the first time to study the cytological taxonomy and the evolutionary relationships between the pufferfishes.

B0019- A STUDY OF KARYOTYPES AND MOLECULAR PHYLOGENETICS OF *ALLIUM* (LILIACEAE)

Acharya Rangsit¹ • Tapawittra Pongpawee¹ • Jari Thawat Domsakul¹ •

¹Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

E-mail address: acharya@swu.ac.th

Abstract: A study of karyotypes of *Allium* in Thailand showed that *A. ampeloprasum*, *A. cepa* var. *aggregatum*, *A. cepa* var. *viviparum*, *A. fistulosum*, *A. longicollum*, *A. longicollum* (large cloves) and *A. longicollum* (small cloves) had the same chromosome number of $2n = 2x = 16$. *A. longicollum* (large cloves) on the other hand, had twice the number of chromosomes ($2n = 4x = 32$). The average size of chromosomes ranged between 3.893 and 6.059 μm and most of the chromosomes were metacentric. Based on chromosome characteristics of *Allium* could be divided into an onion group and a garlic group. These two groups were clearly distinguished by the presence of satellited chromosomes in the former and secondary constrictions in the latter. Results of phylogenetic analyses based on the ITS region confirmed (BS: 66%) that it is interesting to note that in the onion group (BS: 90%) *A. cepa* var. *aggregatum* is more closely related to *A. longicollum* (BS: 64%) than to *A. cepa* var. *aggregatum*. This is also true for plants in the garlic group (BS: 98%) where *A. ampeloprasum* (large cloves) is more closely related to *A. ampeloprasum* (BS: 60%) than to *A. longicollum* (small cloves). Therefore, *A. ampeloprasum* and *A. ampeloprasum* could merely be varieties of *A. cepa* and *A. longicollum*, respectively.

B0020-DISPLAYS AND DISPERSION IN THE SIAMESE FIREBACK *LOPHURA DIARDI* (AVES: PHASIANIDAE)

Nichaya Praditsup¹, Philip D Round¹, Pilai Poonswad² and Amara Naksathit²

¹Department of Biology, Faculty of Science, Mahidol University, Bangkok, Thailand

²Department of Microbiology, Faculty of Science, Mahidol University, Bangkok, Thailand

E-mail address: nichaya@yahoo.com, pdround@kss.th.com and grams@mahidol.ac.th

Abstract: The social behaviour of the near-threatened Siamese Fireback *Lophura diardi* was studied in Khao Yai National Park, Thailand during May 2002 until April 2003. Seven types of displays, wing-whirring, grunt-whirring, threatening, chasing, fighting, courtship, submissive and displacement behaviour were recorded.

The wing-whirring display was performed chiefly by males (wing-whirring in females was rare). Single males gave whirring displays more often than multiple-male groups, while male-only groups performed whirring more often than mixed-sex groups. The Siamese Fireback wing-whirred in the breeding season more than in the non-breeding season. Wing-whirring in the Siamese Fireback was not relevant to courtship behaviour but could be related to dominance hierarchy, territorial advertisement, flocking signals and possibly mate attraction. Siamese Firebacks did not appear to show harem polygyny. Apparent pair associations were seen during the breeding season, suggesting that the breeding system was either monogamy or sequential polygyny.

B0021- LIFE CYCLE of an aquatic firefly, *Luciola brahmiana*

Anchana Thanchareon¹, Sangvorn Kithawee¹, Pilai Poonswad² and Virut Baimai¹ •

¹Department of Biology, Faculty of Science, Mahidol University, Bangkok, Thailand

²Department of Microbiology, Faculty of Science, Mahidol University, Bangkok, Thailand

E-mail address: g4438093@student.mahidol.ac.th

Abstract: *Luciola brahmina* is a common aquatic firefly distributed throughout freshwater areas in Thailand. This firefly has an extremely high risk of population decline because its habitat occurs in non-conserved areas or in uninhabited areas that have high chances of being destroyed and changed to a new ecosystem. Thus, an understanding of its biology is essential for conserving the species. In the present study, *L. brahmina* were cultured under laboratory conditions and its life cycle, developmental time and biology of each stage including the behavior of larvae were studied. Development takes about 3-4 months under laboratory conditions. Females were found to oviposit about 400-600 eggs under leaves of the aquatic plant, *Spirodella* sp. After hatching, the 6 stages of aquatic larvae were fed on golden apple snails, *Pomacea canaliculata*. When the larvae became mature, they climbed out from the water to pupate underground in earthen cells, and then emerged to adults. Measurements indicated size differences between males and females of mature larval, pupal and adult stages.

B0022-LOCALIZATION OF GLUTATHIONE S-TRANSFERASE IN CATTLE RUMEN FLUKE, COTYLOPHORON COTYLOPHORUM

Witoon Khawsuk, Winanda Seangtong

Department of Medical Science, Faculty of Science, Burapha University, Chonburi 20131, Thailand

E-mail address: Witoonj@yahoo.com

Abstract: Rumen fluke (*Cotylophoron cotylophorum*) is the cause of paramphistomiasis in cattles. Antelmintic drug treatment of the disease can kill only the juvenile parasite but there is less effect to the adult stage. It is thought that the adult parasite has a high amount of drug neutralization-enzyme, glutathione S-transferase (GST), to encounter the efficacy of the drug. To study the location and distribution of GST in the tissues of the adult rumen fluke, the adult parasites were stained with Hematoxylin & Eosin (H&E) and Periodic acid Schiff (PAS) techniques. The other group of parasites was stained with immunoperoxidase technique by using rabbit sera against *F. gigantica* GST as primary antibody. The results showed that GST was localized in various tissues of *C. cotylophorum* but has different staining intensity among organs. The strongest positive reaction was found in the parenchymal tissue. The moderate staining was observed in reproductive organs. Caecum and tegument showed only weak positive staining. However, the staining of GST in parenchyma can be divided into 4 levels; strong, moderate, weak and no staining, which is corresponded to the type of parenchymal cells stained with H&E and PAS techniques. This study suggests that adult *C. cotylophorum* contains very high concentration of GST and it has highest concentration of GST in parenchyma, moderate in reproductive organ and lowest in caecum and tegument. It is possibly that the highest neutralization reaction of anthelmintic drug by GST is occurred in the parenchyma rather than the other tissues.

B0023-EFFECTS OF ASTAXANTHIN AND VITAMIN A SUPPLEMENTATION ON GROWTH, SURVIVAL AND LOW SALINITY TOLERANCE OF *Penaeus monodon* LARVAE

Rungjit Yoddee, Somkiat Piyatitivorakul, Piamsak Menasveta

¹Department of Biotechnology,

²Marine Biotechnology Research Unit, and

³Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok.

E-mail address: jumiko@maildozy.com and psomkiat@chula.ac.th

Abstract: *Penaeus monodon* larvae (zoea, mysis and postlarvae) were fed 9 different diets consisting three levels of astaxanthin (AX; 0, 200 and 500 ppm) and three levels of vitamin A (A; 0, 20,000 and 40,000 IU/kg). The experiment was 3x3 factorials in a completely randomized design with three replicates. Diets were practical diets with mean protein and lipid of 50 and 11%, respectively. The results showed that zoea and mysis survival and growth rate had interaction between AX and A. Fed AX 500 ppm had provided the highest survival and growth. For the PL15 stage, larvae with no A diet fed AX 500 ppm had higher survival rates than of shrimp fed other diets. The growth rate of PL15 shrimp fed the diet containing 0 ppm AX and A was significantly greater than that of shrimp fed other combination diets. Shrimp fed A 40,000 IU/kg showed less survival in zoea stage, but in mysis and PL stage, shrimp fed higher AX and A contents gave less survival than these shrimp fed only A diets. During a low salinity stress test, PL15 shrimp fed diets containing AX 500 ppm had significantly greater tolerance to low salinity exposure.

B0024-Partial characterization of bacteriocin produced by *Streptococcus* SK 5.1 : antimicrobial spectrum and optimal incubation time for bacteriocin production

Nipaporn Sankuntaw, Warayut Suranarakun, Parichat Phumkhachorn and Pongsak Rattanachaikunsopon*

Department of Biological Science, Faculty of Science, Ubon Ratchathani University, Warinchamrap, Ubon Ratchathani 34190; e-mail : pongsak@sci.ubu.ac.th

Abstract: Antimicrobial activity of a bacteriocin produced by *Streptococcus* SK 5.1 was examined by swab-paper disc method against several indicator strains. The results showed that the bacteriocin had ability to inhibit growth of *Leuconostoc mesenteroides*, *Bacillus cereus*, *Bacillus subtilis*, *Salmonella typhi* and *Proteus vulgaris*. Additionally, the optimal incubation time for bacteriocin production of *Streptococcus* SK 5.1 was determined. It was found that the optimal incubation time was 8 hr and the maximal bacteriocin activity was 2560 AU/ml.

B0026-Inhibitory Effect of Extracts from Clove (*Eugenia caryophyllus* Bullocks & Harrison) and Sweet flag (*Acorus calamus* Linn.) on Some Pathogenic Bacteria

Yingmanee Tragoolpua¹, Matcha Porn-in¹, Rannu Yucharoen¹, Narumol Thongwar¹, Khajornsak Tragoolpua² and Araya Jansatiern¹

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand, ²Department of Clinical Microbiology, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai 50200, Thailand

¹e-mail address: yboony@chaingmai.ac.th

Abstract: Crude extracts of *Eugenia caryophyllus* Bullocks & Harrison and *Acorus calamus* Linn. at concentrations of 3.3% and 33% were tested against *Staphylococcus aureus*, *S. epidermidis* and Methicillin Resistant *S. aureus* (MRSA) in this study. Using paper disc diffusion method, *Eugenia caryophyllus* Bullocks & Harrison extract at 33% could inhibit all strains better than 3.3%. Inhibition of the extract on MRSA strains was better than Penicillin at 2.0×10^7 unit/ml. While extracts of *Acorus calamus* Linn. at 33% and 3.3% inhibited all strains at the same level and inhibition of this extract on MRSA strains was not different from Penicillin at 2.0×10^7 units/ml. Thus, this will be useful for anti-bacterial drug development from Thai medicinal plant.

B0027-Tertiary lauraceous leaves from Li Basin, Lumphon Province, Northern Thailand

Paramita Phanwong^a, Prakart Sawangchote^a, Paul J. Currie^b

^aDepartment of Biology, Faculty of Science, Prince of Songkhla University, Songkhla 90112, Thailand

^bSchool of Biology, Institute of Science, Suranaree University of Technology, Sakon Nakhon 40000, Thailand

Abstract: Two fossil leaves were discovered from lacustrine deposits in Ban Pua Kha Subbasin, Li Basin, Lumphon Province, Northern Thailand. The subbasin was determined to be Late Oligocene to Early Miocene. The comparative leaf architectural analysis of gross form and fine venation of the fossils and living leaves is being performed based on the methods described by Hickey (1973), Dikcher (1974), LAWG (1999), and Sawangchote (2004). The preliminary results show that the fossils have affinity close to the genera *Neomomium*, *Leptocarya*, and *Neobuxus* for example of the family Lauraceae. Apart from lauraceous leaves, leaves of some other families also show similarity to the fossils. Further analysis is needed for exact generic and specific identification. Moreover, a leaf key to the living species with venation types that are the same as or similar to those of the fossils will be constructed. Discussion on modern and past distribution of the nearby living relatives identified will also be provided.

B0028-GROWTH FORM COMPARISON OF *PORPHYRA VIETNAMENSIS* TANAKA ET PHAM-HOANG HO AT KAOSENG AND SUANSONGTALAY, SONGKHLA, THAILAND

Sutinee Sinutok¹ and Anchana Prathep²

^{1,2}Faculty of Science, Prince of Songkhla University, Songkhla, Thailand, 90112

E-mail address: ssutinee@hotmail.com and panchana@fsc.psu.ac.th

Abstract: *Porphyra vietnamensis* Tanaka et Pham-Hoang Ho was collected three times in 22 November 2003, 17 January and 29 February 2004 at Kaoseng and Suansongtalay, Songkhla. Length, width and dry weight of *P. vietnamensis* and physical factors such as temperature, salinity, pH and wind speed were investigated. ANOVA revealed that length, width and dry weight varied among sites ($p < 0.05$). *P. vietnamensis* at Kaoseng was shorter and narrower than *P. vietnamensis* at Suansongtalay. There were no differences in temperature and pH among sites ($p > 0.05$). Salinity was 28-30 ppt and was different among sites ($p < 0.05$). However, mature thallus of *P. vietnamensis* can grow well between 20-30ppt (Ruangchuay and Notoya, 2003). Therefore, salinity was unlikely to influence the differences of length and width of *P. vietnamensis*. However, Kaoseng was more exposed to wave and wind than Suansongtalay. Thus, we found shorter and narrower *P. vietnamensis* frond at Kaoseng. The algae adapt their morphology to reduce the effect of wave motion.

B0029- Study on Webspinners Order Embiidina in Chiang Mai University

Paitoon Leksawasdi, Mr. Artit Rukkasikorn

Biology Department, Faculty of Science, Chiangmai University, Chiangmai 50200

Abstract: The Study of webspinners Order Embiidina in Chiang mai University was conducted during the period of August 2002 to March 2004. The ecological study found changing in number of some webspinners which were high in summer, lower in the rainy season and very low in winter. Gallery building behavior of webspinners were all similar. Gallery patterns, found only in habitats of webspinners on tree bark, were simple and complex. External morphological studies were on antenna, ventral papillae, and wing venation and cerci in males. These characteristics were used for classification and taxonomic identification of webspinners, resulting in three families: Oligotomidae, Notoligotomidae and Embidae. Also, they could be classified in three genera: *Aposthonia*, *Oligotoma*, *Ptilocerebia*. The remaining of two species could not be identified in to genera level from observation of 6 species.

B0030-SINGLE COPY NUCLEAR DNA MARKER FOR POPULATION GENETIC STUDIES OF THE GIANT TIGER SHRIMP (*Penaeus monodon*)

Supaporn Thumrungratanakit¹, Rungnapa Leetanawit¹, Sirawut Klinbunga², Anchalee Fassanakajon¹, Padermsak Jarayabhand^{3,4} and Priamsak Menasveta^{2,4}

¹Program of Biotechnology, ²Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand;

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), 113 Paholyothin Rd., Klong 1, Klong Luang, Phatumthani 12120, Thailand;

³Aquatic Resources Research Institute, Chulalongkorn University, Bangkok 10330, Thailand; e-mail: sirawut@biotec.or.th

Abstract: RT-PCR was carried out for identification of sex-specific/differential expression in ovaries and testes of *P. monodon*. A 920 bp product specifically expressed in ovaries (PMscnDNA1) was cloned and sequenced. A primer pair was designed. RT-PCR still revealed a female-specific expression pattern of this marker. Polymorphism of PMscnDNA1 was found when representative individuals of *P. monodon* were genotyped. This newly isolated marker was then used to examine genetic diversity and differentiation of *P. monodon* from main fisheries in Thai waters (Satun, Trang, Phangnga, Chumphon and Trat). The number of alleles per locus and observed heterozygosity of PMscnDNA1 were 6 alleles and 0.3043 – 0.5128, respectively. High genetic diversity within geographic samples but low degrees of genetic differentiation between geographic samples was observed in this species.

B0031-ISOLATION AND CHARACTERIZATION OF GENE EXPRESSED IN OVARIES AND TESTES OF THE TROPICAL ABALONE *Haliotis asinina* BY cDNA SUBTRACTION

Piti Amparup¹, Sirawut Klinbunga^{2*}, Anchalee Tassanakajon³, Takashi Aoki⁴, and Padermsak Jarayabhand^{5,6}

¹Program of Biotechnology, ³Department of Biochemistry, ⁵Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), 113 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120, Thailand.

⁴Laboratory of Genome Science, Graduate School of Marine Science and Technology, Tokyo University of Marine Science and Technology, Konan 4-5-7, Tokyo 108-8477, Japan.

⁶Aquatic Resources Research Institute, Chulalongkorn University, Bangkok 10330, Thailand
mail address: sirawut@biotec.or.th

Abstract: Subtractive cDNA libraries were established from ovaries and testes of the tropical abalone (*Haliotis asinina*). A total of 270 randomly selected clones were unidirectional sequenced. Results indicated that 71 clones (64.5%) and 56 clones (35.0%) of ovary (forward subtraction) and testis (reverse subtraction) libraries were homologues of known transcripts. Sex related transcripts were predominated and the most abundant transcript in ovaries and testes of *H. asinina* was VCP41 and sperm lysin ESTs, respectively. The full length of sperm lysin cDNA was obtained and first isolated in *H. asinina*. Expression of sex-related genes was further examined using RT-PCR. Female-specific expression was found from homologues of VCP1, VCP3, VCP7, VCP49 and VTG1.

B0032-ISOLATION AND CHARACTERIZATION OF FEMALE-SPECIFIC EXPRESSION cDNA MARKERS IN THE GIANT TIGER SHRIMP (*PENAEUS MONODON*)

Rungrapa Leelatanawit¹, Sirawut Klinbunga^{2*}, Padermsak Jarayabhand⁴ and Piamsak Menasveta²

¹Program of Biotechnology, ³Department of Biochemistry, Faculty of Science, Chulalongkorn University, Bangkok, 10330 Thailand;

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology (BIOTEC), NSTDA, 113 Paholyothin Rd., Klong 1, Klongluang, Pathumthani 12120;

⁴Aquatic Resources Research Institute, Chulalongkorn University, Bangkok 10330 Thailand; e-mail address: sirawut@biotec.or.th

Abstract: Subtractive cDNA libraries of ovaries of the giant tiger shrimp (*Penaeus monodon*) were constructed. A total of 155 clones were unidirectionally sequenced. Most of the expressed genes in ovaries encoded thrombospondin (TSP), 45 clones accounting for 28.7% of total expressed sequence tags (ESTs), peritrophin (17 clones, 10.8%) and unknown transcripts (76 clones, 49.2%). Gender-specific expression of candidate sex-linked gene homologues was examined by RT-PCR. While peritrophin was expressed in both ovaries and testes, a TSP homologue revealed sex-specific expression in ovaries but not in testes of *P. monodon*. Semi-quantitative PCR indicated significant differences in expression levels of TSP in 4-month-old and broodstock-sized *P. monodon* ($P < 0.05$).

B0033-EXPRESSION OF CHITINASE FROM *LEUCAENA LEUCOCEPHALA* DE WIT IN KHAO DAWK MALI 105

Mana Kaomek¹ and James R. Ketudat-Cairns^{2*}

¹Program of Chemistry, Faculty of Science and Technology, Walailak University, Pathumthani, Thailand.

²School of Biochemistry, Institute of Science, Suranaree University of Technology, Muang District, Nakhon Ratchasima, Thailand.

E-mail address: kaomek@mail.vru.ac.th, cairns@ccs.sut.ac.th

B

Abstract: This research studied the expression of *Leucaena leucocephala* chitinase from Khao Dawk Mali 105. Plasmid was constructed by chitinase insertion into pCambia 1300. It was compared with pCambia 1301 contain a gus gene reporter gene under the control the 35s promoter. They were transformed into Khao Dawk Mali 105 calli by agrobacterium EHA 105 and grown on 2ND6. The percentage of calli Khao Dawk Mali 105 was 75.

B0034 Development of AFLP markers for fast-growing *Penaeus monodon*

APIRADEE RIENNUKOOOL, BUSABUN CHAISAI EE and Kanokporn Triwitayakorn*

Institute of Molecular Biology and Genetics, Mahidol University, Salaya, Nakhonpathom, 73170, Thailand

* Correspondence to: Kanokporn Triwitayakorn, E-mail: imbktw@mahidol.ac.th

Abstract: The black tiger shrimp, *Penaeus monodon*, is one of the most economically important aquaculture species in Thailand. Farming of *P. monodon* has been facing several problems especially out break of diseases, poor farming management and broodstock limitation resulting decreasing of shrimp products. To overcome the problems, applications of molecular biology and genetic seem to be one of the promising methods. In this project, the AFLP (Amplified Fragment Length Polymorphism) technique was used to generate genetic markers that are specific to fast-growing and sex in the *P. monodon*. A total of 171 primer combinations of *EcoRI*-ANN, *MseI*-GNN and *EcoRI*-GNN, *MseI*-GNN were used to screen 151 day-old shrimp samples which were classified into four groups according to their body weight and sex. The results showed 24 markers were derived from large shrimp, 21 from small shrimp, 17 from female sex and 10 from male sex. All identified AFLP markers will be converted to SCAR (Sequence Characterized Amplified Region) marker in order to improve efficiency of the markers for a large scale application in Marker Assisted Selection Program (MAS). Moreover, the AFLPs will be useful for construction of genetic linkage map of the *P. monodon*.

B0035-MORPHOLOGY AND PALYNOLOGY OF KALA (*ALPINIA NIGRA*) IN KOKRET, PAKKRET DISTRICT, NONTABURI PROVINCE

Kanokon Riwlung, Tian Kanpuy and Ratapol Sornprasert

Program of Biology, Faculty of Science and Technology, Chandakasem Rajabhat University, Bangkok 10900, Thailand

Abstract: Morphology of Kala (*Alpinia nigra*) in Kokret, Pakkret District, Nonthaburi Province found that Kokret community call it "Naw Kala". The Kala is a herbaceous plant, grows well on riverside and can grow on land. The underground stem is a rhizome while the aerial stem is pseudostem with approximately 3.08 meters in height. Leaf shape is oblong type. Inflorescence is penicle type with flowers bloom at the apices in floret has involucre bract constancy. The floret consists of three sepals are 3 lobes. It has three petals, which are white-green color and 3 lobes. The flat labellum is 4 lobes, light pink color. Placentation in the inferior ovary is axile placentation, which are 3 carpels. Simple fruit is berry. Ripe fruit is black, round-shape. Seed is dry, brown with white aril. Floral formula is $\Phi \bullet \text{ca}^{(3)} \text{co}^{(3)} \text{s}^1 \text{p}^3$. Palynology of Kala found that the pollen is monad, nonaperturate grain, with spheroidal shape, isopolar pole, inaperture, radial symmetry, exine sculpturing is echinate.

B0036-Molecular cloning and identification of superoxide dismutase and arginine kinase variants in black tiger shrimp, *Penaeus monodon*.

Sansook Boonseub¹, Narongsak Puanglarp² and Piamsak Menasveta^{2,3}

¹Program of Biotechnology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), 113 Paholyothin Rd., Klong 1, Klong Luang, Phthumthani 12120, Thailand

³Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Superoxide dismutase (SOD) is an enzyme that reduces the toxic of oxidation in living organisms. Arginine kinase (AK) is an enzyme that plays a critical role as energy reserve. The activities of these enzymes are related to oxidative and osmotic stress in marine animals. In this study, cloning and sequencing of Mn-SOD, Cu/Zn SOD and AK were conducted. The identification of different forms of these enzymes in different tissues was also carried out using single stranded DNA conformation polymorphism (SSCP) technique. The result indicated that there were 4 variants of Mn-SOD while only 1 form of Cu/Zn-SOD and AK was observed. The complete DNA sequences from each form of these enzymes will be further determined. The result will help to develop primers more specific to each form of these enzymes. The activities of these enzymes can be measured and used as biomarkers for indication of stress condition in *Penaeus monodon*.

B0037-IDENTIFICATION OF SEX-SPECIFIC MARKERS FROM BLACK TIGER SHRIMP *Penaeus monodon* USING GENOMIC DNA SUBTRACTION

Srisupaph Poonlaphdecha¹, Narongsak Puanglarp², Sirawut Klinbunga² and Piamsak Menasveta^{2,3}

¹Program of Biotechnology, ²Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), 113 Paholyothin Rd., Klong 1, Klong Luang, Phthumthani 12120, Thailand

Abstract: Shrimp culture currently uses natural male and female broodstock. To avoid the overexploitation of natural shrimps, more efficient culturing techniques are required. Monosex culture is one of the techniques that gain more attention. Therefore, sex specific markers of *P. monodon* identified by molecular techniques will be very helpful for the development of shrimp monosex culture. Genomic DNA subtraction, a technique that differ the nucleic acid composition of two cell samples, was carried out in this experiment. By subtracting genomic DNA of male from female and *vice versa*, 9 and 4 recombinant clones were obtained from male and female subtraction, respectively. One recombinant clone (PMMSH8) from male subtraction was used as probe for Southern blot analysis. The result revealed faint band from the genomic DNA of both male and female indicating no sex specificity of this clone. The identification of sex-specific marker from the other subtracted clones is on process.

B0038-CLONING, EXPRESSION AND PRODUCTION OF POLYCLONAL ANTIBODIES AGAINST RECOMBINANT VP26 CAPSID PROTEIN OF WHITE SPOT SYNDROME VIRUS (WSSV)

Phitomsak Phattanapattikul¹, Parin Chaivisuthangkura², Sombat Rukpratanporn¹, Siwaporn Longyant², Weerawan Sithigorngul¹ and Paisarn Sithigorngul²

¹Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; ²Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand.

³Marine Biotechnology Research Unit at Chulalongkorn University, National Center for Genetic Engineering and Biotechnology (BIOTEC), Bangkok 10330, Thailand
e-mail address: parin@swu.ac.th

Abstract: A truncated VP26 capsid protein encoding gene (lacking the N-terminal hydrophobic region) of white spot syndrome virus, namely VP26F109 was cloned into a pQE30 expression vector and transformed into *E. coli*. After induction, the bacteria were able to produce the recombinant VP26F109 protein (rVP26F109). The recombinant protein was purified by SDS-PAGE and used for immunization in Swiss mice for polyclonal antibody production. The antibodies specifically bound to VP26 protein from WSSV and can be used to detect WSSV infection in tissue by immunohistochemistry and in gill extract by dot-blotting. In the future, monoclonal antibodies specific to rVP26F109 will be generated in order to develop a simple immuno-based test kit for WSSV detection with high accuracy and sensitivity at low cost.

B0039-ISOLATION AND PROPERTIES OF LIPASE FROM BACILLUS FOR USING IN LAUNDRY DETERGENT

Wut Damrongrak¹, Narumon Jeyashoke², Khin Lay Kyu³ and Khanok Ratanakhanokchai^{4*}

¹Division of Biochemical Technology, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkokthien, Bangkok 10150, Thailand

E-mail address: wutruu@yahoo.com

Abstract: Twenty-seven *Bacillus* strains were selected based on the maximum activity of lipase to hydrolyse palm oil under an alkaline condition and stability in commercial detergents. *Bacillus* sp. A12 was the best strain among all of the isolates. The crude lipase had an optimum pH from 9.0 to 12.0 and maintained its stability over a broad range of pH between 6.0 to 10.0 for 1 hr. The optimum temperature for crude lipase activity was 60 °C. The lipase was stable between 30 to 60 °C for 1 hr. To evaluate the lipase action in improving the washing efficiency of the detergent, the pieces of white cotton cloth soiled with cow blood mixed with palm oil stain were washed with detergent in the presence of the crude lipase from *Bacillus* sp. A12 and crude protease from *Bacillus* sp. B12. It showed the increase in brightness when compared to the washing only with detergent. Therefore, crude lipase from *Bacillus* sp. A12 was a good candidate to be applied in laundry detergent.

B0040-HABITAT CHARACTERISTICS OF CROAKING GOURAMIS (*Trichopsis vittata*)

Supanee Liengsompan*, Mullica Jaroensutasinee, Krisanadej Jaroensutasinee

CX-KU RUE, Institute of Science, Walailak University, 222 Thasala District, Nakhonsithammarat 80160, Thailand.

supanee.liengsompan@wvu.ac.th, mullica.jwvu.ac.th, krisana.jwvu.ac.th

Abstract: In Thailand Croaking gouramis (*Trichopsis vittata*, Cuvier, 1831) were found to inhabit shallow water with dense vegetation around the edges of rice paddy fields and in small ponds. The shallow nesting water was low in pH, dissolved oxygen, salinity, turbidity, biochemical oxygen demand, nitrite, nitrate, and phosphate, but had high levels of conductivity, temperature, and total dissolved solids. Water and fish characteristics in the rice paddy fields differed from those found in the ponds in terms of pH, conductivity, dissolved oxygen, total dissolved solids, phosphate, water depth, temperature, and population density. Males were generally heavier and bigger than females. There was positive correlation between the weight of male fish and its body length and width. However, female weight correlated positively only with body length. There was no correlation between the bubble nest area and the body length and weight of males.

B0041-SUSCEPTIBILITY TEST OF *Propionibacterium acnes* TO AROMATIC OIL SAMPLES EXTRACTED FROM MEDICINAL PLANTS BY BROTH MACRODILUTION METHOD

Jiradej Manosroi^{1,2*}, Rawadee Thongbai¹ and Aranya Manosroi²

¹Pharmaceutical-Cosmetic Raw Materials and Natural Products Research and Development Center (PCRNC), Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand; ²Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

e-mail address: pmpt006@chiangmai.ac.th

Abstract: *Propionibacterium acnes* is a bacteria typically found on human skin and can caused acne. In this study, the susceptibility test by broth macrodilution method of *P. acnes* which was isolated from patients to 3 aromatic oil extracted from medicinal plants was investigated. These 3 oil samples were extracted from Holy Basil (*Ocimum sanctum* Linn), (Kaffir Lime Fruit (*Citrus hystrix* DC), and Tea Tree (*Camellia sinensis* Linn). The positive control was the standard antibiotic, erythromycin stearate. The aromatic oil samples were diluted with dimethylsulfoxide (DMSO) with the aid of Tween 80 to disperse the oil throughout the brain-heart infusion broth. 2,3,5-triphenyl-tetrazolium chloride (TTC) was added to the broths as a growth indicator to assist the visual determination of the Minimum Inhibitory Concentration (MIC). The system was incubated in an anaerobic chamber at 37° C for 36-48 h. The result showed that Holy Basil oil gave the highest activity with the Minimum Bactericidal Concentration (MBC) of 1,589.25 g/ml which was lower than that from Kaffir Lime Fruit oil and Tea Tree oil.

B0042-PRODUCTION OF ANDROSTADIENEDIONE FROM PROGESTERONE BY BIOTRANSFORMATION

Jiradej Manosroi^{1,2*}, Suda Saowakon^{2*} and Aranya Manosroi^{1,2}

¹Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand 50200.

²Pharmaceuticals Cosmetic Raw Material and Natural Product Research and Development Center, Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai, Thailand 50200.

E-mail address : pmpti006@chiangmai.ac.th, saowakon_sq@hotmail.com, and pmpti005@chiangmai.ac.th

Abstract: The objective of this study was to investigate the production of androstadienedione (ADD) from progesterone by dehydrogenation reaction using biotechnological process. Nine strains of *Bacillus sphaericus* isolated from soils in Chiang Mai, Thailand and 3 standard strains from ATCC were investigated. They were cultured in enriched medium containing progesterone 0.3 mg/ml and shaken at 200 rpm, 25±2°C. The results showed that *B. sphaericus* ATCC 245 gave the maximum yield of 64.67±3.97% at 144 hours. *B. sphaericus* ATCC 7063, ATCC 13805, FISTR 670, SRP I, SRP II, SRP III, SRP V and B 509417 gave only trace of ADD in the range of 0.07%-2.82% whereas *B. sphaericus* SRP IV, SRP VI and SRP VII gave no ADD production. The result indicated that the microorganism that can produce ADD from progesterone can produce the dehydrogenase enzyme. The result from this study can be used as an alternate for the currently used chemical method for the production of ADD and important precursor for the production of steroid hormone.

B0043-Analysis of the Essence of ORF76 Gene in *Synechococcus* PCC7942

Siam Popluechai, Sirirat Fa-aroonsawat, Wipa Chungjatupornchai

Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakornpathom 73170, Thailand. E-mail address: siam_plc@hotmail.com

ABSTRACT: A *Synechococcus* PCC7942 gene, encoding 76 amino acids of an unknown protein (designated ORF76), is located at the same orientation and downstream from the heat shock protein gene (*hsp6j*). The ORF76 promoter responds to light intensity. To investigate the function of the ORF76 gene, the ORF76-inactivated strains were constructed and segregated. The ORF76 gene was inactivated by insertion of spectinomycin-resistant gene cassette via homologous recombination. PCR and Southern blotting analysis revealed that all copies of ORF76 gene on *Synechococcus* chromosomes were inactivated. The results indicate that ORF76 gene is not essential for cell viability in optimal growth condition. Since the ORF76 gene is located downstream of the *hspG* gene, the ORF76-inactivated strains grown under high temperature were investigated. Results revealed that cell growth and morphology of ORF76-inactivated strains grown under 42°C were not significantly different from those of wild type strain. Thus, ORF76 gene is not essential for cell viability under high temperature. In order to obtain recombinant ORF76 protein to raise antibody for detection of ORF76 protein in *Synechococcus*, the ORF76 gene was cloned into the *E. coli* expression vectors pTYB2 and pTYB12. The resulting plasmids pB2C76 and pB12N76 harbor the *intein* gene fused in frame with 3' end and 5' end of ORF76 gene, respectively. No ORF76 fusion protein was detected in *E. coli* harboring pB2C76. However, *E. coli* harboring pB12N76 produced a high amount of CBD (Chitin Binding Domain)-Intein-ORF76 fusion protein inclusions. Thus, the remaining small amount of soluble CBD-Intein-ORF76 fusion protein was used for CBD and Intein-mediated protein purification system. The yield of purified ORF76 protein is about 180 µg/l, which is not enough to raise antibody in mice.

B0044-Catalytic and Structural Contributions for Glutathione Binding Residues in a Delta Class Glutathione S-transferase

Pakorn Winayanuwattikun and Albert J. Ketterman

Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhon Pathom 73170, Thailand

E-mail address: pakorn_gst@yahoo.com

Abstract: Glutathione S-transferases (GSTs) are dimeric proteins that play a major role in cellular detoxification. The GSTs in mosquito *Anopheles dirus* species B, an important malaria vector in South East Asia, are of interest because they can play an important role in insecticide resistance. In this study, we characterize the AdGST D3-3 that is an alternatively spliced product of the *adgst/AS1* gene. The data from the crystal structure of GST D3-3 shows that Ile-52, Glu-64, Ser-65, Arg-66 and Met-101 interact directly with glutathione. To study the active site function of these residues, alanine substitution site-directed mutagenesis was performed resulting in five mutants: I52A, E64A, S65A, R66A and M101A. Interestingly, E64A expresses in *E. coli* in inclusion form suggesting that this residue is involved with the tertiary structure or folding property of this enzyme. However, I52A, S65A, R66A and M101A mutants were purified by glutathione affinity chromatography and the enzyme activity characterized. On the basis of steady state kinetics, difference spectroscopy, unfolding and refolding studies, it is concluded that these residues: (1) contribute to the affinity of the G-site for GSH; (2) influence GSH thiol ionization; (3) participate in k_{cat} regulation by affecting the rate-limiting step of the reaction; and in the case of Ile-52 and

Arg-66 influenced structural integrity and/or folding of the enzyme. The structural perturbations from these mutants are probably transmitted to the H-site through changes in active site topology or through effects on GSH orientation. Therefore these active site residues appear to contribute to various steps in the catalytic mechanism as well as an influence on the packing of the protein.

B0045-PARTIAL PURIFICATION AND CHARACTERIZATION OF FIBROINASE FROM DIGESTIVE FLUID OF THE SILKWORM, *Bombyx mori*

Sripong Langprasertkit¹, Sunanta Ratanapo¹, Tertsuk Ngernsiri² and Amornrat Promboon^{1*}

¹Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

²Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand

E-mail address: fseisnr@ku.ac.th, fseirp@ku.ac.th

Abstract: Fibroinase is a proteolytic enzyme whose activity is to hydrolyse fibroin. Fibroin is a fibrous protein, the main protein component of silkworm cocoons. In this study, fibroinase from digestive fluid of domestic silkworm larva precipitated by 30-80% saturated ammonium sulfate was further purified on Sephacryl S-200 and Mono-Q columns, respectively. The elution profile of Mono-Q column showed three peaks of fibroinase activities. The fibroinase giving highest activity was further purified on Phenyl Sepharose 6 fast flow (high sub) column. The purification fold of the fibroinase increased 50.48 times with its specific activity of 24.26 U/mg. The purified fibroinase has native molecular weight about 100 KDa, the optimum pH and temperature were 9.5 and 45°C. Furthermore, it was inhibited by Co²⁺ and Mg²⁺.

B0046-ANTIBACTERIAL ACTIVITIES AND ANTIMUTAGENICITY OF MULBERRY LEAF-TEAS AND ROOTS

Chantima Keyanont¹, Pornpimon Numsanguan¹, Amornrat Promboon¹, Sunanta Ratanapo^{1*}

¹Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

E-mail address: fseisnr@ku.ac.th

Abstract: To study antibacterial activities, mulberry extracts were extracted from mulberry leaf-teas of ten varieties and dry roots from seven varieties with hot water and methanol, respectively. Antibacterial activities were assayed by agar diffusion method. It was found that six of forty-two human pathogenic bacterial strains were inhibited by leaf-tea extracts whereas twelve strains were inhibited by root extracts. The antibacterial activities were different among mulberry varieties by agar dilution method. Antimutagenic properties of leaf-tea extract and root extract from a mulberry, Mon-Noi (*Morus rotundifolia* Koidz) were investigated. Both extracts possessed antimutagenic activities against *Salmonella typhimurium* TA 98, a Tryptophan-induced mutagenic strain. The antimutagenic IC₅₀ of mulberry root extracts was approximately ten folds higher than of leaf-tea extracts.

B0047-WATER QUALITY AND FRESHWATER FISHES OF PROMLOK WATERFALL, KHAO LUANG NATIONAL PARK, NAKHONSITHAMMARAT PROVINCE

Suparporn Sutin*, Mullica Jaroensutasinee, Krisanadej Jaroensutasinee

CX-KURUE, Institute of Science, Walailak University, 222 Thasala District, Nakhon Si Thammarat, 80160, Thailand;

E-mail address: asuparporn@yahoo.com, jmullica@wu.ac.th, jkrisana@wu.ac.th

Abstract: This study examined water quality and diversity of fish life at Promlok Waterfall, Khao Luang National Park, Nakhonsithammarat Province. Differences in alkalinity and dissolved oxygen were found at three stations. However, there was no significant difference in water temperature, air temperature, pH, conductivity, nitrite, nitrate, ammonia, hardness, and total dissolved solid. Eleven fish species were found. Soro brook carp (*Neolissochilus soroides*), Soro brook carp (*Tor soro*), two species of Blue danio (*Danio regina* and *Danio aequipinnatus*), Silver rasbora (*Rasbora argyrea*), T-barb (*Puntius lateristriga*), Lesser spiny eel (*Macrogynathus aculeatus*), Loach (*Nemacheilus masyae*), two species of Red-tailed snake-head (*Channa limbata* and *Channa gachua*), and *Mystus wolffi*.

B0048-COMPARATIVE LEAFANATOMY OF THE GENUS *SYZYGium* GAERTN. (MYRTACEAE) IN THAILAND

Chortip Kantachote, Pranom Chantaranonthai and Achra Thammathaworn

Applied Taxonomic Center, Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand.

E-mail address: Jar_cho@yahoo.com, Pranom@mail.kku.ac.th and Achra@mail.kku.ac.th

Abstract: Seventeen taxa of the genus *Syzygium* Gaertn. were investigated by epidermal peel and transverse sections of lamina and petioles to determine its taxonomic significance. The analysis of the anatomical information obtained showed that the shape of margin, midrib and petiole, epidermal cell wall, stomatal type, presence or absence of hypodermis, number of palisade and spongy layers, shape of vascular bundle at midrib and petiole, presence or absence of sclereid at midrib and petiole and crystal type are characters that could be useful for the species identification.

B0049-IMPROVEMENT MEAT QUALITY OF RED TILAPIA (*OREOCHROMIS NILOTICUS* LINN.) USING *SPIRULINA PLATENSIS* AND *CLADOPHORA* SP.

J. Promya¹, P. Hongvityakorn², S. Traichaiyaporn¹

¹Phytoplankton and Water Quality Research Unit, Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai, 50200 Thailand

² Department of Biology, Faculty of Science, Maejo University, Chiang Mai 50200
e-mail: kol255@yahoo.com

Abstract: Improvement meat Quality of red tilapia (*Oreochromis mossambicus*) using *Spirulina platensis* and *Cladophora* sp. Feed *Spirulina platensis* and *Cladophora* sp. four experimental diets were used to feed red tilapia. Feed diets algae 0%, feed diets *Cladophora* 5%, feed diets *Spirulina* 5% and feed diets *Spirulina* 10% respectively. The mass cultured red tilapia in nets of 60 days. Results showed that carotenoids in red tilapia with feed diets *Spirulina* 10% had significantly higher than those feed with feed diets *Cladophora* 5%, feed diets *Spirulina* 5% and feed diets algae 0% ($p \leq 0.05$) respectively.

B0050-WATER QUALITY AND PHYTOPLANKTON DIVERSITY IN DOI TAO LAKE, CHIANG MAI PROVINCE

Taweesak Khuantrong and Siripen Traichaiyaporn

Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

E-mail address: taweesak_29@hotmail.com and siripen.traichaiyaporn@gmail.com

Abstract: Monitoring of water quality and phytoplankton diversity in Doi Tao lake were conducted during August 2003-June 2004. Doi Tao lake had water depth 0.50-0.60 m, mean area 1.71 ha, water temperature 22.20-27.88 °C, pH 7.21-9.77, EC 142.03-502.17 $\mu\text{S cm}^{-1}$, TSS 73.98-102.00 mg l⁻¹, SS 11.75-22.75 mg l⁻¹, Hardness 35.68-206.48 mg l⁻¹ CaCO₃, DO 2.61-6.48 mg l⁻¹, BOD 1.15-9.55 mg l⁻¹, COD 1.28-44.09 mg l⁻¹, ammonia 0.11-16.16 mg l⁻¹. Study results showed that the water quality in Doi Tao lake was significantly different among various species. Phytoplankton communities in Doi Tao lake composed of 168 species, 594 genera, 66 divisions. Phytoplankton community composition: Cyanophyta 65.41%, Chrysophyta 17.24%, Chlorophyta 12.98%, Cryptophyta 4.44%, Euglenophyta 1.27%, Pyrrophyta 0.58%. Comparison of the water quality of Doi Tao lake with surface water quality in Doi Tao lake in rainy and dry rainy seasons should be in class 5, whereas in winter it is found to be in class 2-3.

B0051- Water Quality at the Mae Moh Power Plant, Lampang Province (II)

Pongsa-ruj Jumsurum, Siripen Traichaiyaporn, Prachak Mahaveta, Anurat Pongpradit and Somporn Jongsakul

¹ Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand; ² Pollution Control Research Unit, National Center for Genetic Engineering and Biotechnology, Department of Marine Science, Faculty of Science, Chulalongkorn University; ³ Department of Soil Science, Faculty of Agriculture, Chiang Mai University, Chiang Mai 50200, Thailand E-mail address: pjumsurum@yahoo.com

Abstracts: The monitoring of water quality from six reservoirs around Mae Moh thermal power plant were conducted during January - December 2003. There was a statistical significantly difference for values of electrical conductivity, total dissolved solid, hardness, silica, arsenic and lead between natural water sources, Mae Kham and Mae Chiang reservoirs, its all reservoirs in wastewater treatment system, Settlingable solid & flotation pond, Biochemical pond, Diversion pond and South wetland pond, which receiving the effluent from the plant. There are no statistical difference between the before and after used reservoirs for water temperature, SS, pH, DO, BOD, COD, ammonia-nitrogen, orthophosphate, total nitrogen, total phosphorus and zinc. From this monitoring and assessment, the water quality of Mae Kham and Mae Chiang reservoirs were classified into class 2-3 while the other 4 reservoirs were classified into class 4 according to the standard value of surface water recommended by Pollution Control Department of Thailand. However the concentration of arsenic, lead and zinc in water are not exceed the industrial effluent standard of Thailand.

B0052-IMPACT OF FISH CAGES ON WATER QUALITY AND DIVERSITY OF PHYTOPLANKTON IN RESERVOIRS OF MAE MOH POWER PLANT (II)

Chinuma Pinkate¹ and Siripen Traichaiyaporn

Phytoplankton and Water Quality Research Unit, Department of Biology, Faculty of Science, Chiang Mai University,

Chiang Mai, 50200 Thailand, e-mail address: chinuma.p@yahoo.com

Abstract: Water quality and diversity of phytoplankton at Mae Kham and Mae Moh reservoirs. The samples were conducted during January - December 2003. There are significantly different ($p < 0.05$) between without and with cage of Mae Kham reservoirs for DO and Chlorophyll a levels. While Mae Moh reservoir no significantly different ($p < 0.05$). Mae Kham reservoir could be classification into 6 division, 51 genera, 75 species and *Cylindrocapsa* sp. (*Woloszy*, *Seenayya & Subba*, *Oscillatoria* sp., *Raphidiopsis curvata* and *Synechococcus* sp. were dominant species, whereas Mae Moh reservoir could be classification into 6 division, 57 genera, 89 species and *Chlorella* sp., *Cryptomonas* sp. and *Spermatopsis exultans* Korsch. were the dominant species. There were also significant difference ($p < 0.05$) in the diversity of phytoplankton between without and with cage were Division Cyanophyta, Chrysophyta, Pyrrophyta and Pyrrophyta, respectively. Division Euglenophyta, Pyrrophyta and Chrysophyta were positively correlated with NO₃-N ($r = 0.536$), Chlorophyll a ($r = 0.620$) and temperature ($r = 0.509$) respectively. While division Chlorophyta was positively correlated with NH₄-N ($r = 0.513$) and TKN ($r = 0.672$) and division Cryptophyta were positively correlated with TKN ($r = 0.550$). Assessment of water quality using chlorophyll a (Wetzel, 1983), these reservoirs were classified as mesotrophic status. Referring to the National Environment Committee Announcement (1994), these reservoirs of without and with cage were in the second and third category, these meant a good and medium water quality, respectively.

B0053-CORRELATION OF NITROGEN AND PHOSPHORUS ON ALGAE DIVERSITY IN DOI TAO LAKE, CHANG MAI (I)

Niramol Donghong* and Siripen Trichaiyaporn

Phytoplankton and Water Quality Research Unit, Department of Biology, Faculty of Science, Chang Mai 50200 Thailand

e-mail: d_niramol@yahoo.com

Abstract: Correlation of nitrogen and phosphorus on algae diversity in Doi Tao Lake was studied during September 2003 – February 2004. For nutrients the results were: $\text{NH}_3\text{-N}$ 0.000-0.431 mg/l, $\text{NO}_2\text{-N}$ 0.001-0.074 mg/l, $\text{NO}_3\text{-N}$ 0.004-0.374 mg/l, TKN 0.028-0.534 mg/l, Total-N 0.037-0.783 mg/l, $\text{PO}_4\text{-P}$ 0.000-0.072 mg/l and Total-P 0.010-0.087 mg/l were as follows N : P ratio was 10 : 1. Algae was classified into 6 Division, 59 Genera, 74 Species. Division Cyanophyta were maximal and negatively correlated with $\text{NO}_3\text{-N}$ ($p < 0.05$). Assessment of water quality in Doi Tao Lake by nutrients as well as National Environment Committee Announcement (1994) indicated that it was in the second and third category and medium water quality.

B0054-Expression of Thai Der p 1 allergen in *Pichia pastoris*

Thitirat Ngaotepprutaram¹, Nat Malainual² and Surapon Piboonpocanun¹

¹ Institute of Molecular Biology and Genetics, Mahidol University, Salaya, Thailand.

² Department of Parasitology, Faculty of Medicine Siriraj Hospital, Bangkok, Thailand.

Abstract: Allergic diseases such as asthma have been emerged as one of major diseases affecting Thai population. Eighty percent of Thai asthmatic children had allergic response to house dust mite allergen (1). Although many mite allergens are identified, group 1 allergen is considerably a major cause of allergic diseases (2). Because *Dermatophagoides pteronyssinus* (Dp) is the most abundant species (3). Thus, currently, commercial whole Dp dust mite extracts from U.S.A. and Europe have been used to diagnose a cause of allergic symptoms and disease in Thai allergic patients. However, these imported Dp mite extracts may pose a risk to Thai patients due to they also contain unknown components, which might cause allergic reactivity, as well as other allergens. These impurities may induce anaphylaxis in some patients. Furthermore, genetic polymorphism of the gene coding Dp group 1 allergen (Der p 1) was also reported in many countries. These polymorphic variants have been shown to have altered allergenicity and may be different from the Thai variants. Thus, it is important for Thai medical community to have purified Thai Der p 1 for correct diagnosis, preventing adverse effects, and reducing a medical cost. This study aimed to express recombinant Thai Der p 1 in *Pichia pastoris*.

B0055-CLONING AND EXPRESSION OF A *CRYPTOVALSA* SP. (BCC7197) XYLANASE GENE IN *PICHIA PASTORIS*

Katewadee Boonyapakorn^{1,2}, Kusol Pootanakit², Kanyawim Kitikara¹ and Lily Eurwilaichitr¹

¹BIOTEC Center Laboratory, 113 Thailand Science Park, Phahonyothin Road, Klong 1, Klongluang, Pathumthani 12120 Thailand;

²Institute of Molecular Biology and Genetics, Mahidol University, Salaya, Nakhon Pathom 73170, Thailand.

Abstract: *Cryptovalsa* sp. (BCC7197), a filamentous fungus, has been previously collected from Phuket, Thailand. A preliminary testing for the potential enzyme activities demonstrated that BCC7197 produces xylanases at high level when compared to over 1,000 other fungi. Since xylanases are one of the industrially valuable enzymes (1), this work aims to isolate gene(s) that encode xylanase from BCC7197 and express it in *Pichia pastoris*. First, total RNA was isolated from BCC7197 which was induced the xylanase production. RT-PCR and RACE methods were performed to identify the full-length xylanase cDNA from BCC7197. The result showed that the xylanase cDNA has an open reading frame of 978 bp encoding 325 amino acid residues. The BLAST search in GenBank database revealed that the BCC7197 xylanase gene belonged to glycosyl hydrolase family 10 (2) and showed high sequence similarity to other fungal xylanases. Expression of the full-length xylanase gene in *P. pastoris* expression vector, pPICZαA, was performed. The results showed that the active BCC7197 xylanase protein was successfully produced and secreted from *P. pastoris*.

B0056-Identification of xylanase genes from Bor Khlueng Hot Spring DNA

Viriya Nitteranon¹, Kusol Pootanakit¹ and Sutipa Tanapongpipat²

¹Institute of Molecular Biology and Genetics, Mahidol University, Salaya, Nakhonpathom, Thailand,

²BIOTEC Central Research Unit, 113 Phahonyothin Road, Klong 1, Klongluang, Pathumthani 12120, Thailand,

E-mail address: g4636864@mahidol.ac.th

Abstract: Great microbial diversity is found in soil. It is estimated that only 1% of microorganisms could be cultured using standard methods (Amann *et al.*, 1995). Therefore, 99% of unculturable microorganisms might produce novel target enzymes. Xylanases are one of the valuable enzymes for biotechnological industries. One of the enzyme characteristics that is required for industrial process is thermostability. To obtain thermostable xylanase genes directly from environmental DNA, the hot spring is one of many sources that can be used to isolate these enzymes. DNA from Bor Khlueng Hot Spring sediment was extracted using SDS with CTAB and proteinase K. Universal primers specific to 16S rRNA were used to amplify the 16S rRNA gene to assess the integrity and purity of the DNA. Consensus primers based on the conserved regions of family 10 xylanases were used to obtain the 165 bp PCR fragments of xylanase genes. The PCR products were ligated to pGEM-T Easy vector and submitted to DNA sequencing. The nucleotide sequence analysis exhibits 65% amino acid sequence similarity to *Thermobacillus xylanilyticus* *xynA* and *abfA* genes. Using these partial sequences, genomic walking PCR will be performed to obtain the full-length of xylanase gene.

B0057-Silencing of Aminopeptidase N gene in *Aedes aegypti* larvae by RNA interference

Plaipol Dedsitsakul and Kusol Pootanakul

Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhon Pathom 73170

E-mail address: g4636863@mahidol.ac.th

Abstract: The bacterium *Bacillus thuringiensis* synthesizes toxins which bind to specific receptors located on the midgut epithelial cells of the susceptible insect larvae leading to pore formation and eventual death. In various insect species, aminopeptidase N (APN) is considered to be the receptor of Cx4Ba toxin (2,3,4,5). However, in *Aedes aegypti*, the receptor has not yet been identified. Here, RNA interference technique was employed to specifically knock down the APN expression to determine if APN serve as receptor to Cx4Ba toxin. Two-day old *A. aegypti* larvae were fed with specific double stranded RNA (dsRNA) producing *E. coli*. The suppression of APN was monitored by semi-quantitative RT-PCR. The result showed that introduction of APN dsRNA to *A. aegypti* larvae reduced its expression. In addition, *Bt* toxicity test was also performed after 72 hours of feeding dsRNA. The results showed slight reduction of percent mortality.

B0058-Identification of endoglucanase gene from *Syncephalastrum racemosum*, a thermotolerant fungus

Benjaminorn Wongan, Kusol Pootanakul, and Eus Eamsa-archon

¹Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhon Pathom 73170

²BIOFEC Center Laboratory, 113 Thaniarat Science Park, Phakongkarn Road, Klong Luang, Kanchanaburi, Pathumthani 12120, Thailand

E-mail address: g4636875@mahidol.ac.th

Abstract: Cellulose is one of the major source of biomass used as a substrate for various industries such as paper and pulp, textile, food and fuel (Beguin and Aubert, 1994; Chaplin, 1985a,b; Manders, 1987). Cellulose can be degraded by the cellulose degrading enzymes or cellulases. As high temperature is employed in many industrial processes, thermotolerant enzymes are needed. *Syncephalastrum racemosum*, a thermotolerant fungus, produces high levels of thermotolerant cellulases. It is of our interest to clone and characterize genes encoding cellulolytic enzyme, specifically endoglucanase which catalyze internal hydrolysis of the cellulose chain, from this fungus. PCR based cloning approach was employed in this study by using degenerate primers designed based on the conserved regions of endoglucanase from fungi in the same groups. The partial sequence of endoglucanase was obtained. It showed 80% similarity to the endoglucanase genes of *Aspergillus oryzae* RCF 1/2 and 3. The results suggested that we have successfully obtained the partial sequence of *Syncephalastrum* endoglucanase gene. Full-length genes of endoglucanase will next be obtained using Rapid Amplification of cDNA Ends (RACE).

B0059-Activity of viral promoters in Sf9 and primary shrimp cells

Nichanun Phochanukul, Pongsopce Attasart and Sakol Panvorn

Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Thailand

E-mail address: g4636874@student.mahidol.ac.th

Abstract: The shrimp aquaculture is the economically important industry in several countries including Thailand. However, there are few reports about gene expression and gene function in shrimp, especially for the functional promoter in shrimp cells. This study is aimed to characterize the promoter activity from different viruses in shrimp cells. Putative p1 and p50 promoters controlling expression of non-structural and structural proteins, respectively, from hepatopancreatic parvovirus (HPV), putative promoters of ribonucleotide reductase large subunit (rr1) and small subunit (rr2) from white spot syndrome virus (WSSV), as well as human cytomegalovirus promoter (cMV) were tested. *Firefly* luciferase was used as reporter gene. Because of the unavailable of shrimp cell line and the difficulty to culture primary shrimp cells, functions of these promoters were investigated in Sf9 insect cells in order to provide the preliminary information of promoter activities. After transfection for 48 hours, the luciferase expression could be detected from all promoters, except for putative p50 promoter, in which rr2 promoter showed the highest activity. However, these promoters will be further characterized their activities in primary shrimp cells.

B0060-GUT CONTENT OF TILAPIA (*Oreochromis niloticus*) AND SELECTED NATIVE FISH SPECIES IN BANGPHRA RESERVOIR, CHONBURI PROVINCE

Patchara Nithirojpakdee, Wansuk Senanan

Department of Aquatic Science, Faculty of Science, Borapha University, Chonburi, 20131

E-mail: Patij_22@yahoo.com, Wansuk@buu.ac.th

Abstract: Nile tilapia, an alien species to Thailand, has become feral in many natural waters, partly due to their ability to compete for food. To explore feeding relationships between the tilapia and two native species (Silver barb and Bagrid catfish) in Bangphra Reservoir, Chonburi, we evaluated types and proportions of diets (%DI) as well as diet dissimilarity (Bray-Curtis dissimilarity index, BC) within and among species. All species ingested similar types of diet at different proportions (BC > 0.38). A dominant diet category in Nile tilapia, Silver barb, and Bagrid catfish included phytoplankton (average %P = 57.44), zooplankton (average %DI = 22.15) and benthic invertebrate (average %DI = 43.65), respectively. Our results suggest that all species rely on different food resources within Bangphra Reservoir. Occupying slightly different

ecological niche may allow them to co-exist. This information can be useful for monitoring impacts of alien species on Thailand biodiversity.

B0061-USING OF ALFALFA IN REPLACING OF SOYBEAN MEAL IN THE DIET OF JUVNILE HYBRID TILAPIA

Bundit Tengjaroenkul

Department of Veterinary Medicine, Faculty of Veterinary Medicine, Khon Kaen University, Khon Kaen 40002
e-mail: btengjar@kku.ac.th

Abstract: Juvenile hybrid tilapia fed on diets using alfalfa to replace soybean meal from 10 to 50 percents for 8 weeks. From our results in terms of growth rate, fish fed on alfalfa from 40 to 50 percent demonstrated statistically different from the other group ($p < 0.05$). Furthermore, from histo-pathological study, some fish fed on alfalfa at 50 percent showed generalized blood congestion in the liver, whereas, no any lesion was found in other groups of fish. Our results suggest that the alfalfa are likely suitable in replacing of soybean meal in the ration of the juvenile hybrid tilapia at no more than 30 percents.

B0062-COMPARISON ON PHYSICAL PROPERTIES OF THE FRESHWATER PRAWN FEED GRANULES PREPARED FROM THREE DIFFERENT CELLULOSE BINDERS

Bundit Tengjaroenkul¹; Padungkwan Chitropas²; Watcharee Khunkitti²; Pawin Saihu¹

¹Faculty of Veterinary Medicine, Khon Kaen University, Khon Kaen 40002

²Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen 40002

Abstract Artemia is commonly used in larvi-culture of the giant freshwater prawn, *Macrobrachium rosenbergii*. Though the imported artemia is quite expensive, most of the farmers have used it in larval prawn-feeding regimen. In order to reduce the imported artemia, feed granules of the larval prawn were developed by using wet granulation method. The purpose of this study was to compare physical properties of the developed granules prepared from three kinds of cellulose binders (ethylcellulose, methylcellulose, hydroxypropylmethylcellulose). From the results, mean granule size, moisture content, density and flow rate of the granules using hydroxypropyl methylcellulose were significantly different from other binders. Hydro-stability and floatability of the ethylcellulose granules was significantly different from the others ($p < 0.05$). From this study, it may be conclude that the feed granules could be prepared by wet granulation method. Ethylcellulose could be the suitable binder in preparation of the prawn feed granule.

B0063-Preparation of *Vibrio cholerae*-like Antigen by Flagellar Display Technique

Arce Thattivaphong¹, Amornrat Promboon², Chaivat Kittigul³, Krongkaew Supawal⁴, Pathom Sawanpunyalert⁴, and Sunanta Ratanapo^{2*}

¹ Interdisciplinary Bioscience Program, Faculty of Science, Kasetsart University, Bangkok, Thailand.

² Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.

³ Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand.

⁴ National Institute of Health, Department of Medical Sciences, Ministry of Public Health, Nonthaburi, Thailand.

E-mail address : ¹aree@dmsc.moph.go.th, and ²fscisnr@ku.ac.th

Abstract: Peptides binding to antibodies are expected to play roles as antigens. In some cases the preparation of antigens are harmful such as that of severe infectious agents or are inconvenient as that of gram negative bacterial O-polysaccharide. In this study, peptides that specifically bind NHV4, a monoclonal antibody to O-polysaccharide of *Vibrio cholerae* O139, were screened from a FliTrx peptide library to be used as antigens. Twenty-seven clones interacted with NHV4 by panning method had given positive results by Western Blot analysis. They showed a band of 63 KDa at the site of thioredoxin protein. The majority of selected clones provided a 180-bp PCR product. Sequences of random inserted-nucleotides are being investigated. Binding properties of the peptides will be compared with those of *V. cholerae* O139 O-polysaccharide against NHV4. If they have the same binding abilities, they will be used as *V. cholerae* O139 antigen and this method will be useful for the preparation of any other antigens in case of having a specific antibody.

B0064-BATCH FERMENTATION OF ETHANOL PRODUCTION BY *SACCHAROMYCES CEREVISIAE* ON CASSAVA PEEL HYDROLYSATE

Kanlaya Yoonan, Jirasak Kongkiattikajorn and Kanok Rattanakanokchai

Division of Biochemical Technology, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

E-mail address: jirasak.kon@kmutt.ac.th

Abstract: Cassava peels were used to be raw material for reducing sugars production. Reducing sugars were maximal produced by 1.5% cassava peel hydrolysed by 0.1 M sulfuric acid (w/v) at 135°C under pressure 15 lb/inch² for 90 min producing 66.28 % yield. For α -amylase and amyloglucosidase hydrolysis producing 49.14 %yield. HPLC analysis was demonstrated that the sugar produced from the the hydrolysate were 37.09, 4.79 and 4.05 % yield for glucose, xylose and rhamnose, respectively. However, the hydrolysate contained 0.14 %yield of 5-hydroxymethylfurfural. HPLC analysis found the sugar in the enzymatic hydrolysate 16.23 and 2.04 % yield for glucose and xylose, respectively. Batch fermentation by *Saccharomyces cerevisiae* showed a dramatic substrate utilization at 30 °C with 150 rpm in shaking incubator and resulted in the formation of 5.54 g/l ethanol after 20 h. This study suggests that the cassava peel could be used for the carbon source for yeast fermentation to produce ethanol.

B0065-XYLITOL PRODUCTION FROM A MIXTURE OF GLUCOSE AND XYLOSE BY CO-CULTURE OF *SACCHAROMYCES CEREVISIAE* AND *CANDIDA TROPICALIS*

Arisra Rodmui¹, Yuwapin Dandusitapun² and Jirasak Kongkiattikajorn¹

¹Department of Biochemical Technology, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok.

²Department of Biotechnology, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

E-mail address: jirasak.kon@kmutt.ac.th

Abstract: This study was developed a co-culture system for efficient xylitol production from a mixture of glucose and xylose by co-culture of *Saccharomyces cerevisiae* and *Candida tropicalis*. For xylitol production, the process was studied in fermentation with culture mixture of *Saccharomyces cerevisiae*, associated with *Candida tropicalis* using a synthetic medium contained 20 g/l glucose, 20 g/l xylose and mixture of glucose and xylose (16 g/l glucose, 4 g/l xylose) as carbon source. After incubation at 30 °C for 18 h in shaking incubator the fermentative performances by *Candida tropicalis* using xylose and glucose as carbon source were obtained xylitol at 7.73 and 4.64 g/l, respectively. Under these conditions the culture mixture of *Saccharomyces cerevisiae* and *Candida tropicalis* produced xylitol at 4.84, 4.74 and 8.20 g/l using xylose, glucose and mixture of glucose and xylose as carbon source, respectively. This indicates that mixed culture in mixture of glucose and xylose could perform the highest fermentation for xylitol production so the co-culture could be used for fermentation of carbon source containing glucose and xylose such as lignocellulose hydrolysate to increase the yield of xylitol production more than single culture.

B0066-STUDY OF AMINE OXIDASE FROM CEREALS SEEDINGS

Kienghathai Yeunyongsuwan and Jirasak Kongkiattikajorn

Division of Biochemical Technology, School of Bioresources and Technology King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

E-mail address: jirasak.kon@kmutt.ac.th

Abstract: Amine oxidase was isolated from seven to fourteen-day-old mung bean, soybean, and maize seedlings grown in the dark. The enzyme was present in extracts of the roots and shoots of cereals seedlings. The enzyme oxidized ethylamine and putrescine to produce hydrogen peroxide which was determined for the enzyme activity by coupling assay with peroxidase reaction. The specific activities for the enzyme for putrescine were 1.26, 0.33 and 1.43 U/mg protein determined at the pH optima 7.5 for the enzyme from maize, mung bean and soybean, respectively. The specific activities for the enzyme for ethylamine and were 1.43, 0.70 and 2.94 U/mg protein determined at the pH optima 7.5 for the enzyme from maize, mung bean and soybean, respectively. This study suggested that the cereals seedlings contained monoamine oxidase and diamine oxidase. For the soybean enzyme, amine oxidation was greater than the other two amine oxidases.

B0067-ETHANOL PRODUCTION FROM CASSAVA PULP HYDROLYSATE USING FERMENTATION BY *SACCHAROMYCES CEREVISIAE* 5049

Jirasak Kongkiattikajorn and Kanlaya Yoonan

Division of Biochemical Technology, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

E-mail address: jirasak.kon@kmutt.ac.th

Abstract: The objective of this study was to produce the fermentable sugars from cassava pulp by enzymatic hydrolysis and use the fermentable sugars as substrates for fermentation by *Saccharomyces cerevisiae* to produce ethanol. The experimental was performed by enzymatic saccharification of 1.5% w/v cassava pulp by α -amylase was pH 6.0, 90°C for 2 hours and produced 31.76% yield of reducing sugars. The reaction mixture was then reacted with amyloglucosidase at pH 4.0, 50°C for 24 hours. The hydrolysate contained reducing sugars of 52.85% yield. For ethanol production, the process was studied using cassava hydrolysate as carbon source (5.20 g/l reducing sugars) incubated with 5049 in a shaker with 150 rpm at 30 °C. Under condition study, ethanol was produced with a yield of 2.28 g/l and the substrate conversion yield was 44.23%.

B0068-Proteomics Analysis of Taura Syndrome Virus (TSV) Infected *Penaeus vannamei*

Phattara-orn Chongsatja, Apichai Bourchookarn, Chartchai Krittanai

Institute of Molecular Biology and Genetics, Mahidol University, Nakhonpathom 73170,

Thailand. Email address: stckt@mahidol.ac.th

Abstract: *Penaeus vannamei* or the Pacific white shrimp originate on the Western Pacific coast of Mexico. *P. vannamei* was introduced into Asia experimentally from 1978- 79, but commercially only since 1996 into Mainland China and quickly spread to Thailand. TSV locates itself in the cytoplasm of infected epithelial cells of the shrimp's cuticle. TS disease is generally a highly virulent disease in *P. vannamei*, but cumulative mortality can vary from five to more than 95%. The system of TSV infected *P. vannamei* was divided into two phases were the acute and chronic phase. We have purified from infected *P. vannamei*, in 15 – 25% sucrose gradient. After 1 day post infection TSV was detected by RT – PCR from infected haemolymph. Since the knowledge and understanding in the molecular level of TSV infected *P. vannamei* is far from adequate, especially, the expressed protein profile. 2D – PAGE (two – dimensional polyacrylamide gel electrophoresis) was employed to analyze to proteomics changes upon TSV infection. The changes were observed in

increasing and decreasing expression of specific proteins. From the proteomic map, select the interesting protein spots on the 2D gel were identified and then discussed.

B0069-Characterization of the Molten-Globule State in Cyt2A Unfolding

Weerachon Lapanant, Boonhang Promdonkoy, Chatchai Krittanai

Institute of Molecular Biology and Genetics, Mahidol University, Nakhonpathom 73170, Thailand

Abstract: Unfolding of Cyt2A has been investigated by guanidine hydrochloride (GuHCl) in equilibrium condition. It shows three state of native, intermediate and unfolded state. Conformational structure of intermediate has been characterized by several spectroscopic approaches of fluorescence, CD and ANS binding assay. The fluorescence and ANS binding have shown that the intermediate is consisted of different of tertiary structure and opening of hydrophobic core. While the CD spectrum shows a similarity of secondary structure between native and intermediate state. Our result demonstrates a molten-globule structure of intermediate state, which may display an important role in biological function.

B0070-Effects of Yellow Head Virus Infection to Expression of Cytoskeletal Proteins in Lymphoid Organ from *Penaeus monodon*

Chatchai Krittanai, Apichai Bouchookarn

Institute of Molecular Biology and Genetics, Mahidol University, NakhonPathom 73170, Thailand

e-mail address: stckr@mahidol.ac.th

Abstract: *Penaeus monodon* or black tiger has an economic impact for the annual export of Thailand. This industry is currently facing to several problems from bacterial and viral diseases. The yellow head virus (YHV) is one of the serious diseases. In the shrimp infected with YHV, the cephalothorax turns yellowish and the shrimp can die within a few days. Since a deep and clear understanding on the mechanism of this disease in shrimp has not been established, our study aims to analyze and understand how shrimp responses to YHV to the protein level. Two-dimensional polyacrylamide gel electrophoresis (2D-PAGE) and mass spectrometry was employed to analyze for the proteomic changes in the shrimp-lymphoid organ upon YHV infection. The results clearly demonstrated changes in expression of cytoskeletal proteins. The functional role of these proteins will be discussed.

B0072- AFLP genetic markers for a fast growing trait and sex of the Black Tiger Shrimp (*Penaeus monodon*)

Supavit Sraphet, Benchamart Moolmung, Sakol Panyim and Kanokporn Triwitayakorn*

Institute of Molecular Biology and Genetics, Mahidol University, Salaya, Nakhonpathom, 73170, Thailand

Abstract: The Amplified Fragment Length Polymorphism (AFLP) technique was used to develop genetic markers that are specific to sex and fast growing traits of *Penaeus monodon*. A total of 64 primer combinations of EcoRI-ENN and MseI-CNN were used to screen 151-day-old shrimp which were classified into 4 different groups according to their weight and sex. A total of 18 polymorphic loci were identified from 13 primer pairs. Of these, 14 markers are specific to growth trait, while the other 4 markers are specific to sex with 1 marker specific to male sex and 3 markers specific to female sex. All identified AFLP bands were reamplified and 12 bands showed PCR products, which were subsequently cloned and sequenced in order to design primers for Sequence Characterized Amplified Region markers (SCARs). The primers were tested against pooled and individual genomic DNAs, and one SCAR marker designated SE-E51M29 was identified with a polymorphism specific to the fast growing trait with about 75% accuracy of phenotype prediction. The polymorphic bands of the SCAR SE-E51M29 are the results of an insertion/deletion of nucleotides within the amplified region. However, the AFLP markers that were not converted to SCARs will be of use in the construction of a genetic linkage map and the SE-E51M29 marker will be useful for a Marker Assisted Selection Program of fast growing *P. monodon*.

B0073-GROWTH OF *Bradyrhizobium japonicum* USDA110, NA6080, AND NA6154 IN ACID CONDITION

Napat Puranamaneewiat^{1,2}, Hataichanoke Niamsup^{1,2} and Shigeyuki Tajima³

¹Division of Biotechnology, Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand

²Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

³Department of Life Science, Faculty of Agriculture, Kagawa University, Kagawa 761-0701, Japan

E-mail address: sechi029@chiangmai.ac.th

Abstract: The objective of this study was to investigate the growth of *B. japonicum* USDA110, NA6080 and NA6154 in HM broth at various pHs. These 3 strains of *B. japonicum* could grow at pH 6.8, 6, 5.5, 5 and 4.7. During the growth, decreased pHs of medium were detected. While negligible growth rates were observed at pH 4.5. It can be concluded that all 3 strains of bacteria have mild acid-tolerance property and NA6080 is the best acid tolerant strain.

B0074-POTENTIAL USE OF FRESHWATER MACROALGAE IN NAN RIVER AS FOOD AND DRUG IN THE SECOND YEAR

Yuwadee Peerapornpisal¹, Isarapong Pongsirikul², Komson Ruangrit¹, Jeeraporn Pekkoh¹, Suntaree Preangkarn¹, Kunya Sutjaritvongsanond¹, Ruttikarn Mungmai¹, Sudaporn Tongsi³ and Aram Khumklang⁴

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

²Department of Product Development Technology, Faculty of Agro-Industry, Chiang Mai University, Chiang Mai, Thailand

³Biological science program, Department of science service, Ministry of science and technology, Bangkok, Thailand

⁴Institute for Food Product Research and Development, Kasetsart University, Bangkok, Thailand

⁵Institute for Science Technology Research and Development, Chiang Mai University, Chiang Mai, Thailand

*Rajamongkula Institute of Technology: Nan Campus, Nan, Thailand
E-mail address: kruangrit@hotmail.com

Abstract: The study of the potential use of freshwater macroalgae in the Nan River as a food and drug in the second year during July 2003 to June 2004. Isolation and cultivation of Kai (*Cladophora* spp. and *Microspora* spp.) and Lon (*Nostochopsis* spp.) in media C, CB, JM and BG-II at bench scale is still in the process of analysis. Semi-continuous cultivation of Kai in raceway ponds was more efficient than cultivation at bench scale. Nutrition value in Kai which was cultivated in April 2004 was similar to the past year except selenium which was higher to 460.4 µg per 100 g dry weight. For product development from Kai, fourteen products were produced. Consumer acceptance level was moderate. In some products, the consumer acceptance level tended to correlate negatively with an increasing amount of Kai in the formulate.

B0075-UNFOLDING PATHWAY INVESTIGATION OF GLUTATHION S-TRANSFERASES

Juthamart Piromjitpong and Albert J. Ketterman

Institute of Molecular Biology and Genetics, Mahidol University, Salaya, Nakhon Pathom 73170

e-mail: g4536667@student.mahidol.ac.th

Abstract: Equilibrium denaturation studies of proteins provide valuable information on the autonomous folding of domains, the relationship of folding and oligomerization process, and determination of the thermodynamic significance of subunit interface interactions. Most of our knowledge on protein folding derives from studies on small monomeric proteins. However, the majority of native proteins are more complex structures, composed of several subunits that in turn consist of domains. The extrapolation of results obtained in the study of small proteins to larger ones is not always appropriate, and it is therefore important to investigate proteins composed of more than one subunit. Glutathione S-transferases (GSTs; EC 2.5.1.18) provide a useful model for studying stability and folding within a well-characterized super family of dimeric proteins with conserved overall structures and diverse functional properties. The insect class delta GSTs are of interest because of their potential role in insecticide resistance. AdGSTD3-3 purified from *Anopheles dirus*, a Thai malaria vector, is further of interest because it arises from alternate splicing and crystal structure is available. After unfolded by guanidinium chloride (0 to 5 M) in unfolding buffer at room temperature overnight (~16 hr) to achieve equilibrium unfolding, the protein was monitored structural changes during the unfolding by five probes: the enzyme activity remaining, the intrinsic tryptophan fluorescence spectroscopy, far-UV circular dichroism (CD), ANS binding assay, and size-exclusion chromatography to observe quaternary structure, tertiary structure, secondary structure, subunit interface and overall component changes, respectively. The results indicated that adGSTD3-3 unfolds via a four-state pathway ($N_2 \rightleftharpoons I_2 \rightleftharpoons 2M \rightleftharpoons 2U$). Polar interactions predominate at the subunit interface suggests ionic strength has major affect on stability. The GST solvation by water and/or shielding by salt during unfolding most likely affect subunit association and facilitate the formation of the stable dimeric and monomeric intermediates.

B0076-THE WOUND HEALING EFFICACY OF DURIAN POLYSACCHARIDE GEL (PG) DRESSING FILM IN DOG SKIN.

Raveewan Siripokasupkul¹, Piyaat Chansiripornchai², Churee Pramatwinai³, Anudep Rangsipipat⁴, Sunan Pongsamart¹

¹Department of Biochemistry, Faculty of Pharmaceutical Science,

²Department of Veterinary Pharmacology,

³Department of Veterinary Surgery,

⁴Department of Veterinary Pathology, Faculty of Veterinary Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: A preliminary study investigated the wound healing efficacy of polysaccharide gel (PG) extracted from fruit-hulls of durian (*Durio zibethinus* L.) for the treatment of fullthickness excisional wounds in dog. Eight full-thickness wounds were created on both side of ventral midline of a dog. The wounds were randomly divided into 4 groups, wounds treated with 1% povidone iodine, PG dressing film, PG dressing gel and Opsite[®] Flexigrid. Subsequently, the process of wound healing was evaluated by gross pathology every 3 days postoperatively when wounds were cleaned, given a new dressing and wound size measured. The wound area was calculated using a computer program. The results demonstrated a faster healing rate for wounds using the PG film dressing. These results suggested that PG film dressing might be beneficial in promoting wound healing and could be satisfactory when used for the treatment of full-thickness open wounds in dog.

B0077-Antimicrobial activity (in vitro) of essential oils useable in gel preparation of antibacterial polysaccharide from durian fruit-hull

Naruphat Paphattarapong¹, Unchulee Pongwiwatana¹, Vimolmas Lipipun², Sukanya Jesadanont³ and Sunanta Pongsamart¹

¹Department of Biochemistry,

²Department of Microbiology, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok, 10300 Thailand.

³Faculty of Science and Technology, Chandrakasem Rajabhat University, Bangkok, Thailand, 10900
E-mail address : daisynaja@hotmail.com

Abstract: Antimicrobial activity of betel oil, tea tree oil and oleoresin of curcumin was determined for its application as an ingredient in disinfectant gel preparation of antibacterial polysaccharide from durian fruit-hull. Inhibitory activity was tested by agar diffusion and broth macrodilution methods. Minimal inhibitory concentration (MICs) and minimal bactericidal concentration (MBCs) were demonstrated. Betel oil showed higher antimicrobial activity than that of tea tree oil by this investigation. MBCs of betel oil and tea tree oil were $\leq 0.16\%$ and $0.1-0.6\%$, respectively, against 9 bacteria, *S. aureus*, *S. epidermidis*, *M. luteus*, *B. subtilis*, *E. coli*, *P. vulgaris*, *Salmonella typhimurium*, *K. pneumoniae*, *Ps. Aeruginosa* and 2 fungi, *C. albican* and *S. cerevisiae*. Betel oil, tea tree oil and oleoresin of curcumin, exhibited inhibition zone on agar plates against 9 tested bacteria.

B0078- In vitro antibacterial activity of polysaccharide gel from durian fruit hulls against *Staphylococcus* sp. isolated from dairy cow mastitis

Tanatchaporn Phaunfoong¹, Kittisak Ajariyakajorn¹, Vimolmas Lipipun² and Sunanta Pongsamart¹

¹Department of Biochemistry.

²Department of Microbiology Faculty of Pharmaceutical Science.

³Department of Veterinary Medicinal, Faculty of Veterinary Sciences, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: The in vitro antibacterial activity of polysaccharide gel (PG) extracted from fruit-hull of durian (*Durio zibethinus* L.) was performed to evaluate the activities against isolates of *Staphylococcus* sp. from mastitis of cow. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were in the range of $3- >50$ mg/ml and $6- >50$ mg/ml, respectively. Gentamicin was performed as control and the MIC and MBC against these isolates were $< 0.007-2 \mu$ g/ml and $< 0.007-4 \mu$ g/ml, respectively. The PG prepared from varieties of durian were tested. The MIC (MBC) of PG Monthong, PG Chacee and PG Native from Chumphon province against *S. aureus* ATCC 29213 and *S. aureus* ATCC 25923 were 25mg/ml(50mg/ml), 3mg/ml(6mg/ml) and <3 mg/ml(<3 mg/ml), respectively. The result showed that the PG from durian fruit-hull at concentration of ≥ 50 mg/ml is a potential antibacterial agent.

B0079-Anti - *Staphylococcus aureus* of water extract from *Malvastrum coromandelianum* Garcke

Chaiyasit Sittiwet¹, Sukanya Jesadanont¹, Sunanta Pongsamart¹, Yupin Taitobsakul², Pintip Pongpech², Penphun Naenna²

¹Department of Biochemistry.

²Department of Microbiology Faculty of Pharmaceutical sciences Chulalongkorn University,

Bangkok 10330, Thailand .³Faculty of Science and Technology, Chandrakasem Rajabhat University, Bangkok 10900, Thailand

e-mail address: Cssittivat@hotmail.com

Abstract: Crude extract from *Malvastrum coromandelianum* Garcke had been tested for antimicrobial activity using Agar Disc Diffusion Susceptibility Test and Broth Macro Dilution test. The extract had been shown to have inhibitory activity against both of methicillin sensitive and methicillin resistant *Staphylococcus aureus*. The 25% (w/v) of the water extract could inhibit 11 out of 14 *Staphylococcus aureus* methicillin sensitive strains and 8 strains out of 9 *Staphylococcus aureus* methicillin resistance strains in the Agar Disc Diffusion Susceptibility Test. The minimum inhibitory concentration (MIC) of this extract was 25% (w/v) but minimum bactericidal concentration (MBC) could not be determined. Besides, 25%(w/v) extract was shown to have killing effect against 10^6 CFU/ml of 11 strains from 19 test strains. It could be concluded that this extract had the good inhibitory activity against both of methicillin - resistant and methicillin sensitive *Staphylococcus aureus* and also shown to have low killing effect. It was interesting to develop this plant extract to be used as a antistaphylococcal drug and also to study other useful activities in further study.

B0081-MORPHOLOGY AND CYTOGENETIC STUDY ON AROWANA FISHES IN SUBFAMILY OSTEOGLOSSINAE FROM ASIA, AUSTRALIA AND SOUTH AMERICA

Wichian Magtoon, Thawat Donsakul

^{1,2} Department of Biology, Faculty of Science, Srinakharinwirote University

Abstract: The purposes of this study is to determine the morphology and cytogenetics of *Scelopages formosus*, *S. jardini*, and *Osteoglossum bicirrhosum* - all of which are Arowana belonging to the Osteoglossinae subfamily. The findings show that *Scelopages formosus* are prevalent in Asia, *S. jardini* in Australia, and *Osteoglossum bicirrhosum* in the South America. Proportional measurements and meristic counts reveal their morphological and karyotype differences are as follows: *Scelopage formosus* has the standard length of 4.3-5.4 times of width. They have 18-21 dorsal rays, 26-28 anal rays and 20-24 scales in longitudinal series. The diploid chromosome number is 50 (1M+3SM+20A;NF=58). The standard length of *Scelopage jardini* is 3.8-4.5 times body width. They have 20-24 dorsal rays, 28-31 anal rays and 32-35 scales in longitudinal series. The diploid chromosome number is 49 (11M+13A;NF=70). *Osteoglossum bicirrhosum* has the standard length of 5.9-9.5 times body width. They have 42-46 dorsal rays, 50-55 anal rays and 31-36 scales in longitudinal series. The diploid chromosome number is 56 (1 ST+27A;NF=56).

B0082-IDENTIFICATION OF DIFFERENTIALLY EXPRESSED GENES IN OVARIES AND TESTES OF THE GIANT TIGER SHRIMP *Penaeus monodon* USING RAP-PCR

Bavornlak Khamnamtong¹, Sirawut Klumbua², Anchalee Lissanakajon¹ and Pramsak Menasveta^{1,3}

¹Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), 113 Paholyothin Rd., Klong 1, Klongluang, Pathumthani 12120

²Department of Biochemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

³Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Differentially expressed markers in ovaries (24 fragments) and testes (15 fragments) of *P. monodon* generated by RNA-arbitrary primed (RAP)-PCR were cloned and sequenced. Major transcripts were unknown genes (56.5%), 18S rRNA (13.0%) and thrombospondin (TSP, 10.9%) homologues, respectively. In addition, homologues of functionally important genes including NADPH-cytochrome P450 reductase, Ran-binding protein, cytoskeletal proteins and hypothetical proteins were also isolated.

B0083-DYNAMICS OF TWO NEW RECORD GENERA OF FRESHWATER RED ALGAE IN THAILAND: *Audouinella* AND *Compsopogonopsis* IN A LOTIC ECOSYSTEM OF MAE MOH POWER PLANT, LAMPANG PROVINCE

Siripen Traichayaporn¹, Pongsarun Jansum

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: siripen_t@yahoo.com

Abstract : Survey of freshwater red algae together with monitoring of water quality and some ecological factors in the Diversion Pond of Mae Moh Power Plant, Lampang Province for around 2 years (April 2002 to February 2003). Two new recorded genera of freshwater red algae were *Audouinella* and *Compsopogonopsis*. *Audouinella* attached on stones (epilithic algae) while *Compsopogonopsis* attached on molluscs (reprossive algae). Prominence algal biomass occurred in winter (November 2003 to February 2004) where as small biomass was reported in other season. Diversion Pond a lotic ecosystem with 30 - 50 centimeters depth contained a highly variation of water quality in two years found and some parameters were higher than the Standard Surface Water of Thailand, such as TC and Total hardness ($1967.00 \pm 467.62 \mu\text{Scm}^{-1}$ and $533.80 \pm 199.84 \text{ mg l}^{-1}$ as CaCO_3 , respectively). Populations of these freshwater red algae were significant negatively correlated with water temperature, but significant positively correlated with TC and Total hardness.

B0085-Continuous culture of a diatom *Chaetoceros calcitrans*

Paveena Japaneeworawong^{1,2}, Vichaya Gunbua¹ and Sorawat Pongtongrak¹

¹Department of Aquatic Science, Faculty of Science, Burapha University

²Department of Marine Science, Faculty of Science, Chulalongkorn University

³Marine Biotechnology Research Unit (at Chulalongkorn University), National Center for Genetic Engineering and Biotechnology

*Correspondence e-mail: sorawat@biotec.or.th

Abstract: Continuous culture of a diatom *Chaetoceros calcitrans* was performed in 1 L flask and 5 L flat panel photobioreactor. Specific growth rate of 1.0/day obtained from batch culture was used to set up the continuous system. The result showed that, with 1 L culture vessel, the production yield of 1 L/day with cell concentration of 250×10^4 cells/ml was obtained. After scaling up to 5 L photobioreactor, it was found that dilution rate more than 1.0/day could possibly wash the cells out. With the present system along with the dilution rate of 0.5/day, the production yield of 2.5 L/day with cell density at least 400×10^4 cells/ml could be expected.

B0086-EFFECTS OF *Ascophyllum nodosum* SUPPLEMENTED DIETS ON GROWTH AND SURVIVAL OF BLACK TIGER SHRIMP *Penaeus monodon*

Sirikanya Chungthanawong, Somkiat Piyatiratitvorakul and Pramsak Menasveta

Department of Marine Science and Marine Biotechnology Research Unit, Faculty of Science, Chulalongkorn University, Bangkok 10330

Abstract: Effect of seaweed *Ascophyllum nodosum* added diets on *Penaeus monodon* was tested in two experiments. A 28 days feeding trial on postlarvae-L5, tested in a recirculating water system. *A. nodosum* meal was mixed to shrimp basal diet at concentration of 0, 5 and 10% of the diet. At the end of trial, shrimp were evaluated for length, weight and growth rate. The result showed that shrimp length fed of 5% seaweed added diet was higher than those of shrimp fed 10% seaweed added diet, but not different from those of the control (0% seaweed). Weight and growth rate of shrimp in each diet was similarity. For 1.5 month-old shrimp, the same diet was tested at 56 days. The result showed that shrimp fed 5% seaweed had higher weight ($8.01 \pm 2.32 \text{ g}$), than those shrimp fed 0 and 10% seaweed. The length and survival rate of shrimp fed different diets were no significant difference.

B0087-Flow cytometric measurement of reactive oxygen species production in red blood cells of end-stage renal disease patients on regular hemodialysis

Wachiraporn Tipsuwan¹, Derek Bannajak², Yuttana Mundee¹, Somdet Srihairatanakool¹

¹Department of Biochemistry, ²Department of Medicine, Faculty of Medicine, ³Department of Clinical Microscopy, Faculty of Associated Medical Science, Chiang Mai University, Chiang Mai 50200

Abstract: Anemia is commonly found in end-stage renal disease (ESRD) patients on regular hemodialysis, which insufficient erythropoietin (EPO) production is one of causes. Administration of EPO together with iron formulation and intermittent blood transfusion are the medical regimens to maintain the normal hemoglobin level in these patients. Some patients who are unresponsive to EPO treatment or transfusion-dependent are suffered from iron overload and oxidative stress. Excessive iron deposit in cells and tissues enhances Fenton and Haber-Weiss reactions to produce a large amount of reactive oxygen species (ROS) that are harmful to several vital organs and threaten their lives in many ways. The present work was aimed to determine the persistent oxidative stress and preventive effect of curcumin against oxidative stress in the erythrocytes from ESRD patients.

B0088-EFFECTS OF GREEN TEA EXTRACT ON IRON OVERLOAD AND IRON-INDUCED OXIDATIVE STRESS

Sakaewan Ounjaijean, Udomphan Khansuwan, Somdet Srichairatanakool,
Department of Biochemistry, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand
E-mail address: sakaewan@hotmail.com

Abstract: Green tea (GT) has many pharmacological properties. Tealeaf contains many polyphenolic catechins, which epigallocatechin gallate (EGCG) is the most abundant. GT catechins have antioxidative as well as free-radical scavenging properties. These beneficial effects can protect human beings from many pathogenesises such as cancer, hypertension and aging. Oxidative stress results from unbalanced formation of reactive oxygen species (ROS) that is mainly caused by iron catalyst in Haber-Weiss and Fenton reaction. The present study was performed to investigate the effect of GT extract on iron-induced oxidative stress. Different physical methods were tested for the production of GT having high EGCG content, high anti-oxidative and iron-chelating capacity. The results showed that microwave-processed GT was the most potential. GT extract had more binding activity to ferric ion than ferrous ion, which 2.0g% GT extract saturably bound 200 μ M ferric nitrate. GT extract was able to inhibit iron-induced oxidative stress both *in vitro* and *in vivo*. Possibly, this may be due to the high iron-binding and free-radical scavenging capacities existing in the microwave-processed GT product. Further experiments need to be designed strictly and carefully so that GT product can be applicable for prevention or treatment of iron overload in thalassemia patients.

B0089-MORPHOMETRIC VARIATION OF *TOR SORO* AT PROMLOK WATERFALL, KHOA LUANG NATIONAL PARK, NAKHON SITHAMARAT

Manit Pollar*, Mullica Jaroensutasinee, Krisanadej Jaroensutasinee
CXKURUE, Computational Science Graduate Program, Institute of Science, Walailak University, 222 Thasala District, Nakhon Si Thammarat, 80160.
E-mail address: manit_polla@yahoo.com, jmullica@wu.ac.th, jkrisana@wu.ac.th

Abstract: Soro Brook carp (*Tor soro*) inhabitants in the waterfall. We collected 70 *Tor soro* from Promlok waterfall, Khoa Luang National Park, Nakhonsithammarat Province. Fish length varies from 10-20 cm. Adult sex ratio was male biased. Females were heavier and larger than males. Principle component analysis and cluster analysis showed that Soro Brook carp sat Promlok waterfall are from one population and can separate variables are classified into five groups.

B0090-INVESTIGATION OF THE TRANSMEMBRANE PORE OF A CYTOLYTIC TOXIN FROM *Bacillus thuringiensis* BY FLUORESCENCE SPECTROSCOPY

Wanwarang Pathachindachote¹, Chatchai Kritanai², Mongkon Audtho¹, Sakol Panyim² and Boonhiang Promdonkoy¹
¹National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, 113 Paholyothin Road, Klong 1, Klong Luang, Pathumthani 12120 and ²Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhonpathom 73170
E-mail address: wanwarang@biotec.or.th, boonhiang@biotec.or.th

Abstract: Cyt2Aa2 is a cytolytic δ -endotoxin produced by *Bacillus thuringiensis* subsp. *darmstadtensis*. To investigate the membrane pore structure of Cyt2Aa2 by fluorometric analysis using environmentally sensitive acrylodan, a single cysteine residue at position 19 was substituted by alanine to generate cysteine-free toxin. Nine single-cysteine substitutions at selected residues were generated using cysteine-free toxin as template. The mutants were labeled with acrylodan at the thiol group of the site-specific cysteine residue. Fluorometric measurements of the labeled toxin were performed in the solution, membrane-bound and delipidation states. A blue shift in the emission maximum observed during solution and membrane-bound state in all mutants indicated conformational changes of the toxin or movement of the acrylodan-labeled residue to more hydrophobic environment. Partially reversal of the blue shift upon delipidation of L187C in $\beta 6$ indicated this residue pointed toward the membrane lipid. Irreversible of a blue shift of other mutants suggested that these residues could be buried within hydrophobic environment created by conformational changes or protein-protein interaction in the oligomer during pore formation.

B0091-Co-expression of *Bacillus thuringiensis* Cry4B and Cyt2Aa2 in *Escherichia coli* Revealed High Synergism Against *Aedes aegypti* and *Culex quinquefasciatus* Larvae

Patcharee Promdonkoy¹, Sakol Panyim² and Boonhiang Promdonkoy¹
¹National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, 113 Paholyothin Road, Klong 1, Klong Luang, Pathumthani 12120 and ²Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhonpathom 73170

Email address: patchareepr@biotec.or.th and boonhiang@biotec.or.th

Abstract: Cry4B, a δ -endotoxin produced by *Bacillus thuringiensis* subsp. *israelensis* (*Bti*), and Cyt2Aa2, a cytolytic δ -endotoxin produced by *Bacillus thuringiensis* subsp. *darmstadtensis*, were introduced separately and in combination into *E. coli*. Cyt2Aa2 expressed in *E. coli* exhibited comparable larvicidal toxicity against *Aedes aegypti* and *Culex quinquefasciatus* larvae with LC₅₀ values of 350 ng/ml and 250 ng/ml, respectively. Cry4B showed high toxicity against *Ae. aegypti* larvae with LC₅₀ values of 140 ng/ml but inactive to *C. quinquefasciatus*. Co-expression of both toxins, Cry4B and Cyt2Aa2, in *E. coli* dramatically increased larvicidal toxicity to *Ae. aegypti*, 50 times and 20 times comparing to those containing only Cyt2Aa2 and Cry4B, respectively. Surprisingly, combination of both toxins decreased the LC₅₀ against *C. quinquefasciatus* by a factor of 12.5 although one parental toxin, Cry4B, is virtually nontoxic to *C. quinquefasciatus*. Statistical analysis showed this high activity was due to synergism between the Cry4B and Cyt2Aa2 toxins.

B0092- MOLECULAR BIOLOGY OF A BINARY TOXIN FROM *Bacillus sphaericus*

Boonhiang Promdonkoy¹, Patcharee Promdonkoy¹, Busabun Chaisalee², Panadda Boonserm² and Sakol Panyim²

¹BIOTEC Central Research Unit, National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency

²Institute of Molecular Biology and Genetics, Mahidol University

Email address: boonhiang@biotec.or.th

Abstract The mosquito larvicidal binary toxin produced by *B. sphaericus* composed of 2 proteins called BinA (42 kDa) and BinB (51 kDa). The toxin is highly toxic to the larvae of *Culex sp.* and *Anopheles sp.* mosquitoes. Both BinA and BinB require each other to exhibit their activity. BinB is expected to act as specificity determinant by binding to a receptor on the gut cell membrane. BinA will then bind to BinB or BinB-receptor complex, translocated into cytosol and exerts its activity via unknown mechanism. Genes encoding both proteins are in a single operon and their expression is control by the same promoter. This operon expressed at low level when cloned in *E. coli* but remain highly toxic to the larvae. Expression level was significantly improved if each gene was separately cloned in *E. coli*. However, their toxicity was dramatically decreased. Single substitution at positions C31, C47 and C195 revealed that disulfide bonds play important roles in maintaining the toxin structure as well as oligomerization. Mutagenesis at position R301 may not change the overall structure but could directly affect the active site of the toxin.

B0093- CHLOROSIS IN LEAVES AND MORPHOLOGICAL CHANGES IN ROOT EPIDERMAL CELLS OF RICE GROWN IN A NUTRIENT SOLUTION WITHOUT IRON

Patamaporn Tilarux, Manit Kosittrakun, Sumontip Bunnag

Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen

E-mail address: meo_tilarux@hotmail.com, mankos@kku.ac.th and sumbun@kku.ac.th

Abstract: Iron deficiency causes chlorosis in leaves and morphological changes in roots. Therefore, a study was conducted on iron deficiency in four rice (*Oryza sativa* L.) cultivars, namely KDML 105, DHL 279, BT and IR 68144. The germinating seeds were grown in Yoshida nutrient solution (pH 5.0) for 30 days under the greenhouse condition. Thereafter, half of the 30-day-old plants were transferred to the nutrient solution without FeCl₃ whereas the other half remained in the initial nutrient solution. The plants were sampled for the determination of leaf total chlorophyll and Fe²⁺ contents and for the investigation on morphological changes in roots. This study revealed that leaf Fe²⁺ content could be used as a better indicator for iron deficiency in rice when compared with leaf total chlorophyll content. In addition, Fe-deficient rice plants also had damaged roots.

B0094-Expression of 5-HT receptor protein during ovarian maturation in black tiger prawn

Suthasinee Somyong, Chalermpong Ongvarrasopone and Sakol Panyim

Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhon Pathom 73170, Thailand

e-mail address: sutha2604@hotmail.com, mbcov@mahidol.ac.th

Abstract: In crustacean, 5-HT or serotonin (5-hydroxytryptamine) induces ovarian maturation. Consequently, understanding 5-HT receptor will be essential to improve prawn production in the future. This research is aimed to generate polyclonal antibody against the third intracellular loop (i3) of the previously cloned full-length 5-HT receptor and to use it for localization and characterization its functions in *P. monodon*. In order to construct recombinant expression plasmids, 317 base pairs of the third intracellular loop of 5-HT receptor (i3-5-HT) was cloned into an expression vector (pGEX 5X-1). The 38 kDa 5-HT fusion protein was expressed in which the bacterial culture was induced by 0.1 mM IPTG and incubated for 8 hours at 30 °C in *E. coli* JM 109. The 5-HT fusion protein was purified by using glutathione-affinity agarose bead. In order to raise polyclonal antibody, the fusion protein was cleaved by factor Xa to remove GST during the purification step by incubation with factor Xa for 16 hrs at 22 °C. Then, i3-5-HT protein (12 kDa) was cut from the gel and injected into mouse. Western blot analysis showed that this antibody bound specifically to a protein of molecular weight approximately 50 to 60 kDa isolated from the membrane of the ovary of *P. monodon* undergoing stage I, II, III, IV and spent phase of ovarian maturation. The expression of 5-HT receptor protein was progressively increased from stage I to IV and reduced during spent phase. In addition, 5-HT protein was expressed in thoracic ganglia, heart, stomach and lymphoid. Immunohistochemistry on the paraffin section of ovary undergoing stage I to IV demonstrated that the positive staining of 5-HT receptor on the ovarian membrane. From these results, it suggested that 5-HT receptor may involve in ovarian maturation.

B0095- INVESTIGATION OF TRANSFORMED PRSV CP SEQUENCES IN TRANSGENIC PAPAYA G2

Permchai Itthisoponpisarn, Asst. Prof. Dr. Sunee Kertbundit, Dr. Miloslav Juricek

Plant Virology Laboratory, Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhon Pathom

Abstract: *Papaya ringspot virus* (PRSV) causes a severe disease in papaya (*Caricapapaya*) throughout the tropical and subtropical areas with significant damage to papaya plantations. The conventional methods failed to control PRSV infection. Transgenic papaya transformed with PRSV *cp* gene can confer resistance against PRSV. In this research, we aimed to study the correlation between PRSV resistance and transformed *cp* gene in transgenic papaya, in order to understand the resistant mechanism which can be used for development of the effective method to protect the plant against PRSV. Determination of *cp* transgene integration using *Pac* I and *Stu* I restriction enzymes by Southern blot analysis implied that the integration of *cp* transgene might occur at a single genetic locus in the papaya genome of the transgenic papaya line G2. PCR and DNA sequence analysis showed extensive rearrangement of DNA within the CP cassette in the genome of the transgenic papaya line G2. It comprised of an insertion of plasmid vector pSA1006 backbone, insertion of plant genomic DNA sequences, and rearrangement of *cp* and *uid4* transgenes.

B0096-ANALYSIS OF PAPAYA LINES TRANSFORMED WITH *Papaya ringspot virus* GENES

Suchada saengwiman¹, Miloslav Juricek¹, Sakol Panyim¹, Sunee Kertbundit¹

¹Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhon Pathom 73170, Thailand.

Email address: ton_suchada@hotmail.com

Abstract: Coat protein gene (CP) and Replicase gene (N1b) isolated from papaya ringspot virus (PRSV) Thai isolate were used to generate transgenic papayas. The integrated viral transgenes were amplified from papaya lines 15001-15004, 39001 and 39002. Southern blot hybridization of all transgenic papayas revealed multiple and rearranged bands of viral transgenes. Truncated *cp* bands were also detected from transgenic papaya lines 15003 and 15004. RT-PCR analysis of viral transgene transcription in transgenic papaya lines 15001-15004 revealed weak amplified bands of 0.96 kb of full-length *cp* and 0.6 kb of 3' end *cp* whereas the strong 0.3 kb fragment was amplified from the 5' end of *cp*. In the N1b-transgenic papaya lines 39001 and 39002, the RT-PCR result showed 1.6 kb N1b transcription product. The PRSV resistance of all transgenic papayas was evaluated by mechanical inoculation. The results showed that various degrees of resistance were observed in all transgenic lines. However, further research is needed to investigate this.

B0097-THE DIFFERENCE IN THE INSECT POPULATION IN COLORED TRAPS

Verapong Kiatsoonthorn

Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand.

E-mail address: verapong@swu.ac.th

Abstract: The study was conducted by using 11.5 × 17.4 × 4 cm³ transparent polyethylene containers, which were colored cream, yellow, red, orange, green, purple, blue or white. Each container was filled with 10% formaldehyde solution, together with a little drop of surface-active agent, placed under three different tree shadows for 2 days, and repeated approximately every 2 months. Insect populations were classified into categories, resulting in 56.2% Dipterans, 27.1% Collembolans and 8.7% Hymenopterans making up the major insect population. Yellow was the most effective color to attract insects, followed by cream, blue, green, white, purple, orange and red respectively. Colored traps situated in less shady areas, attracted more insects than those placed in heavier shaded areas. In addition, insect population fluctuated according to the amount of rain precipitation.

B0098-Identification and conversion of fertility trait specific AFLP to SCAR markers of the Thai swamp buffalo (*Bubalus bubalis*)

Benchamart Moolmuang, Supajit Sraphet, Sakol Panyim, Ancharlie Na-Chiangmai and Kanokporn Triwitayakorn*

¹Institute of Molecular Biology and Genetics, Mahidol University, Salaya, Nakhonpathom.

²The Department of Livestock Development

*Correspondence to: Kanokporn Triwitayakorn, E-mail: mbktw@mahidol.ac.th

Abstract: The Amplified Fragment Length Polymorphism (AFLP) technique was used to develop genetic markers that are specific to a fertility trait of the Thai swamp buffalo (*Bubalus bubalis*). A total of 256 primer combinations of *Eco*RI-ANN and *Mse*I-CNN were used to screen two sets of pooled DNA. Each set of pools composed of high and low fertility buffalo which were classified according to calving interval. The results showed 6 markers that were identified from the high fertility pool and 13 markers that were identified from the low fertility pool. The identified AFLPs were tested with individual samples contributing to the pooled DNAs and two markers, AFE14M30 and AFE12M25, were identified that have 80% and 70% accuracy of phenotype prediction, respectively. All polymorphic AFLP fragments were subsequently cloned and sequenced for Sequence Characterized Amplified Region (SCAR) primer design. The primers were tested with pooled and individual DNA samples and the results showed the polymorphisms that were identified from the new SCAR, SAFE12M29 marker with approximately 60% accuracy of phenotype prediction. Moreover, the sequence analysis using BLAST searches showed that the sequence of the AFE7M24-2 had similarity with the prostaglandin f2a receptor gene while the sequences of the AFE16M25-2 and AFE4M28-3 markers showed similarity with follicle stimulating hormone receptor gene of sheep (*Ovis aries*). The SCAR and the AFLP markers that were identified from this project and showed high correlation between

genotype and phenotype will be useful tools for the construction of a genetic linkage map as well as in a marker assisted selection program for fertility trait of Thai swamp buffalo

B0099-EFFICIENCY OF NITRIFICATION BIOFILTER FOR AMMONIA TREATMENT IN SHRIMP CULTURE POND

Suttikarn Sutti^{1,2}, Sorawit Powtongsook^{2*} and Piamsak Menasveta^{1,2}

¹Department of Marine Science, Faculty of Science, Chulalongkorn University

²Marine Biotechnology Research Unit (at Chulalongkorn University¹), National Center for Genetic Engineering and Biotechnology, Thailand Science Park, 113 Paholyothin Road, Klongluang, Pathum Thani 12120

*Corresponding e-mail: Sorawit@biotec.or.th

Abstract: Efficiency of ammonia treatment by nitrification biofilter was investigated using a custom-made clear PVC chamber placed in the shrimp pond. These chambers were cylinder-shape with 30 cm diameter and 150 cm length placed vertically in the shrimp pond with one end penetrated in the pond bottom at approximately 15 cm depth while another end was above the water surface. The biofilter, made of porous recycled plastic (cylinder-shape, 12.5 cm diameter), was cut into 2 or 4 cm length and immersed in shrimp pond for 1 month before used. The experiment consisted of chamber containing 2 or 4 cm biofilter (treatments) and the chamber without biofilter (control). The results showed that biofilter could induced higher ammonia removal rate in treatment chambers than in control. Increase in nitrate concentration in the chamber indicated that nitrification occurred but most of ammonia reduction was due to microorganism uptake. However there was not significant difference of ammonia reduction between 2 and 4 cm length biofilter.

B0100-BLOOD CHEMICAL AND HEMATOLOGICAL ANALYSIS OF WISTAR RAT TREATED WITH AQUEOUS EXTRACT OF *Coscinium fenestratum*

Salika Aritajat, Suluk Vutteeapol and Kanokporn Saenphet

Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: suluckcmu@hotmail.com

Abstract: Chemical analysis of blood from male Wistar rats treated with aqueous extract of *Coscinium fenestratum* at 30, 60 and 90 mg/ml/day for 30 days, were evaluated. Blood samples were collected and determined for glucose, cholesterol, triglycerides, blood urea nitrogen (BUN), creatinine, hemoglobin, hemocrit, white blood cell count and differential cell count. The results showed that blood glucose and cholesterol of the treated rats were significantly lower than those of the control ($P < 0.01$). Whereas, triglycerides, BUN, creatinine, hemoglobin, hemocrit, white blood cell count and differential cell count were not different from those of the control. It was concluded that *C. fenestratum* aqueous extract had hypoglycemic effect by decreasing blood glucose as well as blood cholesterol levels without any effect on kidney function and hematological system of the experimental animals.

B0101-THE DIVERSITY, USE AND MAINTENANCE OF BIOLOGICAL RESOURCES IN NA HAO, LOEI PROVINCE (NORTHEAST THAILAND)

La-aw Ampornpan¹ and Shivcharn S. Dhillon^{2,3}

¹Department of Biology, Srinakharinwirot Univ., Sukhumvit 23 Road, Bangkok 10110, Thailand; ²Dept. of Ecology & Natural Resource Management, pb 5003, Agric. Univ. of Norway, NO-1432, Ås; ³Centre for Development & the Environment, pb1116, Univ. of Oslo, Blindern, N-0317, Oslo, Norway

la-aw@swu.ac.th and shivcharn.dhillon@ina.nlh.no

Abstract: This study examined the status and cultural values of biodiversity, with a focus on plants in different land use types within a landscape influenced by a wide range of human activities. The study site houses mixed deciduous forest (540 m a.s.l.). A total of 203 plant species were found in different land use types. Of this reported species 168 were found in the forest. Among the 106 of non-domesticated plant species used locally, 51 were used commonly for food and 64 for medicine. The other uses of plants were for construction and rituals. Mushrooms, fish, snake, frogs, other reptiles and amphibians, mammals, birds, insects, and aquatic plants and animals are collected as well. Documentation of local peoples' use of the areas and biodiversity has given valuable insight into socio-cultural and ecological aspects that need to be considered and built into planning restoration projects and management regimes.

B0103-SUBLETHAL TOXICITY EFFECTS OF ROTENONE PARAQUAT AND DIELDRIN ON THE FRESHWATER OLIGOCHATE, *Lumbriculus variegatus*

Nalena Praphairaksit^{1*}, Pensri Pootrakool², Charles Drewes¹

¹Department of Biology, Faculty of Science, Srinakharinwirot university, Bangkok 10110, Thailand; ²Thalassemia research center, Mahidol university, Nakorn Pathom Thailand; ³Department of Ecology, Evolution and Organismal Biology, Iowa State University, Iowa 50011 U.S.A.

e-mail address: nalena@swu.ac.th

Abstract: Rotenone, paraquat and dieldrin are commonly used in the agriculture in Thailand. Researches had been done and showed that these chemicals may be the caused of Parkinson's disease in human who chronically exposed. However, no work has been done in studying the effects on the environment especially on the aquatic organisms which may be exposed to some level of the toxicants. In this study we look at the effects of 3 pesticides, rotenone, paraquat and dieldrin, on neurotoxicity, vasculotoxicity and behavioral responses in the freshwater oligochaete, *Lumbriculus variegatus*, after 10 min

and 24 hours exposure. The tests were carried out and compared between before and after 10 minutes and 24 hours exposure of chemicals

B0104-CLONING, EXPRESSION AND PRODUCTION OF POLYCLONAL ANTIBODIES AGAINST RECOMBINANT VP1 CAPSID PROTEIN OF TAURA SYNDROME VIRUS (TSV)

Parin Chaivisuthangkura¹, Phiromsak Phattanapattikul², Thanawan Tejangkura¹, Sombat Rukpratanporn³, Siwaporn Longyant¹, Weerawan Sithigomgul¹, Paisarn Sithigomgul¹ and Timothy W. Flegel⁴

¹Department of Biology, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand; ²Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand;

³Marine Biotechnology Research Unit at Chulalongkorn University, National Center for Genetic Engineering and Biotechnology (BIOTEC), Bangkok 10330, Thailand

⁴Center of Excellence, Mahidol University, Bangkok, Thailand

e-mail address: parin@swu.ac.th

Abstract: VP1 capsid protein encoding gene of taura syndrome virus was cloned into a pGEX-6P-1 expression vector and transformed into *E. coli*. After induction, the bacteria were able to produce the recombinant VP1 protein (rVP1). The recombinant protein was purified by SDS-PAGE and used for immunization in Swiss mice for polyclonal antibody production. The antibodies can be used to detect TSV infection in tissue by means of immunohistochemistry. In the future, monoclonal antibodies specific to rVP1 will be generated in order to develop of a simple immuno-based test kit for TSV detection with high accuracy and sensitivity at low cost

B0105-Biological and Physical factors influencing territorial defense in fiddler crabs, *Uca hesperiae*

Kanchana Bunnung¹, Kumpol Meesawad¹, Mullica Jaroensutasinee², Krisanadej Jaroensutasinee²

¹Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90110

²School of Science, Walailak University, Thasala, Nakhon Si Thammarat 80160

Email address: kbunnung@yahoo.com, mkumpol@ratree.psu.ac.th, jmullica@wu.ac.th, jkrisana@wu.ac.th

Abstract: This study investigated physical and biological factors of habitat use and territorial defence of *Uca hesperiae* at Libong non-hunting area, Trang province. We found high population density near the water edge, which is high in organic matter and moisture content. Territorial males had larger carapace width, carapace length, propodus, and dactylus than other male fiddler crabs in the population. However, the amount of organic matter did not influence the territory size of male fiddler crabs.

B0106-Screening of plants act against *Heterometrus laoticus* venom activity on fibroblast cell lysis

Nunthawun Uawonggul¹, Sakda Daduang¹, Arunrat Chaveerach², Sompong Thammassirak¹ and Tarinee Arkaravichien³

¹Department of Biochemistry, Faculty of Science, Khon Kean University, Khon Kean, 40002, Thailand

²Department of Biology, Faculty of Science, Khon Kean University, Khon Kean, 40002, Thailand

³Department of Pharmacology, Faculty of Medicine, Khon Kean University, Khon Kean, 40002, Thailand.

Abstract: The water extracts of 64 plant species were screened for their activity against fibroblast cell lysis after *Heterometrus laoticus* venom treatment. The venom was incubated with plant extract for 30 minutes and further treated to confluent fibroblast cell for 30 minutes. The results showed that viable cells had been obtained from treatment with the extracts from *Andrographis paniculata*, *Barringtonia acutangula*, *Calamus* sp., *Clinacanthus nutans*, *Euphorbia neriifolia*, *Ipomeoa aquatica*, *Mesua ferrea*, *Passiflora laurifolia*, *Plectranthus amboinicus*, *Ricinus communis*, *Rumex* sp. and *Sapindus rarak* gave about 50% efficiency showing that they had a tendency to be the scorpion venom antidote, but only *Andr. paniculata* and *Barr. acutangula* extracts gave more than 50% viable cells from extract-alone treatments. The two plant extracts were expected to be scorpion venom antidote with low toxicity.

B0107-H2O2 PRODUCTION, LIPID PEROXIDATION AND ELECTROLYTE LEAKAGE OF TOMATO PLANTS IN RESPONSE TO *FUSARIUM OXYSPORUM* F. SP. *LYCOPERSICI*

Anoma Dongsansuk¹*, Piyada Theerakulpisut¹, Sumontip Bunnag¹ and Weerasak Saksirirat²

¹Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand.

²Department of Plant Pathology, Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand.

E-mail address: Nuning_19@hotmail.com

Abstract: Tomato (*Lycopersicon esculentum* Mill.) cvs. Sida and Walter which are susceptible and resistant to *Fusarium oxysporum* f. sp. *lycopersici* (Fol) race 2, respectively, were inoculated with Fol spore suspension. At day 8 after inoculation, Sida tomato plants started to show mild Fusarium wilt symptoms and after being inoculated for 16 days, leaves of the whole plant turned completely yellow and wilted. Physiological responses of tomato plants to pathogen infection were observed. Production of hydrogen peroxide in three tissues of tomato plants in response to pathogen infection was measured. Hydrogen peroxide production of both cultivars increased after inoculation with the pathogen. However, production of hydrogen peroxide in the roots of Walter plants reduced on day 16 after infection. The increase in lipid peroxidation in the roots, stems and leaves of both tomato plants was associated with increase in electrolyte leakage on days 4 and 8 after infection. Electrolyte leakage values of susceptible Sida plants were higher than those of resistant Walter plants resulting in the plant's symptoms.

B0108-Optimization of antifungal antibiotic production of Actinomycetes from cave soilJeeraphun Jainpon¹, Naowarat Cheeptham², Wanchai Sonthichai³, and Saisamorn Lumyong³.¹Program of Applied Biology, Faculty of Science and Technology, Pibulsongkram Rajabhat University.²Department of Biological sciences, Faculty of Science, The University College of the Cariboo, Canada.³Department of Biology, Faculty of Science, Chiang Mai University, ThailandE-mail address : to_jeab@yahoo.com

Abstract: One hundred and eighty-five strains of actinomycetes isolated from cave soils in Mae Hong Son province in the Northern Thailand were screened for their activity against chitin synthesis in fungal cell wall. It was found that a *Streptomyces* strain JA122 show significant antifungal antibiotic against a chitin synthase 1-defective mutant, strain of *Saccharomyces cerevisiae* but did not show activity against a wild type strain. The maximum production of antifungal antibiotics was found when D-mannitol was used as a carbon source and malt extract as a nitrogen source. Optimal temperature and pH for antibiotic production were at 30 °C and 8.0, respectively.

B0109-The of rapid anti-inflammatory compounds screening by using COX inhibition assay

Duanpen Sandee, Vanicha Vichai and Kanyawim Kirtikara

Bioassay Laboratory, National Center for Genetic engineering and Biotechnology, 113 Thailand Science Park, Pathumthani

E-mail address: duanpen@biotec.or.th

Abstract: Cyclooxygenase enzyme (COX) is the one of enzyme in prostaglandin (PGs) synthetic pathway. Two isoforms of COX have been identified. COX-1 is the major enzyme found in most tissue and seems to be housekeeping roles for normal physiological functions, whereas COX-2 is preferentially induced in cells by inflammatory mediators and produces PGs that contribute to inflammation. NSAIDs or Non steroidal inflammatory drug has been used to relieve inflammation. However, most of them are non-specific COX inhibitor. Therefore, undesirable side effects could be found. To identify more specific COX inhibitor, selective screening method must be developed. Many methods have been used. These can be *in vitro* assay utilizing microsomal membrane or purified enzyme. The other method has been developed as cell-based assay in which cells expressing one isoform of COX are used. However, those methods are time consuming and costly. Therefore, in the present studies, we attempt to develop cell-free method to screen COX inhibitor from natural compounds. COX enzyme needs glycosylation process to create a correct folding, which retains activity. Therefore, *Pichia pastoris* was use as an expression host. Human COX-1 or COX-2 genes were amplified by using PCR. A single band of about 1800 bp was obtained and it was cloned into pPICZ A expression plasmid. The recombinant plasmid was then transformed into *P. pastoris* KM71 by electroporation. The zeocin-resistant transformants were selected and performed small-scale expression by induction of methanol. A secreted protein was analysed by SDS-PAGE and immunoblotting. A 100 kDa recombinant protein was observed. The size of protein is bigger than the size of intact enzyme this may be due to hyperglycosylation or uncleaved protein. The recombinant protein will be purified and characterized by colorimetric method using TMPD as a chromogenic substrate. Natural compounds will be screened by their action on inhibition of COXs enzyme.

B0110-Developing a rapid screening assay to determine inhibitory effects on 3-hydroxy-3-methylglutaryl co-enzyme A reductase (HMG CoA reductase): the rate-limiting enzyme in the early step of cholesterol biosynthetic pathway

Sriwan Wongwisansri and Kanyawim Kirtikara

Bioassay Laboratory, BIOTEC Central Research Unit, National Center for Genetic engineering and Biotechnology, 113 Thailand Science Park, Pathumthani, 12120

E-mail address: sriwan@biotec.or.th

Abstract: It has been well accepted that increasing serum cholesterol, especially LDL cholesterol, is correlated with increased risk of fatal cardiovascular diseases. One of the key enzymes in the early step of cholesterol *de novo* synthetic pathway is the rate-limiting enzyme, 3-hydroxy-3-methylglutaryl coenzyme A reductase (HMG CoA reductase). HMG CoA reductase catalyzes the reduction of HMG CoA in the presence of a cofactor NADPH and yields mevalonic acid, CoA and NADP. Inhibitory compounds that suppress this key enzyme would reduce the level of plasma cholesterol and subsequently lead to fewer incidents of fatal cardiovascular disease in human. A number of lead compounds containing anti-cholesterol activity were identified from microbial metabolites. In this study, we propose to develop a quick screening assay based on the mouse HMG CoA reductase expressed from *E. coli*. The integrity of the assay will be verified using standard HMG CoA reductase inhibitors and its robustness will be tested with crude extracts from natural resources such as plants and microorganisms as well as pure compounds. The developed assay will be established as one of the screening services at BIOTEC.

B0111-Developing a rapid bioassay for screening antifungal agents against phytopathogenic fungi

Chanikul Chuttrakul and Kanyawim Kirtikara

National Center for Genetic Engineering and Biotechnology, Bangkok, 12120, Thailand

E-mail address: chanikul@biotec.or.th

Abstract: Rice is Thailand's most important crop economically. However, agricultural yield losses of rice continue to be a problem, particularly those caused by phytopathogenic fungi such as *Magnaporthe grisea*. Currently, the only form of control of the disease is to use synthetic compounds. Using anti-fungal compounds isolated from biological resources could be an alternative practice with fewer harmful effects to environment. This research aims to develop a rapid bioassay for screening active compounds derived from plant and microbes that exhibit anti-*M. grisea* activity. The new assay used the

fungal spores based on microdilution method on 96-well plates. Viability of the fungus was determined by fluorescent measurements. Validation of this bioassay was tested with two standard antifungal antibiotics, amphotericin B and nystatin. Preliminary data showed that the minimum inhibitory concentration (MIC) values of these two compounds against *M. grisea* were determined at $0.1 \mu\text{g ml}^{-1}$. The new assay will be suitable for screening a large number of samples within a short time, reliably and more rapidly than previously established methods.

B0113-Influence of vertical stratification of microclimate on corticolous lichen communities in the tropical rain forest at Khao Yai National Park

Witchasart Polytam, Wasana Chausook, and Kansri Boonpragob

Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, Bangkok 10240, Thailand; e-mail address: lichen@ram1.ru.ac.th

Abstract: Lichen communities along a tree trunk vary markedly due to vertical stratification of microclimate influences by canopy. The objectives of this study are to observe different lichen communities caused by vertical gradient of microclimate under canopy, and for using lichens as bioindicator of climate in the future. The hypothesis is species composition of lichen communities increase from the ground to canopy related to change in light intensity. Microclimate along a trunk of *Acacia robusta* were recorded at 30, 18 and 1.5 meters at the canopy, middle and base of tree trunks respectively. Lichens found at these levels composed of 18, 12 and 4 species with a total of 29 species. The results show great variation of day-night microclimate at the canopy, and differences of microclimate in each level. Light intensity as high as $1300 \mu\text{mol m}^{-2} \text{s}^{-1}$ was recorded at 9:30 hour, highest temperature of 28.7°C was measured at 13:20 hour at the canopy, with lowest record of 21.5°C occurred at 5:05 hour. Relative humidity over 80% was often found from 18:30 to 8:40 hours, with highest 96% was recorded at 5:00 hour, contrasting with noon time low of 60%. The microclimates in mid-trunk are slightly decrease, however, similar to the canopy. Those at the base are quite different, with highest light intensity of only $80 \mu\text{mol m}^{-2} \text{s}^{-1}$ was recorded. Microclimate at the canopy is favorable for many lichens, whereas that at the base of stem is marginal and survived by few lichens.

B0114- The influences of microclimate on lichen transplantation at Khao Yai National Park

Mongkol Pangpet and Kansri Boonpragob

Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, Bangkok 10240, Thailand; e-mail address: lichen@ram1.ru.ac.th

Abstract: The objectives of transplanting lichens at Khao Yai National Park are to studies method of transplantation, influence of microclimate on lichen establishment, and to compare lichen growth rates among ecosystems, which have different microclimate. The lichen *Parmotrema incolorum* (Despr. ex Nyl.) Hale was collected from the Secondary forest and transplanted to Tropical rain forest, Dry evergreen forest, Lower montane rain forest, and Secondary forest. Transplantation were performed by attaching fragment of thallus on bark with nylon fishing line at four aspects (N, S, W, and E) of trees at every 1.5 m from the base to canopy. Growths of the transplanted lichens were measured every six months. Microclimate and mortality rates were recorded every two months. After two months transplanted lichens at the canopies seem to attach on bark, but died at the bases. After six months, lichens from mid trunks to canopies started to grow died at the lower level. Approximately 58% of the transplanted materials in the Lower montane rain forest survived and grow, whereas, those in the Secondary forest, the Dry Evergreen Forest and the Tropical Rain Forest had survival rates of 51%, 9% and 3% respectively. Microclimatic record showed that light intensity was as low as $11 - 27 \mu\text{mol m}^{-2} \text{s}^{-1}$ at the bases of most trunks, with higher intensity up to $50 - 699 \mu\text{mol m}^{-2} \text{s}^{-1}$ from mid trunks up to the canopies. Light intensity has the highest influence on growth rate of lichens. North-facing tree trunks from the Secondary forest show that lichens grows less than the other sides. These differences were not observed in the other ecosystems.

B0115-The Lichen Herbarium at Ramkhamhaeng University, Thailand.

Kawinrat Buaruang, Narumon Meesrueuang, Wasinee Wimonasuk, Kansri Boonpragob, Piboon Mongkolsuk, Natsurang Homchantara and Ek Sangvichien

Department of Biology, Faculty of Science, Ramkhamhaeng University, Bangkok, Bangkok 10240, Thailand; e-mail address: kawinrat@hotmail.com

Abstract: Lichen herbarium at Ramkhamhaeng University is assigned RAMK for her international recognition from Index Herbariorum Database. The herbarium is results of collecting surveys and studies since 1993. It consists of 20,000 pieces of lichen specimens comprised of 927 species from 159 genus, 25 families, with 42 type specimens, 583 species of new records from Thailand. In addition of more than 100 undescribed taxa which probable be new species. Every specimen has specific information, place, date, habitat etc. of the collections. They are recorded in electronic form using Microsoft Access program. Before deposition in the herbarium the specimens were treated in -18°C for 24 - 48 hours to eliminate microbe and pest. The specimens are then store in the herbarium chamber under temperature $20 - 21^\circ\text{C}$, 50 - 60% relative humidity. The collections were organized in alphabetical order of the scientific names. Key and description to 520 lichen species is finished. More over, the herbarium houses international collections donated by Professor P.W. Rundel from U.S.A.. It consists of 10,000 specimens from 38 countries comprising of almost 1,400 species from 285 genera. In addition 472 species of 160 genera from lichen exsiccata with major herbariums all over the world is included. These collections represent lichen

flora from every continent and diverse habitats of the globe. All together RAMK lichen herbarium hold 30,000 pieces of lichen specimens from 43 countries comprise of approximately about 2,500 species, 450 genera. In addition, lichen library is established. It holds about 50,000 items of books and journals. Lichen herbarium and library at Ramkhamhaeng University are welcome for public to explore lichen information.

B0116-ISOLATION OF 4-ARYLCOUMARIN FROM STREPTOMYCES AUROFACIENS AND ITS ANTIFUNGAL ACTIVITY

Thongchai Tacchowisan¹, Shen Yuemao² and Saisamorn Tunyong³

¹Department of Biology, Faculty of Science, Silpakorn University, Nakorn Pathom, Thailand.

²Kunming Institute of Botany, The Chinese Academy of Sciences, Kunming, China

³Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

E-mail address: tewson84@hotmail.com, yshen@public.km.cn, Sebn009@chiangmai.ac.th

Abstract: *Streptomyces aureofaciens* CMU-Ac130 was isolated from the root tissue of *Zingiber officinale* Rose (Zingiberaceae). It was an antagonist of *Colletotrichum musae* and *Fusarium oxysporum*, the causative agents of anthracnose of banana and wilt of wheat, respectively. The culture filtrate and crude extract from this strain were all inhibitory to tested phytopathogenic fungi. The major active ingredient from the culture filtrate of *S. aureofaciens* CMU-Ac130 was purified by silica gel column chromatography and identified as 5,7,4'-trimethoxy-4-phenylcoumarin by NMR and mass spectral data. Bioassay studies showed that 5,7,4'-trimethoxy-4-phenylcoumarin had an antifungal activity against tested fungi and its minimum inhibitory concentration was found to be 120 µg/ml. This is the first report of 5,7,4'-trimethoxy-4-phenylcoumarin from microorganisms as an active ingredient for the control of phytopathogenic fungi.

B0117-Application of Cysteine Proteinase Inhibitors for Anti-SARS Drugs Design by Molecular Docking Method

Kongsakda Norpanit¹, Khanok Ratanakhanokchar, Khin Lay Kyin and Sutapong Pongplang *

¹Division of Biochemical Technology, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkokthien, Bangkok 10150, Thailand.

²Department of Food Science, Faculty of Science, The University of the Thai Chamber of Commerce, Bangkok 10100, Thailand.

E-mail address: s5402302@st.kmutt.ac.th

Abstract: The aim of the work presented was to contribute to the understanding of the characteristic of active center S1 subsite of papain (EC 3.4.22.2) and actinidin (EC 3.4.22.14). The molecular docking between papain and para-ortho-ortho-derivative substrates were studied by AutoDock 3.0. The molecular docking program and the interaction energy between papain and actinidin with substrates were evaluated. The results were obtained in terms of intermolecular energy of papain and actinidin reaction with *N*-Ac-L-Phe-Gly-*p*-NA, *N*-Ac-L-Phe-Phe-*p*-NA, *N*-Ac-L-Phe-Arg-*p*-NA, *N*-Ac-L-Phe-*Orn*-*p*-NA and *N*-Ac-L-Phe-Leu-*p*-NA and found that *N*-Ac-L-Phe-Arg-*p*-NA has the minimum energy. The oxygen atoms of amino acid in S1 subsite of papain is important for forming the hydrogen bond with side chain of P1 to increase in binding with the *N*-Ac-L-Phe-Arg-*p*-NA. The investigation of active site of the cysteine proteinase reaction with substrate can be used this postulate model for application of cysteine proteinase inhibitor for anti-SARS drugs design by using molecular docking method.

B0118-THE ISOLATION OF NOVEL GENES ENCODING STARCH-DEGRADING ENZYMES FROM HOT SPRING SOIL IN THAILAND BY PCR-BASED CLONING APPROACH

Kittapong Tang, Tanatchaporn Utairungsee, Rutchadaporn Sriprang, Verawat Champreeda, Lily Eurwilachitr, Kanyawim Kirtikara and Sutipa Tanapongpipat

BIOTEC Central Research Unit, National Center for Genetic Engineering and Biotechnology, Thailand Science Park, 113 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani, 12120, Thailand

E-mail address: kittapong@biotec.or.th, sutipa@biotec.or.th

Abstract: Soil is one of resources containing a variety of microorganisms, however, only 1% of these microbes can be cultured using standard methods. Therefore, any novel proteins, especially valuable enzymes, from unculturable microorganisms are yet to be found. In this study, we attempt to isolate novel genes encoding a starch-degrading enzyme directly from hot spring soil using a PCR-based cloning approach. The 600 bp partial gene fragments were amplified from genomic DNA of the hot spring soil, collected from Bor Khlueng, Ratchaburi, Thailand. These fragments contained conserved regions found in amylolytic enzymes. The differences within these sequences comparing with those of known bacteria suggested the possibility to acquire novel starch-degrading enzymes from the hot spring. The full-length gene of one clone, BK13, was further identified by genome walking approach, resulting in the 1,860 bp fragment encoding an ORF with a putative size of 619 amino acids was achieved. It exhibited 48% similarity to neopullulanase of *Thermoactinomyces vulgaris* and *Bacillus stearothermophilus* and 47% similarity to maltogenic amylase of *Thermus* sp. IM6501. The protein expression of BK13 in *E. coli* system showed the induced protein band of 69 kDa approximately in size. The investigation of enzyme activity is now in progress.

B0119-The study of structure-function relationship of a thermotolerant xylanase from *Aspergillus* sp. TR159 via site-directed mutagenesis

Rutchadaporn Sriprang, Jarupan Kobsuk, Sutipa Tanapongpipat, Lily Eurwilachitr, Verawat Champreeda and Kanyawim Kirtikara

Molecular and Enzyme Screening Laboratory, National Center for Genetic engineering and Biotechnology, 113 Thailand Science Park, Pathumthani
E-mail address: rutchadaporn@biotec.or.th

Abstract: Xylanases (1,4- β -D-Xylan xylanohydrolase) have raised enormous interest in the past decade in view of their applications in many industries such as the pulp and paper, animal feed, textile, wheat flour, fruit juices and wines production. Although extensive studies have been carried out on the industrial applications of xylanases, there are only a few reports on the molecular enzymology of this group of enzymes. Therefore, molecular study of xylanases might establish basic information for biotechnology applications. The xylanase gene from *Aspergillus* sp. strain TR159 was amplified, cloned, sequenced and overproduced in *Escherichia coli*. The enzyme was purified by DEAE-Sepharose anion exchange chromatography, giving approximately 21 kDa in size. Recombinant *E. coli* produced over 10 g soluble and active enzyme per liter culture. The purified endoxylanase exhibited the highest activity at the optimal pH of 5.0 and the optimal temperature of 50 °C with specific activity of approximately 6,000 $\pm$ 254 U/mg protein. The purified endoxylanase hydrolysed only xylan and was free from cellulase. When tested towards xylan from birchwood, it showed K_m and V_{max} values of 9.0 $\pm$ 1.41 mg/ml and 10,222 $\pm$ 496 U/mg, respectively. Amino acids involving in substrate binding site and active site were evaluated using site-directed mutagenesis. The mutant proteins were heterologously produced in *E. coli*. Their biochemical properties and kinetic parameters were determined. The specific activity of W54A, E121A and E212A mutant enzymes was drastically reduced.

B0120-Identification and cloning of a full-length xylanase gene from *Aspergillus terreus* (BCC129) which has a broad pH activities

Duriya Chantasingh¹, Pattanop Kanokratana¹, Kusol Pootanakit² and Lily Eurwilaichitr¹

¹BIOTEC Center Laboratory, 113 Phahonyothin Road, Klong 1, Klongluang, Pathumthani 12120, Thailand

²Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Salaya, Phuttamonthon District, Nakhon Pathom 73170, Thailand

E-mail address: duriya@biotec.or.th

Abstract: A filamentous fungus, *Aspergillus terreus* (BCC129), was isolated from soil. A preliminary testing for enzyme activities showed that BCC129 produced xylanase with optimal activity at pH 3 and 10. This property is of value in an industrial enzyme. Therefore, the xylanase gene was isolated via PCR-based method. RT-PCR using degenerate primers, and 3' and 5' RACE were applied. The full-length xylanase gene of 981 bp was successfully obtained.

B0121- A novel thermotolerant α -amylase from an endophyte BCC4124 isolated in Thailand: biochemical characterisation and investigation on external stabilising factors

Verawat Champreda, Rutchadaporn Sriprang, Sutipa Tanapongpipat, Lily Eurwilaichitr, Benchaporn Buaban and Kanyawim Kutikara

Molecular and Enzyme Screening Laboratory, National Center for Genetic engineering and Biotechnology, 113 Thailand Science Park, Phahonyothin Road, Pathumthani 12120

E-mail: verawat@biotec.or.th

Abstract: Amylases are enzymes which hydrolyse starch molecules into dextrins and progressively smaller glucose polymers. Thermotolerant α -amylases play a key role in a variety of industrial processes, including starch processing, fermentation, food and paper industries. From extensive screening of fungus isolates collected in BIOTEC culture collection, an endophyte BCC4124, identified as a species related to a *Botryosphaeria* sp. was found to produce a thermotolerant α -amylase. The purified enzyme catalysed hydrolysis of starch in a broad temperature range with optimal temperature at 50-60°C and pH optima in the neutral range. The enzyme was found to hydrolyse soluble starch with V_{max} = 324.4 $\pm$ 24.9 U/mg and K_m = 2.69 $\pm$ 2.63 mg/ml and also showed some activity on β -cyclodextrin. External stabilising factors on the enzyme stability were investigated. Sr^{2+} was found to be the most efficient stabiliser by enhancing the enzyme stability at 60°C, maintaining more than 90% activity after 1 hour of incubation. Other divalent metal ions in the same periodic column, Mg^{2+} , Ca^{2+} and Ba^{2+} also showed stabilisation effect while transition metal ions were either activators or inhibitors on enzyme activity. Substrates (starch), maltodextrin and polyols were also shown to have strong stabilisation effect on the enzyme.

B0122-Some Hornet Species (Hymenoptera, Vespidae) in Thailand

Saowapa Sontichai, Sa-ngium Promkutkaew, Masao Nakamura²

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: scissnth@chiangmai.ac.th

²Shinsakuragaoka 1-19-5, Hodogaya-ku, Yokohama-shi, 240-0036 Japan

Abstract: Hornet species were collected by sweeping in July, December 2001 and April 2003. Two genera and 11 species were found. These include *Provespa anomala* de Saussure, *Vespa affinis continentalis* (Linn.), *V. affinis indosimensis* Vecht, *V. basalis* Smith, *V. bicolor bicolor* Fabricius, *V. binghami* du Buysson, *V. mandarinia magnifica* Smith, *V. mocsaryana* du Buysson, *V. tropica leefmansii* Vecht, *V. soror* du Buysson and *V. velutina velutina* Lepelletier. Of the 23 species of *Vespa* known in the world, 18 have been recorded in Thailand. Ten species were collected during the survey presented here.

B0123-Karyotypes of Six Species of Fishes in the Family Cichlidae

Soratan Ramangkoon, Thawat Donsakul Wichian Mactoon

มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี กรุงเทพมหานคร 10130

Abstract: The main purpose of this experiment was to study karyotypes of 6 species of fishes in the family Cichlidae were *Aequidens rivulatus* (50.15-71.50 mm in standard length), *Cichlasoma severum* (72.60-116.45 mm in SL), *Astronotus ocellatus* (43.35-51.20 mm in SL), *C. carpio* (69.12-89.15 mm in SL), *Pseudotropheus zebra* (52.30-65.40 mm in SL) and *Haplochromis venustus* (46.10-59.37 mm in SL). Ten specimens of each species of fishes were examined. The finding of this experiment were as follows. The diploid chromosome number of five species of fishes, *A. rivulatus*, *C. severum*, *A. ocellatus*, *C. carpio* and *P. zebra* had 48. On the other hand, the diploid chromosome number of *H. venustus* had 44. The different pattern of karyotypes of six species, *A. rivulatus* (2n=48, 1M+3SM+7ST+13A, NF=56), *C. severum* (2n=48, 1M+1SM+22A, NF=52), *A. ocellatus* (2n=48, 2M+22A, NF=52), *C. carpio* (2n=48, 6SM+9ST+9A, NF=60), *P. zebra* (2n=48, 2M+3SM+7ST+12A, NF=58) and *H. venustus* (2n=44, 3M+4SM+7ST+8A, NF=58) were also describes.

B0124-CHROMATE REMOVAL BY POLYVINYL ALCOHOL-IMMOBILIZED BACTERIUM

Irsara Nuratsa and Pranee Pitanapitpaisal

Department of Biological Science, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani, Thailand

E-mail address: pranee.asetu@ub.ac.th

Abstract: Chromate-contaminated wastewater from stainless steel manufacture, alloy preparation, leather tanning, textile manufacture and paper pulp industries, is one of the problem be concerned. Chromate is highly water-soluble, highly toxic, mutagenic and probably carcinogenic (Venitt and Levy, 1974; Petrilli and DeFlora, 1977). Chemical reduction method for removing toxic chromate require either high energy or large quantities of chemicals. Microbial reduction of toxic hexavalent chromium, Cr(VI), to the less soluble trivalent form, Cr(III), represents a useful development not only for economic detoxification, but also an essential step toward ultimate removal of chromium from an aqueous environment. However wastewater treatment by whole cell may be limiting due to other toxic heavy metals contamination causes cell growth and activity. This study a chromate-reducing bacterium is immobilized in polyvinyl alcohol (PVA) to enhance its stability and to facilitate biocatalyst recovery. Considerable attention is paid to the comprehensive chromate-reducing activity of immobilized cells against those of its non-immobilized counterpart. The immobilization condition has been optimized in terms of physical condition such as PVA concentration, inoculum concentration, age of cells. The optimal immobilization of bacterial cells, isolate N1R9, was 14% (w/v) PVA, 8% (w/v) cell (wet weight) and 48 hours of ages. PVA immobilized cell beads reduced chromate at 94-92% from a 100 µM within 72 hours. The advantages of this bioprocess could be an effective way for using immobilized cells in chromate-concerned industries and chromate-contaminated wastewater treatment.

B0125-Over-expression of the gene encoding for lipase from thermotolerant *Bacillus* sp. RN2 from Ranong hot springKaruna Manohan¹, Kanokrat Sammuang¹, Khajonrat Phothirakul¹, Kenji Matsui², Ladabkio Kariwara³ and Kosum Chansiri^{1*}¹Department of Biochemistry, Faculty of Medicine, Srinakharinwirot University, Bangkok 10110, Thailand²Department of Microbiology, Faculty of Sciences, Srinakharinwirot University, Bangkok 10110, Thailand³Department of Biological Chemistry, Faculty of Agriculture, Yamaguchi University, JapanE-mail address: aum.please@hotmail.com, aum.please@yahoo.com

Abstract: The gene encoding for lipase was isolated from thermotolerant *Bacillus* sp. RN2 Ranong hot spring in Thailand. The gene contained an open reading frame of 576 bp coding for the 17 amino acid signal sequence and a mature of 174 amino acids. The lipase gene was amplified by PCR, cloned into pET-100 expression system and transformed into *E. coli* (DE3). The high-level expression of lipase was induced with IPTG at 37 °C and the enzyme was subsequently purified using Ni-NTA superflow column. The molecular mass of the lipase was determined approximately 19 kDa by SDS-PAGE. The characterization lipase activity such as substrate specificity, pH and temperature optimum, enzyme stability and the effect of metal ions and inhibitor are under investigation.

B0126-IDENTIFICATION AND ISOLATION OF QUORUM SENSING GENE IN *BURKHOLDERIA MALLEI*Patompon Wongtrakongate¹ and Sumalee Tangpradubkul²¹Department of Biology, Faculty of Science, Mahidol University, Bangkok,²Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.E-mail address: u4505110@student.mahidol.ac.th and sestp@mucc.mahidol.ac.th

Abstract: *Burkholderia mallei* is a gram-negative rod shape bacteria and it is a sole species in genus *Burkholderia* which is non-motile. *B. mallei* is considered to be the parasite on equines, in which it causes glanders and the infection can be transmissible to a large variety of animals. Human glanders is rare but can be found. This bacteria has been interested in it biological warfare program, since the efficacy of aerosolized dissemination and the lethal nature of the disease. There is little known about the virulence factors of this pathogen. However, many bacteria have a global gene regulation for their survival and virulence factors production by a cell density-dependent mechanism termed quorum sensing. In this study, we attempt to identify and to isolate the gene involving in quorum sensing system in *B. mallei*. The auto-inducer production in difference environmental conditions, enrich and minimal media, are determined and compared. The *luxI* homologue, *bmal* gene coding for auto-inducer synthase I, is also isolated and its sequenced determined.

B0127-Differential expression of hypothalamic proteins after monosodium glutamate treatment

Anuwat Warthong, Sompong Thammastrak and Khomsorn Lomthaisong

Department of Biochemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

E-mail address: 4550200516@kku.ac.th

Abstract: In this study, we investigated the changes of hypothalamic protein expression patterns in neonatal rat after monosodium glutamate (MSG) treatment. Rats received a subcutaneous injection of 4 g/kg b.w./day of MSG and control group was injected with hyper osmotic saline (1.38 g/kg b.w./day) in every day, for the first 15 days of life. In the 30th day of life, hypothalamus were collected for the study. Two dimension polyacrylamide gel electrophoresis (2D-PAGE) was used for proteins expression analysis. We found that the protein expression patterns of both groups were different. There are spots found to be up-regulated such spot number 8-10 (Mw: 85, 58 and 42 kDa, pI: 7.70, 7.47 and 8.40, respectively). However, there are spots shown to be down-regulated such spot number 1-7 (Mw: 85, 38, 38, 34, 22, 16 and 15 kDa, pI: 7.33, 8.56, 8.76, 8.68, 8.70, 8.63 and 8.76, respectively). This preliminary result is demonstrated to be important which can be used for analysis of monosodium glutamate response proteins in hypothalamus in order to the understanding on physiological changes following the abnormal of hypothalamic activity.

B0125-Differential display reverse transcription-polymerase chain reaction (DDRT-PCR) Analysis of gene expression patterns in the rat adrenal gland following monosodium glutamate treatment using differential display reverse transcription-polymerase chain reaction (DDRT-PCR)

Khomsorn Lomthaisong, Weeraday Khonsantarn, Anuwat Warthong

Department of Biochemistry, Faculty of Science, Khon Kaen University, Khon Kaen Thailand.

E-mail address: khomsorn@kku.ac.th

Abstract: We investigated the changes of gene expression in the rat adrenal gland following monosodium glutamate treatment at a concentration of 5 mg/g body weight/day for 15 days. DDRT-PCR was used to analyzed the expression pattern of the expressed gene. PCR products were found when following condition was used: hot start (95 °C for 5 min), low stringency (35 °C for 1 min, 5 rounds), high stringency (60 °C for 1 min, 30 rounds). DDRT-PCR products were visualized by gel denaturing (8 M Urea) polyacrylamide gel electrophoresis (PAGE). Changes of gene expression in the adrenal gland were analyzed by Quantity One TM Analysis software and found that band 3, 4, 5 and 7 of DDRT-PCR products were up-regulated in the monosodium glutamate treated rats. However, these interested PCR products need to be re-amplified, sequenced, and aligned to other know genes in the genome in order to obtain their possible roles. This research has shown that there are changes in the gene expression in the rat adrenal gland after monosodium glutamate treatment. This result suggested that monosodium glutamate treatment causes difference of gene expression and may result in a dysfunction of the adrenal gland.

B0129-POLLEN MORPHOLOGY AND RAPD ANALYSIS OF SOME CLOSELY RELATED TAXA OF *POLYGONUM* M.

T. Triasom Seeprasert, Piyada Theerakulpisut, Pranom Chantaranothai and Duangkamon Thong-a-ram

Appl. ed Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand

E-mail address: seeprasert2009@vsnl.com, piyada@kku.ac.th, Pranom@kku.ac.th and duatho@kku.ac.th

Abstract: DNA polymorphism in 4 species and 2 varieties of *Polygonum* collected from northeastern Thailand was examined using random amplified polymorphic DNA (RAPD) technique. Of the twenty primers used, six produced 188 RAPD bands. Of these, 99.47% were polymorphic ranging from approximately 173 to 2,648 base pairs. The genetic similarities were estimated from banding pattern using UPGMA. Cluster analysis divided the samples into 3 groups: *P. hirsutum* in group 1, *P. pedunculare* and *P. tomentosum* in group 2 and 3 varieties of *P. chinense* in group 3. Study on pollen morphology of 3 varieties of *P. chinense* was undertaken by acetolysis method. The polynological characters were examined by light microscope and scanning electron microscope. Pollen grains of all three varieties were spheroidal, prolate spheroidal or prolate in shape, isopolar in polarity, 3-colpate in apertures and reticulate in exine sculpturing. The range in diameter of pollen in *P. chinense* var. *chinense*, *P. chinense* var. *ovalifolium* and *P. chinense* var. *hispidum* were 30 – 50µm, 32 – 62.5 µm and 33 – 50 µm, respectively.

B0130-Expression of *Anopheles minimus* CYP6 cDNAs in the insect-baculovirus expression system

Songkiet Saraputit, Soamrutai Boonsuepsakul, Dolnara Kaewpa, Pornpimol Rongnapanut

Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

E-mail address: g4436741@student.mahidol.ac.th

Abstract: Cytochrome P450 monooxygenase (P450s or CYP) is a superfamily of enzymes involving in metabolism of endogenous and exogenous compounds. Insect P450s in the family 6 (CYP6) have been reported to play an important role in the metabolism of insecticides including pyrethroids, recently used in malaria vector control program. Understanding the role of CYP6s enzymes in the metabolism of pyrethroids will contribute to resistance management program of malaria vector control. We previously isolated the full coding sequence of CYP6AA3, CYP6P7, and CYP6P8 genes from *Anopheles minimus* strain resistant to deltamethrin. The results implicate that these CYP6(s) might play role in pyrethroid metabolism in this mosquito. Further study is to examine functional role of these enzymes in pyrethroid metabolism. CYP6AA3, CYP6P7 and CYP6P8 cDNAs were successfully expressed in the insect-baculovirus expression system and the highest amount of the corresponding proteins were obtained 72 hours post-infection as shown on SDS-PAGE. Cytotoxicity test using MTT assay was performed against deltamethrin insecticide and the results showed that deltamethrin is less toxic to all

B

CYP6(s) expressed cells comparing to parental cells. These results have an implication in the functional role of these CYP6 enzymes in deltamethrin metabolism. We have begun to determine the activities of all three CYP6(s) towards pyrethroid insecticides using the P450-P450 reductase reconstitution system.

B0131- EFFECT OF CODON USAGE ALTERATION ON EXPRESSION OF PLASMEPSIN II IN *ESCHERICHIA COLI* SYSTEM

Theerawat Prasertanan¹ and Jirundon Yuvanyama²

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok.

²Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.

E-mail address: u4505079@hotmail.com and scjyx@mahidol.ac.th

Abstract: Plasmeprin II plays a key role in the degradation of hemoglobin in the food vacuole of *Plasmodium falciparum*, a malaria parasite that causes over two million deaths annually due to malaria disease. Since plasmeprin II inhibition leads to starvation of the parasite, it has been acknowledged as an important target for the development of new antimalarials. Overexpression of plasmeprin II from the cloned gene in heterologous host *Escherichia coli* leads to a formation of insoluble, intracellular aggregates of the expressed proteins. For other proteins, attempts to increase soluble expression of target proteins have been made by removal of the rare codons that exist in clusters by mutagenesis. In this research, we are interested in optimizing the codon usage in the *Plasmodium falciparum*-plasmeprin II gene (*Pf*-PMII gene) for expression in *E. coli* by synchronizing the usage frequency of each codon in *E. coli* with the usage in the original organism *P. falciparum*. This is based on an assumption that the usage frequency of each codon should correlate with the speed of protein synthesis at that particular site, which in turn may affect co-translational protein folding and hence folding efficiency. Synchronization of the usage pattern in the gene between the native and expression hosts may allow for expression of soluble *Pf*-PMII. The patterns of codon frequency of *P. falciparum* and *E. coli* for each codon in the *Pf*-PMII gene are compared based on the codon usage statistics taken from the codon usage database. The codons whose frequency statistics differ significantly between the two species are identified as candidate mutation sites to be replaced by a synonymous codons of similar usage frequency, with respect to *P. falciparum*. Six out of three 390 codons encoded for PMII were mutated. The result indicate that the mutant did not affect the solubility of *Pf*-PMII as shown by SDS-PAGE analysis and kinetics assay. Yet we are still pursuing more mutations of the PMII gene.

B0132-STOMATA, GUARD CELL AND TRICHOME STRUCTURES OF MAKJONG (*Scaphium macropodum* Beaum.)

Sujaree Khamparat*, Nicharat Swasdipan, Warinee Palasarn and Aranya Pimmongkol

Department of Biological Science, Faculty of Science, Ubonratchathani University, Warinchanrab, Ubon Ratchathani 34190, Thailand

e-mail address: su_khamparat@yahoo.com

Abstracts: Makjong (*Scaphium macropodum* Beaum.) is a member of the family Sterculiaceae. There are four leaf shapes depending on developmental stages of this plant. Anatomical studies of stomata, guard cells and trichomes of Makjong were conducted by peeling, staining with safranin and viewing under light microscope. For the level of electron microscopy specimens were fixed with glutaraldehyde, dehydrated with ethyl alcohol series and dried with CPD. Before viewing, the specimens were coated with gold. Every type of leaves has the same stomatal complex type, anisocytic, i.e. comprising guard cells surrounded by three subsidiary cells. Cordate, palmately three-lobed, palmately five-lobed and ovate shaped leaves have 223, 226, 336 and 226 stomata/mm², respectively. Trichomes is glandular, simple globular shape containing multicellular cells and regularly distribute.

B0133-Imipenem resistance in *Pseudomonas aeruginosa* strains isolated from Songklanagarind Hospital

Wanutsanun Tunyapanit¹, Saowalak Pongpaichit² and Wiwit Samasanti²

¹Department of Pediatrics, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand 90112

²Department of Microbiology, Faculty of Science, Prince of Songkla University, Songkhla, Thailand 90112

E-mail address: twanutsa@ratree.psu.ac.th, psouwala@ratree.psu.ac.th and swiwit@ratree.psu.ac.th

Abstract: *Pseudomonas aeruginosa* is a common causative agent of nosocomial infections. It is highly resistant to various antimicrobial agents including imipenem which is a potent antipseudomonad β -lactam. Fifty-three isolates of imipenem resistant *P. aeruginosa* from clinical specimens of patients at Songklanagarind hospital were tested for their susceptibility. 55% of them had a low level of imipenem resistance (MIC 8-32 μ g/ml) and 45% had high a level of resistance (MIC > 32 μ g/ml). The mechanism of imipenem resistance was investigated by analysis of their outer membrane proteins using SDS-PAGE. All imipenem resistant isolates had lost a 45 KDa outer membrane protein (OprD).

B0134-Cloning and expression of polyphosphate kinase gene (*ppk*) in *Burkholderia pseudomallei*.

Suda Tunpiboonsak¹ and Sumalee Tungpradabkul²

Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.

E-mail address: scstb@mahidol.ac.th

Abstract: The polyphosphate kinase (*ppk*) gene encodes PPK response for the synthesis of inorganic polyphosphate. The product is a linear chain of hundreds of orthophosphate (Pi) residues and deals with ATP, which is a high energy substance linked together by phosphoanhydride bond. Generally, the *ppk* gene can be found in microbes, fungi, plants, and animals and responsible for polymerize the terminal phosphate of ATP into poly P chain. Poly P has many survives in the stationary

B

phase of growth. The *ppk* mutant has been attributed partly to the control expression of gene *rpoS* that encodes σ^s in stationary phase condition. In *Burkholderia pseudomallei*, a *ppk* gene involve in the tolerance in environmental stress conditions. This study focuses on cloning and expression of the *ppk* gene and in order to study its function of the stress conditions later.

B0135-Differentiation and polymorphic of WaaF gene in *Burkholderia pseudomallei* using PCR-RFLP technique

P. Rojvirat*, S. Tungpradabkul

Department of Biochemistry,*Department of Biology, Faculty of Science, Mahidol University, Bangkok 10400

E-mail address: golf_sc113@hotmail.com

Abstract: The project is aim to differentiate *B. pseudomallei* based on PCR-RFLP technique. Our study will be focused on a gene, WaaF gene, which involved in LPS biosynthesis. A pair of specific primers was designed based on the WaaF gene sequence. Polymerase chain reaction followed by restriction endonuclease (PCR-RFLP) analysis was performed. At least three restriction enzymes were used to differentiate the different LPS structure among 100 isolates from different sources such as patient, environment from Thailand and Australia. The results show the different pattern between patient and environment in Thailand and also different from isolated from Australia. The differences in the PCR-RFLP patterns will be analyzed when the number of isolates more than 200 cases and will be constructed a phylogenetic tree. The results from this study might be related with evolution and distribution of *B. pseudomallei* found in this region. Moreover, the different PCR-RFLP patterns might be explained to the differences in virulent property of the bacteria

B0136-Comparisons of *Agrobacterium tumefaciens* strains for its transformation efficiency to cucumber (*Cucumis sativus* Linn.)

Narupat Hongdilokkul^{1,2} and Kanyarat Supabulwatana¹

¹Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok, Thailand

²Junior Science Talent Project, Thailand

Abstract: The factor influencing on transformation frequency of *Agrobacterium tumefaciens*-mediated gene transformation into cucumber explants was investigated. Both bacterial strains and donor sources of explant were affected on the transformation frequency. Among various types of explant, hypocotyl that derived from in vitro seedlings of cucumber was suitable to use to co-cultivate with *A. tumefaciens* due to it presented high percentages of survival and callus formation after co-cultivation. The highest percentages of explant survival and callus formation were observed when co-cultivated hypocotyl with *A. tumefaciens* strain 1 BA4404 that harboring the recombinant plasmid pTOK233. Histochemical analysis for GUS expression in putative transformed tissue revealed that this bacterial strain was the most effective for transformation because the highest number of the tissue with positive expression of *gus* gene was detected. The result from this study can provide the useful information for further studies of gene transformation in cucumber with desirable characteristics.

B0137-Acute toxic effect of Thai neem *Azadirachta indica* var *siamensis* Valeton seed extract on liver of tadpole common tree frog *Polypedates leucomystax*

Nonthawat Prachantasena, Kingkaew Wattanasirmit*, Jirarach Srijunngam

Department of Biology, Faculty of science, Chulalongkorn University, Bangkok 10330, Thailand

Email address: myticeti@yahoo.com

Abstract: Nowadays, biopesticide deriving from Thai neem, *Azadirachta indica* var *siamensis* Valeton, have been wildly used in various agricultural areas in Thailand. Neem products have been reported to have antifertility properties in insects and mammals which are target organisms. The effect on non-target organism have been reported as histopathological alterations in liver, blood and ovary of the Nile tilapia *Oreochromis niloticus*. In this study, amphibian was chosen as a test model because it lives in water in a part of its life and it becomes important in economics. The objective of this study is to study acute toxic effect of neem seed extract on liver of the tadpole. The tadpole *Polypedates leucomystax* between stage 1 and stage 2 (or the stage that it develops hindlimb knob) was used in acute toxicity test to obtain the LC50 at 96 hours. The tadpole were exposed to 10, 30, 60 and 100 mg/l extract. The LC50 at 96 hours was determined by probit analysis at 17 mg/l. The tadpole died within 96 hours were sampled and livers were examined under light microscope. Histological alteration of liver tissue were observed and found both less severe and more severe lesions in treated group. Hydroptic swelling of hepatocytes and increase of fat vacuole in hepatocytes were found. Vacuolated cytoplasm were also seen. Pynosis, karyolysis and diffuse necrosis of hepatocytes were observed, especially around blood vessel. Eosinophil and macrophage penetration were also evidenced. Moreover, recovery of liver tissue of the treated group was studied. The 10 mg/l treated group was further raised continuously in normal water for 3 days. Then, they were sampled for histological examination. The liver were found to be intact structure like normal condition. They have well developed hepatocytes similar to that of the control group. The result of this study shows that Thai neem seed extract have acute toxic effect on liver of the tadpole in concentration related manner.

B0138-*Bacillus subtilis* (Bs) PROCESSING FOR INDUSTRIAL PRODUCTION

Solot Suwanyun^{1*}, Suchada Chaisawadi¹, Darawan Thongbute¹, Suwaree Sompong¹ and Supachai Boonnumma¹

^{1*} Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: suwaree_som@yahoo.com

Abstract: *Bacillus subtilis* (Bs) is one of the bacteria which high potential for probiotic production. In some strains of Bs have high potential for aquaculture application especially on shrimps farm industry. To develop Bs processing for industrial production, which give a high productivity and low operating cost, agro industrial waste utilization has been concern. Molasses and soybean meal, the selected agro industrial wastes have been chosen as substrate with some additional of essential carbon and nitrogen source. PDTI 1, the high potential strain of Bs for aquaculture application was selected for this study. The result showed the highest productivity in 1500 L fermentor with molasses and soybean meal was 1.1×10^9 cells/ml with 40 hrs processing time. Molasses and soybean meal also showed 5.4×10^8 cells/ml in 150 L fermentor with 16 hrs processing time. The products from this production process were further developed to make liquid and powder Bs products with some preservatives and binders adding. These developed products showed high stability for at least one year with glass bottle and aluminum foil packaging. The developed production process has been implemented by Production unit Industrial Park, KMUTT using Fermentation Pilot Plant. The results showed high productivity and low operating cost. The preliminary study on financial analysis showed feasible on commercial production. The developed process for Bs production is now in the process of technology demonstration and technology transfer. And therefore, it is quite ready to expand for commercial production in the near future.

B0139-Effect of *Cinnamomum* leaves water-extract on grassy plants seed germination.

Chalermchai Wongwattana¹ and Teerarat Chamechayaporn²

¹Dept. of Biology, Faculty of Science, Srinakharinwirot University, Bangkok

²Applied Biology, Nakhonpathom Rajabhat University, Nakhonpathom

Abstract: Study on the effect of leaf water-extract of *Cinnamomum parthenoxylon* Meisn., *C. camphora* Nees ex Eberm., *C. loureiri* Nees, and *C. zeylanicum* Nees were carried out using rice, corn, *Pennisetum setosum* (Swz.) L.C. Rich. and *Chloris barbata* Sw., as test plants. Crude water extract of all *Cinnamomum* dry leaves affected seed germination and seedling growth of the test plants, especially at high concentration, but at different inhibitory levels. *C. parthenoxylon* and *C. camphora* leaves provided higher inhibitory effect than the other two species. Among the test plants, *Pennisetum* and *Chloris* were more susceptible than rice and corn, especially in seed germination. Using KCl solutions with similar EC value to the crude extracts for germination test indicated that the inhibitory effect of *Cinnamomum* leaves crude extract provided from some chemicals in their leaves.

B0140-Effects of Eliminating a Proteolytic Site within the C-terminal Half of the *Bacillus thuringiensis* Cry4Ba Protoxin

Nattha Wannissorn¹, Chanan Angsuthanasombat², Panadda Boonserm², Somsri Sakdee²

¹ Mahidol Wittayanusorn School, Salaya, Nakhonpathom 73170, Thailand

² Laboratory of Molecular Biophysics, Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakhonpathom 73170, Thailand

Abstract: Proteolytic activation of the 130-kDa *Bacillus thuringiensis* Cry4Ba 1-endotoxin produces protease resistant products of ca. 47 kDa and ca. 20 kDa. Previously, elimination of a trypsin site in domain I of Cry4Ba at arginine-203 resulted in an increase in larvicidal activity. In this study, PCR-based mutagenesis was employed to initially eliminated a putative trypsin cleavage site, i.e. lysine-693 and arginine-650, located within the C-terminal half of both the wild type and mutant (R203Q) Cry4Ba toxins by mutating to glutamine. Both K693Q and R203Q/K693Q mutant toxins were found to exhibit the same level of toxin expression, inclusion solubilization, proteolytic activation and mosquito-larvicidal activity as the wild type toxins. Further elimination of another cleavage site at arginine-650 of the R203Q/K693Q double mutant toxin revealed that the trypsin activated product of the R203Q/R650Q/K693Q triple mutant appears to be significantly larger than the 65-kDa activated double mutant. In addition, *Escherichia coli* cells expressing the triple mutant toxin apparently exhibited higher larvicidal activity than the wild type. The same effects of eliminating the trypsin-site at arginine-650 were also observed for the R650Q/K693Q mutant. These results suggest that blocking a trypsin site within the C-terminal half of the Cry4Ba protoxin might increase the toxin stability upon proteolytic degradation *in vivo*, leading to an increase in toxin activity.

B0141-CITRIC ACID PRODUCTION FROM STARCH BY *Aspergillus niger* Yang No.2

Manus Suwamin¹, Tharat Supasiri¹, Yuwadee Watanapokasin² and Somsak Saranghin³

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand.

²Department of Biochemistry, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand.

³Faculty of Information Technology, North Bangkok College, Bangkok, Thailand.

E-mail: yw.watana@yahoo.com

Abstract: Citric acid has been widely used in cosmetics, food, beverage, and pharmaceutical industries etc. According to our previous report, rice straw is the best carrier for citric acid production by *Aspergillus* in semi-solid culture using glucose as carbon source. Since glucose is an expensive carbon source, so it is not applicable at industrial scale for citric acid production. In this work, four types of starch, including soluble starch, corn starch, cassava starch and rice starch were used as carbon source using rice straw as a carrier. The result showed that the highest amount of citric acid, at 73.93 g/L, was obtained using soluble starch as carbon source on the fourth day of cultivation. Glucoamylase and β -glucosidase activities were determined everyday during the cultivation period (7 days). It was found that the enzyme glucoamylase possesses high activity (6.0-10.0 U/mL) in the first period of fermentation while β -glucosidase has low activity (0.2-0.6 U/mL).

B0142-ISOLATION AND CHARACTERISATION OF PHENOL DEGRADING MICROORGANISMSPranadda Pimsee¹, Thararat Supasiri¹, Yuwadee Watanapokasin² and Somsak Sarangbin³¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand,²Department of Biochemistry, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand,³Faculty of Information Technology, North Bangkok College, Bangkok, Thailand,

E-mail address: ywwatana@yahoo.com

Abstract: The hazardous nature of contaminated soil and waste water system has potential impact on human and environmental health. Phenol is one of the toxic compounds that affect many systems including muscle weakness, tremors, loss of coordination, paralysis, convulsion, coma and death. It is also categorized as carcinogen. Our work is aimed to isolate phenol degrading microorganism from petroleum hydrocarbon contaminated soil. Eight types of bacterial strains, PHE1-PHE8, were isolated and they were able to use phenol as the sole source of carbon and energy in KSN minimal medium at 37°C. In addition, PHE1 and PHE8 can also grow at 50°C, PHE1 showed the highest growth and phenol degradation up to 10 mM. Enzyme involved in the degradation of phenol was assayed and tyrosinase activity was detected in the culture medium of PHE1 using L-tyrosine as a substrate.

B0144-Preliminary study on Transformation of *Citrus reticulata* Blanco. with antisense ACC oxidaseDuangkamol Tangpong¹ and Sumontip Bunnag²¹Department of Biology, Faculty of Science, The Graduate School, Khon Kaen University, Khon Kaen 40002, Thailand

E-mail address: tdekno@yahoo.com

²Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

Abstract: The suitable medium for regeneration of *Citrus reticulata* Blanco. was MS (Murashige and Skoog, 1962) medium containing 3 µM BA. Its regeneration percentage was 100. The suitable medium for root induction was ½ MS medium supplement with 8 µM NAA. The explants which showed higher regeneration percentage were shoot, node and internode respectively. Shoot were inhibited by kanamycin at 300 mg./L. The highest concentration of cefotaxime that shoot could tolerate was 500 mg./L. Transformation of *C. reticulata* mediated by *Agrobacterium tumefaciens* strain EHA105 pCambia 1305.1 containing antisense ACC oxidase showed *gus* activity. The optimal co-cultivation time of explants with *Agrobacterium* was 15 minutes. Successful transformation of antisense ACC oxidase into *C. reticulata* by biolistic particle bombardment was verified by *GUS* assay. The *GUS* assay revealed the *gus* activity.

B0145-CHROMATE REMOVAL BY POLYVINYL ALCOHOL-IMMOBILIZED BACTERIUM

Itsara Nuratsa and Pranee Pttanapitpaisal

Department of Biological Science, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani, Thailand.

E-mail address : pranee@sci.ubu.ac.th

Abstract: Chromate-contaminated wastewater from stainless steel manufacture, alloy preparation, leather tanning, textile manufacture and paper pulp industries, is one of the problem be concerned. Chromate is highly water-soluble, highly toxic, mutagenic and probably carcinogenic (Venitt and Levy, 1974, Petrilli and DePlora, 1977). Chemical reduction method for removing toxic chromate require either high energy or large quantities of chemicals. Microbial reduction of toxic hexavalent chromium, Cr(VI), to the less soluble trivalent form, Cr(III), represents a useful development not only for economic detoxification, but also an essential step toward ultimate removal of chromium from an aqueous environment. However wastewater treatment by whole cell may be limiting due to other toxic heavy metal-contamination causes cell growth and activity. This study a chromate-reducing bacterium is immobilized in polyvinyl alcohol, PVA to enhance its stability and to facilitate biocatalyst recovery. Considerable attention is paid to the comprehensive chromate-reducing activity of immobilized cells against those of its non-immobilized counterpart. The immobilization condition has been optimized in terms of physical condition such as PVA concentration, inoculum concentration, age of cells. The optimal immobilization of bacterial cells, isolate NTR9, was 14% (w/v) PVA, 8% (w/v) cell (wet weight) and 48 hours of ages. PVA immobilized cell beads reduced chromate at 94.92% from a 100 µM within 72 hours. The advantages of this bioprocess could be an effective way for using immobilized cells in chromate-concerned industries and chromate-contaminated wastewater treatment.

B0146-EFFECTS OF FOREST RESTORATION ON PLANT LITTER DYNAMIC AND SOIL INVERTEBRATE DIVERSITY OF DOI SUTHEP-PUI NATIONAL PARK

Nuttira Gavinjan, Suttatorn Suwanrat, Saowapa Sontichai

Biology Department, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

E-mail address: g4525224@cmu.edu, s.suwanrat@chiangmai.ac.th and scissnth@chiangmai.ac.th

Abstract: The study of plant litter dynamic were conducted in the framework species experimented plots of Forest Restoration Research Unit (FORRU) in Doi suthep – Pui National Park from September 2003 – May 2004. The study plots were located in the area with different plantation age : 7, 5, 3 years and the area without plantation as control plots. The average litter fall in planted areas were increased with increasing age of trees (77.22, 74.75, 33.30 and 48.50 kg/rai in 7, 5, 3 years plantation plots and control plots respectively.) The highest decomposition rate was found in 3 year-old site (k = 3.09). The decomposition rate was highest in the first 60 days and afterwards decreased rapidly. The soil dwelling invertebrate community was also investigated. Seven classes and 18 orders were found. The highest number of invertebrate was found in the 7-year-old plot, while the highest species diversity index was in the 5-year-old plot.

B0147-COLLAGEN EXTRACTION FROM EGG-SHELL MEMBRANE TO REMEDY FOR HUMAN SKIN INJURY

Kestip Isarankura Na Ayudhya

Srivikorn School Science and Mathematics Branch, The student of Junior Science and Talent Project 6 of National Science and Technology Development Agency

Abstract: This project aims to extract the protein collagen from eggshell membrane for possible use in healing of human skin injury from i.e. burn or boiling water. Collagen has a fibril meshwork structure and is found in connective tissue and it gives skin elastic. So strengthening skin with collagen may be useful to reduce time in skin repair. This research provides for an alternative to using bovine collagen which many patients are allergic to. Collagen could be extracted from eggshell membrane by treatment with pepsin at pH 3.0-4.0 overnight. The extract showed three bands on SDS-Polyacrylamide gel electrophoresis at the same position as rat tail collagen. Amino acid analysis showed glycine, proline, and hydroxyproline as expected for collagen. The results show that collagen can be extracted from eggshell membrane and further studies are needed on the potential use of this process.

B0148-Alpha-glucosidase in *Apis florea*

Rumpalai Padoongsupalai^a, Chanpen Chanchao^a, Siriwat Wonesiri^b

^aProgram of Biotechnology

^bDepartment of Biology Faculty of Science, Chulalongkorn University, Bangkok 10330 THAILAND

Abstract: *Apis florea* is one of native species in Thailand. Its honey and bee products are in progress of promoting to consumers. Alpha-glucosidase, AG (E.C. 3.2.1.20) is an enzyme that can hydrolyze glycosidic linkage of disaccharide. Honey is produced by the aid of AG. Crude extract of heads and honey crops were obtained and quantitated by comparing to the standard curve of Bovine Serum albumin (BSA). From heads, 61.65 mg/ml of total protein were obtained while from honey crops, 54.92 mg/ml of total protein were obtained. Crude extracts from both sources were electrophoresed by SDS polyacrylamide gel (12%). After coomassie blue staining, different patterns were observed. After renaturation of SDS PAGE and activity staining for AG, positive band above 120 kDa was appeared. Total RNA was isolated and quantitated. The 18s and 28s rRNA were determined. Primers of AG for RT-PCR were designed from conserved region of AG of *A. mellifera*. Under optimum condition, the product of 357 bp was obtained. Then it was sequenced. The alignment was performed. The homology of about 80% was estimated.

B0149-Alpha glucosidase in *Apis cerana*

Suwisa Pilalun^a, Chanpen Chanchao^a, and Siriwat Wonesiri^b

^aProgram of Biotechnology, ^bDepartment of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: *Apis cerana* is one of native species to Thailand. The same as *A. mellifera*, both can be managed in an apiary. Its honey and other products such as royal jelly, wax, propolis, etc. are popular among consumers. Alpha-glucosidase (AG) as in E.C. 3.2.1.20 is an enzyme that specifically hydrolyses 1, 2 linked-alpha-glucosidic bond in sucrose. It involves in honey production. Hypopharyngeal glands (HPGs) located in a head and honey crops were used to be AG sources. Crude proteins were extracted and determined by Bradford's assay. There is less than 10 mg/ml protein in HPGs but there is 31 mg/ml protein in honey crop. Due to SDS PAGE, different patterns of crude protein from both sources were obtained. In order to get the full length of AG sequence, total RNA was extracted and amplified by primers designed from conserved regions of AG from other organisms. Under optimum condition, the 850 bp RT-PCR product was obtained and sequenced. The homology of above 90% were estimated when it is compared to the AG sequence of *A. mellifera*.

B0150-INTERSPECIFIC RELATIONSHIP IN *Zingiber* (ZINGIBERACEAE) FROM NORTHEAST THAILAND BASED ON NUCLEAR RIBOSOMAL DNA ITS SEQUENCES

Piyada Theerakulpisut, Pranom Chantaranothai, Duangkamol Thong-a-ram, Juthaporn Khampila, Pramote Triboun, Wuttipong Mahakham.

Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand.

E-mail address: piyth@kku.ac.th, Pranom@kku.ac.th, duatho@kku.ac.th, jutha_@hotmail.com, Zingiber44@hotmail.com, wutti_kku@hotmail.com

Abstract: DNA sequences of nuclear ribosomal DNA (ITS1-5.8S-ITS2 region) were determined for 10 species of *Zingiber* and 2 species of *Kaempferia* collected from northeastern Thailand. Phylogenetic analysis of *Zingiber* species based on ITS sequence data using *Kaempferia* sequences as the outgroup strongly supports the division of *Zingiber* species into two groups. The first group consists of *Z. fragile* and *Z. mekongense* belonging to the section *Chryphantum* characterized by having the inflorescence borne on a radical, procumbent peduncle. The remaining eight species are clustered in the second group belonging to the section *Zingiber* characterized by having the inflorescence borne on a radical, erect peduncle. Within the second group, the neighbor-joining tree resolves *Z. junceum* as sister to the rest. The divergence of *Z. junceum* from other species in the group based on molecular data is consistent with its having the unique character in that it can produce two types of inflorescence, borne on a radical, erect peduncle as well as on a terminal leafy stem.

B0151-AROMATIC VEGETABLES IN UDONTANISeewapong Chamratpan

Faculty of Science and Technology, Udonthani Rajabhat University, Udonthani, 41000

E-mail: schamratpan@rudon.ac.th

Abstract: People residing in Udonthani still have native vegetables for meal. Some of these vegetables are medicinal. Some are aromatic. These aromatic vegetables are used for seasoning food and sweet. Aromatic vegetables were surveyed in 2 markets and 3 villages in Udonthani Province during 1998-2004. Sixty-seven species of aromatic vegetables were found. These were under 29 families. Most of these vegetables were in Zingiberaceae. These vegetables were used as seasoning and fresh eaten. Some were medicinal such as *Curcuma longa*, *Aganostma marginata* and *Alpinia conchigera*.

B0152-DIVERSITY OF EPIPHYTIC MOSSES AT HUAY KOG-MA DOI SUTHEP-PUI NATIONAL PARK CHIANG MAI PROVINCEKanjana Yongkuna* and Kanya Santanachote

Biology Department, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand; e-mail address:

kaj.janayongkuna@hotmail.com

Abstract: Huat Kog-Ma is located in Doi Suthep-Pui National Park, Maung, Chiang Mai at 1,200-1,300 m elevation. Part of the Maesa-Huay Kog Ma biosphere. This area was announced by UNESCO to be a of the world's biosphere in 1977. The forest is primary, evergreen, seasonal, hardwood forest on granite bedrock. The aim of this study is to investigate moss community diversity in this area in ecological and taxonomic terms. The study was done from May 2003 to June 2004. There are 7 families, 12 genera, and 20 species of mosses collected from 45 trees (10 tree species). Eight species of mosses are acrocarpic (Leucobryaceae 2 species, Calymperaceae 3 species, and Dicranaceae 3 species) and twelve species are pleurocarpic (Sematophyllaceae 8 species, Meteoriaceae 2 species, Orthotrichaceae 1 species, and Hypnaceae 1 species). *Leucobryum aduncum* Dozy & Molke var. *sculare* (C. Mull. ex Fleisch.) A. Eddy (Leucobryaceae) has the highest relative dry weight (biomass), relative frequency, and importance value indices. The diversity index is 0.41, which indicates medium diversity of the moss community there.

B0153-Efficacy of *Stemona* sp. Extracts on the Golden Apple Snail (*Pomacea canaliculata*)Bungorn Thaewon-ngiw, Somporn Bua-Kang* and Sukonthip Savatenalinton†

†† Department of Biology, Faculty of Science, Mahasarakham University, Mahasarakham, 44150, Thailand

bthungorn@hotmail.com

Abstract: At the present, golden apple snail (*Pomacea canaliculata* Lamark) is serious destructive damages of rice crops nearly all of area in Thailand. The efficacy test of *Stemona* sp. extracts on the golden apple snail was investigated. Eight concentration (0 (control), 15, 16, 17, 18, 19, 20, 25 ppm) were applied to test the snails and percentage mortality of snail were recorded at 24, 30, 36, 42 and 48 h. The study showed that the concentration 25 ppm caused 100 percent mortality to all size snails at 48 h. Up to 17 ppm concentration caused > 50 percent mortality to small snails while the medium and large size snails percent mortality at 48 hours were less than 50 percentage. At 20ppm concentration caused 50 percent mortality to medium and large size snails at 48 hours. Moreover it can be found that comparison of the control group with the treatment groups showed highly significant difference ($P < 0.01$). Thus *Stemona* sp. extracts caused mortality of the golden apple snail.

B0154-THE EFFECTS OF SOME TRADITIONAL MEDICINAL PLANTS ON BLOOD GLUCOSE LEVELS OF STREPTOZOTOCIN - INDUCED DIABETIC RATS.Wilawan Phromprom, Chusri Talubmook and Jeeraphan Suksringarm

Department of Biology, Faculty of Science, Mahasarakham University, Mahasarakham

E-mail address: phromprom@hunsu.com, chusri.t@msu.ac.th

Abstract: The effects of five traditional medicinal plants; *Pandanus amaryllifolius* Roxb. roots, *Coccinia grandis* Voigt. leaves, *Momordica charantia* Linn. fruits, *Aegle marmelos* (L.) Corr. leaves and *Piper samentosum* Roxb. leaves on the blood glucose levels and alterations of small and large intestine in streptozotocin-induced diabetic rats were studied. The oral administration of 0.5 mg of each plant to the individual was conducted daily for eight weeks. The results of the study could be generalized as following. The blood glucose levels of the rats were significantly reduced ($P < 0.05$) after fed with different plants. The blood glucose levels of the rats treated with *P. amaryllifolius* Roxb. roots and *M. charantia* Linn. fruits were lower than other groups. Also, the histological study showed that the tissues of muscular, submucosa and mucosa taken from the duodenum, ileum, colon and rectum of the rats treated with *P. amaryllifolius* Roxb. roots were perfect than those from other rats. The results indicate that the five traditional medicinal plants in this study can be used for lowering the blood glucose levels of the streptozotocin-induced diabetic rats.

B0155-EFFECTS OF BETEL VINE (*Piper betle* Linn.) ON THE DEVELOPMENT OF OVARIES IN WISTAR RATS.Warannya Udomkam, Chusri Talubmook, Unchalee Kongbantad and Ratikorn Chatchanayuenyong.

Department of Biology, Faculty of Science, Mahasarakham University, Mahasarakham, Thailand.

E-mail address: chusri.t@msu.ac.th

Abstract: The study of the effects of Betel vine (*Piper betle* Linn.) on the development of ovaries was conducted in Wistar rats. Comparison of ovarian weight and amount of primary, secondary and graafian follicles between controls and rats

treated with 0.25, 0.5, 0.75, and 1.0 ml/Kg of Betel extracts was performed in a daily oral administration of 0.5 ml/individual for 4 weeks. Ovarian weight of control and treated rats were 0.05, 0.08, 0.08, 0.08 and 0.07 g. Primary follicles were 9.98, 3.71, 3.98, 2.77 and 3.45, secondary follicles were 4.97, 2.31, 2.71, 0.61, and 0.75, and graafian follicles were 0.01, 0.40, 0.53, 0.10, and 0.02 follicles respectively. No significant differences were found in between the treated ovarian weight but significantly ($P < 0.05$) increased when compared to control group. Also, the significant differences were not found in the amount of primary and secondary follicles obtained from treated rats but significantly decreased when compared to the response controls. In contrast, the amount of graafian follicles were significantly ($P < 0.05$) increased in 0.25 and 0.5 ml/Kg treated rats when compared to control group. This suggests that the extract of Betel vine at the concentration of 0.25 and 0.5 ml/Kg provided the development of graafian follicles. On the other hand, increasing the concentration of extract to 0.75 and 1.0 ml/Kg lowering the development of graafian follicle.

B0156-MYCORRHIZAL HERBACEOUS PLANTS IN THE LAND USE TYPES OF AN AGRO-FOREST LANDSCAPE IN NORTHEASTERN THAILAND

Marit Eriksen^{1,2}, Panadda Larpkern^{1,3}, Shivcham S. Dhillion¹, La-aw Ampornpan³

¹ Agricultural University of Norway, Department of Ecology and Natural Resource Management, P.O Box 5003, NO-1432 Ås, Norway

² Ostfold University College, Department of Teacher Education, Remmen, NO-1783 Halden, Norway

³ Department of Biology, Faculty of Science, Srinakharinwirot University, Sukhumvit 23 Road, Bangkok 10110, Thailand
E-mail address: marit.eriksen@hiof.no, panadda.larpkern@ina.nlh.no, shivcham.dhillion@ina.nlh.no, la-aw@swu.ac.th

Abstract: Various biological elements interact to sustain the species diversity and ecosystem functions (productivity, nutrient retention, nutrient cycling). One of the biotic factors potentially important in building up ecosystem functions and enhancing plant diversity, is mycorrhizal associations (Janos 1980, Thompson 1994, van der Heijden et al. 1998, Klironomos et al. 2000). Arbuscular mycorrhizas improve the growth and nutrient uptake of plants and are formed in more than 80% of all land plants. They are likely essential components contributing to production and diversity of agroforestry systems, which use low fertilizer inputs, particularly in nitrogen (N) and phosphorus (P). Little information is available of the status of mycorrhizas in weeds and other plants taking part in low input agro-forestry systems in tropical areas. In this study we collected roots from 52 plant species, many weeds, from different land use types (agricultural fields, fallows and forest) at Na Hao Forest Reserve (NHFR), Tambon Na Hao, Loei Province in Thailand. We wanted to find out more about the diversity of weeds and other herbs growing in an agro-forestry landscape in northeastern Thailand. Are they non-mycorrhizal, or can they possibly contribute to maintenance of the fungal inoculum in the soil by being mycorrhizal? To evaluate the disturbance factor we assessed mycorrhizal colonization in plants from different agricultural fields, fallows in different stages and from a forest.

B0157- LOCAL USE OF SATHON, *Millettia utilis*, IN NA HAO, NORTHEAST THAILAND

Kristine Stubberud

Agricultural University of Norway, Department of Ecology and Natural Resource Management, P.O Box 5003, NO-1432 Ås, Norway

ABSTRACT: Sathon, *Millettia utilis*, is a tree that grows in Loei, Pitsanulok and Petchaburi Province. It is unique for the Northeast region to use the leaves to make sathon sauce as a compliment to add taste to the food (Agricultural office, Dan Sai). The local people make it in March- April every year. There is not much research on this species even though it has long traditions in use. The objective of this study was to find out more about its use, harvesting method and the processing of the product. From earlier studies in the village we knew they kept sathon in homegardens, but little was known about the status of the natural population and the origins of sathon.

The research for this study took place at Ban Bung village in Na Hao district in the Western part of Loei Province. A part of the fieldwork was done at the Kao Nam Lin temple forest, about 1km West of Ban Bung. The study includes both qualitative and quantitative data attained from social survey and biological assessment. For social survey we mainly did household interviews, semi-structured and open-ended as well as informal conversations. The results show that *M. utilis* has many uses and the villagers share the same knowledge about its use. We also found that they can use two species for making the sauce; both *M. utilis* and *M. leucantha* var. *buetooides*.

B0158-AQUATIC PLANT DIVERSITY AND USE BY VILLAGE COMMUNITIES IN NA HAO, NORTHEASTERN THAILAND

Petcharat Werukamkul¹, La-aw Ampornpan¹, Shivcham S. Dhillion^{2,3}

¹ Department of Biology, Faculty of Science, Srinakharinwirot University, Sukumvit 23 Road, Bangkok 10110, Thailand;

² Department of Ecology and Natural Resource Management, Agricultural University of Norway, pb 5003, N-1432, Ås, Norway, and

³ Centre for Development and the Environment, pb 1116, University of Oslo, Blindern, N-0317, Oslo, Norway

E-mail address: p_werukamkul@hotmail.com, la-aw@swu.ac.th, shivdh@nlh.no

Abstract: Aquatic plants diversity and use by local communities in a mountain village (480 – 650 m.a.s.l.) were studied in Na Hao district, Northeastern Thailand. The plants were studied in eight different sites. A total of 45 aquatic plant species was recorded from 3 different seasons, summer, rain and cold, for 2 consecutive years from April 2002 to December 2003. Of the total, forty-three species were found in the study sites and 2 outside the sites. They were distributed within 28 plant families and 1 green algae. Four aquatic plant functional groups were identified (submerged, floating leaves, floating and emerged). The emerged plants were the highest number, 33 species. Shannon-Wiener Diversity Index was found to be 2.90.

The species number and composition were decreased in the second year but the differences between year 1 and 2 were not significant ($p > 0.05$). Twenty-five species which accounted for 55.56 % of the total were used for food, medicine, economic, and cultural practices. *Centella asiatica* (L.) Urban. is the most popular use as vegetable and medicine in the village and nation - wide. The study shows that the local communities depend upon the plant resources for their subsistence.

B0159-EFFECT OF PHYTOESTROGEN IN MULBERRY LEAVES (*Morus alba* Linn.) ON BROILER PERFORMANCE

Wisut Nualchuen

Department of Science Education, Faculty of Science, Rajabhat Walaya Alongkorn University, Pathumthanee, Thailand, 13180

Abstract: The objectives of this study were to determine the quantity of estrogen like compound in mulberry leaves and also studied on supplement in broiler feed for broiler production performance. For the beneficial used as feed supplement of mulberry leaves was done by the using of complete randomized design. The 160 Ross one broilers aged 2 week were random to 4 treatment, 4 replication 10 chicken each. The 4 treatments were supplemented with the mulberry leave in the feed at 0 (control), 5, 10 and 15 percent by weight. By radioimmunoassay (RIA) technique analysis, it was found that dried mulberry leaves contained 81.7 picogram per gram. The chicken were raised until 7 week. The results showed that the broilers which were supplemented with mulberry leaves at 5 percent showed the better performance than others. When they were supplemented with mulberry leaves at 5 percent, the increased weight, the final weight and also carcass got the highest feed conversion ratio and highest growth rate. Every group showed no significantly different ($P > 0.05$) in mortality rate and in feed budget per 1 kilogram increased weight. The training and practice was conducted with the participant of 30 farmers were satisfaction using questionnaire and quiz test which most farmers satisfied and got higher different marks after attended the workshop from 8.53 ± 1.59 to 14.80 ± 1.16 ($P < 0.05$).

C0001-Chemical Constituents from the Leaves of *Ceriops decandra*Pakakrong Thongdecying¹, Chanita Ponglimanont¹, Chatchanok Karalai¹ and Kan Chantrapromma²¹Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat-yai, Songkhla 90112, Thailand.²Institute of Science, Walailak University, Thasala, Nakhon Si Thammarat 80160, Thailand.

E-mail address: s4622054@maliwan.psu.ac.th

Abstract: Air-dried ground leaves of *Ceriops decandra* (Griff.) Ding Hou (Rhizophoraceae) were extracted with hexane, methylene chloride and acetone, successively. The crude hexane extract was separated by chromatographic techniques to yield eight lupane-type triterpenes: Lupeol (1), Betulinaldehyde (2), 3 α -(Z)-Coumaroyl lupeol (3), 3 β -(E)-Coumaroyl lupeol (4), 3-*epi*-Betulinic acid (5), Betulin (6), Betulinic acid (7), and 3 β -(E)-Feruloyl betulin (8). Their structures were determined by spectroscopic methods (IR, UV, NMR).

C0002-SOL GEL ROUTE TO IRON NIOBATE FINE POWDERSPitak Yoomee¹, Griangkai Kungtong¹ and Sukon Phanichphant²¹Program of Chemistry, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok 65000, Thailand²Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

E-mail address : pitakyoome@hotmail.com

Abstract: Iron niobate (FeNbO₄ or FN) is an increasingly important material because of its good electrical and thermal conductivities, which make it ideal for use as a photoanode material in such applications as the conversion of solar energy (1-2). The synthesis of single phase FeNbO₄ by solid state reaction requires temperature in excess of 1150 °C for extended periods (3). Hence, there is need to explore any other potential methods for the preparation of FeNbO₄ powder with lower firing temperature and time. In this study, a sol gel route has been developed for the synthesis of FeNbO₄ powders by using iron chloride and niobium chloride as starting precursors. The formation of FN phases in the calcined powders has been investigated as a function of calcination temperature and time by using X-ray diffraction (XRD) technique. It has been found that phase-pure FeNbO₄ powder was successfully obtained for a calcination temperature of 900 °C for 4 hours.

C0003-Chemical Constituents of the Essential Oil and Antibacterial Activity of *Zingiber wrayi* var. *halabala*

Vanida Chairgulprasert, Somporn Prasertsongsakun and Wiratda Wichaporn

¹แผนกวิชาเคมี คณะวิทยาศาสตร์และเทคโนโลยี มหาวิทยาลัยราชภัฏวไลยอลงกรณ์ จ.ปทุมธานี 94000

Abstract The chemical constituents and antibacterial activity of the rhizomes of *Zingiber wrayi* var. *halabala* were studied. The essential oil, obtained by hydrodistillation was analysed by GC-MS. *Trans*-anethole (96.5%) was detected as the absolute major component. Using disc diffusion method, the essential oil, petroleum ether and dichloromethane crude extracts exhibited activities against *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus* and *Sarcina typhimurium*.

C0004-EXTRACTION OF CADMIUM LEAD AND ZINC ON MESOPOROUS SILICA DOPED WITH 1-PHENYL-3-METHYL-4-STEAROYL-5-PYRAZOLONE

Tuanjai Yubolpas and Amarawan Intasiri*

Organic Synthesis Research Unit (OSRU), Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

E-mail address: Amarawan.I@Chula.ac.th

Abstract: 1-Phenyl-3-methyl-4-stearoyl-5-pyrazolone doped mesoporous silica was synthesized by encapsulation of a pyrazolone ligand in a surfactant-templated silica. Optimum conditions for effective extraction of Cd(II), Pb(II) and Zn(II) were investigated. It was demonstrated that the reproducibility of HPMSD doped mesoporous silica was excellent. The sorption of metal ions increased with pH and reached its maximum at pH 4. The metal sorption enhanced with the presence of various sodium salts. Extraction efficiency of Zn(II) was also proportional to the concentration of NaNO₃.

C0005-SYNTHESIS AND CHARACTERIZATION OF SALEN-DOPED MESOPOROUS SILICA THROUGH SOL-GEL METHOD AND ITS APPLICATION TO Cu(II) EXTRACTION

Pornmanee Khamloet and Amarawan Intasiri*

Organic Synthesis Research Unit (OSRU), Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, 10330, Thailand.

E-mail address: Amarawan.I@Chula.ac.th.

Abstract: Salen doped mesoporous silica was prepared via a sol-gel route using tetraethoxysilane (TEOS) as the silica precursor with base as catalyst. The influence of salen/TEOS ratios on the salen incorporation into the silica was studied. X-ray diffraction (XRD) and N₂ sorption analysis were used to characterize the morphology and the pore size distribution of the materials. Preliminary metal extraction study of such mesoporous silica presented a very effective to Cu(II) extraction from aqueous solution.

C0006-EXTRACTION AND EVALUATION OF MICROCRYSTALLINE WAX FROM PRESS MUD WASTE OF THE SUGAR INDUSTRY IN THAILAND

Phannee Rattanachaisit, Jintana Pinwatananurak, Raewadee Srisakuldee, Chulee Seriumnuay, Thassanee Peerayuth

Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand.

E-mail address: phannee.rat@kmutt.ac.th

Abstract: The raw material press mud is a rejected waste material of sugar cane industries which causes the unwanted problem of pollution to surrounding of the sugar mills on accumulation. This work presents the development of method for the isolation and analysis of microcrystalline wax from press mud wastes of the sugar industry in Thailand. Microcrystalline wax is extracted by dichloromethane and isopropyl alcohol. Physico-chemical was made for characterization of isolated microwax. The yield of hard wax was found from 11.83% - 17.59%. The colour of the microwax was light yellow. The activated charcoal removed any desirable colours of wax to produce light cream colour. Melting point, Acid value, Saponification number, Molecular weight and Iodine number were 92.33-95.55°C, 7.09 -26.83, 6.5 -20.33, 6.5 -20.23, 775.5 -787.5, 0.44 - 0.74 respectively.

C0007-PREPARATION OF NANOSIZED TITANIUM DIOXIDE AT TEMPERATURE BELOW 100°C

Miki Kanna, Sumpun Wongnawa*, Orawan Sirichote, Chaveng Pakawatchai and Phadoong Boonsin
Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90112, Thailand.
e-mail address: wsumpun@ratree.psu.ac.th

Abstract: The nanosized titanium dioxide powders were studied by x-ray diffraction (XRD), BET surface area measurement, thermogravimetric analysis (TGA), and scanning electron microscope (SEM). The samples prepared by controlling hydrolysis of $TiCl_4$ in aqueous solution at temperature below 100°C with small amount of HCl, HNO_3 or CH_3COOH were a mixture of mainly amorphous TiO_2 with mixture of small amount of anatase and rutile phases. The average particle sizes were about 4 and 15 nm for anatase and rutile, respectively. Moreover, in the same procedure but using H_2SO_4 , the synthetic powder was also mainly amorphous TiO_2 with only small amount of anatase and its average particle size was about 4 nm. The morphology of the oxides appears a non-uniform structure with fewer in aggregation.

C0008-POLYMERIC ISOMORPHOUS STRUCTURES OF TRIS(2-THIAZOLINE-2-THIOL) CHLORO- AND BROMOSILVER(I)

Saowanit Saithong, Chaveng Pakawatchai*, Pravut Sudkeaw and Sumpun Wongnawa.
Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla, 90112 Thailand
e-mail address: s_saowanit@yahoo.com

Abstract The polymeric complexes of tris(2-thiazoline-2-thiol-5)chloro- and bromosilver(I), $[Ag(C_3H_5NS_2)_3X]_n$ ($X = Cl$ and Br , $n = \infty$) were prepared by the reaction of silver(I)chloride / silver(I) bromide with 2-thiazoline-2-thiol in suitable condition. The crystal structures have been determined by single crystal X-ray diffraction technique and solved by direct method. The complexes crystallize in orthorhombic space group $Pbca$ (No.61) with cell parameters $a = 11.344(8)$, $b = 8.627(6)$, $c = 25.109(2)$ Å, $R_1 = 0.0150$ for the complex of silver(I) chloride and $a = 11.385(1)$, $b = 8.793(1)$, $c = 25.359(3)$ Å, $R_1 = 0.0452$ for the complex of bromide, respectively.

C0009-DETERMINATION OF COPPER, CADMIUM, LEAD AND ZINC IN RAINWATER IN HAT YAI USING SOLID PHASE EXTRACTION WITH AMBERLITE IRC-748 CHELATING RESIN AND GRAPHITE FURNACE ATOMIC ABSORPTION SPECTROMETRY(GFAAS)

Rabiab Suwanpetch and Puchong Wararattanurak*
Department of Chemistry, Faculty of Science, Prince of Songkla University, Songkhla, Thailand,
E-mail address: s4522054@maliwan.psu.ac.th

Abstract: To optimize conditions for preconcentration of Cu, Cd, Pb and Zn by using chelating resin(Amberlite IRC-748) and optimize conditions of Graphite Furnace Atomic Absorption Spectrometry (GFAAS) for determination of Cu, Cd, Pb and Zn in rainwater samples in Hat Yai. The results shown that percentage of recovery of Cu, Cd, Pb and Zn were larger than 70 % when eluted with 1 M of HNO_3 . The optimal pyrolysis temperature for Cu, Cd, Pb and Zn were 1200, 900, 850 and 900 °C, respectively and optimal atomization temperature for Cu, Cd, Pb and Zn were 2000, 1400, 1500 and 1700 °C, respectively.

C0010-SYNTHESIS AND CHARACTERIZATION OF 4-METHYL-2-(PHENYLAZO)-PYRIDINE LIGAND

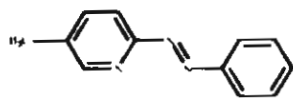
Kittiya Muaksang and Kanidtha Hansongnern*
Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla, 90112, Thailand.

Abstract: The new bidentate ligand, 4-methyl-2-(phenylazo)pyridine or 4mazpy, has been synthesized and spectroscopically characterized. Its structure is similar to 2-(phenylazo)pyridine (azpy). The structure of this compound was supported by Nuclear Magnetic Resonance spectroscopy (NMR). The results from Infrared spectroscopy (IR) showed the N=N(azo) stretching mode occurred at 1310 cm^{-1} .

C0011-SYNTHESIS AND CHARACTERIZATION OF THE GREEN-[Ru(5MAZPY)2Cl2] COMPLEX

Uraivan Changsaluk and Kanidtha Hansongnern*
Department of Chemistry, Faculty of Science, Prince of Songkla University, Songkla 90112, Thailand.

Abstract: Reactions of $RuCl_3 \cdot 3H_2O$ and 5mazpy in ethanol under refluxing condition gave the complex of green-[Ru(5mazpy)2Cl2]. This compound was characterized by IR and NMR spectroscopic techniques.



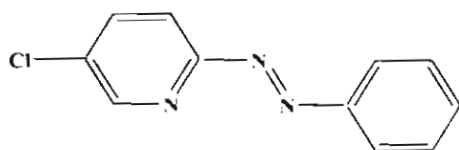
5-methyl-2-(phenylazo)pyridine (5mazpy)

C0012-SYNTHESIS AND CHARACTERIZATION OF $[Ru(Cl\text{-}azpy)_2Cl_2]$

Luksamee Sahavisit and Kanidtha Hansongnem

Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90112, Thailand

Abstract: The aim of this research is to study the synthesis of $Ru(Cl\text{-}azpy)_2Cl_2$ complex which was prepared from the reaction between $RuCl_3 \cdot 3H_2O$ with the Cl-azpy in ethanol solution. The complex was purified by column chromatographic technique. The structure of compound was determined by Nuclear magnetic resonance spectroscopy. In addition, Infrared spectroscopic data showed that the N=N stretching mode in the complex is shifted to lower frequencies than that in the free ligand.



5-Chloro-(2-phenylazo)pyridine (Cl-azpy)

C0013-FATS AND FATTY ACIDS, A NUTRACEUTICAL AND FUNCTIONAL FOOD OF THAI "YOR" (*Morinda citrifolia*) IN "NONI" PRODUCTSPranee Nandhasri¹, Kammal Kumar Pawa², Jamnong Kaewtubtim², Charoonchai Jeamchanya², Chalerm Jansom¹ and Chisanucha Satapolpan¹¹Research Center Faculty of Medicine, Thammasat University²Faculty of Medicine, Thammasat University, Patumthani, Thailand,E-mail address: pranee_nan@yahoo.com

Abstract: *Morinda citrifolia* Linn. or "Yor" in Thai is commonly called "Noni" or "Indian mulberry" in English. The leaves and fruits of Yor have been used as food and a traditional medicine for fever, pain and vomiting relief longer than 2000 years. Recently(1999-present) Noni juice is considered to be a nutraceutical and functional food (NFF) which has ability to lower hypertension and promote a healthier cardiovascular system. This report aims to determine the fats and fatty acids content in Noni products which may have some relation to lower hypertension and healthier the cardiovascular system. The Caviezel method based on the Gas Chromatographic technique and Buchi Fat Determination B-920 can determine, with in 30 minutes, saturated, unsaturated, poly unsaturated fatty acids. The total fats content in dried fruit powder (DFP), dried leave powder (DLP), dried fruit powder in capsule (DFP-C), spray dry bioactive yor juice(SD-BYJ) and bioactive yor juice(BYJ) are obtained 6.950, 4.007, 4.090, 4.130 and 0.455 % respectively. The total fatty acids content (TFA) of the stated products before are 5.783, 2.234, 3.155, 3.290 and 0.100 % respectively.

C0014-Chemical Constituents from the Fruits of *Garcinia cowa*

Wipapan Pongcharoen, Kanda Panthong and Vatcharin Rukachaisirikul

Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla 90112, Thailand;

e-mail address : wipapan.yoo@hotmail.com

Abstract: Six xanthenes were isolated from the fruits of *Garcinia cowa*. Based on spectroscopic data, such as IR, UV and NMR, the compounds isolated were assigned as -mangostin

(1), 1-hydroxy-3,6,7-trimethoxy-2,8-bis(3-methyl-2-butenyl)xanthone (2); 1,3-dihydroxy-6,7-dimethoxy-2,8-bis(3-methyl-2-butenyl)xanthone (3); 7-O-methylgarcinone E

(4), 1,6-dihydroxy-7-methoxy-5,8-bis(3-methyl-2-butenyl)-6',6'-dimethylpyrano(2',3':3,2)xanthone (5) and 1,6-dihydroxy-7-methoxy-8-(3-methyl-2-butenyl)-6',6'-dimethylpyrano(2',3':3,2)xanthone (6)

C0015-EFFECT OF DIRECT CURRENT IN THE SUBFIELD (OR TIME FIELD) ON INCREASING RATE OF REDOX REACTIONSApichai Sivapraphagorn^{1*}, Supon Samran¹, Poramest Boonsri²^{1*}Department of Chemistry, ¹ Department of Physics, Faculty of Science, Ubonratchathani University, Ubonratchathani, 34000, Thailand, e-mail address : Apichai.sivapraphagorn@ub.ac.th²Research and Service Office, Bansomdejchaopraya Rajabhat University, Bangkok, 10600, Thailand

Abstract: The Subfield (or Time field) being a shape like a pyramid was the result of the discovery about time dimension as a vector and the geometry of time dimension. The Subfield (or Time field) was tested successfully to increase and decrease

the rate of the redox reaction with using many capacitors set at the each side of the Subfield (or Time field). In this study found that the change from using many capacitors set at the each side of the Subfield (or Time field) to using 1.0 ampere direct current to the each side of the Subfield (or Time field) by direct current supply regulator under a magnetic field. The investigation found that with completely activating process, the rate of redox reaction can increase at the equal concentration and temperature. The result as the first crucial step may lead to using the Subfield (or Time field) in the commercial sector in the future.

C0016-IMMOBILIZATION AND CHARACTERIZATION OF JACK BEAN UREASE FOR APPLICATION IN BLOOD UREA ESTIMATION

Kornvalai Panpae, Sukunya Sukprem, Chadaporn Supannanuyok, Noocharin Ratthanaporn and Arjaree Suntichai
Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand

Abstract: Urease (urea aminohydrolase), a nickel-dependent metalloenzyme, catalyses the hydrolysis of urea to form ammonia and carbon dioxide with a rate *ca* 10^{14} times the rate of the uncatalysed reaction.⁽¹⁾ The use of enzymes is often limited due to their high cost, availability in small amounts, instability (thermal decomposition) and the limited possibility of economic recovery of these soluble biocatalysts from a reaction mixture. Recent developments⁽²⁾ in the field of biotechnology for immobilizing enzymes can overcome some of these problems. Entrapment is one of the four methods for the immobilization of enzymes. Calcium alginate is commonly used for entrapment of enzymes as it is inexpensive and convenient to use. This research aims to immobilize urease purified from jack bean seeds (type III) on calcium alginate in the form of beads. The immobilized enzyme has a better shelf-life (75 days-half life) at 4°C than soluble enzyme (30 days-half life). Various aspects of enzyme immobilization are discussed. Blood urea estimation is carried out with immobilized enzyme beads compared with soluble enzyme and the beads can be used repeatedly for this purpose making it an economical procedure compared to standard automatic analyzer.

C0017-ACTIVITIES OF SUPPORTED PLATINUM-RUTHENIUM CATALYSTS FOR ETHYLENE HYDROGENATION

Saowapa Chotisuwana¹*, Jatuporn Wittayakun¹ and Bruce C. Gates²

¹School of Chemistry, Suranaree University of Technology, Nakhon Ratchasima, Thailand

²Department of Chemical Engineering and Materials Science, University of California,

Davis, CA, USA

E-mail address: esaowapa@yahoo.com and jatuporn@ccs.sut.ac.th

Abstract: Supported bimetallic Pt-Ru catalysts were prepared by deposition of a mixed solution of Pt(cod)Cl₂ and Ru(cod)Cl₂ (cod = 1, 5-cyclooctadiene) in CH₂Cl₂ onto γ -Al₂O₃ and MgO, and treated further in H₂ at 300°C after removal of solvent under vacuum. The nature of metal and interaction with support was studied by Infrared (IR) spectroscopy and temperature-programmed reduction (TPR). Ethylene hydrogenation over γ -Al₂O₃ and MgO-supported catalysts were carried out at -40°C and 1 atm. The temperature dependence of ethylene hydrogenation over these samples gave nearly the same apparent activation energy of 6.7 ± 0.1 kcal/mol.

C0018-THE SELECTION OF SUITABLE SOLVENTS FOR STERIOD EXTRACTION OF *SERICOCALYX SCHOMBURGKII* (CRAIB) BREMEK BY USING THIN LAYER CHROMATOGRAPHY TECHNIQUE

Anukorn Phuruengrat and Sirirat Phaisansuthichol

Department of Chemistry, Faculty of Science, Maejo University, Chiangmai, Thailand,

E-mail address: sirir.p@mjou.ac.th

Abstract: *Sericocalyx schomburgkii* (Craib) Bremek is a traditional Thai herb for relieving osteoarthritis pain which is treated with steroid medicines by modern physicians. This research was aimed to select suitable solvents for steroid extraction of *Sericocalyx schomburgkii* (Craib) Bremek. The results of using 3 solvents including chloroform, petroleum ether, and methanol were compared by using thin layer chromatography to identify the number of steroids in these solutions. It was found that chloroform is more suitable solvent than petroleum ether and methanol in this study because there were more numbers of steroids which appeared in solutions.

C0019-NEW SYNTHETIC METHODOLOGY FOR THE SYNTHESIS OF PHENANTHRENES AND ITS APPLICATION TO THE SYNTHESIS OF NATURAL PHENANTHRENE ALKALOIDS

Poolsak Sahakitpichan¹ and Somsak Ruchirawat^{1,2,3*}

¹Chulabhorn Research Institute, Vipavadee Rangsit Highway, Bangkok 10210, Thailand

²Department of Chemistry, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand

³Chulabhorn Research Centre, Institute of Science and Technology for Research and Development, Mahidol University, Salaya Campus, Thailand

e-mail address: somsak@tubtim.ri.or.th

Abstract: Phenanthrene derivatives have been successfully synthesized in one-pot by Suzuki-Miyaura cross coupling of 2-formylphenylboronic acid and 2-bromobenzyl derivatives followed by aldol-like condensation. It was found that the success of the reaction depended on the presence of electron withdrawing groups at the benzylic position. Some of the derived phenanthrenes could be further transformed to the natural alkaloid.

C0020-Chemical Constituents from the Twigs of *Garcinia bancana*

Wanpen Naklug and Vatcharin Rukachaisirikul

Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla 90112, Thailand;

e-mail address : ting_344@hotmail.com

Abstract : Investigation of *Garcinia bancana*'s twigs afforded three new compounds : 1,6-dihydroxy-3,7-dimethoxy-4,8-bis(3-methylbut-2-yl)xanthone (1), 2,3,4,4'-tetrahydroxy-5-methoxy-6-(3-methylbut-2-yl)biphenyl (2) and 3,3'-dihydroxy-4,4',5'-trimethoxy-2,5-bis(3-methylbut-2-yl)biphenyl (3), together with six known compounds : cambogin (4) camboginol (5), mellein (6), 8-hydroxy-6-methoxy-3-pentylisocoumarin (7), stigmaterol and lupeol. The structures were elucidated by spectroscopic method.

C0021-Chemical Constituents from the Leaves of *Garcinia hombroniana*

Somsak Saelim and Vatcharin Rukachaisirikul

Department of Chemistry, Faculty of Science, Prince of Songkla University, Hatyai Songkhla 90112, Thailand.

E-mail address: somsaksaelim@hotmail.com

Abstract: The investigation of chemical constituents from the leaves of *G. hombroniana* has led to the isolation of four new compounds: (24*E*)-3 α ,9 α -dihydroxy-17,14-friedolanostan-12,24-dien-26-oic acid (1), (24*E*)-3 β ,9 α -dihydroxy-17,14-friedolanostan-12,24-dien-26-oic acid (2), (22*Z*,24*E*)-3 α ,9 α -dihydroxy-17,14-friedolanostan-12,22,24-trien-26-oic acid (3) and (22*Z*,24*E*)-3 α ,9 α -dihydroxy-17,13-friedolanostan-14,22,24-trien-26-oic acid (4) with nine known compounds: methyl (24*E*)-3 α ,23 α -dihydroxy-17,14-friedolanostan-8,14,24-trien-26-oate (5), methyl (24*E*)-3 α ,9 α ,23 α -trihydroxy-17,14-friedolanostan-14,24-dien-26-oate (6), 3 β -hydroxy-23-oxo-9,16-lanostandien-26-oic acid (7), 3 α -hydroxy-23-oxo-9,16-lanostandien-26-oic acid (8), lupeol, stigmaterol, friedelin, 8-(β -D-glucopyranosyl)-5,7-dihydroxy-2-(4-hydroxyphenyl)-4H-1-benzopyran-4-one and a mixture of β -sitosterol glucoside and β -stigmaterol glucoside

C0022-THE USE OF DIATOMITE TO REMOVE COLOR AND TURBIDITY IN SUGAR INDUSTRY

Atthawan Benjamas and Ladda Meesuk

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900 Thailand

E-mail address: b_atthawan@yahoo.com, lseldm@ku.ac.th

Abstract: Diatomite is a pale colored, light-weight rock composed mostly of silica microfossil of algae known as diatoms. The experiments of using diatomite from Lampang province to remove color and turbidity in sugar cane juice from a sugar industry gave good results. It was found that natural diatomite can remove color and turbidity in sugar cane juice. The ICUMSA color and turbidity of the treated juice were better (lower) than that of the clarified juice of the industrial process. The optimum condition was to use diatomite 4% by weight of the juice associated with 3 ppm anionic polymer. Analyses of properties of the treated juice and physical and chemical properties of diatomite revealed both physical and chemical adsorption of diatomite.

C0023-ENANTIOMERIC SEPARATION OF AROMATIC ALCOHOLS BY GAS CHROMATOGRAPHY USING BETA-CYCLODEXTRIN DERIVATIVE AS A STATIONARY PHASE

Ormuma Konghuirob and Aroonsiri Shitangkoon*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: A number of mono- and di-substituted fluoro-, chloro-, and methyl-derivatives of 1-phenylethanol was synthesized and their enantiomers were separated by gas chromatography using heptakis(2,3-di-O-methyl-6-O-tert-butyldimethylsilyl)- β -cyclodextrin as a stationary phase. It was observed that type, number, and position of substituent on the aromatic ring of alcohols greatly influenced both the retention factor and enantioselectivity.

C0024-Effect of *Alangium salviifolium* (L.f.) Wang Leaf Organic Solvent Extracts on Germination and Growth of *Desmanthus virgatus*Pranee Boonwat¹, Patchanee Charoenying¹ and Wirat Phuwiwat²¹Department of Chemistry, Faculty of Chemistry, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520 Thailand²Department of Horticulture, Faculty of Agriculture Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520 Thailand;e-mail address : kcpatchanee@kmitl.ac.th

Abstract: The effect of organic solvent extracts, hexane chloroform and methanol, from the dry leaves of *Alangium salviifolium* (L.f.) Wang on the germination and growth of *Desmanthus virgatus* was investigated by using the concentration

of the crude extract at 500, 1,000, 2,000 and 4,000 ppm. The distilled water was used as the control. The results showed that the crude extract significantly inhibited seedling germination. Increasing concentration of the methanol extract resulted to higher inhibitory potential. As the concentration at 4,000 ppm was treated, 55% reduction of seed germination was recorded. In addition, the crude methanol extract was separated by chromatographic technique into 8 fractions and each fraction was diluted to 250, 500, 750 and 1,000 ppm for *D. virgatus* seed germination test whereas the distilled water was used as the control. Results found that the fraction 3 inhibited 87.97% of seed germination when using the concentration at 1,000 ppm. In term of seedling growth, the use of fraction 3 at 1000 ppm decreased 66.23% of the seedling length as compared with the control seedling.

C0025-DETERMINATION OF 20-HYDROXYECDYSONE AND ECDYSONE BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Chonlada Dechakutkarn¹, Urai Tengraoenku¹ and Somporn Chantara¹

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: chonlada_25@hotmail.com

Abstract: This research aims to determine ecdysteroid hormones by high performance liquid chromatography (HPLC). The ecdysteroid hormones of interest are 20-hydroxyecdysone and ecdysone. Two mobile phase systems including methanol/water and acetonitrile/water were explored. Some variables such as detection wavelength, mobile phase composition and the flow rate were optimized. Before applying the optimum HPLC conditions to real sample analysis, the SPE method for real sample pretreatment was studied. Eluting profiles of mixed standards obtaining from various concentrations of eluting solvent were investigated. It was found that the flow rate for acetonitrile/water system needed to be adjusted from 1.5 mL/min to 0.5 mL/min due to some matrices in samples.

C0026-Complexing Properties of Alkoxy Phenolic Diazacrown Ether Derivatives towards Transition and Heavy Metal Ions

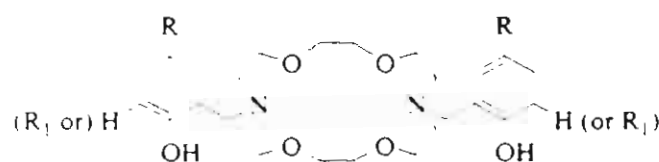
Saowarux Fuangswasdi¹, Thawatchai Tuntulani¹ and Paul B. Savage²

¹Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

²Department of Chemistry and Biochemistry, Brigham Young University, Provo, Utah, USA

E-mail address: sawarux_f@chula.ac.th, tuntulani@chula.ac.th, paul_savage@byu.edu

Abstract: Complexation between alkoxy phenolic diazacrown ether derivatives **1-5** and transition and heavy metal cations (Co(II), Ni(II), Zn(II), Cu(II), Cd(II), Pb(II), Hg(II)) have been studied in methanol using UV absorption spectrophotometry. Most ligands formed only mononuclear complexes ML with metal ions, while **1** only 1:2 complexes ML₂. Two different complexes ML₂ and M₂L were found in the case of **4** with Cd(II). The different complex stoichiometry of **1** could be explained by the different position of substituents on phenolic side arms: the two alkoxy groups would cause steric hindrance if both phenolic oxygens point inwards the ring cavity. The order of complex stability in general is Co(II) > Ni(II) > Zn(II). The stability of the complex increases when the *p*-substituting group on phenol is longer.



1: R = -CH₂CHCH₂; R₁ = OCH₃

2: R = -OCH₂CHCH₂

3: R = -O(CH₂)₆CH₃

4: R =

5: R =

C0027-COMPLEXATION OF PHENOLIC DIAZACROWN ETHERS WITH TRANSITION AND HEAVY METAL IONS

Nattawut Kaveevititchai¹, Thawatchai Tuntulani¹, Saowarux Fuangswasdi^{1*}, and Paul B. Savage²

¹Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

²Department of Chemistry and Biochemistry, Brigham Young University, Provo, Utah 84602, USA.

E-mail address: nattawut23@yahoo.com

Abstract. Stability constants of complexes between six derivatives of phenolic diazacrown ether and seven divalent transition and heavy metal ions, i.e. Co, Ni, Cu, Zn, Cd, Hg and Pb, had been determined by UV absorption spectrophotometric titration and were evaluated by Sirko.¹ Experimental results showed only ML formation in most of the systems studied, with the exception of Cd²⁺ and **L3**, and Co²⁺ and **L6** where only ML₂ complexes were found. The second binuclear complex M₂L was also formed in the system of Zn²⁺ with **L1**, **L5** and **L6**. In general, the stability of ML complex increases when the length of substituents on phenolic group increases. For a given ligand, the order of the stability is as following: Zn²⁺ < Ni²⁺ < Co²⁺

C0028-CCSD(T) CALCULATION OF Rn_2 BINDING ENERGY

Kowit Kittiwutthisakdi, Ketsiri Kueseng, Virasak Dungsrikaew

Institute of Science, Walailak University, Nakhonsithammarat 80160, Thailand;

E-mail address: kkowit@wu.ac.th

Abstracts: The potential energy curves of Rn_2 were calculated with the correlation-consistent basis sets, cc-pVDZ and aug-cc-pVXZ (X=D, T), at CCSD(T) level. The Binding Energy of 0.180, 0.704 and 1.101 kcal/mol at the inter nuclear distances of 5.00, 4.63 and 4.38 a.u. were obtained accordingly. The accuracy was tested by comparison with the plot between binding energy and boiling points of other inert gases. The aug-cc-pVDZ binding energy is quite accurate: it is on the straight line of the plot with $R^2 = 0.9996$. However, the aug-cc-pVTZ binding energy is higher than the correct value. This finding is contradicted to the convergence behavior of He_2 calculation done by other: larger size of correlation-consistent basis sets gives more accurate result than smaller one[1]. For cc-pVDZ, the binding energy is quite low because it does not have diffuse functions.

C0029-CHEMICAL MODIFICATIONS OF MANGOSTIN, THE XANTHONE ISOLATED FROM GARCINIA MANGOSTANA L.

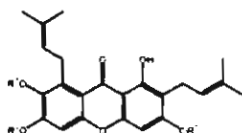
Soycom Kunchanawatta¹, Sunit Suksamram^{1*}, Pinit Ratananukul¹, Nuntana Aroonrerk² and Apichart Suksamram³

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand.

²Faculty of Dentistry, Srinakharinwirot University, Bangkok 10110, Thailand.

³Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand.

Abstract: Mangostin (1), the major prenylated xanthone isolated from *G. mangostana* L., demonstrated interesting biological activities. Compound 1 was subjected to chemical modifications to yield compounds 2-7. Biological activities of compounds 1-7 have been evaluated. Structure-activity relationships of these compounds will be discussed.



(1) $R^1 = R^2 = H$, $R^3 = Me$

(2) $R^1 = R^2 = R^3 = Me$

(3) $R^1 = H$, $R^2 = R^3 = Me$

(4) $R^1 = R^2 = Ac$, $R^3 = Me$

(5) $R^1 = H$, $R^2 = Ac$, $R^3 = Me$

(6) $R^1 = R^2 = COPh$, $R^3 = Me$

(7) $R^1 = H$, $R^2 = COPh$, $R^3 = Me$

C0030-TRITERPENOIDS OF *Ziziphus cambodiana* Pierre.

Panomwan Panseeta¹, Sunit Suksamram^{1*}, Pinit Ratananukul¹, Nitirat Chimnoi² and Apichart Suksamram³

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

²Chulabhorn Research Institute, Bangkok 10210, Thailand

³Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand

Abstract: Six triterpenes, lupeol (1), betulinaldehyde (2), betulinic acid (3), ceanothic acid (4), alphitolic acid (5) and alphitolic acid derivative, 2-O-trans-p-coumaroyl alphitolic acid (6), together with a phenolic compound, alphitol (7) were isolated from the root barks of *Ziziphus cambodiana* Pierre. (Rhamnaceae). Alphitol has not been isolated previously from this plant species. The structure of all compounds were elucidated by analysis of their spectroscopic data and by comparison with the known compounds.

C0031-The Application of Sunflower Stalks as Adsorbents for the Removal of Lead and Copper

Boonlom Purachat

Department of Chemistry, Faculty of Science and Technology, Rajabhat Thepsatri University, Lopburi

E-mail address: bpurachat@hotmail.com or boonloimpu@yahoo.com

Abstract: Sunflower stalks as adsorbents for the removal of heavy metal ions such as lead and copper ions in aqueous solutions have been investigated. The uptake of metal ions was determined from changes in metal concentration in solution measured by Atomic Absorption Spectrometry. The effects of pH, temperature and shaking time on the adsorption process were studied. It was found that the adsorption of lead and copper remains almost unchanged regardless of any change in the temperature and the maximum adsorption start at pH 4. The adsorption rate of lead and copper ions by sunflower stalks were rapid and reached equilibrium within 5 min.

C0032-ANALYSIS OF ALCOHOL BEVERAGES BY GAS CHROMATOGRAPHY

Prasit Purachat

Faculty of Science and Technology, Thepsatri Rajabhat University, Lopburi, Thailand.

E-mail address: ppurachat@hotmail.com

Abstract: The aim of this research was to analyze the alcohol beverage samples such as Whisky, White wine, Red wine, Beer and Native spirit by Gas chromatography (GC). Acetaldehyde, ethyl acetate, methanol, 1-propanol, 3-pentanol and iso-amyl alcohol in samples have been qualitatively and quantitatively determined using Gas chromatography-Flame ionization detector (GC-FID) by GC temperature programming on a Polyethylene glycol capillary column. The influences of parameters such as program temperature of column, temperature of injector and detector, carrier gas flow-rate, split ratio and injection volume were determined for the optimum conditions. For accurate analytical method, 1-Butanol was used as an internal standard was added to the samples and standards prior to preparation of the samples and standards. From this result, it was found that the amount of acetaldehyde, ethyl acetate, methanol, 1-propanol, 3-pentanol and iso-amyl alcohol were found between 4.64 – 84.78, 5.41 – 77.76, 0.00 – 139.78, 3.13 – 148.84, 3.24 – 103.34 and 17.17 – 449.00 mg/L. Accuracy as percentage recoveries of acetaldehyde, ethyl acetate, methanol, 1-propanol, 3-pentanol and iso-amyl alcohol were 90.09, 84.99, 73.43, 74.21, 70.02 and 71.93, respectively. From the result of qualitative and quantitative analysis, can be concluded that all of sample not only show difference in the components but also difference in concentration.

C0033-EXTRACTION OF ACTIVE COMPOUNDS FROM *Zingiber cassumunar Roxb.* BY SUPERHEATED WATER EXTRACTION AND CONVENTIONAL METHODS: A COMPARATIVE STUDY

Thanaporn Poonsukecharoen and Orapin Chienthavorn

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

E-mail address: poonsukecharoen@kku.ac.th, orapin@kku.ac.th

Abstract: Superheated water was utilized to extract active compounds from *Zingiber cassumunar Roxb.* (plai). In the preliminary study, some parameters affecting extraction, such as temperature, flow rate, static time, dynamic time, trapping solvent and modifier, were optimized to obtain the highest yield. After optimization between the yield and extraction time, the chosen conditions were as follows: extraction temperature of 140 °C, flow rate of 1 mL/min, static time of 5 min, dynamic time of 2 min, hexane as trapping solvent and 20% methanol as modifier. The extractant composition detected by GC-FID was comprised of three classes of terpenoid group, e.g. monoterpene, oxygenated and benzene derivatives. Major components of the first group were α -pinene, β -terpinene and γ -terpinene. The second and third group exhibiting anti-inflammatory activity contained terpinene-4-ol and (E)-1-(3,4-dimethoxyphenyl)butadiene (DMPBD), respectively. The efficiency of superheated water extraction was compared with conventional methods, namely sonication and distillation.

C0034-COMPARISON OF VARIOUS SORBENT TRAPS USED IN SUPERHEATED WATER EXTRACTION

Thanaporn Poonsukecharoen and Orapin Chienthavorn

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

E-mail address: poonsukecharoen@kku.ac.th, orapin@kku.ac.th

Abstract: Several solid phase having high thermal stability namely, polystyrene divinylbenzene (PSDVB), Tenax TA, Tenax GR, CarboBlack B and CarboBlack C were applied for superheated water extraction. Different concentration of analytes, e.g. 0.1 mg each for naphthalene and acetophenone, and 0.5 mg for chlorobenzene and benzoic acid were loaded on each sorbent packed in an extraction cell. The extraction temperature of superheated water was studied between 180-220 °C. The first milliliter of aqueous extractant was collected and analysed by RP-HPLC-UV. The result indicated that high recoveries of all analytes, excepted naphthalene, were achieved on PSDVB sorbent at the extraction temperature of 200 °C. Under the conditions, chlorobenzene and acetophenone showed highest yield up to 90% and 98%, respectively. While highest removal of naphthalene was found on CarboBlack but its strong adsorption led to low unsatisfactory result.

C0035-Effects of the sol-gel synthetic method for perovskite LaCoO_3 and LaMnO_3 oxidative catalysts

Siritha Ausadasuk and Atterra Worayingyong*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand,

E-mail address: siritha12@hotmail.com, tserarw@ku.ac.th

Abstract: LaCoO_3 and LaMnO_3 perovskite oxidative catalysts prepared by sol-gel formation have less impure mixed metal oxides than those prepared by coprecipitation method. The X-ray diffraction (XRD) patterns of LaCoO_3 and LaMnO_3 were identified to be hexagonal and cubic systems, respectively. The catalytic activities were tested by oxidation of toluene, which is a representative of aromatic hydrocarbon categorized as hazardous materials. Both LaCoO_3 and LaMnO_3 showed 90% toluene conversion at low temperature of 423 K for 90 min with the exception that the sol-gel prepared perovskites performed well for a longer period of time. It is assumed that the active metal species Co(III) and Mn(III) in the perovskite structures play the important role of the electron transfer step in the oxidation reaction. The negligible percentage selectivity for benzene in the toluene oxidation products confirmed that both catalysts can be used in aromatic destruction at low temperature for environmental remediation.

C0036-DISTRIBUTIONS OF ENERGY OF AI-DOPED SILICA USING CONFIGURATIONAL LATTICE DYNAMICS APPROACH

Suchaya B. Pongsai

Department of Chemistry, Faculty of Science, Burapha University, Bangsaen, Chonburi, Thailand.

E-mail address: busakorn@bua.ac.th

Abstract: Configurational lattice dynamics approach has been performed for calculating the energies of Al-doped silica in a variety of Si:Al ratios within crystalline zeolites: ZSM-5. Each of Si atom was doped by Al atom randomly and for the charge compensation, therefore, a hydrogen atom must be added for each Al doping. From our calculations, the distributions of energy of Al-doped silica, for each Si:Al ratio ($\text{Si}_{96-x}\text{O}_{192}\cdot\text{Al}_x\text{H}_x$), could be illustrated with respect to the unit cell volumes.

C0037-USE OF SIMPLEX FOR MOBILE PHASE OPTIMIZATION OF ION PAIR-REVERSED PHASE HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC ANALYSIS OF METAL CHELATES

Wachirawan Pimrote,¹ Supalax Srijaranai,¹ Chutima Kukusamude and Somkiat Srijaranai¹

¹Department of Chemistry, Faculty of Science, Khon Kean University, Khon Kean, 40002 Thailand

E-mail address : 455020032 @ kku.ac.th ; supalax@kku.ac.th

Abstract: The modified sequential simplex method was used for the optimization of mobile phase composition for ion-pair reversed phase high performance liquid chromatographic (IP-RPHPLC) analysis of metal chelates using 2-(5-nitro-2-pyridylazo)-5-[N-n-propyl-N-(3-sulphopropyl) amino] phenol, disodium salt (Nitro-PAPS) as the ligand. The optimized parameters were percentage of acetonitrile, concentration of buffer and concentration of ion pairing agent (tetrabutyl ammonium bromide, TBABr). A chromatographic response function (CRF) with respect to resolution and analysis time was calculated to evaluate the results. The optimum mobile phase was achieved within 14 experiments. Using the optimum mobile phase, the separation of the Nitro-PAPS chelates of Co(II), Cu(II), V(V), Ni(II) and Cd(II) was successfully achieved within 20 minutes.

C0038-ANALYSIS OF PHENAZINE PRODUCED BY *Pseudomonas* sp.

Wiphada Hongthani¹, Saksit Chanthai¹, Wandee Bunyarachata² and Chaleru Ruangviriyachai¹

¹Department of Chemistry, Faculty of Science, Khon Kaen University 40002, Thailand

²Department of Microbiology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

E-mail address: chal_ru@kku.ac.th

Abstract: In this research, antimicrobials phenazine was produced by *Pseudomonas* sp. in *Pseudomonas* broth under low-phosphate conditions. Phenazine production was studied by UV-Visible Spectrophotometer and analyzed by high performance liquid chromatography using a C₁₈ column. Mobile phase comprised of mixture of solvent A (water-trifluoroacetic acid: 100:0.04) and solvent B (acetonitrile-water-trifluoroacetic acid: 90:10:0.04) in several steps with UV detection at 280 nm. The result was showed that the phenazine compounds can be separated by HPLC under gradient system.

C0039-HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC ANALYSIS OF PHENOLIC COMPOUNDS

Maliwan Sookseam,¹ Supalax Srijaranai,^{1*} and Voranuch Srijesdsadruk²

¹Department of Chemistry, Faculty of Science, Khon Kean University, Khon Kean, 40002, Thailand.

²Department of Food Technology, Faculty of Technology, Khon Kean University, Khon Kean, 40002, Thailand.

E-mail address: 4550200304@kku.ac.th; supalax@kku.ac.th

Abstract: The separation of 15 phenolic compounds by reversed phase high performance liquid chromatography (RP-HPLC) with a fluorescence and a photodiode array detector (PDA) in series was studied. Gradient elution using acetonitrile and 1% acetic acid was investigated. Good separation of the fourteen studied phenolic compounds and the internal standard, 2,5-dihydroxybenzaldehyde was achieved within 40 minutes. The limit of detection (LOD) were 0.002-0.050 µg/ml for fluorescence detector, and were ranged from 0.001-2.000 µg/ml for PDA. The present method gave high precision in terms of reproducibility (one-day reproducibility) and repeatability (day-to-day reproducibility) for both retention time and peak area.

C0040 -Analysis of Oligosaccharides and Amino acids by Ion Chromatography

Wannilak Wannachai¹, Supalax Srijaranai¹, Saksit Chanthai¹ and Virat Sungkawisit²

¹ Department of Chemistry, Faculty of Science, Khon Kaen University, Mitrapap Rd, Khon Kaen 40002, Thailand.

² Mitr Phol Co., Ltd., Ploenchit Center, 2 Sukhumvit Rd., Klongtoey, Bangkok 10110, Thailand.

E-mail address: 4550200338@kku.ac.th; supalax@kku.ac.th

Abstract: Analysis of 7 oligosaccharides and 3 amino acids by ion chromatography coupled with pulsed amperometric detection was studied. The present method has advantage of able to simultaneous and direct analysis of oligosaccharides and amino acids mixture without the derivatization. A gradient elution of sodium hydroxide was used with the range of concentration between 2 – 20 mM. Seven oligosaccharides and three amino acids were separated within 40 minute on CarboPac PA10 column at 30 °C. This method gave high precision, wide linear range with the regression coefficients greater than 0.98 and sensitivity with the detection limits of 0.50 – 1.00 µg/mL for both oligosaccharides and amino acids.

C0041-STUDY OF CHEMICAL CONSTITUENTS AND CYTOTOXICITY ON CANCER CELLS OF THE SUBSTANCES EXTRACTED FROM THE RHIZOME OF *CANNA INDICA* LINN.

Kanyanat Kokkaew^{1*}, Vinay Soukharath¹, Sunan Chainakul¹, Chinda Tambunchong¹ and Pornpipa Picha²

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand. ²Section of Experimental Oncotherapy, Research Division, National Cancer Institute, Bangkok, Thailand.

E-mail address : sunan @ swu.ac.th

Abstract: The Rhizome of *Canna indica* Linn. was extracted exhaustively with hexane, chloroform and methanol respectively. The crude extracts were separated using column chromatography and tested cytotoxicity against P388 leukemia cells. Isolation of the crude hexane extract yielded stigmasterol (1), 6 β -hydroxystigmasta-4,22-diene-3-one (2) and two minor toxic fractions. The isolated compounds showed cytotoxicity against P388 with ED₅₀ 55.50, 37.50, 19.00 and 21.50 μ g/mL respectively. The crude chloroform extract yielded two mixtures, a mixture of stigmasterol(1) and β -sitosterol(3) and a mixture of stigmasteryl-3-O- β -D-glucopyranoside (4) and β -sitosteryl-3-O- β -D-glucopyranoside (5) both had ED₅₀ greater than 100 μ g/mL and a minor toxic fraction with ED₅₀ 12.50 μ g/mL. From methanol extract, a pure compound of trans-ferulic acid (6), a mixture of stigmasterol (1) and β -sitosterol (3), a mixture of stigmasteryl-3-O- β -D-glucopyranoside (4) and β -sitosteryl-3-O- β -D-glucopyranoside (5) and a minor toxic fraction with ED₅₀ 19.00 μ g/mL were isolated. The structure of compounds were elucidated by spectroscopic techniques.

C0042-DEVELOPMENT OF BEAD INJECTION SYSTEM FOR CHONDROITIN 6-SULFATE ASSAY

Rattikan Chantiwas^{1*}, Prachya Kongtaweler², Supaporn Kradtap¹, Jaroon Jakmunee^{1,3} and Kate Grudpan^{1,3}

¹Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai, Thailand

²Department of Biochemistry, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

E-mail address: rattikan@chiangmai.ac.th

Abstract: Bead injection system for determination of chondroitin 6-sulfate (CsC) was developed by utilizing bead as a mobile solid-phase in a sequential flow method. Chondroitin sulfate assay in body fluids is important for diagnosis of cartilage diseases. CsC coated bead was injected to the laboratory-designed flow cell. Then microfluid amounts of a mixture of CsC standard, CsC specific antibody, peroxidase-conjugated antibody and peroxidase substrate were sequentially introduced. The product of colored beads was monitored in real time at 630 nm. The sequential flow system composed of a syringe pump, a selection valve, a switching valve and an optical detector. The developed bead injection system was operated semi-automatically. Calibration range of 500-6000 μ g/mL CsC (R, correlation coefficient = 0.99) and reproducibility (1000 μ g/mL CsC, n=4) of 5 %RSD were obtained.

C0043-COLLECTION/CONCENTRATION APPROACHES FOR ULTRATRACE ANALYSIS OF GASEOUS POLLUTANTS AND TOXIC ELEMENTS

Kritsana JitmaneeP^{1,2*}, Piyanete SritharathikhunP², and Shoji Motomizu³

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

²Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham, Thailand.

³Department of Chemistry, Faculty of Science, Okayama University, Okayama, Japan

E-mail address: TUK_jitmanee@hotmail.com/UT

Abstract: The solid-phase adsorbent is a potential media for the collection and concentration of target analytes. The "column on valve" concept was applied for setting up the on-line analytical system. The solid-phase adsorbent was kept in housing and connected to the 6-way valve. A small size, high surface area of the solid-phase adsorbent was resulting in the high collection efficiency of analyte in a short length of adsorbent and requiring a small volume of carrier or eluent to remove the analytes out. These were resulting in highly concentrated sample zone which was carried to the detection system. The usefulness of solid-phase adsorbents were clarified in this presentation, e.g., chromatomembrane cell (CMC), filter-type ion exchange resin.

C0044-FLOW INJECTION SYSTEM FOR BRADFORD PROTEIN ASSAY

Kanchana Watla-lad¹, Saowaluck Nganrungrung¹, Rattikan Chantiwas² and Kate Grudpan^{1,2}

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200 Thailand.

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200 Thailand.

E-mail address: g4665022@cmu.edu and kate@chiangmai.ac.th

Abstract: A simple flow injection system with UV/Vis spectrophotometric detection has been developed for the assay of Bradford protein in cow milk and soymilk. The results obtained by using the proposed system agreed with that of batchwise procedure.

C0045-ON-LINE STANDARD ADDITION WITH NITROGEN MONOSEGMENT SEQUENTIAL INJECTION FOR VOLTAMMETRIC DETERMINATION OF CADMIUM LEAD AND COPPER

Watsaka Siriangkhawut¹, Siripat Suteerapataranon¹, Jaroon Jakmunee^{1,2} and Kate Grudpan^{1,2}

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200 Thailand.

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200 Thailand.

E-mail address: g4665038@cmu.edu and scijjkmn@chiangmai.ac.th

Abstract: An on-line standard addition procedure with nitrogen monosegmented flow analysis for simultaneous determination of Cd(II), Pb(II) and Cu(II) using a laboratory-made sequential injection voltammetric (SI-ASV) system has been developed. Only one single mixed standard solution was used in the developed SI system. On-line standard addition was performed by variation of volume of the stock standard solution. The proposed SI-ASV with on-line dilution illustrated linear calibration curves of the metal standards with low detection limits at 2-3 μ g/L.

Determination of the metal ions in a certified reference material of natural water sample (SRM 1640) by the proposed SI-ASV with on-line standard addition method was performed, and the results were compared with those obtained by off-line standard addition.

C0046-DEVELOPMENT OF SEQUENTIAL INJECTION ANALYSIS WITH LAB-AT-VALVE FOR ON-LINE LIQUID-LIQUID EXTRACTION

Rodjana Burakham¹, Somchai Lapanantnoppakun^{1,2}, Jaroen Jakmunee^{1,2} and Kate Grudpan^{1,2}

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200 THAILAND

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200 THAILAND

E-mail address: kate@chiangmai.ac.th

Abstract: Sequential injection analysis with "Lab-at-Valve (LAV)" system is proposed for on-line liquid-liquid extraction. Sample, reagents, and organic solvent are sequentially aspirated into a holding coil. By flow reversal, good extraction efficiency can be achieved. After that, the aqueous and organic phases are separated in a conical separating chamber attached at one port of a conventional multiposition selection valve. The organic phase containing extracted product is then propelled into a flow cell setting in a spectrophotometer for detection. Advantages and limitations of the system will be discussed.

C0047-A STOPPED FLOW INJECTION-DIFFERENTIAL PULSE VOLTAMMETRIC (sFI-DPV) SYSTEM FOR SIMULTANEOUS DETERMINATION OF CHLORATE AND CHLORITE IN AGROCHEMICAL SAMPLES

Orawan Tue-Ngeun, Jaroen Jakmunee and Kate Grudpan

Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: senjkmn@chiangmai.ac.th

Abstract: A stopped flow injection-differential pulse voltammetric (sFI-DPV) system for simultaneous determination of chlorate and chlorite in agrochemical samples was developed. The electrochemical reactions of chlorate and chlorite were investigated in sulfuric acid medium by cyclic voltammetry. In 3 M sulfuric acid solution, chlorate and chlorite undergo reduction on platinum working electrode at -110 ± 6 and -790 ± 4 mV (vs Ag/AgCl), respectively. This allowed simultaneous determination of chlorate and chlorite by sFI-DPV. Linear calibration graphs in range of $1.2 \times 10^{-2} - 9.6 \times 10^{-2}$ M for chlorate and $7.4 \times 10^{-4} - 44.5 \times 10^{-4}$ M for chlorite were obtained. Sample throughput of 120 h^{-1} was achieved. Application to agrochemical samples was demonstrated.

C0048-STUDY ON MALONDIALDEHYDE ANALYSIS FOR DETERMINATION OF IRON IN PLASMA IN PRESENCE OF SIDEROPHORE

Chalerm Ruangviriyachai^{1*}, Saengrawee Sutthiparinyanont¹, Aroonsri Priprem² and Saksit Chanthai¹

¹Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand

²Department of Pharmaceutical Technology, Faculty of Pharmaceutical, Khon Kaen University, Khon Kaen, Thailand.

Abstract: Siderophore is bio-chelating agent that have an important and interesting properties as high specific with iron. Therefore, the reducing of excess iron in plasma by siderophore was studied and determined by RP-HPLC with malondialdehyde (MDA) as biomarker. MDA is secondary product of Lipid peroxidation (LP). The role of iron in this reaction is strong catalyzes with produce high reactive free radical that it is cause of LP initiation step. It can assume that MDA is indicator of varied iron quantity in plasma. The separation and detection of MDA were performed after derivatization by 2-thiobarbituric acid (TBA) using fluorescence detector, λ_{ex} at 532 nm and λ_{em} at 552 nm. Chromatographic conditions were necessary to study for complete separation within suitable time and decrease analytical variation from ionic strength, pH and temperature effect. The results showed that 10 mM phosphate buffer at pH 7.4 in ratio of buffer : methanol as 60 : 40 (%v,v) were appropriated for mobile phase system with control column temperature at 25 °C. This method could be used to specifically detect MDA with and/or without the presence of siderophore and iron in plasma samples. An effect of pH and temperature would also be discussed.

C0049-ASSOCIATION OF IRON AND ALUMINIUM, RELEASED FROM A CONTAMINATED SOIL, WITH HUMIC ACID COLLOIDS STUDIED BY ASYMMETRIC FLOW FIELD-FLOW FRACTIONATION-INDUCTIVELY COUPLED PLASMA-MASS SPECTROMETRY (AF⁴-ICP-MS)

Siripat Suteerapataranon^{1*}, Muriel Bouby², Horst Geckeis², Thomas Fanghaenel² and Kate Grudpan^{1*}

¹School of Science, Mae Fah Luang University, Chiang Rai, Thailand,

²Institute for Nuclear Waste Disposal, Karlsruhe Research Centre, Karlsruhe, Germany,

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand,

E-mail address: siripat@mfu.ac.th and kate@chiangmai.ac.th

Abstract: The association of Fe(III) and Al(III) with humic acid (HA) colloids was investigated by employing AF⁴-ICP-MS. Acidic leachates from a soil collected close to a coal mining site are found to contain Fe(III), Al(III) and other trace heavy metal ions. Those leachates were mixed with HA solution to simulate the mixing of contaminated water with HA in natural surface water. The fractograms showed that the metals partly associate with HA, and the size of the metal-HA (M-HA) colloids depends on the M:HA concentration ratio, and pH. It is assumed that the association of M-HA leads either to M-HA complexes (smaller colloids) or inorganic Fe(OH)₃ and Al(OH)₃ colloids stabilized by HA (larger colloids). Those inorganic colloids are likely formed in the studied pH range. At higher M:HA ratio, larger colloids are formed and finally precipitated.

whereas the smaller colloids were rather found at lower M:HA ratios. Those smaller colloids are assumed to be mobile in natural water.

C0050-The Rate of Kinetic Adsorption for The Aqueous Solution of Naphthalene on Coconut Fiber Based Activated Carbon(AC)

Suntree Rincome

Rajamankala Institute of Technology, Northern campus, Chiangmai, Thailand.

Abstract: The order of adsorption was determined by the simple kinetic adsorption. These are the pseudo first order, the second order, the pseudo second order, the third order and the pseudo third order. For the complicated kinetic adsorption data of the aqueous solution of Naphthalene(adsorbate) on coconut fiber based Activated Carbon(adsorbent) can not agree with any of the simple adsorption kinetics. Therefore, the mixed order of adsorption kinetic rate models was reasonable for applying in these cases. The result was amenable with the mixed order of adsorption kinetic. Furthermore, the adsorption kinetics parameters of Naphthalene solution, when the mass of AC was increased the order of the adsorption increased too. It also increasing the adsorption kinetic orders models mathematically. The adsorption kinetic rate constants were shown the same value in the same order model mathematically, and shown different in the different order model mathematically.

C0051-DEVELOPMENT OF FLOW INJECTION ANALYSIS SYSTEM FOR DETERMINATION OF IRON(II) AND TOTAL IRON IN GROUND WATER

Kulwadee Pinwattana and Jintana Klamtet

Department of Chemistry, Faculty of Science, Naresuan University, Pitsanulok, 65000, Thailand

E-mail address : pinwattana@hotmail.com and jintanakl@nu.ac.th

Abstract: A reversed flow injection spectrophotometric technique for determination iron(II) and total iron has been carried out based on the reaction between iron(II) and 4-(2-pyridylazo)-resorcinol (PAR) in acetate buffer pH 9.0 yielding a yellowish-orange coloured complex with an maximum absorption at 714 nm. The 50 μ l of 5×10^{-4} M PAR solution was injected into a continuous flowing stream of 0.1 M HCl with a appropriate flow rate of 0.9 ml min⁻¹. Then, it was merged with sample solution and acetate buffer flowing at the rate of 2.2 and 2.4 ml min⁻¹, respectively, and the sample zone was detected by spectrophotometer. The optimum conditions of this system were determined. A linear calibration curve over the concentration range 0.5-10.0 ppm of iron(II) solution was obtained with the regression equation $Y=0.1799X+0.0109$ ($r^2=0.9988$). A detection limit was 0.012 mg l⁻¹ and a recovery of added iron(II) of 99.34-101.51% ($n=20$). This method was very reproducible with the RSD lower than 0.4% ($n=20$). Moreover, the methods comparison showed no significant difference (95% confidence level) between proposed method and standard method, according to *t*-test.

C0053-EXTRACTION AND CHARACTERIZATION OF MONTMORILLONITE IN CLAY FROM LOPBURI PROVINCE, THAILAND

Nuttinee Supamathanon, Tritaporn Choosri,

School of Chemistry, Institute of Science, Suranaree University of Technology, Nakhon-Ratchasima, Thailand.

E-mail address : nat_tree@yahoo.com, tritapor@ccs.sut.ac.th

Abstract: Montmorillonite, (Na, Ca)(Al, Mg)₆(Si₄O₁₀)₃(OH)₆ · nH₂O, is a member of smectite group of clay minerals. Montmorillonite is an aluminosilicate with a layer structure classified as 2:1 phyllosilicate (Fig.1). Montmorillonite has ability to swell when wet which allows cations and organic compounds to be inserted into its layer structure. This property makes montmorillonite a useful material such as it can be used as a starting material in several syntheses of the polymer nanocomposites, as catalyst, as absorbent, etc. The aim of this study is to separate montmorillonite from vertisol soil from Lopburi province. The extraction of clays from soil required sample pretreatment to destroy the strongly cementing materials like carbonates and organic matter, which led to clay aggregation. The 0.2 μ m clay particles were separated by centrifugation. Then the characterization were made by XRD, TGA, DTA, FTIR and SEM techniques. The results show that the clay samples contain about 60% of the 0.2 μ m particles with montmorillonite as a dominant content.

C0054 Analysis of ascorbic acid in fruit juice samples and vitamin C tablets by capillary electrophoresis

Jane Chantarasupasen* and Sunanta Wangkarn

* Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address : Jane@science.cmu.ac.th

Abstract: A capillary electrophoresis method was developed for the determination of ascorbic acid in fruit juice samples and vitamin C tablets without any sample treatment other than dilution and filtration. The optimal conditions were 25 mM borate buffer containing 50 mM sodium dodecyl sulfate adjusted at pH 9.3, 30 kV as applied potential and 72 cm effective length. Detection was direct UV at 267 nm. A linear calibration graph was achieved with a correlation coefficient of 0.9995.

C0055-DICARBOXYLATE ANION RECEPTOR AND SENSOR CONTROLLED BY ALKALI METAL IONS

Auamphon Rattanasing, Chomchai Suksai and Thawatchai Tuntulani*

*Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

Abstract: Receptor 1 containing thiourea unit was synthesized by coupling (diaminobenzyl)diazacrown ether with thioisocyanate. The binding property of receptor 1 with various dicarboxylate anions was examined by UV-vis spectrophotometry. Results show that receptor 1 can bind dicarboxylate anions and give a color change that can be detected by naked-eyes. The complexes between receptor 1 with glutarate anion give an optimal color change compared to those of other dicarboxylate anions. Thus receptor 1 can be used as a dicarboxylate receptor and sensor.

C0056-CONTROL OF BROMIDE RECOGNITION OF HETERODITOPIC RECEPTOR CONTAINING CROWN ETHER AND AMIDOFERROCENE BY ALKALI METAL CATIONS

Chomchai Suksai¹, Pannee Leeladee¹, Disyapong Jainuknan¹, Thawatchai Tuntulani¹, Nongnuch Muangsin¹, Palangpol Kongsaree² and Chavang Pakavatachai³

¹Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

²Center for Excellence in Protein Structure and Function, Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.

³Department of Chemistry, Faculty of Science, Prince of Songkhla University, Songkhla 90112, Thailand 90112.

E-mail address: tthawtc@chula.ac.th

Abstract: A heteroditopic receptor containing crown ether/amidoferrocene (**2**) was synthesized and the binding ability with various anions were reported in the presence and absence of alkali metal cations. In the presence of Na⁺, receptor (**2**) showed positive cooperative binding towards Br⁻ which the binding affinities for Br⁻ was $K_{ass} = 16,096 \text{ M}^{-1}$. Therefore, receptor (**2**) presented the "switched on" Br⁻ binding in the presence of Na⁺ and showed "switched off" in the absence of Na⁺.

C0057-SOLVENT EXTRACTION OF RARE EARTHS BY DI-2-ETHYLHEXYL PHOSPHORIC ACID

Wanee Srinuttrakul¹, Kannika Kranlert², Jarunee Kraikaew¹, Surasak Pongpansook¹ and Chavalek Chayavadhanangkur¹

¹Chemistry and Material Science Research Program, Office of Atoms for Peace, Bangkok, Thailand.

²Transferred to Ministry of Energy, Bangkok, Thailand.

E-mail address: neesrinut@hotmail.com

Abstract: Solvent extraction has been widely applied for individual rare earth separation because the separation time is rapid and a large quantity of products is obtained. In this work, this technique was utilized to extract mixed rare earths, obtained from monazite digestion process. Di-2-ethylhexyl phosphoric acid (D2EHPA) was used as an extractant. The factors affected the extraction including HNO₃ concentration in mixed rare earth nitrate solution and the amount of D2EHPA were studied. The appropriate concentrations of HNO₃ and D2EHPA were found to be 0.01 and 1.5 M, respectively. From the result of equilibrium curve study, it was observed that heavy rare earths were extracted more efficient than light rare earths. A 6-stage continuous countercurrent solvent extraction was simulated for rare earth extraction. The optimum ratio of solvent to feed solution (S/F) was 2. Because of the high cost of D2EHPA, 1.0 M of D2EHPA was suitable for the rare earth extraction by the continuous countercurrent solvent extraction.

C0058-A Novel Chromatographic Detection of Iodide in Pharmaceutical Products Using the Boron Doped-diamond Thin Film Electrode

Maliwan Amatongchai¹, Duangjai Nacapricha¹, Orawon Chailapakul², Prapin Wilairat¹ and Kate Grudpan³

¹Department of Chemistry, Faculty of Science, Mahidol University, Rama 6 Rd, Bangkok, 10400, Thailand.

²Department of Chemistry, Faculty of Science, Chulalongkorn University, Patumwan, Bangkok, 10330, Thailand.

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, 50200 Thailand.

E-mail address: g4536619@student.mahidol.ac.th

Abstract: This work exploits, for the first time, use of boron doped-diamond thin film electrode (BDD) for amperometric detection of iodide in an ion pair chromatographic system. Prior to the application in liquid chromatography, cyclic voltammetry of iodide in 60 mM phosphate buffer (pH 5) at the BDD, was previously investigated [1, 2]. The results were used to construct a simple amperometric detector for direct determination of iodide as applied to flow injection analysis (FIA) [2]. The FIA system works very well with non-complicated sample matrices such as potassium iodide tablets (for thyroid protection in the case of nuclear emergency) and a liquid patent medicine for asthma (Mix. Stramonium Co.). However for complicated samples, such as vitamin tablets, utilization of a separation system is necessary. For the employment in high performance liquid chromatography (HPLC), we were able to shape the BDD to fit a commercial flow through detection cell. This detection system fulfills very well general requirements as an electrochemical cell for HPLC. Operating conditions for the determination of iodide ions by ion-pair chromatography were optimized. The clear separation of iodide from interferents (vitamin B2 and C) was achieved within 10 minutes. The amperometric detection at BDD electrode provided highly reproducible responses and reasonable wide linear calibration graph (0.2 – 160 ppm of iodide). The limit of detection was observed at 8.4 ppb. The application of the detection system to iodide determination in multivitamin tablets will be presented and its validation to other methods will also be discussed.

C0059-INVESTIGATION OF A PRETREATMENT METHOD FOR MULTIVITAMIN TABLET PRIOR TO IODIDE DETERMINATION BY CHEMILUMINESCENCE FLOW INJECTION

Nathawut Choengchan^{*}, Benjamaporn Promthong, Pornprapa Krasar, Patcharin Chaisuwan, Prapin Wilairat and Duangjai Nacapricha

Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand 10400.

E-mail address: nuthawat13@hotmail.com

Abstract: This work presents method development for pretreatment of extracts of multivitamin tablets prior to determination of iodide by using a gas diffusion (GD) flow injection (FI) system with chemiluminescence (CL) detection. We found, from preliminary results, that ascorbic acid seriously interferes the iodide determination by using the proposed FI method. Therefore, in this work, we propose use of anion exchange resin for removing ascorbic acid prior to the iodide analysis. Under the optimal condition, ascorbic is completely separated from iodide. The pretreatment method was then applied to five samples of multivitamin tablets. The method provided satisfactory iodide recovery (90-99 %). Iodide contents determined by the FI (after pretreatment) and by iodide ion selective electrode (ISE) were not significantly different according to the paired *t*-test ($P = 0.05$).

C0060-DETERMINATION OF PHOSPHORUS BY ALL INJECTION ANALYSIS

Perapat Anujaravat, Natchanon Amornthammarong, Patcharin Chaisuwan and Duangjai Nacapricha
Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.
E-mail address: anujaravata@yahoo.com

Abstract: All Injection Analysis (AIA) is one of the new generations of the original flow injection analysis (FIA), which was first introduced by H. Itabashi et al. in 2001.[1]. For this technique, reagents and samples are injected as liquid plugs and all of the solution plugs are circulated and finally carried to the detector. In this work, the system of Itabashi was modified by placing the detector at a position where we could monitor also the round number of circulation. The sensitivity can be improved by summation of signals from a number of the circulation rounds. The system is a better choice than the common FIA because we only use relatively smaller volumes of reagents for the AIA. The AIA for determination of phosphate, based on the molybdenum blue method, was developed.

C0061-GAS DIFFUSION-FLOW INJECTION FOR KINETIC DETERMINATION OF IODIDE

Nathawat Choengchan, Benjamaporn Promthong*, Pornprapa Krasar, Prapin Wilairat and Duangjai Nacapricha
Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand
E-mail address: nuthawat13@hotmail.com

Abstract: This flow injection (FI) method employs a well-known iodide-catalysed reaction between Ce(IV) and As(III) for determination of iodide. Although in principle, the method can be used directly with samples containing iodide but sometimes there are kinetic interferences present in the liquid sample injected into the FI system. To avoid the interferences, we propose use of the kinetic method with gas diffusion (GD) to selectively detect only the phenomena resulting from iodine itself. In practice, a liquid sample containing iodide ion is injected and is oxidized to elementary iodine in a donor stream. Iodine that permeates through a hydrophobic membrane fitted inside the GD unit, is reduced in-line by arsenous acid in the acceptor stream before involving into the kinetic cycle for detection. The detection employs the visible absorption wavelength of Ce(IV) at 420 nm. The analytical features will be presented. Discussion will be made on the possibility of using this method on real samples.

C0062-PROFILE MODELLING OF A CONTINUOUS-FLOW EXTRACTION TECHNIQUE

Kamonthip Sereenonchai, Patcharin Chaisuwan, Thitirat Mantim, Prapin Wilairat, Juwadee Shiowatana and Duangjai Nacapricha
Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.
E-mail address: g4536501@student.mahidol.ac.th and zircon_bee@yahoo.com

Abstract: Recently, a continuous-flow extraction technique has been used to extract metal [1, 2] and orthophosphate [3] from soils and sediments. However there has not been such a modeling studies carried out for this type of extraction. Thus, in this work, profiles of the extraction were first investigated experimentally using (a) a homogenous solid phase such as $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ and (b) resin-adsorbed orthophosphate (Dowex 1X2, 50-100 mesh). The experimental data were evaluated using % errors of the exponential fittings, given the Sigma plot software. The results were then compared to a theoretical model of Continuous-flow Stirred Tank Reactor (CSTR). According to the theory, the extraction profile should obey an exponential equation. It was observed that the fitting errors for all experiments were below 1%. This indicates that we may be able to use the CSTR theory to predict the profile model of the continuous-flow extraction. This model may be useful for explaining some phenomena obtained from samples of soil or sediment.

C0063-PERVAPORATION-FLOW INJECTION FOR DETERMINATION OF IODIDE BY CHEMILUMINESCENCE DETECTION

Nuanlaor Ratanawimarnwong^{1*}, Prapin Wilairat¹, Ian McKelvie², Terence Cardwell³ and Duangjai Nacapricha¹
¹ Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, 10400, Thailand
² Water Studies Centre, School of Chemistry, Monash University, Victoria, 3800, Australia
³ Analytical Chemistry Laboratories, Department of Chemistry, La Trobe University, Victoria, 3086, Australia
E-mail address: g4436357@student.mahidol.ac.th

Abstract: A pervaporation (PV) -flow injection (FI) system for the determination of iodide by chemiluminescence detection is described. By means of this system, iodide present in the sample was oxidized with potassium dichromate in acidic medium to produce iodine before entering the pervaporation unit. At the unit, the evaporation of iodine takes place. Iodine

gas generated then diffuses through the hydrophobic PTFE membrane into a stream of iodide solution to mix with a stream of luminol solution to produce chemiluminescence light at 425 nm. Since pervaporation seems to be a viable alternative to gas diffusion, comparison of the analytical features between pervaporation and gas diffusion will be presented. Discussion will be made on the possibility for a real use of this method for determination of iodide.

C0064-Chemical Constituents from the leaves of *Garcinia bancana*

Nawona Boonnak*, Kanda Panthong

Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla 90110

E-mail address: nawongb@yahoo.com

Abstract Four pentacyclic triterpenes and a mixture of two steroids were isolated from the leaves of *Garcinia bancana*. Based on spectroscopic data, their structures were identified as 14 α -Taraxeran-3 α -ol(1), Urs-12-en-3 β -acetate(2), Lup-20(29)-en-3 β -acetate(3), 11 α -12 α -Oxidotaraxerol(4) and a mixture of Stigmasterol and Sitosterol(5)

C0066-SYNTHESIS OF 5,6-EPOXYPREGNEOLONE ACETATE FROM PREGNEOLONE ACETATE BY EPOXIDATION REACTION

Aranya Manosroi^{1,2}, Penpan Khanrin², Aphiwat Teerawutgulrag¹, Duang Buddhasuk³, Jiradej Manosroi^{1,2}

¹Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand 50200

²Pharmaceutical-Cosmetic Raw Material and Natural Product Research and Development Center, Institute for Science and Technology Research and Development, Chiang Mai University, Thailand 50200

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand 50200

E-mail address: pmpti005@chiangmai.ac.th, aranyam@hotmail.com

Abstract: The objective of this study was to synthesize 5,6-epoxypregnenolone acetate (EPA) from pregnenolone acetate (PA). EPA is an important intermediate for the synthesis of a contraceptive, medroxy progesterone acetate. The epoxidation at 5 and 6 of PA was by hydrogen peroxide and catalysed by 10% NaOH solution. The reaction was completed at 72 hours. The reaction temperature was controlled at 0-4 °C. The percentage yield of the product was 87.9%. EPA was identified by melting point determination, TLC, IR and HPLC. The percentage content of EPA in the product was more than 80% when determined by HPLC.

C0067-DETERMINATION OF VANADIUM IN CHEMICAL FERTILISERS AND ITS EFFECT ON PLANT GROWTH

Narumol Vachirapatana¹, Yaowapha Jirakiattikul², Greg Dicinoski³, Ashley T. Townsend⁴ and Paul R. Haddad^{1*}

¹Department of Chemistry, Faculty of Science and Technology, Thammasat University, Rangsit, Pathumthani, 12121, Thailand

²Department of Agricultural Technology, Faculty of Science and Technology, Thammasat University, Rangsit, Pathumthani, 12121, Thailand

³Australian Centre for Research on Separation Science, School of Chemistry, University of Tasmania, GPO Box 252-75, Hobart, TAS 7001, Australia, GPO Box 252-75, Hobart, TAS 7001, Australia.

⁴Central Science Laboratory, University of Tasmania, GPO Box 252-74, Hobart, TAS 7001, Australia

Abstract: Studies have indicated that vanadium exhibits considerable toxicity related to heart muscle contraction and renal failure in mammals, with stock losses due to contaminated feeds being reported. It has been reported in the literature that the presence of low levels (ppb) of V is required for normal cell development, but vanadium becomes toxic at the ppm level. Additionally, it has been shown that V(V) is considerably more toxic than V(IV). N-P-K fertilizers generated from phosphate rocks can also be contaminated with vanadium and this is known to effect the growth of plants to which such fertilizers have been applied. The determination of vanadium has therefore been of substantial interest in environmental and nutritional research areas. The separation and determination of the vanadium (V) ternary complex formed with 4-(2-pyridylazo)-resorcinol (PAR) and hydrogen peroxide using ion-interaction reversed phase high performance liquid chromatography on a C18 column has been investigated. The optimal mobile phase was a methanol-water solution (32% v/v) containing 3 mM tetrabutylammonium bromide, 5 mM acetic acid and 5 mM citrate buffer at pH7, with absorbance detection at 540 nm. The stoichiometry of the ternary complex of vanadium at pH6 in 10 mM acetate buffer using the mole ratio and Job's method was determined. The detection limit for V(V) was 0.09 ng/mL using a 100 μ L injection loop. This method was applied to the analysis of fertilizers from various sources. The results for vanadium obtained by the HPLC method agreed well with those from magnetic sector ICP-MS analysis. A method for the determination of vanadium using on-line sample clean up system has also been investigated on a C18 column. The sample clean up HPLC method was applied to determine the vanadium concentration uptake by plant tissues. All plant samples used in this present study were cultured hydroponically in Knop's solution containing different concentration of standard ammonium metavanadate. In addition, the effect of vanadium on plant growth was also studied.

C0068-Strategies to Greener Analytical Chemistry including Micro Total Analysis System

Napaporn Youngvises¹, Tepparat Lelasattarakul², Saisunee Liawruangrath²

¹Department of Chemistry, Thammasat University, Pathum Thane, Thailand, 12121

²Department of Chemistry, Chiang Mai University, Chiang Mai, Thailand, 50200

Corresponding author: nyoungvises@hotmail.com Tel/fax:66-2-5644483

Abstract: Four strategies were applied to develop analytical methods to be a greener analytical chemistry for environmental concerning and analysis cost reducing which is the heart of these works. Almost of these researches emphasized to pharmaceutical analysis and its quality control. However, some parts of this research related to environmental monitoring with micro total analysis system or lab on a chip was also demonstrated.

C0069-Removal of Hg(I) and Hg(II) by using adsorbent obtain from modified paper.

Saravut Yongprapar¹, Weraut Srichaisriwech

Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathumthani 12121, Thailand

E-mail address: saravut.111111@gmail.com

Abstract: Waste from day-life such as charcoal from rubber plant and paper has been modified to adsorb mercury from Hg(I) and Hg(II). Comparing with activated carbon, in experiment with mercury concentration at 10ppm in 60 minutes the best adsorbent is an activated carbon followed by paper treated with urea and paper boiled with NaOH. But at 40 ppm the results is different because the best adsorbent is paper treated with urea the second was the activated carbon in Hg(I) and paper boiled with NaOH in Hg(II). In all experiment charcoal is the worst adsorbent which could adsorb around 25-35%. The results indicate that the modified paper had better capacity property than activated carbon but still has worst equilibrium property

C0070-COMPOSITION OF THE ESSENTIAL OILS FROM LEAVES AND PEELS OF AEGLE MARMELOS

Sinpen Jankasem¹, Ubon Rerk-am¹, J.J. Brophy²

¹Pharmaceutical and Natural Product Department, Thailand Institute of Scientific and Technological Research, 196 Phaholyothin Rd., Chatuchak, Bangkok 10900, Thailand

²School of Chemistry, University of New South Wales, UNSW Sydney, NSW 2052, Australia.

E-mail address: sj_jaw@hotmail.com, bling112@yahoo.com

Abstract: *Aegle marmelos* is a rutaceous plant of which its leaves and peels are rich in essential oil. Therefore, we investigated the essential oils from leaves and peels of the plant in term of the oil yield and their constituents. Hydrodistillation of leaves and peels gave the oil yields of 0.36 and 0.02 % (v/fresh wt.), respectively. Capillary GC and GC MS analysis of the two oils resulted as follows: leaf oil, 25 components were identified of which α -phellandrene (39.61%), sabinene (17.33%), β -phellandrene (16.69%), limonene (6.81%) and α -pinene (5.07%) were found to be the main constituents, peel oil, 28 components were identified of which the main constituents were limonene (43.97%), p-cymene (6.79%) and caryophyllene oxide (4.79%).

C0071-Determination of Iron in Sediments using Cyclic Voltammetry Technique on a glassy carbon electrode

Acharawadee Chooyimpanit¹, Saravut Dejmanee² and Roongroje Ratana-ohpas³

¹The Center for Scientific and Technological Equipment, Walailak University, Nakhon Si Thammarat 80160, Thailand;

^{2,3}School of Chemistry, Institute of Science, Walailak University, Nakhon Si Thammarat 80160, Thailand;

E-mail address: eadchara@wvu.ac.th 1, dsaravut@wvu.ac.th 2, roongro@wvu.ac.th 3

Abstract: Iron complexes of EDTA can be determined by Cyclic Voltammetry(CV) under the optimum parameter: such as equilibration time and scan rate. The peak potential set approximate at -0.067 V. Linear calibration plots over the range 0.24 - 500 ppm were obtained. Detection limits of 4.512×10^{-2} ppm and a relation standard deviation of 2.664%, 0.895%, 1.119% and 1.579% (n = 7) were achieved at a concentration of 63.986, 62.303, 62.032 and 62.069 ppm for digested sediment solution (SED1-4), respectively.

C0072-ARSENIC FRACTIONAL DISTRIBUTION IN SOLID WASTES

Janya Buanuam, Sopon Purawatt and Juwadee Shiowatana

Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.

E-mail address: g4336622@student.mahidol.ac.th

Abstract: Contamination of arsenic in natural water has been reported in many areas worldwide and seriously causes health problems. Adsorption process using adsorbents is an economically appealing method for the removal of arsenic from contaminated water. Low cost solid materials such as MnO₂, activated carbon and alum are often used in water treatment. A continuous-flow sequential extraction method was applied to study the mobility of arsenic in three different solid wastes from water treatment and soil amended by such wastes.

C0073-CONTINUOUS-FLOW DIALYSIS SYSTEM WITH ON-LINE ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRIC AND pH MEASUREMENTS FOR IN VITRO MINERAL BIOAVAILABILITY STUDY

Jeerawan Promchan and Juwadee Shiowatana

Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.

E-mail address: g4736447@student.mahidol.ac.th

Abstract: A continuous-flow dialysis (CFD) method with on-line electrothermal atomic absorption spectrometric (ETAAS) and pH measurements for the study of in vitro mineral bioavailability was developed. The dialysis profile and pH change

with time can be used to interpret the differences in dialyzability of various samples. Understanding of mineral bioavailability could help reduce the risk of their deficiencies.

C0074-USE OF FIELD-FLOW FRACTIONATION AS AN ALTERNATIVE PRECONCENTRATION AND MATRIX REMOVAL DEVICE BEFORE ICP-MS AND ICP-AES DETECTIONS

Supharat Sangsawong and Atitaya Siripinyanond

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand

E-mail address: g4636327@student.mahidol.ac.th and scasp@student.mahidol.ac.th

Abstract: A flow field-flow fractionation (FFF) sample channel is modified for both preconcentration and matrix removal. In order to preconcentrate the analyte, large volume sample introduction was used to introduce the complexes between polyethyleneimine (PEI), which is a high molecular weight polymeric complexing agent, and analyte into the FFFF channel. During sample loading and focusing step, matrix elements which do not form complexes with PEI, permeated through the membrane and left the channel. The PEI-analyte complexes, however, still remain inside the channel owing to their higher molecular weight as compared to the molecular weight cut-off of the membrane used inside the FFFF channel. Then, the preconcentrated sample is introduced directly to the ICP nebulizer for further elemental detection. In this study, the optimum pH for complex formation between analyte and PEI was found to be at 9. With the proposed technique, preconcentration factor of 25 fold was achieved.

C0075-Size Characterization of Starch Particles Using Sedimentation Field-Flow Fractionation

Sudarat Saesew, Atitaya Siripinyanond and Juwadee Shiowatana

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400,

Thailand.

Abstract: The aim of this study was to separate and determine particle size distribution of starch granules using sedimentation field-flow fractionation (SdFFF) in steric mode. Mung bean, tapioca, and rice flour were studied. A 0.1% EL-70 with 0.02% NaN₃ was used as carrier liquid. The retention times of all starch granules were less than 6 min. Particle size distributions were ranging around 15-55, 10-32, and 10-20 μ m for mung bean, tapioca, and rice flour, respectively. Fractions from SdFFF experiment were collected for further characterization by scanning electron microscopy (SEM). The experimental results from both techniques agreed well.

C0076-ELEMENTAL FRACTIONATION IN AIR PARTICULATE USING A CONTINUOUS FLOW SEQUENTIAL EXTRACTION.

Atitaya Samontha and Juwadee Shiowatana

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand

atitaya221@hotmail.com, g4536498@student.mahidol.ac.th and scysw@student.mahidol.ac.th

Abstract: An air particulate collector (APC) was used as a relatively simple tool for collecting dust particles by dry deposition and wet deposition. Monitoring stations include 3 sites: area close to a lead smelter, area with heavy traffic and rural area. Sequential extraction procedure was used to investigate the elemental fractionation in air particulate.

C0077-SIZE SEPARATION AND CHARACTERIZATION OF AIR PARTICULATE USING SEDIMENTATION FIELD-FLOW FRACTIONATION

Usarat Kamtabtim, Atitaya Siripinyanond and Juwadee Shiowatana

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand

Abstract: The applicability of sedimentation field-flow fractionation (SdFFF) was investigated for size separation and size characterization of air particulate. In this study, the effect of various dispersing agents and pH values on dispersion stability of air particulate was examined by zeta potential measurement. The result showed that 0.1% SDS could efficiently disperse the air particulate. A 0.1% SDS with pH 8 was chosen as both dispersing agent and carrier liquid because high dispersion stability was obtained. Monomodal fractograms were obtained for air particulate samples showing the size range from 0.2 to 1.2 μ m. The mean diameters determined by SdFFF showed similar trends with those obtained from scanning electron microscopy and laser scattering techniques. This investigation indicated the potential of SdFFF for size characterization of air particulate.

C0078-FIELD-FLOW FRACTIONATION-INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY: AN ALTERNATIVE APPROACH TO INVESTIGATE METAL-HUMIC SUBSTANCE INTERACTION

Sumattana Worapanyanond and Atitaya Siripinyanond

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand.

Abstract: Interaction between humic substances and metal was investigated using a hyphenated technique, field-flow fractionation-inductively coupled plasma mass spectrometry (FFF-ICP-MS). A commercial Aldrich humic acid and isolated humic substances from lead-contaminated soil were examined for their metal binding abilities. With FFF, information on diffusion coefficient, size and molecular weight of humic substances was obtained to be approximately $1.69 \times 10^{-8} \text{ cm}^2 \text{ s}^{-1}$, 2.13 nm, and 2,900 Da, respectively. With ICP-MS, binding of Cd, Cu, and Pb with humic substances was observed. Moreover, aggregation of humic substances in the presence of Ca was examined over suitable time interval. The aggregation

was evidenced by change of humic size distribution profile at a given pH value. Change of elemental size distribution profile of Cd, Cu, and Pb to a larger hydrodynamic and molecular size also was observed, implying that these metals are less mobile in the presence of Ca.

C0079-Development of Test Kit for Inorganic Arsenic Speciation

Thanyarat Techalertramee and Juwadee Shiowatana

Department of Chemistry, Mahidol University, Rama VI Rd, Bangkok 10400, Thailand.

Email address: g4436368@mahidol.ac.th

Abstract: A simple field test kit, based on arsine generation with subsequent trapping by mercuric bromide coated on a strip paper, was used for inorganic arsenic speciation. The reaction between arsine and mercuric bromide yields a yellow color of which the intensity is proportional to the arsenic concentration in solution. Zinc /hydrochloric acid is used for arsine generation to determine total inorganic arsenic (AsIII+AsV).

Aluminium/sodium hydroxide is used for arsine generation to determine AsIII. The detection limits of both tests were 5 µgAs/L, with the working range of 5-500 µgAs/L. Analysis time for total As is 10 minutes and for AsIII is 20 minutes.

C0080-Size Characterization of Micrometer Particles Using Hollow Fiber Flow Field-Flow Fractionation

Pranee Phukphatthanachai, Juwadee Shiowatana and Atitaya Siripinyanond

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand,

E-mail address: g4636326@student.mahidol.ac.th

Abstract: Hollow fiber flow-field flow fractionation (Hf-FIFFF) is a simple version of flow field-flow fractionation technique applicable to separate and characterize submicrometer particles. This technique uses a cylindrical channel made with hollow-fiber membrane. The flow introduced to the hollow fiber is divided into two parts: first, part of the flow penetrates the fiber wall (radial flow); second, the rest exits along the fiber (axial flow). Separation is achieved by the balance between particle diffusivity and the radial flow. The main advantages of Hf-FIFFF are miniaturization, simplicity, and low cost of the fractionator components. In this work, the Hf-FIFFF was set up and evaluated for its separation efficiency by testing with polystyrene standards. Separation in both normal mode (for particles < 0.5 µm) and steric mode (for particles > 0.5 µm) was carried out. Preliminary results showed the potential of Hf-FIFFF for size separation of particle in micrometer range.

C0081-Determination of Organophosphate and Organochlorine Pesticide Residues in Surfacewater Samples from Agricultural Areas in Thunayaburi District, Pathumthani Province

Churairat Duangdeun

Faculty of Science, Rajamangala Institute of Technology, Pathumthani, 12110, THAILAND.

E-mail address: churairat@rit.ac.th

Abstract: Organophosphate and Organochlorine pesticides were persistent toxicity substances which have been used extensively in agriculture. Due to their chemical and thermal stability, their toxicity remains in the environment for such a long time that their concentration in water should be closely monitored. Trace Organophosphate and Organochlorine can be analyzed by using gas chromatography with flame photometric and electron capture detectors, respectively. In this research work, these pesticide residues in surfacewater samples from various agricultural areas in Thunayaburi District, Pathumthani Province, were determined. The water samples were extracted with solution of diethyl ether and hexane. For Organophosphate, the extracts were concentrated and then diluted by hexane prior to direct injection into the chromatographic system. For Organochlorine, the extracts were cleaned up by passing them through the column packed with silica gel and then eluted by solution of diethyl ether and petroleum ether. The elutes were concentrated and then diluted to appropriate volume by hexane prior to an analysis by gas chromatography. The amount of these pesticide residues found in all sample did not exceed the recommended tolerance level.

C0082-Improved Simultaneous Inorganic Anions and Organic Acids Analysis in HSA Components of Hard Disk Drive by Gradient Ion Chromatography

Tanawat Prommanuwat

Western Digital (Bangpa-in), Ayutthaya, Thailand.

E-mail address: tanawat.prommanuwat@wdc.com

Abstract: The purpose of this work is to improve and characterize the method for simultaneous separation of inorganic anions such as fluoride, chloride, nitrite, bromide, nitrate, sulfate and phosphate from low molecular weight organic acids such as acetate, formate and oxalate by gradient elution ion chromatography using an automated hydroxide eluent generation system. Both of latexed anion exchange resin (quaternary alkanol amine as functional group) and grafted anion exchange resin were tested to find the optimized chromatographic conditions by evaluating their separation parameters. The chromatographic conditions for both anion exchange materials were achieved by using single gradient mode for the grafted anion exchange column and using dual gradient mode for latexed anion exchange column. The method detection limits (MDL) for most anion under both conditions are well below 1.0 ng/ml with 1 ml sample injection. The grafted anion exchange column was found to provide superior separation for fluoride, acetate and formate. The extraction of HSA components were evaluated and optimized in terms of temperature and time of extraction. This present work also described effects of organic acids on corrosion in HSA component.

C0083-Extraction of Polycyclic Aromatic Hydrocarbons in Airborne Particulate MatterWalaya Sangchan¹, Somporn Chantara¹, Sunanta Wangkarn¹ and Hans Mosbæk²¹Department of Chemistry, Faculty of Science, Chiang Mai University, 50200, Thailand.²Department of Environment and Resources DTU, Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark

Abstract: Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in particulate matters was conducted. Samples were collected by using the MiniVol air sampler with flow rate 5 L min^{-1} . This equipment gave low amount of particulates on filter. Therefore, optimum analysis method was investigated in order to gain the suitable determination method for PAHs in airborne particulate samples using a low-volume air sampler. Spiked PAHs standards were extracted from quartz filter paper dissolved in 10 ml of acetonitrile following with ultrasonic extraction. The volume of extracted sample was reduced with evaporator. Then, it was analyzed by Gas Chromatography-Flame Ionization Detector (GC-FID) in splitless injection mode. The recoveries of the 16 PAHs were obtained in a range of 63-85 %. Detection limit (DL) of GC-FID was in a range of 0.06-0.22 ng/ μl , which was low in sensitivity and selectivity for PAHs determination in particulates. Therefore, Gas Chromatograph-Mass Spectrometer in selected ion monitoring mode (GC-MS-SIM), which provided DL in a range of 0.01-0.04 ng/ μl , is more preferable for measurement of PAHs in airborne particulate samples taken with low-volume system. The method was applied to determine 16 PAHs in 10 μm of particulate matters (PM_{10}) which have been collected at selected sampling site in the city of Chiang Mai for 24 hours.

C0084-Simultaneous Determination of Methanol Ethanol and Fusel oil in Alcoholic Beverage Samples by High Performance Liquid Chromatography

Amorn Chaiyasat and Preeyaporn Chaiyasat

Chemical Research Institute, Rajamangala Institute of Technology, Pathumthani, 12110, THAILAND

E-mail address: preeyaporn.cri@it.ac.th

Abstract: Methanol ethanol and fusel oil are important substances in alcoholic beverages that indicate to quality of them. Their concentrations should be closely monitored. In this research, high performance liquid chromatography with refractive index detection was developed for simultaneous separation of methanol ethanol and fusel oils (propanol, iso-butyl alcohol and iso-amyl alcohol). The isocratic elution was optimized for a minimum analysis time and sufficient resolution for the chromatographic peaks. Flow rate of a mobile phase system consisting of concentration of sulfuric acid and temperature of column were employed. An optimal condition was found at 5 mM sulfuric acid mobile phase, flow rate of 0.8 ml/min and 90°C column temperature resulting in an elution time of 24 minutes. The separations of them were achieved without the interference peaks under the optimized condition obtained.

C0085-PHOSPHORUS DETERMINATION BY ADSORPTIVE ACCUMULATION OF PHOSPHOMOLYBDATE WITH POLYPYRROLE ON CARBON PASTE ELECTRODE

Chatchai Ponchio and Waret Veerasai*

Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400

E-mail address: scwvr@mahidol.ac.th*

Abstract: The phosphomolybdate composite in polypyrrole film on carbon paste electrode has been developed and applied for phosphorus determination by Cyclic voltammetry and Differential pulse voltammetry. Phosphorus as phosphomolybdate complex is accumulated of simultaneous with the electropolymerization process of polypyrrole on carbon paste electrode. This electrode surface is easily regenerated, mechanically. Reversible cyclic voltammetric signal with low background current is observed. The differential pulse voltammetric peak current depend linearly on the phosphorus concentration in range of 0.15 μM to 15.0 μM , % RSD = 6.19% at 15.0 μM ($n = 11$) and the detection limit of 0.14 μM .

C0086-Surface Modification of Activated Carbon : Adsorption Isotherm and Effect of Adsorption Transition Metal ionMangkorn Kitiphatmontree¹, Maethinee Boonchupleing, Pornchan Sangkarn

Chemical Research Institute, Rajamangala Institute of Technology

E-mail address: kitiphatmontree@yahoo.com, mangkorn_kri@it.ac.th

Abstract: The anionic surfactants; SDS and AOT were used to modify surface of activated carbon. The experiments were separated into 4 parts. The first was determination of surface of activated carbon at pH 7, affected to saturated adsorption of SDS and AOT. The results showed that saturated concentrations of the surfactants were 10 and 64 CMC of SDS and AOT, respectively. The second, calculations, the adsorption data good corresponded with the Langmuir model. The calculations of the Langmuir isotherm of AOT and SDS at the initial pH 7 at 30°C for 1 mm of activated carbon size afforded the adsorption capacities (X_m) were 14.006 mg.AOT/g, and 1.382 mg.SDS/g, respectively, and adsorption energy constants (b) were 0.073 and 0.877, respectively. The third part was the study of metal ion Cu(II) removal in batch reactors. The adsorption experiments carried out pH 3, 4, 5 and 6. The results showed that the best Cu(II) adsorption of the SDS-coated activated carbon was obtained at pH 3, while the AOT-coated activated carbon was shown the high performance of adsorption in pH range of this study. On the other hand, non-coated activated carbon showed the Cu(II) removal decreased as lower pH. The final part, the surfactant-coated activated carbon could be reused for metal ion adsorption in water and wastewater. The 2 M of Sodium Sulfate solution was chosen to regenerate the surfactant-coated activated carbon via ion exchange mechanism. Additionally, it can be adapted in practical implications for industrial use and environmental applications.

C0087-APPLICATION OF GAS CHROMATOGRAPHY-MASS SPECTROMETRY IN THE STUDY OF VOLATILE AND AROMA COMPOUNDS IN LEAVES AND GRAIN WITH RIPENING PHASE OF KHAO DAWK MALI 105 RICE

Pornthep Suksaranjit*, Tinnagron Seesiadka and Sugunya Wongpornchai

Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand; e-mail address: psuksaranjit@yahoo.com

Abstract: The organic compounds obtained the leaves and grains in ripening phase of Khao Dawk Mali 105 rice were studied. The leaves and grains samples were extracted by using acidic and basic solvent extraction and 2,4,6-trimethylpyridine (TMP) was used as internal standard. The supernatant was then extracted again with dichloromethane. The extracts were subjected to analysis using gas chromatography-mass spectrometry. The results revealed more than 100 volatile constituents. Among these, 75 volatiles were identified, including 2-acetyl-1-pyrroline (2AP), a major component in aromatic rice. Determination of 2AP in leaves and grains was performed extracting by acidic solutions containing TMP as internal standard. The extracts were analyzed by gas chromatography with flame ionization detector. Concentrations of 2AP resulted in leaves and grain were found in the range 1.35 ± 0.09 - 8.71 ± 0.04 and 2.31 ± 0.12 - 21.50 ± 0.11 $\mu\text{g/g}$ respectively.

C0088-ANALYSIS OF ESSENTIAL OIL COMPOSITIONS OF VETIVERIA ZIZANIODES NASH DETECTED BY SOLID PHASE MICROEXTRACTION AND GAS CHROMATOGRAPHY-MASS SPECTROMETRY

Patcharee Pripdeevech¹*, Sugunya Wongpornchai¹ and Ampan Promsiri²

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

*e-mail address: kittycat4005038@hotmail.com

²Department of soil science and conservation, Faculty of Agriculture, Chiang Mai University, Chiang Mai, 50200, Thailand

Abstract: This research was carried out to study the essential oil compositions of scented-vetiver roots (*Vetiveria zizanioides* Nash). Three different cultivation systems were applied; (1) cultivation without microbial inoculation, (2) cultivation by using microbial inoculation and (3) semi-hydroponic cultivation by using nutrient solution. The essential oil compositions were studied by solid phase microextraction (SPME) coupled with gas chromatography-mass spectrometry (GC-MS). The results showed that chromatograms of volatiles, obtained from essential oil of each different cultivation system, were reflected the same quality, both chemical constituents and number of volatiles. Most of the detected components were mainly in a group of sesquiterpene and its derivatives. However, the quantities of these chromatograms were also shown differently.

C0089-DIRECT ANALYSIS OF 2-ACETYL-1-PYRROLINE IN RICE SEED USING HEADSPACE-GAS CHROMATOGRAPHY

กัญจน์, ปิณณิชา และ สุทธิชัย วงศ์พรชัย

Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand; e-mail address: nong_020@hotmail.com and scismth@chiangmai.ac.th

Abstract: Analysis of the aroma compound, 2-acetyl-1-pyrroline (2AP), in grain of Khao Dawk Mali 105 (KDML 105) rice was simplified by utilizing a headspace(HS)-gas chromatography(GC) with flame ionization detector. This method allows direct analysis of 2AP from headspace of the rice grain samples. The conditions optimized included sample preparation, headspace autosampler parameters and the chromatographic system. Standard calibration curve was constructed based on internal standard method using 2,4-dimethylpyridine (DMP) as internal standard. Linearity was in the range 0.5 - 10.0 $\mu\text{g/g}$ with a correlation coefficient of 0.9998. The limit of detection and limit of quantitation were 0.3 $\mu\text{g/g}$ of 2AP and 0.2 g of KDML 105 brown rice, respectively. The relative standard deviation of repeatability obtained by analyzing of KDML 105 brown rice thirteen times a day was 4.01 % and the relative standard deviation of reproducibility of seven times in each day for five days was 4.35 %.

C0090-SYNTHESIS, CHARACTERIZATION OF CHROMIUM COMPLEXES AND APPLICATIONS IN OXIDATION REACTION

Poonsuk Poosimma¹, Sujitra Youngme¹, Chaveng Pakawatchai² and Somying Leelasubcharoen¹*

¹Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen,

²Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Thailand,

E-mail address: poosimma@yahoo.com

Abstract: Reactions of $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ with phen as bidentate ligand in methanol and dien as tridentate ligand and in ethanol gived $[\text{Cr}(\text{phen})(\text{H}_2\text{O})_2\text{Cl}_2]\text{Cl} \cdot \text{H}_2\text{O}$ (1) and $[\text{Cr}_2(\text{dien})_2(\text{OH})_2\text{Cl}_2]2\text{Cl} \cdot 2\text{H}_2\text{O}$ (2) respectively. Both complexes were characterized by spectroscopic method and structural determined by X-ray diffraction. Complex 1 is a monomer with octahedral geometry and crystallized in orthorhombic space group Pccn. Complex 2 crystallized in the crystal system of triclinic space group P1.

C0091-Synthesis, Characterization and Investigation the Catalytic Reactivity of Chromium Complex for Ethylene Polymerization

Yuppharat Pinkaew¹, Choosak Poonsawat¹, Chaveng Pakawatchai² and Somying Leelasubcharoen¹*

¹Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand.

²Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90112, Thailand.

Abstract: To synthesize and characterize of chromium complex with N,N-substituted ligands. Procedures are given for the preparation of chromium complex with 2,2'-bipyridine (bpy), yielding $[\text{Cr}(\text{bpy})\text{Cl}_2(\text{H}_2\text{O})_2]\text{Cl} \cdot \text{H}_2\text{O}$. Characterizations were performed by IR, NMR, ESR and UV-vis spectroscopy, magnetic moment, elemental analysis as well as a single crystal X-ray diffraction. The crystal structure was determined and revealed as an octahedral geometry. The molecular structure of the complex crystallized in the orthorhombic space group Pccn , with unit cell dimensions of $a = 6.8781(1) \text{ \AA}$, $b = 11.9147(11) \text{ \AA}$, $c = 20.2969(18) \text{ \AA}$, and $\alpha = 90^\circ$, $\beta = 90^\circ$, $\gamma = 90^\circ$. The magnetic moment of $3.55 \mu\text{B}$ is consistent with a chromium (III) ion. The complex decomposes at 275.0°C .

C0092-Plasticity Effect in a series of $[\text{Cu}(\text{dpyam})_2(\text{NCO})]\text{Y}$, $\text{Y} = \text{Br}^-$, NO_3^- , PF_6^- and ClO_4^- : Crystal Structures and Electronic Properties

Jaturong Phatchimkun¹, Unchulee Suksangpanya¹, Chaveng Pakawatchai² and Sujittra Youngme^{1*}

¹Department of Chemistry, Faculty of science, Khon Kaen university, Khon Kaen 40002, Thailand;

²Department of Chemistry, Faculty of science Prince of Songkla University, Hatyai, Songkla 90112, Thailand;

e-mail address: jaturong.pat@chaivo.com and sujittra@kku.ac.th

Abstract: The present work involves the preparation, crystal structures, electronic properties and structural correlation of five-coordinate copper(II) complexes $[\text{Cu}(\text{dpyam})_2(\text{NCO})]\text{Br}$ (1), $[\text{Cu}(\text{dpyam})_2(\text{NCO})]\text{NO}_3$ (2), $[\text{Cu}(\text{dpyam})_2(\text{NCO})]\text{PF}_6$ (3) and $[\text{Cu}(\text{dpyam})_2(\text{NCO})]\text{ClO}_4$ (4). Complexes display the five coordinate geometries ranging from the distorted square-based pyramid ($\tau = 0.09$) to the intermediate five-coordinate ($\tau = 0.53$). The distorted geometries of $[\text{Cu}(\text{dpyam})_2(\text{NCO})]^+$ with different counter ions (Br^- , NO_3^- , PF_6^- , ClO_4^-) have been studied in relation to the electronic spectra and electronic properties of complexes.

C0093-FLOW INJECTION – BEAD INJECTION SYSTEM FOR DETERMINATION OF COPPER AT TRACE LEVEL

Apichart Boonmalai¹, Supaporn Krattap^{1,2}, Jaroorn Jakmunee^{1,2} and Kate Grudpan^{1,2}

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai, Thailand.

E-mail address: g4625162@cmu.edu

Abstract: Flow injection analysis (FIA) system with bead injection (BI) was developed for determination of low concentration of ions. Copper was chosen as a model analyte in this study. Chelex-100 resin beads were employed. Copper(II) could be determined based on the reaction between copper(II) and ammonium pyrrolidine dithiocarbamate (APDC). A yellow colour complex was monitored using colorimetric detector with a blue LED light source. The experimental conditions were optimized and the calibration curve over the concentration range of 0.10 – 1.00 ppm of copper (II) was established for 1 min sample loading time. The relative standard deviation for 9 replicated injections was found to be 3%. The proposed method was applied to determine amount of copper(II) in water sample collected from a swimming pool and in supplement food tablets. All results were in good agreement with those obtained from the FAAS method and the amount of copper shown on the label.

C0094-A SIMPLE FLOW INJECTION SPECTROPHOTOMETRIC PROCEDURE FOR DETERMINATION OF DIAZEPAM IN PHARMACEUTICAL FORMULATION

Jirayu Makchit^{1*}, Saisunee Liawruangrath¹, Boonsom Liawruangrath²

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

²Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, 50200, Thailand.

Abstract: A single channel flow injection (FI) manifold with spectrophotometric detector has been designed and fabricated for diazepam determination. A 100 μL sample and/or standard solution containing diazepam was injected into the flowing stream of 0.1 mol L^{-1} hydrochloric acid with the optimum flow rate of 6.8 mL min^{-1} . As soon as the sample reached the detector, the FI signal as a peak was recorded at 360 nm. Optimum conditions for μg amounts of diazepam were achieved. A linear calibration graph over the range of 2-110 mg L^{-1} diazepam was obtained with the regression equation of $Y = 0.2926X + 0.5896$ ($r^2 = 0.9929$). The method was very sensitive as little as 0.40 mg L^{-1} could be detected; very reproducible with the RSD of 3.3 % ($n = 11$); and very rapid with a sampling rate of 100 h^{-1} . The proposed FI procedure has been satisfactorily applied to the quantitation of diazepam in commercial pharmaceutical formulations. Results obtained were in good agreement with those obtained by conventional spectrophotometric method verified by the student t-test.

C0095-DEVELOPMENT OF A COMPUTER ASSISTED FLOW INJECTION SYSTEM FOR CHLORATE DETERMINATION

Saisunee Liawruangrath^{1,*}, Thanyarat Chuesaard¹ and Boonsom Liawruangrath²

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

²Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand.

E-mail address: scislwrm@chiangmai.ac.th

Abstract: An interfacing has been developed to connect a spectrophotometer with a personal computer and used as a readout system for development of a reversed flow injection (rFI) procedure for chlorate determination. The method is based on the oxidation of indigo carmine by chlorate in an acidic solution leading to the decrease in absorbance at 610 nm. The

decrease in absorbance is directly related to the chlorate concentration present. Optimum conditions for chlorate were examined. A linear calibration graph over the range 0.1-0.5 mg.L⁻¹ chlorate was established. The detection limit (3 σ) of 0.03 mg.L⁻¹ and the RSD of 3.2 % for 0.3 mg.L⁻¹ for 0.3 mg.L⁻¹ chlorate (n=11) together with a sample throughput of 92 h⁻¹ were obtained. Major interference for chlorate determination were found to be BrO₃⁻, ClO₂⁻ and IO₃⁻.

C0096-DETERMINATION OF pK_a OF SUBSTITUTED GUANIDINES BY AB INITIO METHOD

พุทธนา คันทิรุ่งโรจน์ชัย^{1*}, ทัศนดา สุวัชรนาถ¹, และ จำรัส ลิ้มตระกูล²

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand

²Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

E-mail address: scytt@mahidol.ac.th, paninid@hotmail.com, fscjrl@ku.ac.th

Abstract: Acidity of molecules is quantified by the pK_a value which can be determined experimentally or predicted by theory. The accurate prediction of pK_a from the first-principle still remains a challenging task due to the high accuracy required in the calculation. In practice, a balance between accuracy and computational cost has to be established. We introduce in this work the combination of an extrapolated ONIOM(G2MS) method and a continuum solvation model as a practical choice for determining the G_{gas} and G_{sol} respectively as defined in thermodynamic cycle. Our focus is on the determination of pK_a values of substituted guanidines which are a building block in several biomolecules. The results indicate that our employed method can provide a reasonable estimation of pK_a with the standard deviation of 0.93 among the molecules studied in a relatively short time.

C0097-AB INITIO PREDICTION OF pK_a AND ELECTRONIC SPECTRA OF DYE INDICATORS

สุพชากร วสุธาดิชา¹, พุทธนา คันทิรุ่งโรจน์ชัย^{1*}, และ จำรัส ลิ้มตระกูล²

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand

²Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

E-mail address: supachakae@hotmail.com, scytt@mahidol.ac.th, fscjrl@ku.ac.th

Abstract: Acidity of molecules is quantified by the pK_a value which can be determined experimentally or predicted by theory. The accurate prediction of pK_a from the first-principle still remains a challenging task due to the high accuracy required in the calculation. In practice, a balance between accuracy and computational cost has to be established. We introduce in this work the combination of an extrapolated ONIOM(G2MS) method and a continuum solvation model as a practical choice for determining the $\Delta G^{\circ}_{\text{gas}}$ and $\Delta G^{\circ}_{\text{sol}}$ respectively as defined in thermodynamic cycle. Our focus is on the determination of pK_a values of dye indicators which have a large change in electronic structure upon the protonation process. The results indicate that our employed method can provide a reasonable estimation of pK_a with the standard deviation of 0.94 among the molecules studied in a relatively short time. Additionally we investigated the change of electronic spectra, hence the colour, of the dye indicator upon the protonation process by using the ZINDO method. However this ZINDO can predict the colour change only qualitatively.

C0098-DENSITY FUNCTIONAL THEORY CALCULATION OF SCALING FACTORS FOR ZERO-POINT VIBRATIONAL ENERGY

เมศวิทย์ สุภวณิช, พุทธนา คันทิรุ่งโรจน์ชัย*

Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand

E-mail address: g4636458@student.mahidol.ac.th, scytt@mahidol.ac.th

Abstract: The scaling factors which is used to convert the calculated zero-point vibrational energy to match the experimental value were determined at the density functional theory level for several combinations of exchange-correlation functionals and basis sets. Thirty-nine compounds were considered in a test set for a statistical least-square fitting process.

C0099-Determination of Metals in Seasalt by GFAAS

Aungkoon Bunya and Marisa Arunchaiya

Department of Chemistry, Faculty of Science, Kasetsart University, Jatujak, Bangkok 10900, Thailand.

E-mail address: tojo@chairo.com, fscimsa@hotmail.com

Abstract: Determination of some metals (Cu, Fe and Pb) in seasalt by graphite furnace atomic absorption spectrometry (GFAAS) has been developed. Ongard II M and chelex 100 (both containing iminodiacetate chelating resin) were used to concentrate trace amount of metals in seasalt sample and separate metal from matrix salt. The seasalt sample was dissolved in 2% HNO₃ and mixed with acetate buffer (pH 6.0-7.0). The sample solution was passed through the columns then acetate buffer and water was subsequently passed through the columns to clean the columns. Finally 1 M HNO₃ was used for a total eluting of metals from the columns. The final effluent was then determined for amount of metals by GFAAS. The result showed that trace metals of ppb level in seasalt could be determined by this method with good recovery.

C0100-OXIDATION OF CYCLOOCTANE CATALYSED BY CLAYS SUPPORTED IRON COMPOUND CATALYSTS

Parichat Damrongpong, Wimonrat Trakampruk*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

E-mail address: twimonra@hotmail.com

Abstract: In this work, clays supported iron compound catalysts were synthesized and used in oxidation of cyclooctane. Iron compounds in 2.5, 5 and 10 equivalents with respect to exchangeable cation in clay were loaded onto clays (bentonite, kaolin and talcum). The catalysts were characterized using FT-IR, XRD, and AA spectroscopy. Reaction products are cyclooctanone and cyclooctanol, characterized by GC. The parameters affected the oxidation including type and amount of oxidants, type of solvents, type and amount of iron compounds, reaction time and type of supports. It was found that bentonite supported iron compounds show the highest activity using *tert*-butyl hydroperoxide as oxidant at 70°C with 15% conversion and %selectivity (one: ol) = 82:18. In addition, it was also tested that the catalysts can be reused.

C0101 -ETHANOL CONVERSION TO LIGHT OLEFINS USING MORDENITE CATALYSTS

Sirinapa Arenamart, Wimonrat Trakanpruk

Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

E-mail address: wimonra@hotmail.com

Abstract: In this work, conversion of ethanol to light olefins was studied using mordenite catalysts. The main product was ethylene. The catalysts were prepared and characterized using FT-IR, BET, XRD, and XRF techniques. Parameters affecting the ethanol conversion were studied: type of metals and temperature. Comparing type of metal, it was found that Zn has higher selectivity to ethylene than Mn and Co. Using two different types of metals, it was found that Zn-Mn has higher selectivity to ethylene than Mn-Co. Selectivity to methane was increased. When increasing temperature from 350 to 550°C, selectivity to methane was increased but selectivity to ethylene was decreased.

C0102-SYNTHESIS AND CATALYTIC ACTIVITY OF IRON OXIDES PILLARED HECTORITE

Tanawat Kanjanaboonmalert, Nipaka Sukpirom and Soamwadee Charanansutcharit*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330,

E-mail address: ssuwanak@sc.chula.ac.th

Abstract: Iron oxides pillared hectorite (Fe-pillared hectorite) with various iron content from 0.5-10 meq/g of clay, were synthesized by intercalation method. All Fe-pillared hectorites were characterized using X-ray diffraction (XRD), AA spectroscopy and N_2 adsorption techniques. After calcination at 300°C for 5 hours, the d-spacing of the samples were reported in the range of 11-15 Å. The catalytic activities of Fe-pillared hectorites were performed for alkylation of benzene with 1-dodecene. The results showed high conversion of 1-dodecene and high selectivities to 2-phenyl and 3-phenyldodecane products which are the best biodegradable isomers in environments.

C0103- $La_{1-x}Sr_xCo_{1-y}Fe_yO_{3-\delta}$ perovskite oxides: Effect of amounts of Sr^{2+} and Fe^{3+} on the phase purity and kinetic study of precursor

Nitiphong Jirathiwathanakul, Oravan Sanguanruang*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330,

e-mail address: oravan_s@chula.ac.th

Abstract: The perovskite materials of $La_{1-x}Sr_xCo_{1-y}Fe_yO_{3-\delta}$ (LSCF) were synthesized by citrate method and calcined at 800 °C. The membranes were prepared by pressing LSCF powder using an uniaxial pressing machine to form the discs and sintering at 1200-1400 °C for 10 hours. The phase purity of perovskite powders and membranes were examined by the X-ray diffraction. The morphology was investigated by scanning electron microscopy. It was found that the secondary phase appeared when amount of Sr and Fe more than 0.4 mole ratio. In addition the kinetics of perovskite precursor (LSCF) in acidic and basic conditions were studied by stopped-flow spectrofluorimetry. The rate constant of the reaction (k) in acid condition equals to $3.057 \times 10^3 \text{ M}^{-1}\text{s}^{-1}$ which is much faster than that in basic condition. The mechanisms of both reactions are dissociative interchange (I_d) supported by positive value of entropy of activation ($\Delta S^\ddagger$).

C0104-The Components and Anticancer Activity of the Volatile Oil from *Streblus asper*

Weerachai Phutdhawong,^{1*} Arvorn Donchai,^{1,4} John Korth,² Stephen G. Pyne,² Pornnipa Picha,³ Jarunya Ngamkham¹ and Duang Buddhasukh⁴

¹Department of Chemistry, Maejo University, Chiang Mai 50290, Thailand.

²Department of Chemistry, University of Wollongong, NSW, 2522, Australia

³National Cancer Institute, Department of Medical Services, Ministry of Public Health, Bangkok, 10400, Thailand

⁴Department of Chemistry, Chiang Mai University, Chiang Mai, 50202, Thailand.

*Corresponding authors to Dr. Weerachai Phutdhawong, e-mail : weerachai@mjmu.ac.th

Abstract: The purposes of this work was to determine the anticancer and antioxidant properties of the volatile oil of *S. asper* leaves and to identify the volatile components using gas chromatography (GC-FID) and gas chromatography/mass spectrometry (GC-MS). The volatile oil from fresh leaves of *Streblus asper* Lour. was isolated by hydrodistillation and analyzed through a combination of gas chromatography (GC-FID) and gas chromatography/mass spectrometry (GC-MS). The essential oil was obtained in 0.005 % yield as a brown liquid. The major constituents of the volatile oil of *S. asper* were phytol (45.1 %), α -farnesene (6.4 %), *trans*-farnesyl acetate (5.8%), *carryophyllene* (4.9%), and *trans-trans*- α -farnesene (2.0%). In addition, the volatile oil showed anticancer activity ($ED_{50} < 30 \mu\text{g/mL}$) from cytotoxicity primary screening tests with P388 (mouse lymphocytic leukemia) cells but no significant antioxidant activity (IC_{50} values of $>>100 \mu\text{g/mL}$) in a DPPH radical scavenging assay.

C0105-The Determination of Procaine by Flow Injection Analysis with Cerium(IV)

Nisa Nauangchamnong, Riantong Seetongchairungrot, Yot Kijchanalert, Napaporn Youngvises
 Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Thani, Thailand 12121
nisanan2003@yahoo.com

Abstract: Flow Injection Analysis Technique was developed for determining of procaine hydrochloride using the reaction of procaine and Cerium(IV) sulfate tetrahydrate and monitoring the color changing by spectrometer at 580 nm. The calibration graph was linear in the range of 5.0 – 150 $\mu\text{g ml}^{-1}$ and R^2 0.9991. Detection limit was 3.6 $\mu\text{g ml}^{-1}$ and % recoveries were 102-106. RSD of 11-replicate injection was 0.1%. This system can be applied for determination of procaine in injection preparation.

C0106- Dynamics of Rigidly Rotating Spiral Wave under Local Feedback Control in the Light-Sensitive Belousov-Zhabotinsky Reaction

Chanante Uthaisar* and On-Uma Kheowan.

Chemical Physics, Department of Chemistry, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand; email: g4437290@student.mahidol.ac.th, seokw@mucc.mahidol.ac.th

Abstract: Rigidly rotating spiral waves are investigated in the light sensitive excitable Belousov-Zhabotinsky reaction under local feedback control. Each light pulse is applied at the moment that corresponds to the passage of the wave front through a particular measuring point of the excitable medium. For a small distance (less than 0.15 of the spiral wavelength) between the measuring point and the initial core location of the unperturbed spiral wave, a resonance attractor with hypocycloidal shape is observed, whereas for a larger distance an epicycloidal resonance attractor occurs. The size of the attractors can be changed by introducing a time delay into the feedback loop. Experimental results are compared with an earlier developed theory on the resonance attractor.

C0107-COMPARATIVE STUDIES ON ANALYTICAL OF LEAD IN PTT PUBLIC COMPANY LIMITED GASOLINE, THAILAND

Jinda Yuenyongchaiwat*, Suneerat Pipatmanomai^a, Wasana Chamnan^a, Nattaya Poolkeaw^a, and Supap Silapakamprirapap^b
^aDepartment of Chemistry, Faculty of Science and Technology, Bangkok Rajabhat University, Bangkok 10600, Thailand; ^b Quality Control Division, PTT Public Company, Bangkok 10260, Thailand
 e – mail address : junday@yahoo.com,

Abstract: The experimental research aimed at comparing the analytical methods for determination of lead content in PTT (Petroleum Authority of Thailand) gasoline. The representative gasoline samples were extracted with iodine monochloride and analyzed by Inductively Coupled Plasma Atomic Emission Spectrometer (ICP-AES) and Atomic Absorption Spectrometer (AAS). The other method used was the extraction of the gasoline samples with iodine and tetraethyl ammonium chloride and subsequently analyzed by UV-VIS Spectrophotometer for determination of lead content. Gasoline samples were collected from gas stations situated in Bangkok-Yai, Bangkok-Noi, and Thonburi area. The accuracy of lead content analysis was presented as the percentage recovery and the precision. The results of lead content in PTT gasoline determined by ICP-AES were in the range of 0.1260-0.2122 mg/L, and by AAS were in the range of 0.0256-0.0669 mg/L. The lead content in gasoline could not be determined using UV-VIS Spectrophotometer because of the amount of lead content in gasoline lower than the detection limit. The results by the three analytical methods show that the lead content in the representative gasoline samples were below the maximum standard set by the Ministry of Energy. Comparison of results from the three analytical methods for lead content determination in PTT Public company limited gasoline showed the difference in statistical significance at level 95%. However, it might be concluded that ICP-AES is a suitable analysis method for sample with the lead content less than 0.1 mg/L.

C0108-THE ROLE OF ZEOLITE ON THE CONVERSION OF PALM OIL INTO METHYL ESTERS

Nareerat Thongchai, Udom Nusalo, Surin Laosooksathit

*Department of Industrial Chemistry, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand

E-mail address: sls@surin@hotmail.com

Abstract: Palm oil cannot be used directly as a diesel engine fuel because it has a higher viscosity than fuels obtained from petroleum products. Palm oil must be converted into smaller molecules (e.g., methyl esters) before it can be used as a diesel fuel. In this research, the conversion of palm oil into methyl esters has been successfully carried out by a transesterification method that uses nitric acid absorbed on zeolite as a transesterification catalyst and with palm oil and methanol in the ratio of 1:3 by volume. The best yield of 37% of methyl esters was obtained using a transesterification catalyst of 9 M of nitric acid absorbed on 3 g of zeolite and with a reaction time of 5.5 hours. It was also found that increasing the amount of zeolite tended to minimize the time required for product washing because zeolite has an ability to absorb some of the nitric acid.

C0109-THE EFFECT OF SOL GEL METHOD ON THE STRUCTURE OF CERIUM/TiO₂ (ANATASE) CATALYST

Ramida Rattanakam and Attera Worayingyong*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand;

E-mail address: wasnotptz@hotmail.com, fscriarw@ku.ac.th

Abstract: Preparation of cerium/TiO₂ (anatase) by sol-gel method was presented as an example in control of molecular scale mixing to produce active metal oxide phase suitable in catalysis. The relative activities of precursor hydrolysis and condensation were proved to dictate the structure of gel network in forming TiO₂ (anatase) and cerium/TiO₂ (anatase) after calcination as a result. The prepared gel from low mole ratio of water to titanium precursor (titanium(IV)bis(ethylacetoacetato)diisopropoxide) exhibited mainly active anatase phase of titanium oxide. Active cerium ion on TiO₂ (anatase), produced from the cerium nitrate which was readily hydrolyzed and the condensation reactivity was different from the titanium precursor, otherwise inactive cerium titanium oxide compound formed instead.

C0110-DESIGN LAB ON A CHIP WITH OPTICAL SENSOR FOR DETERMINATION OF COPPER (II) IN MICRO FLOW SYSTEM

Tapparath Lelasattarakul¹, Napaporn Youngvives², Winai Ouangpipath² and Saisunee Liawruangrath^{1*}

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Department of Chemistry, Faculty of Science and Technology, Thammasat University, Pathum Than 12121, Thailand.

³Division of Analytical Chemistry, Department of Chemical Technology, Rajamangala Institute of Technology, Bangkok Technical Campus, Bangkok 10120, Thailand

E-mail: Tapparath@hotmail.com

Abstract: The design lab on a chip with an optical sensor for determination of copper (II) in micro flow system was described. The system consisted of PDMS top plate and a planar glass chip. The fiber optic sensor was used to monitor the Cu(II)-Zincon complex after mixing the solution of Cu(II) and 2-carboxy-2'-hydroxy-5'-sulfoformazyl benzene (Zincon) in the universal buffer pH 9 in a single line network on a chip. The geometry of the channel network on a chip was 50 µm width and 150 µm depth. The PEEK tube (0.5 i.d. x 10 mm) on the vertical axis at the end of the channel acted as flow through cell with 10 mm path length which protected any stray and scattering radiations. The light absorption was directly monitored on a chip at 610 nm using fiber optic spectrometer. The calibration graph was linear over the range 0.1–3.0 µg mL⁻¹ Cu(II) with a correlation coefficient 0.9991. Both RSD for 10-replicate measurements and repeatability (n = 10) were less than 3%. This design is simple, portable which can be applied to determine Cu(II) in waste water from electroplating industry.

C0111-ADSORPTION OF COPPER (II) IONS ON DIFFERENT MATRICES

Urai Tengjaroenkul^{*}, Chawlit Prasertsomboon, and Natthapong Jongrak

Department of Chemistry, faculty of Science, Chiangmai University, Chiang Mai, Thailand

E-mail address: urai.c@chiangmai.ac.th

Abstract: The adsorption of Cu(II) ions from aqueous solutions at room temperature on activated carbon, diatomaceous earth, and zeolite have been investigated. The solid materials were preliminary characterized on some parameters such as particle size distribution, iodine number, water retention capacity, and total cation exchange capacity. Adsorbed amounts of Cu(II) ions were obtained from the determination of Cu concentration left in the solutions by atomic absorption spectrophotometry. Optimum adsorption time for all matrices was 12 hr and the effect of solution pH was observed. Adsorption behavior of Cu(II) ions could be interpreted by Langmuir and Freundlich isotherms that applied to monolayer adsorption. For all matrices, adsorption capabilities increased with pH from 3 to 6. Maximum adsorption capabilities occurred at pH 6 were found in a range of 2.53–4.11 mg/g.

C0112-Determination of Resveratrol in Grapes and Wine Grapes Using High Performance Liquid Chromatography

Yongyuth Tundulawessa¹, Waradool Chutrtong¹, Atchara Buachuen²

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110

²Kanjanapisakevitayalai, Hancar District, Uthai-tani Province

Abstract: The quantitative analysis of resveratrol were studies in red wine and grape berries by HPLC with photodiode array, compared with a fluorimetric detector. The reveratrol had been identified to decrease(3) chloesterol and triglyceride deposition in liver(2,5), to inhibit blood platelet aggregation(4),and anticancer(6) by inhibiting enzyme cyclooxygenase(2,3,6), inaddition to protect atherosclerosis(4). Thus grape berries were interest in the better choice for people to consume than expensive wine-drinking. Resveratol (3,5,4'-trihydroxy stilbene) is a compound found both free and as glycosides in two isomeric forms(1), cis-trans-resveratol as shown in Fig 1

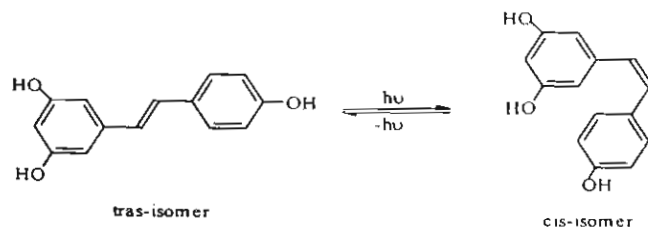


Fig.1 Chemical structures of trans- and cis-resveratrol (3,5,4' trihydroxystilbene)

C0113-STUDY OF MAILLARD REACTION IN MODEL SYSTEMS BETWEEN STANDARD SUGAR AND AMINO ACID

Pompimol Muangthai^{*}, Pichit Sutta, Peerapong Nichamnarn, Thanawan Boonyasakscri

Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand
E-mail address: pompi@swu.ac.th, pompimolm@yahoo.com

Abstract: Maillard reaction is nonenzymatic browning reaction which occurs from reaction between sugar and amino acid. This reaction gave many products and finally the darkbrown color products. In this work, hydroxymethylfurfural contents which is one of Maillard product were analysed in model systems between amino acid lysine, cysteine with glucose, fructose, lactose and sucrose. The effect of variation of time between 0.08, 5, 10 and 30 min and variation of temperature between 60, 80 and 100 °C were studied using Ultraviolet Spectrometry. The results presented that cysteine reacted with all those 4 sugars better than lysine in Maillard reaction which occurred at same temperature and time. However, this work also confirmed that Maillard reaction depends on temperature and heating time in the system.

C0114-Isolation and Antimicrobial Activity of *Spilanthes acmella* Murr.

Saowapa Suphamong¹, Supaluk Prachayasittikul¹, Rungrot Cherdtrakulkiat², Virapong Prachayasittikul² and Somsak Ruchirawat³

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

²Department of Clinical Microbiology, Faculty of Medical Technology, Mahidol University, Bangkok 10700, Thailand

³Laboratory of Medicinal Chemistry, Chulabhorn Research Institute, Bangkok 10210, Thailand

Abstract: *Spilanthes acmella* Murr., a Thai medicinal plant has been used for treatment of toothache, local anesthetic and analgesic. Crude ethyl acetate of *Spilanthes acmella* Murr. was isolated by chromatographic methods to give 3-acetylauritic acid 1, vanillic acid 2 and β -sitosterone 3. Their structures were elucidated by spectroscopic methods. Antimicrobial activity of fractions and isolates was studied against 28 strains of microorganisms. The results showed that fraction E3 completely inhibited the growth of *C. diphtheriae* NCTC 10356 at 128 μ g/mL. In addition, Fractions E4 and E14 completely exhibited antgrowth activity against *C. diphtheriae* NCTC 10356 at 64 μ g/mL.

C0115-PRECONCENTRATION TECHNIQUE USING ACTIVATED CARBON FOR DETERMINATION OF METALS IN FISH

Pornlada Daorattanachai, Fuangfa Unob, and Apichat Imyim

Environmental Analysis Research Group, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand, Tel. 02 218 7607

E-mail: p_pornlada@hotmail.com, Fuangfa u@chula.ac.th, apichat@chula.ac.th

Abstract: A preconcentration procedure in SPE technique using an activated carbon column was developed for the determination of trace levels of Cd, Cu, Ni, Pb and Zn in aqueous solution obtained from digestion of fish tissue. Ammonium pyrrolidinedithiocarbamate (APDC) was used to form metallic complexes that could be retained in the column. The metal concentrations were determined by AAS. The effect of flow rate, amount of APDC and pH were also investigated. The present method was validated. The MDL were 11.70, 10.60, 13.40, 10.05, and 12.65 μ g/kg for Cd, Cu, Ni, Pb and Zn, respectively. %recovery and % RSD were within a range of 81.87 – 101.06 % and 0.64 – 15.28 % respectively.

C0116-SYNTHESIS MODIFICATION AND CHARACTERIZATION OF SUPERCONDUCTOR $\text{Bi}_2\text{Ca}_2\text{Sr}_2\text{Cu}_3\text{O}_x$

Seiney Kruanetr¹, Saowanee Rattanaphani², Wichit Rattanaphani² and Saisunee Liawruangrath¹

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200.

²School of chemistry Suranaree University of Technology, Nakhon Ratchasima 30000.

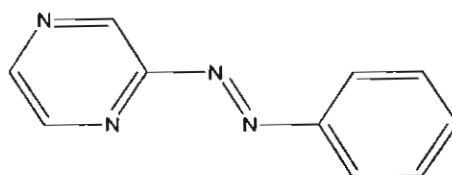
Abstract: High temperature superconductor of $\text{Bi}_2\text{Ca}_2\text{Sr}_2\text{Cu}_3\text{O}_x$ was synthesized from Bi_2O_3 , SrCO_3 , CaCO_3 and CuO by evaporation to dryness method. The metal ions of the oxides were prepared by dissolving in nitric acid. Appropriate volumes of each solution were taken and mixed to obtain the desired atomic ratio followed by evaporation to dryness. The precipitated powder was calcined at 800-830 °C. After pressing into pellets, the samples were sintered at 840-870 °C. The comparison of the 2223 superconductor was modified by partial substitution of Bi and Sr with Pb and Ba respectively to improve the superconductivity. The prepared superconductors were characterized by Meissner effect, and the T_c value. The superconductor that exhibited the maximum T_c ($T_c = 107$ K and the T_c onset 120 K) of Bi : Pb : Ca : Sr : Ba : Cu = 1.4 : 0.6 : 2 : 1.9 : 0.1 : 3.

C0117-SYNTHESIS AND SPECTROSCOPIC STUDIES OF RUTHENIUM COMPLEX WITH 2-(PHENYLAZO)PYRAZINE LIGAND

Kanidtha Hansongnem¹, Duangrat Thongkum²

¹Department of Chemistry, Faculty of Science, Prince of Songkla University, Hatyai, Songkla 90112, Thailand.

²Department of Chemistry, Faculty of Science and Technology, Nakhon Si Thammarat Rajabhat University, Meang, Nakhonsithammarat 80280, Thailand.



2-(Phenylazo)pyrazine (azine)

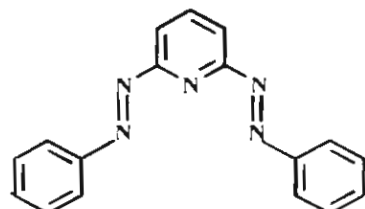
Abstract: 2-(Phenylazo)pyrazine (azine) is a new bidentate ligand in the azomine family and was reacted with $\text{RuCl}_3 \cdot 3\text{H}_2\text{O}$ in dimethyl formamide solvent under refluxing condition. The blue- $[\text{Ru}(\text{azine})_2\text{Cl}_2]$ complex was obtained. The electronic transition of the compound was studied by UV-Visible absorption spectroscopic technique. The result from Infrared spectroscopy showed that the $\text{N}=\text{N}$ stretching mode of this complex was observed at lower frequency than azine ligand. The molecular structure of the compound was confirmed by NMR spectroscopy.

C0118-SYNTHESIS AND SPECTROSCOPIC STUDIES OF RUTHENIUM COMPLEX WITH 2,6-(DIPHENYLAZO)PYRIDINE LIGAND

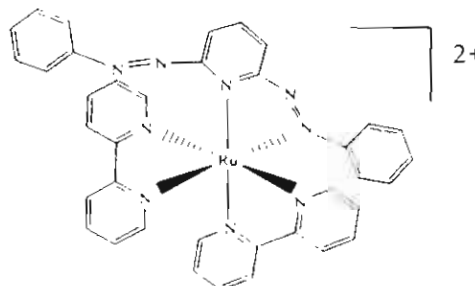
Kanidtha Hansongnem¹, Paweena Nookong²

¹Department of Chemistry, Faculty of Science, Prince of Songkla University, Hatyai, Songkla 90112, Thailand.

²Department of Chemistry, Faculty of Science and Technology, Nakhon Si Thammarat Rajabhat University, Meang, Nakhonsithanmarat 80280, Thailand



2,6-(Diphenylazo)pyridine (diazpy)
(1)



$[\text{Ru}(\text{diazpy})(\text{bpy})_2]^{2+}$
(2)

Abstract: The aim of this research is to synthesize and to characterize the $[\text{Ru}(\text{diazpy})(\text{bpy})_2]^{2+}$ complex (when diazpy is 2,6-(diphenylazo)pyridine and bpy is 2,2'-bipyridine). This complex synthesized by condensing $[\text{Ru}(\text{diazpy})\text{Cl}_2]$ with bpy in methanol. The structure of $[\text{Ru}(\text{diazpy})(\text{bpy})_2]^{2+}$ complex was confirmed by ^1H NMR and ^{13}C NMR techniques. Moreover, the electronic transition of the compound was studied by UV-Visible absorption spectroscopic technique.

C0119 -STUDY OF WATERBORNE PARTICLE SIZE SEPARATION IN NATURAL WATER BY GRAVITATIONAL SPLITT FRACTIONATION METHOD

Orapun Thawornsinsurakul², Nongnuch Tantidanai¹ and Waret Veerasai^{1*}

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400

E-mail address: scwvr@mahidol.ac.th.

²On leave for M.Sc. at AAICP-MU, Office of Atoms for Peace, 16 Viphavadee Road, Chatujak, Bangkok 10900

Abstract: Gr-SPLITT Fractionation in Full Feed Depletion mode (FFD-GrSplitt) is a binary separation technique that allows separation of particulates in fluid into two fractions. Samples can start from any cross-sectional position and are driven by the gravitational field to various equilibrium positions where they occupy different lamina before separation by the outlet splitter. The FFDGrSplitt has the advantage that no external dilution is introduced during theseparation, so that the total sample concentration is unaffected. In this study, Continuous separation of natural river water particulates has been performed by this technique based on the sedimentation coefficient, which is closely related to the particle size. The degree of separation was verified by optical microscopy.

C0120-MODIFICATION OF SCREEN PRINTED ELECTRODE FOR DETECTION OF HYDROGEN PEROXIDE : A KEY COMPOUND IN MANY ENZYMIC REACTIONS

Tanin Tangkuaram and Waret Veerasai*

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Road, Bangkok 10400, Thailand.

*E-mail address : scwvr@mahidol.ac.th

Abstract: Cobalt protoporphyrin IX (CoProP) complex was modified in polypyrrole (PPy) conducting film on a disposable screen printed carbon electrode (CoProP/PPy/SPCE). The CoProP/PPy/SPCE was studied by cyclic voltammetry (CV) for electrocatalytic oxidation of hydrogen peroxide (H_2O_2) between ranges -0.25 V to +0.25 V vs. Ag/AgCl pseudo reference electrode at a scan rate 0.1 V/s in 0.1 M Na-citrate buffer solution pH 6.0. The signal to background current ratio of CoProP/PPy/SPCE was better than that of CoProP/SPCE whatever of PPy/SPCE no reaction occurred. The CoProP/PPy/SPCE shows a wide linear response to H_2O_2 in the range of 10-100 μM , with a sensitivity 0.845 nA/ μM as well as good detection limit was 7.95 μM at 3σ by CV current measurement at +0.2 V.

C0121-PROTONATION OF SCHIFF BASE LIGANDS AND THEIR ZINC AND NICKEL COMPLEXES IN METHANOL

Hussadee Detsen¹, Vithaya Ruangpornvisuti¹, Nuanphun Chantarasiri^{1*}, Nongnui Muangsini¹ and Narongsak Chaichit²

¹Department of Chemistry, Faculty of Science, Chulalongkorn University 10330, Bangkok, Thailand; e-mail address: Hussadee_D@yahoo.com

²Department of Physics, Faculty of Science and Technology, Thammasat University at Rangsit, Pathumthani 12121, Thailand

Abstract: Protonation constants of Sal_2trien , $\text{Sal}_2(\text{OMe})\text{trien}$, $\text{Sal}_2(\text{OEt})\text{trien}$, and stability constants of their zinc and nickel complexes were determined by potentiometric titration technique using 1.00×10^{-2} M $\text{Bu}_4\text{NCF}_3\text{SO}_3$ in methanol at 25 °C. Stability constants in terms of $\log K$ are 4.56 ± 0.05 , 4.30 ± 0.11 , 3.76 ± 0.09 for $\text{ZnSal}_2\text{trien}$, $\text{ZnSal}_2(\text{OMe})\text{trien}$, $\text{ZnSal}_2(\text{OEt})\text{trien}$ and 4.80 ± 0.17 , 5.77 ± 0.14 , 7.08 ± 0.03 for $\text{NiSal}_2\text{trien}$, $\text{NiSal}_2(\text{OMe})\text{trien}$, $\text{NiSal}_2(\text{OEt})\text{trien}$, respectively. Binding and complexation energies of these complexes were computed using DFT method.

C0122-Hydrolysis reaction mechanism of methoxide species to methanol over Fe-ZSM-5 catalysts investigated by an ONIOM method.

Suwat Pabchanda, Piboon Pantu, Jumras Limtrakul*

*Laboratory for Computational and Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand; e-mail address: fscijrl@ku.ac.th

Abstract: The hydrolysis reaction mechanism of methoxide species to methanol over Fe-ZSM-5 catalysts has been investigated using the ONIOM (Our-own-N-layer Integrated molecular Orbital + molecular Mechanics) approach with a 46T cluster of Fe-ZSM-5 zeolite modeled by the ONIOM2(B3LYP/6-311+G(3df,2p):UFF) method. The activation energy for hydrolysis of methoxide species, $\text{Z}[(\text{HO})\text{Fe}(\text{OCH}_3)]$ to form adsorbed methanol product, $\text{Z}[\text{Fe}(\text{OH})_2(\text{HOCH}_3)]$ is 13.7 kcal/mol. The $\text{Z}[\text{Fe}(\text{OH})_2]$ then reacts with the excess water vapor to form the initial state of the active site $\text{Z}[\text{FeO}]$. The predicted activation energy for this process is 19.4 kcal/mol. These results are apparently identical to the experimental observation.

C0123-Effects of substituted groups to the energetic profile of Beckmann rearrangement of formaldehyde oxime on H-Faujasite zeolite

Jakkapan Sirijaraensre and Jumras Limtrakul*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand; e-mail address: fscijrl@ku.ac.th and jakkapan@lcac.ku.ac.th

Abstract: The heterogeneous catalytic Beckmann rearrangement (BR) on a FAU catalyst has been investigated by both the quantum cluster and embedded cluster approaches at the B3LYP level of theory using the 6-31G (d,p) basis set. Our calculation indicates that the rate determining step of reaction is the rearrangement step. Our finding found that the catalytic activity of zeolite depends on the suitable size of the adsorbate molecule with the pore size of the zeolite. Increasing the size of the oxime compound from formaldehyde oxime to Z- and E- methyl formaldehyde oxime, the activation energy, especially, in the rearrangement step is decreased from 58.0 to 27.1 and 31.1 kcal/mol for Z- and E- methyl formaldehyde oxime, respectively. This indicates that the shape-selectivity of zeolite plays an important role to the reaction.

C0124-CALCULATING NMR CHEMICAL SHIFTS OF NEVIRAPINE IN GAS PHASE AND DMSO SOLVATION MODEL

Veeramol Vailikhit, Theerachart Leepasert, Supana Techasakul, and Supa Hannongbua

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
E-mail : g4584026@ku.ac.th

Abstract: The structure of the HIV-1 reverse transcriptase inhibitor, 11-cyclopropyl-5,11-dihydro-4-methyl-6H-dipyrido[3,2-b:2',3'-e][1,4]diazepin-6-one (nevirapine) has been investigated by NMR chemical shift calculations. The option of reaction field calculation in Gaussian 03 using the IEF-PCM model has changed in meaning with respect to Gaussian 98 thus the ^1H and ^{13}C chemical shift calculations with Gaussian 98 and 03 programs were compared. Based on B3LYP/6-31G** optimized geometry, GIAO calculations were performed at the B3LYP/6-311++G** level by Gaussian 98 and 03 programs. Correlation between experimentally determined ^1H -NMR and ^{13}C -NMR chemical shifts in DMSO solutions and GIAO-calculated chemical shifts included with the solvent effect using SCRF-IEFPCM solvation model at B3LYP/6-311++G** level are reported and compared. The obtained ^1H -NMR and ^{13}C -NMR calculation results of Gaussian 03 agree well with experimental results but it used less CPU time than Gaussian 98 program.

C0125-GROUND STATE GEOMETRY ANALYSIS OF 2-pyridine-(9,9'-diethylfluorene) BASED DYAD; QUANTUM CHEMICAL CALCULATIONS APPROACH

Rungtiwa Chidthong, Potjaman Poolmee, Wichanee Meeto and Supa Hannongbua

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand; E-mail address: rchuenta@yahoo.com, fscisph@ku.ac.th

Abstract: Conformational analysis of 2-pyridine-(9,9'-diethylfluorene) was performed by using HF/3-21G* and B3LYP/6-31G* methods. The obtained results were compared and it was found that there are two minima at 10.4 and 169.6 degrees, calculated by HF/3-21G* and 17.4 and 162.6 degrees, calculated by B3LYP/6-31G*, respectively. The similar results were obtained from both methods. The estimated electronic properties of this dyad were then performed.

C0126-THEORETICAL STUDY OF METHYL TERT-BUTYL ETHER (MTBE) FORMATION FROM ISOBUTENE AND METHANOL OVER ZSM-5 ZEOLITE:AN ONIOM STUDY

Karan Bobuatong and Jumras Limtrakul*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand; e-mail address: fscijrl@ku.ac.th

Abstract: The complete reaction mechanism for the etherification of isobutene and methanol over ZSM-5 zeolite was investigated theoretically by means of ONIOM2 (B3LYP/6-31G(d,p)/UFF), and the influence of the zeolite framework on the geometries of the species involved and on activation reaction energies were analyzed. The etherification starts with the protonation of the adsorbed isobutene by an acidic zeolite proton leading to the formation of the tert-butyl carbenium ion intermediate and, subsequently, the tert-butyl carbenium ion reacts with a methanol molecule forming a methyl tert-butyl ether (MTBE) product. The computed adsorption energy of isobutene is -15.48 kcal/mol, which compared well with the experimentally reported values of -17.4 kcal/mol. The computed activation energies are 20.20 and 28.99 kcal/mol for the first and second step, respectively.

C0127-THE ETHYLENE DIMERIZATION OVER FAUJASITE ZEOLITE INVESTIGATED BY THE ONIOM METHOD

Supawadee Namuangruk, Pihoon Pantu and Jumras Limtrakul*

Laboratory for Computational and Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand

E-mail address: supawadeenamuangruk@yahoo.com and fscjrl@ku.ac.th

Abstract: The ethylene dimerization has been investigated using an 841 cluster of faujasite zeolite modeled by the ONIOM2(MP2/6-311++G(d,p)/HF/6-31G(d)/UFF) method, which had been proved to be the accurate model for studying the reaction in zeolite [1,2]. The concerted and stepwise mechanisms have been evaluated. For the stepwise mechanism, the reaction starts with the protonation of ethylene formed ethoxide intermediate followed by C-C bond formation between ethoxide and the second ethylene molecule leading to the butoxide product. The activation barrier of the first and the second step are almost equivalent and calculated to be 30.06 and 28.87 kcal/mol, respectively. The first step is the rate-determining step. For the concerted mechanism, there are no ethoxide intermediate occurring during the reaction (the protonation and C-C bond formation occur simultaneously at one transition state). The activation barrier of the concerted mechanism is evaluated to be 38.08 kcal/mol, which has an energy barrier higher than the stepwise mechanism. Therefore, the stepwise mechanism dominates overall the deactivation reaction. The dominated mechanism of both benzene alkylation from previous study [2] and the ethylene dimerization in this study are compared. The activation barrier of the concerted mechanism of benzene alkylation of 33.41 kcal/mol has an energy barrier higher than the stepwise mechanism of ethylene dimerization of 30.06 kcal/mol. Therefore, the ethylene dimerization occurs faster than the benzene alkylation.

C0128-THE ONIOM STUDY OF THE SURFACE SPECIES PRESENT IN ACETONE CONDENSATION ON H-ZSM-5 CATALYST

Bundet Bockfa and Jumras Limtrakul*

Laboratory for Computational and Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand.

E-mail address: fscjrl@ku.ac.th

Abstract: The keto-enol isomerization of acetone, which is the first step of aldol condensation, has been investigated in the gas phase, water solution and strong acid catalyzed zeolite. In the gas phase and water solution system, the MP2/6-31G(d,p) has been employed, while the ONIOM2(MP2/6-31G(d,p)/UFF) has been used for the zeolite model. The predicted activation energies of acetone on the gas phase, water solution and H-ZSM5 are 324.51 kJ/mol, 188.9 kJ/mol and 112.92 kJ/mol, respectively. The adsorption energy of acetone on H-ZSM-5 is -135.85 kJ/mol, which agrees well with the experimental data (-130 ± 4 kJ/mol). In addition, the coadsorption of acetone has been observed and the diacetone alcohol product could occur through a reasonable transition state. The calculated activation energy for aldol condensation of acetone is 53.63 kJ/mol.

C0129-DIELS-ALDER ADDITION OF SINGLE-WALL CARBON NANOTUBES AND FULLERENES WITH ELECTRON-RICH DIENES

Chompunuch Warakulwit, Suwassa Bamrungsap, Patraporn Luksirikul, Pipat Khongpracha and Jumras Limtrakul*

Laboratory for Computational & Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand;

E-mail address: fscjrl@ku.ac.th

Abstract: The transition states and products of the Diels-Alder (DA) cycloaddition of different types of dienes have been investigated within the framework of Our own N-layered Integrated molecular Orbital and molecular Mechanics (ONIOM) approach utilizing the two layered ONIOM scheme (B3LYP/6-31G* AM1). The structure and activity relationship for a series of different types of dienes interacted with armchair (5,5) single wall carbon nanotube (SWNT) was established, i.e. the reactivity of the DA has been related to the distance between the methylene carbons in the butadiene moiety ($R_{1,4}$). The reactivity becomes higher as the $R_{1,4}$ is shortened. Thus, the diene(2) (2,3-dimethylene-1,4-dioxane) with the shortest $R_{1,4}$ of 3.005 Å was found to be the most reactive one. Nevertheless, the activation energy in SWNTs reaction is still much higher than that of [60]fullerene complex, due to the increase of the curvature of dienophile. To enhance the reactivity of the DA reaction, the metal cation was introduced into the SWNTs. The decreasing of activation energy of the DA reaction seems to be due mainly to the electron deficiency nature of the double bond of Na@SWNT.

C0130-ADSORPTION OF BENZENE ON NANOPOROUS MCM-41

Bavornpon Jansang and Jumras Limtrakul*

Laboratory for Computational & Applied Chemistry, Physical Chemistry Division, Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
E-mail address: navompon@yahoo.com and fscu@kku.ac.th

Abstract: MCM-41 nanoporous materials have drawn tremendous interest from fields ranging from physics and chemistry to engineering, owing to their unique characteristics, i.e. shape- and size-selectivity. Here, the first of aromatic hydrocarbon adsorption inside in this nanomaterials has been carried out and adsorption properties are compared to known behaviors in the MCM-41. The two-layer ONIOM (Our own N-layered Integrated molecular Orbital + molecular Mechanics) methods have been carried out on nanocluster models representing MCM-41 and their complex with benzene. When carefully calibrated using the experimental observation as a benchmark, the ONIOM(B3LYP 6-311++G(d,p) UFF), in which a reaction site is treated at the B3LYP 6-311++G(d,p) level, and the rest using Universal Force Field (UFF) has been found to provide reliable information for evaluating the influence of the extended framework on the structure and energetic properties of the MCM-41 nanosystem. The predicted interaction energy for this ONIOM scheme is -15.2 kcal/mol, which agrees well with the experimental result of -14.4 kcal/mol.

C0131-The Study of Adsorption of Pyridine on H-ZSM-5 Zeolites: An Embedded ONIOM Study

Jarun Limtrakul and Jumras Limtrakul*

Laboratory for Computational & Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand

e-mail address: fscu@kku.ac.th (J. Limtrakul)

Abstract: The quantum cluster, ONIOM (Our-own-N-layered Integrated molecular Orbital + molecular Mechanics) and Embedded ONIOM models have been used to investigate adsorption properties of pyridine in H-ZSM-5 zeolites. The active site has been modeled with realistic clusters size up to 46 tetrahedra. The predicted adsorption energies of pyridine H-ZSM-5 complexes for the Embedded ONIOM2(MP2 6-31G(d,p) UFF) scheme is -45.90 kcal/mol, which corresponds well with the experimental estimate of -47.60 ± 2 kcal/mol, whereas the conventional quantum cluster yields an underestimate value of -23.72 kcal/mol. This finding clearly demonstrates that acidity does not depend only on the Brønsted group center but also on lattice framework surrounding the Brønsted site. The results obtained in this study suggest that the Embedded ONIOM approach yields a more accurate in studying adsorption of pyridine on zeolites.

C0132-A QM/MM STUDY OF ISOMERIZATION OF NITROSAMINE OVER FAUJASITE ZEOLITE

Chorchari Sonthornpalin and Jumras Limtrakul*

Laboratory for Computational & Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand

e-mail address: fscu@kku.ac.th (J. Limtrakul)

Abstract: To unravel isomerization and decomposition of nitrosamine over H-faujasite, the ab initio molecular orbital calculations (B3LYP 6-31G(d,p)) and the ONIOM2 method (B3LYP 6-31G(d,p) UFF) have been performed with three different cluster sizes, 3T, 12T, and 84T. The reaction intermediates and reaction routes are defined. Nitrosamine can decompose via trans-diazene, cis-diazene, and cis-diazene-trans-H intermediates. These reaction intermediates are not stable and quickly decompose to N₂ and H₂O. The zeolite framework stabilizes the intermediates via the formation of hydrogen bonds. These hydrogen bond interactions play an important role in the binding of intermediate species on the zeolite and the course of reaction. The interactions between the reaction intermediates and H-faujasite are relatively strong and evaluated to be 24.87, 23.49, 21.59, and 18.78 kcal/mol for the nitrosamine H-FAU, trans-diazene H-FAU, cis-diazene H-FAU, and cis-diazene-trans-H H-FAU complexes, respectively. The zeolite acid site facilitates the decomposition of nitrosamine via a series of proton transfer and isomerization reactions.

C0133-ADSORPTION OF LIGHT HYDROCARBONS IN ACIDIC MOLECULAR SIEVE ZEOLITES INVESTIGATED BY THE ONIOM METHOD

Pingjai Wongthong and Jumras Limtrakul*

Laboratory for Computational & Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand

e-mail address: fscu@kku.ac.th (J. Limtrakul)

Abstract: The ONIOM (Our-own-N-layered Integrated molecular Orbital + molecular Mechanics) approach utilizing the three-layer ONIOM3(MP2 6-311++G(d,p) HF 6-31G(d) UFF) scheme has been used to investigate the adsorption properties of light hydrocarbons in two industrially important catalysts, such as mordenite (H-MOR) and faujasite (H-FAU). With the inclusion of the basis set superposition error (BSSE), the ONIOM3 adsorption energies are predicted to be -7.90, -9.68, -11.53, and -12.62 kcal/mol, respectively for H-MOR and -5.38, -8.73, -7.26, and -10.46 kcal/mol, respectively for H-FAU, which compare well with the experimental values of ethane, ethylene, and propane, which are -7.7, -9.7, and -10.7 kcal/mol, respectively for H-MOR and -5.7, -9.0, and -7.5 kcal/mol, respectively for H-FAU. The results derived in this study suggest that the ONIOM approach provides a more accurate method for investigating the adsorption of light hydrocarbons on these zeolites.

C0134-CONFORMATIONAL ANALYSIS AND ELECTRONIC PROPERTIES OF CN-POLY(FLORENEVINYLENE) BY QUANTUM CALCULATIONS

Wichanee Meeto, Potjaman Poolmee, Supa Hannongbua*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand

e-mail address g4564020@ku.ac.th and fscisph@ku.ac.th

Abstract: Poly(fluorenevinylene) (H-PFV), CN-(polyfluorenevinylene), a new green electroluminescence polymer, (CN-PFV) and (CN2-(polyfluorenevinylene) (CN2-PFV) were studied by quantum chemical calculations. The conformational analysis and electronics properties of poly(fluorenevinylene) and its derivatives were performed, based on semiempirical, *ab initio*, and density functional methods. The potential energy surfaces of the dimeric molecules of H-PFV2 provided two local minima which corresponding to α ($\angle C1-C2-C3-C4$) around 15-30 and 150-165 degrees. Whereas PFV2-derivatives showed slightly higher torsion angle than H-PFV2. They are around 30-45 and 135-150 degrees. The extrapolated excitation energy which calculated by ZINDO//AM1 method of H-PFV, CN-PFV and CN2-PFV are 2.9, 3.4 and 3.4 eV, respectively.

C0135-A THEORETICAL STUDY OF ADSORPTION OF CARBON MONOXIDE AND NITROGEN OXIDE ON Ag-ZSM-5 ZEOLITE

Pipat Khongpracha^{1,2}, Pitti Treesukol^{1,3}, Thanh N. Truong^{*2}, and Jumras Limtrakul^{*1}

¹Laboratory for Computational and Applied Chemistry, Chemistry Department, Kasetsart University, Bangkok 10900, Thailand

² Henry Eyring Center for Theoretical Chemistry, Chemistry Department, University of Utah, 315 S 1400 E, rm 2020, Salt Lake City, Utah 84112, USA

³ Chemistry Division, Faculty of Liberal Arts and Science, Kasetsart University, Nakornpathom 73140 Thailand

E-mail address: fscijrl@ku.ac.th

Abstract: The adsorptions of CO and NO on Ag-ZSM-5 have been studied by using the Surface Charge Representation of External Embedded Potential (SCREEP) embedded cluster model at the B3LYP level of density functional theory. We found that CO adsorbs on the Ag⁺ ion in the linear configuration with the bond distance of 1.130 Å and binding energy of 18.63 kcal/mol. Adsorbed NO on the other hand has a bend configuration with the AgNO angle of 127.5° and Ag-N bond distance of 1.150 Å. The binding energy for NO is 9.24 kcal/mol. The larger binding energy in CO/Ag-ZSM-5 and different adsorption configurations between CO/Ag-ZSM-5 and NO/Ag-ZSM-5 can be explained by the use of natural bond orbital analysis (NBO). The former is found to have a stronger σ donation and also more π -back donation. We also found that the Madelung potential, incorporated in the embedded cluster model, has small perturbation on the structure and binding energy of the adsorption complexes, but it has noticeable effects on the stretching frequency of the adsorbate. It improves the agreement between the calculated frequency shifts and those of experimental observations.

C0136-MOLECULAR DYNAMICS SIMULATIONS OF THE SELF-DIFFUSION OF p-XYLENE IN SILICALITE

Tanin Nanok^{1,2}, Philippe A. Bopp² and Jumras Limtrakul¹

¹Laboratory for Computational and Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand

²Laboratoire de Physico-Chimie Moléculaire (UMR 5803), Université Bordeaux I, 351 Cours de la Libération, F-33405 Talence CEDEX, France

E-mail address: fscijrl@ku.ac.th

Abstract: Molecular dynamics computer simulations of the self-diffusion of p-xylene in silicalite have been studied. Both the zeolite and the guest molecule are modeled as flexible entities. We determine the self-diffusion coefficients as a function of temperature and loading and investigate some details of the diffusive motion and its coupling with the vibrations of the zeolite itself. At the low temperature, the diffusivity of p-xylene is mainly controlled by the p-xylene-zeolite interaction. However, this interaction becomes less important when the temperature is increased, leading to the expected temperature dependence of self-diffusion coefficient. At higher loadings, the importance of xylene-xylene interaction starts to affect the diffusion process. The space accessible to the molecules becomes more restricted when the neighboring sites in the zeolite are also occupied. It is found that the coupling between the motions of the guest molecule and zeolite itself is not negligible. The calculated diffusion coefficients are of the order of 10^{-7} to 10^{-6} cm²s⁻¹, which is the same order of magnitude as found by other MD simulations.

C0137-STRUCTURAL CONFORMATIONAL ANALYSIS OF SC558 : THE INHIBITOR OF CYCLOOXYGENASE-2, BASED ON QUANTUM CHEMICAL CALCULATIONS

Darinee Sae-Tang and Supa Hannongbua*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand.

Email address: fscisph@ku.ac.th

Abstract: A conformational analysis of SC558 was carried out in an attempt to understand the molecular flexibility in the sulfonamide dihedral angle. This conformational change is very important for fitting this inhibitor towards hydrophilic region of Val523 on COX-2 binding pocket in order to inhibit the enzyme activity. The potential energy surface as the function of the important rotatable dihedral angles of sulfonamide side chain was generated by the semiempirical (AM1 and PM3) and *ab initio* (at the HF/3-21G, HF/6-31G, HF/6-31G* and HF/6-31G** levels of calculation). The energy barriers between the different local minima are lower than 4 kcal/mol. The most stable conformation of the sulfonamide dihedral angle is restricted to 90° or 270° and the results are consistent in all levels of calculation.

C0138-SYNTHESIS OF TETRAKIS(TRIETHYLENE GLYCOL)-BIS-PORPHYRINS AND COMPLEXATION STUDY WITH ANION

Thanit Pranecnararat¹, Buncha Pulpoka^{1*}

¹Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand,

E-mail address: nnpra@hotmail.com, Buncha.P@chula.ac.th

Abstract: Tetrakis(triethylene glycol)-bis-porphyrin was synthesized in 3 steps: tosylation of triethylene glycol, nucleophilic substitution of ditosylate with salicylaldehyde and condensation of dialdehyde with pyrrole in a solvent system of propionic acid and toluene (3:10) to afford the desired product as a violet solid. The product was confirmed by using ¹H-NMR spectroscopy. Then, tetrakis(triethylene glycol)-bis-porphyrin was reacted with zinc acetate in dichloromethane to give the complexes of Zn₂(bis-porphyrins). The complexes are violet-pink solid. UV-Vis Spectroscopy confirmed that spectra of ligand and complexes were different. Complexation with various types of anions for the complexes is now under extensive investigation

C0139-Separation and Characterization of Castasterone from Seeds of *Delonix regia* Raf.

Chalev Pachthong^{1,2*}, Dumrat Supyen¹, Duang Buddhasukh¹ and Araya Jatisatien³

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

²Department of Chemistry, Faculty of Science and Technology, Rajabhat Institute Kanchanaburi, Kanchanaburi 71000, Thailand.

³Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

e-mail: pachthong_c@yahoo.com

Abstract: The castasterone in seeds of *delonix regia* Raf. was isolation and characterization. The seeds sample were extracted with organic solvent and purification. The castasterone in purified extract was characterized by gas chromatography-mass spectrometry. The result indicated that the contain amount of castasterone was 43.2 ngkg⁻¹ of fresh weight. In this study occurrence of castasterone in seeds of *Delonix regia* Raf. was demonstrated for the first time.

C0140-INVESTIGATION OF CHEMICAL COMPONENTS FROM THE EXTRACT OF *Arfeuillea arborescens* Pierre

Benjamas Chiangka, Kullaya Youngnoy and Chaalev Pachthong

¹Chemistry Program, Faculty of Science and Technology, Kanchanaburi Rajabath University, Kanchanaburi 71000, Thailand; e-mail address: bchiangka@yahoo.com

²Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract: The chemical components in flower and leave of *Arfeuillea arborescens* Pierre were studied. The flower and leave samples were extracted by mean of acidic and basic solvent -extraction, while oily residues were collected from leaves by mean of distillation. The extracts were analysed by gas chromatography-mass spectrometry. The results indicated that more than 80 compounds were obtained. Among these, 54 compounds were identified, in which 30 compounds were of the oil fraction from leaves, 16 and 21 compounds were of the extracts from flowers and leaves, respectively.

C0142-APPLICATION OF POTENTIOMETRY FOR DETERMINATION OF FLUORIDE FROM TEA PRODUCTS IN KANCHANABURI PROVINCE.

Svimon Aonlamoon^{1*}, Chalev Pachthong¹, Prin Kerd Siri¹, and Ponlayuth Sooksamiti²

¹Department of Chemistry, Faculty of science and Technology, Kanchanaburi Rajabhat University, 71000,Thailand: e-mail address: Suvimon1982@yahoo.com

²Primary Industries and mineral office3, Chiang Mai, 50202, Thailand.

Abstract: This study was carried out to quantitative analysis of fluoride in tea products, obtained tea leave, bag tea and instant tea some trade mark in Kanchanaburi province. The tea leaves and bag tea were soaked with 100 ml distilled water at 100 °C, at various time. The results indicated that fluoride concentration in tea leave, bag tea and instant tea were in the rang of 31.73±3.20-132.49±3.72, 12.85±0.50 – 95.51±16.63 and 0.37±0.03 – 1.43±0.04 ppm respectively. The percentage of recovery and relative of standard deviation was 90.59±8.50 and 2.22±1.28,detection limit 7.01x10⁻³ ppm.

C0143-IMPROVE MENT OF DOXAZOSIN DETERMINATION IN HUMAN PLASMA BY USING HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY WITH FLUORESCENCE DETECTOR

Pattana Sripalakit^{1,2*}, Penporn Nermhom² and Aurasorn Saraphanchotiwitthaya³

¹ Department of Pharmaceutical Chemistry and Pharmacognosy, Faculty of Pharmaceutical Sciences, Naresuan University, Phitsanulok 65000, Thailand

² Bioequivalent Test Center, Faculty of Pharmaceutical Sciences, Naresuan University, Phitsanulok 65000, Thailand

³ Department of Pharmaceutical Technology, Faculty of Pharmaceutical Sciences, Naresuan University, Phitsanulok 65000, Thailand

E-mail address: pattana9@excite.com

Abstract: A simple, sensitive, rapid and reproducible high-performance liquid chromatographic method was developed and validated for the determination of doxazosin in human plasma without solvent extraction procedure. This method involves plasma protein precipitation using methanol. The structurally related compound prazosin was used as an internal standard. Doxazosin was detected with high sensitivity using spectrofluorimetry. Over the concentration range 0.5-20 ng/ml, the absolute recovery values were all greater than 98%. The method has a quantification limit of 0.5 ng/ml. The coefficient of variation and inaccuracy values were all less than 7.8 and 6.2%, respectively in both intra- and inter-day. Hence the method has been applied in pharmacokinetic studies of doxazosin.

C0144-SYNTHESIS AND COMPLEXATION OF CALIX[4]ARENE-CALIX[4]PYRROLE-CROWN-5

Songtham Ruangchaithaweesuk, Nongnui Muangsin, Thawatchai Tuntulani and Buncha Pulpoka*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. E-mail address

asongtham@hotmail.com, pbuncha@chula.ac.th

Abstract: Calix[4]arene-calix[4]pyrrole-crown-5 **4** has been synthesized and characterized. The potassium and tetrabutylammonium salts have been chosen to study its complexation. By using ³¹H-NMR spectroscopy, it was found that the largest affinity for anion belonged to the fluoride ion encapsulated in the calix[4]pyrrole moiety, whereas the potassium cation located in the crown ether unit. Moreover, it was revealed that the complexation occurred quite slowly. This may be due to preorganization of the distorted of the crown ether cavity between calix[4]arene and calix[4]pyrrole which demonstrated by the X-ray structure of the calix[4]arene-calix[4]pyrrole **3**.

C0145-Synthesis of tripodal-amine hexahomotriazacalix[3](aza)crown

Chatthai Kawtong and Buncha Pulpoka*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. E-mail address

tanamisu@hotmail.com, pbuncha@chula.ac.th

Abstract: The tripodal-amine hexahomotriazacalix[3](aza)crown **4** was synthesized by condensation of *p*-chlorophenol with formaldehyde by using NaOH as catalyst to afford 4-chloro-2,6-di(hydroxymethyl)phenol **1**. Compound **1** was refluxed with benzylamine in toluene to provide *p*-chloro-N-benzylhexahomotriazacalix[3]arene **2**. Nucleophilic substitution of **2** with methyl bromoacetate afforded *p*-chloro-N-benzylhexahomotriazacalix[3]-tri(methyl acetate) **3**. Finally, compound **3** was condensed with tris(2-aminoethyl)amine to obtain the desired product, tripodal-amine hexahomotriazacalix[3](aza)crown **4**.

C0146-STUDY OF CHEMICAL CONSTITUENTS AND CYTOTOXICITY ON CANCER CELLS OF SUBSTANCES ISOLATED FROM *HEDYOTIS CORYMBOSA* LAMK.

Kamonwan Anan¹, Chantip Saeon¹, Sunan Chainakul¹, Chinda Tambunchong¹, Pornnipa Picha²

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

²Section of Experimental Oncotherapy, Research Division, National Cancer Institute, Bangkok, Thailand

E-mail address: sunan@swu.ac.th

Abstract: *Hedyotis corymbosa* Lamk. has been used in a Thai traditional medicinal with other herbs for the treatment of cancer. The crude extracts from hexane, ethyl acetate, methanol, the isolated components and fraction were tested for cytotoxicity against P388 leukemia cells. The ED50 values of the crude hexane extract was 30 µg/mL and other two crude extracts showed ED50 greater than 30 µg/mL. The crude extracts were purified by chromatographic techniques to afford five pure compounds, 3-O-acetyl aleuritic acid (**1**), salicylic acid (**2**) (ED50 = 29.80 and 66.50 µg/mL respectively), auranthamide acetate (**3**), 1,5-anhydroglucitol (**4**), β-sitosterol-3-O-β-D-glucopyranoside (**5**) and a mixture of 22,23-dihydrochondrillasterol and chondrillasterol (**6**) (ED50 21.50 µg/mL). Compounds (**3**), (**4**) and (**5**) showed ED50 greater than 30 µg/mL. Other nine toxic minor components were isolated. The structures of the compounds were elucidated by spectroscopic techniques.

C0147-HEADSPACE/GAS CHROMATOGRAPHY(HS/GC), A CLEAN TECHNIQUE FOR DETERMINATION OF BTEX IN WASTEWATER.

Winyu Chitsamphandhvej*, Charnwit Phacharapongsakul and Krissada Ngarmtab

*Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand

e-mail address: iwinhvej@kmutt.ac.th

Abstract: BTEX in wastewater samples were determined by using HS/GC. 5.00 mL of wastewater samples were pipetted into 20 mL sealed headspace vials. They were heated in headspace oven at 70 °C for 15 minute. GC condition for separation BTEX used EC-20 capillary column in isothermal mode at 50 °C, helium gas flow rate 2.0 mL/min. Analysis time 10 minutes for each sample. External standardization method was selected for quantitative analysis. The obtained calibration curves of standard BTEX showed good linearity with R² > 0.996. Detection limit < 1 ppb, %RSD 0.47-1.51% and % recoveries in the range of 82.8-103.5 %. The analysis of BTEX in 8 samples of wastewater found benzene 15.8-38.5 ppm, toluene 17.6-37.2 ppm, ethylbenzene 19.9-44.6 ppm and xylene 23.3-34.3 ppm.

C0148-NANOCRYSTALLIZATION IN Fe₈₁B_{13.5}Si_{3.5}C₂ AMORPHOUS MAGNETIC RIBBONS

Weeraphat Pon-un, Pongtip Winotai

Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Road, Bangkok 10400, Thailand

E-mail address: g4637664@student.mahidol.ac.th, wponun@yahoo.com and scpwn@mucc.mahidol.ac.th

Abstract: The nanocrystallization of $\text{Fe}_{81}\text{B}_{13.5}\text{Si}_{3.5}\text{C}_2$ amorphous ribbons were investigated after annealing for two hours under argon atmosphere at various temperatures in the range 400-600°C by x-ray diffraction (XRD), Mössbauer spectroscopy (MS), scanning electron microscopy (SEM) and differential scanning calorimetry (DSC) respectively. In the temperature range 400 °C-475°C, the amorphous ribbon partially crystallized giving rise nanograins embedded in the remaining amorphous phase which was confirmed by XRD, DSC and MS. The DSC measurements showed two-step crystallizations at 495°C and 525°C with activation energies E_a of 803.4 and 903.3 meV respectively. Furthermore, the kinetics of crystallization of the ribbon annealed 495°C at different durations was investigated by using XRD, SEM and MS to find the optimal condition so that the magnetic nanograins could be obtained.

C0149-SIMULATION OF SPIRAL WAVE DYNAMICS UNDER GLOBAL FEEDBACK CONTROL DERIVED FROM CONFINED SQUARE DOMAIN

Supichai Kantrasiri and On-Uma Kheowan

Department of Chemistry, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand

E-mail address: g4436240@student.mahidol.ac.th

Abstract: Pattern formation and spiral waves in the Belousov-Zhabotinsky (BZ) reaction have been controlled by using feedback techniques [1-4], which can be applied to the spatiotemporal dynamics in other excitable media such as spiral waves in cardiac tissues [5]. One of the feedback mechanisms is the global feedback control, which choosing the feedback signal to be proportional to the integral of the wave activity taken over the domain geometry. The spiral wave dynamics under the global feedback control in circular domain were studied experimentally [3-4] and numerically [2]. In this work we perform a numerical study of rigidly rotating spiral waves subjected to the global feedback derived from a confined square domain. The spiral wave dynamics depends on the feedback intensity, feedback sign, domain size, and domain geometry. Different shapes of spiral attractor can be observed by varying the size and geometry of the domain. A theoretical approach is proposed to explain the observed phenomena

C0150 -STUDY OF CADMIUM BIOAVAILABILITY IN CONTAMINATED SOILS AFFECTED FROM SMELTER ACTIVITIES

Namfon Tongtavee^{1,2}, Juwadee Shiowatana², Ronald G. McLaren³ and Colin W. Gray³

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Sukumvit Rd. Bangkok 10110 Thailand.

²Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd. Bangkok 10400 Thailand.

³Soil and Physical Sciences Group, Lincoln University, Canterbury, New Zealand.

Email address: namfon_t@yahoo.com

Abstract: Smelting factory is one of the human activities, which can generate some metals into the environment, resulting in considerable soil contamination. Many chemical extraction methods have been developed to investigate metal bioavailability but lacking of selectivity of extractant. Isotope dilution method is widely used to determine the metal bioavailability. In this work, study of bioavailability and mobility of cadmium were carried out using radioisotope dilution methods (¹⁰⁹Cd) under two different approaches. The first approach, after spiking a radioactive tracer, the specific activity was measured under equilibrium condition. The second approach, isotopically exchangeable Cd was estimated by wheat plants grown in equilibrated-spiking soils with ¹⁰⁹Cd. The results showed that Cd bioavailability as the percentages of total concentrations of Cd, obtained from the both approaches was ranging between 39-65% for E values and 14-67% for L values. In comparison of 5 soil samples, these two approaches showed good agreements; $R^2 = 0.96$ ($P < 0.01$).

C0151-Composition and Central Nervous System Depressive Effect of the Essential Oil of *Amomum biflorum*

Sirinan Thupthimthed, Wipaporn Phatvej, Ubon Rerk-am, and Siripen Jarikasem Pharmaceutical and Natural Product Department, Thailand Institute of Scientific and technological Research (TISTR), Bangkok, Thailand

E-mail address: sirinan@tistr.or.th

Abstract: The essential oil composition of *Amomum biflorum* (Wan Sao Loung) is reported. Using GC and GC/MS, 24 compounds were found and more than 85% of the oil was represented by (E)-but-1-enyl-4-methoxybenzene. The other constituents were limonene (2.2%) β -pinene (2.1%) and camphor (1.8%). The central nervous system depressive effect of this oil upon inhalation in rats was studied by activity cage. This system could automatically monitor the horizontal or vertical movements of the animals by counting the number of animal movements across the infrared beams. The results showed that *A. biflorum* oil decreased both types of movements when compared to the control group.

C0152-PHOTOCHEMICAL STUDIES OF NOVEL PYRENYL PROBE ON SPECIFIC CLEAVAGE OF PROTEINS

Apinya Chaivisuthangkura (Buranaprapuk)^{1*} and Challa V. Kumar²

^{1*}Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

²Department of Chemistry, University of Connecticut, USA

E-mail address: apinyac@swu.ac.th

Abstract: A new probe, L-phenylalanine-1-(1-pyrene) methylamide (PMA-L-Phe) carrying a free amino terminus, was synthesized. Photocleavage of lysozyme by PMA-L-Phe, in 57% yield, is achieved in the presence of Co(III)hexamine chloride (CoHA), quencher of PMA-L-Phe fluorescence, and no reaction occurs in the absence of CoHA or light.

Spectroscopic studies indicates that PMA-L-Phe binds to both lysozyme and bovine serum albumin (BSA) with nearly equal affinity constants (K_b) of $3.3 \times 10^5 \text{ M}^{-1}$ and $3.8 \times 10^5 \text{ M}^{-1}$, respectively. However, lysozyme is cleaved in higher yields (57%), while BSA is cleaved in poor yields (<5%). The former is an example of the highest photocleavage yield obtained so far.

C0153-REMOVAL OF CHROMIUM IN WASTEWATER BY IRON OXIDE-COATED SAND(IOCS) AND GRAPHITE FURNACE ATOMIC ABSORPTION SPECTROMETRY

Sowaluk Aubpatham and Puchong Wararattanuruk*

Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand.

E-mail address: sowaluk@hotmail.com, s4522085@maliwan.psu.ac.th

Abstract: Removal of chromium(VI) from wastewater is obligatory in order to avoid water pollution. Iron oxide-coated sand (IOCS) is a good absorbents and filters for removal chromium. The optimum conditions for size and weight of sand were 0.425-0.33 mm and 20 g, these conditions shown that the percentage of removal chromium(VI) were 99.61% and 99.58%, respectively. And the concentration of chromium(VI) after removing was determined by graphite furnace atomic absorption spectrometry.

C0154-Synthesis of Polyether Containing Thymine

Karnjana Tanapaiboon^a, Tirayut Vilaivan^a, Varawut Tangpasuthadol^a

^aOrganic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn university

email address: varawut.t@chula.ac.th

Abstract: Novel oligomers with thymine in every repeating unit was synthesized using cationic ring opening polymerization of *N*1-glycidyl-*N*3-benzoylthymine (III) in the presence of $\text{BF}_3 \cdot \text{Et}_2\text{O}$ as a catalyst. The monomer was synthesized from the reaction of *N*3-benzoylthymine (I) with glycidol (II) by Mitsunobu reaction. After polymerization the benzoyl protecting group was removed using aq. $\text{NH}_3 \cdot \text{MeOH}$ in a 1:1 ratio. The structure of the oligomers was verified by NMR. The molecular weight of 639 was obtained. This thymine-carrying oligomer will be subjected to further study as a oligonucleotide-binding molecule potentially useful in biotechnology application.

C0156-Structural and Energetic Analyses of the Effects of the K103N Mutation of HIV-1 Reverse Transcriptase on Efavirenz, based on quantum calculations.

Pornthip Boonsri¹, Peerapol Nunriam¹, Mayuso Kuno² and Supa Hannongbua^{1*}

¹Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok,

²Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok,

E-mail address: g4664016@ku.ac.th, g4564119@ku.ac.th, kuno2help@yahoo.com and fscisph@ku.ac.th

Abstract: Effect of K103N mutation of HIV-1 reverse transcriptase (HIV-1 RT) on the binding of efavirenz was studied by *ab initio* molecular orbital calculation (B3LYP/6-31G(d,p)). The results were compared with the binding of the inhibitor and the wild type enzyme. The binding site of HIV-1 RT was defined and composed of 22 amino acid residues. The obtained results indicate that interaction energy between efavirenz and Lys101 was found to be the most contribution, -11.29 and -14.52 kcal/mol for wild type and K103N mutant type, respectively. In addition, moderate hydrogen bonding between benzoxazin-2-one (-NH and -C=O) and the backbone carbonyl oxygen of Lys101 (-C=O) and the backbone amino hydrogen of Leu100 (-NH) were found with the distances of 1.79 and 1.95 Å, respectively. These hydrogen bond interactions play an important role in the binding of efavirenz in the bound HIV-1 RT complex.

C0157-Structural characterization of natural zeolite by using X-ray diffraction and X-ray fluorescence spectroscopy techniques and its applications in ammonia treatment of wastewater from industrial factories

Malee Prajubsuk^{1*}, Pompan Pungpo¹, Wutthisak Prachamon², Anuson Niyompan², and Usa Onthong³

¹Department of Chemistry, Faculty of Science, Ubonratchathani University, Ubonratchathani

²Department of Physic, Faculty of Science, Ubonratchathani University, Ubonratchathani

³Department of Chemistry, Faculty of Science, Taksin University, Songkhla, 90000

E-mail address: malee.p@sci.ubu.ac.th

Abstract: The natural zeolite, as an effective adsorbent derived from Songkhla province, was characterized by X-ray diffraction (XRD) and X-ray fluorescence (XRF) spectroscopy. The results reveal that the XRD pattern of the zeolite corresponds to the clinoptilolite compound of molecular formula $(\text{Na,K,Ca})_5\text{Al}_6\text{Si}_{30}\text{O}_{72} \cdot 18\text{H}_2\text{O}$. The XRF analysis shows the elemental compositions of the zeolite confirming the structural data obtained the XRD result. Consecutively, the investigations of adsorption of ammonia contaminated in wastewater on the zeolite have been carried out. Wastewater from 2 frozen seafood factories in Songkhla province was sampled. To measure ammonia contaminated in the wastewater, the phenol-hypochlorite method was applied. The results show that the optimum adsorption time is 24 hours and the ratio of zeolite per water sample is 20 g/L. Ammonia was removed from wastewater samples with an average removal efficiency of 65.6%. Consequently, the natural zeolite is successfully applicable for removal of ammonia of wastewater from frozen seafood factories. Its application would significantly reduce the cost of wastewater treatment with environmentally friendly chemical process.

C0158-Two dimensional quantitative structure activity relationship studies of efavirenze analogous active against WT and K103 N HIV-1 RT, using conventional QSAR and hologram QSAR

Pompan Pungpo^{*}, Warankana Suksom, Alakkhana Suwanvisut, Patumtip Samuapark and Patcharin Moktip

Department of Chemistry, Faculty of Science, Ubonratchathani University, Ubonratchathani,
e-mail address: pornpanp2002@hotmail.com

Abstract: Two dimensional quantitative structure-activity relationship methods, based on conventional QSAR (cv-QSAR) and holographic QSAR (HQSAR), has been applied to investigate the structural requirements of HIV-1 RT inhibition of efavirenz derivatives active against wild type (WT) and mutant type (K103N) HIV-1 RT. Starting geometry of compounds was obtained from X-ray crystallographic data of enzyme inhibitor complex. 60 efavirenz structures were built and fully geometrical optimizations were then performed, by *ab-initio* molecular orbital method at HF/3-21G level. Optimized geometries have been used to calculate electronic and molecular properties of compounds used for cv-QSAR study and molecular holograms for HQSAR analysis. All derived models produce are satisfied based on statistical significance and predictive abilities. The information obtained from the cv-QSAR model reveals electronic and molecular properties playing important role to inhibit WT and K103N HIV-1 RT. The graphical results of HQSAR analysis display the key features contributing to inhibitory activities of compounds. The obtained models apparently reveal differentiating structural requirements between WT and K103N HIV-1 RT inhibition of these inhibitors. Moreover, the interpretation of the QSAR model shows good agreement with the experimental data. Consequently, the results provide a beneficial guideline to design and predict novel compounds with enhanced WT and K103N HIV-1 RT inhibitory activities.

C0159-THE INTERFERENCE OF SULFIDE IN CYANIDE ANALYSIS BY ION SELECTIVE ELECTRODE

Paramee Pengprecha*, Pilawan Haouyawe and Wantida Srisongmeoung

Analytical Chemistry Laboratory, Metrology Testing Service Centre, Thailand Institute of Scientific and Technological Research

E-mail Address: paramее@tistr.or.th

Abstract: The analysis of the concentration of cyanide in fermented beverage is influenced by the sulfide. It is found that the concentration of sulfide which is higher than 1 mg/L can cause the false positive to the analysis of cyanide by ion selective electrode (ISE). Further, the relationship between the concentration of sulfide and the measured concentration of cyanide by ISE is proportional and give a linear curve with the slope of 0.929 and R^2 of 0.996. In order to improve the accuracy of the analysis of cyanide, the elimination of sulfide is necessary. It can be overcome by trapping with cotton wool moisten with lead acetate after distillation process. By this process the concentration of sulfide up to 100 mg/L can be removed.

C0160-EFFECT OF THE CONCENTRATION OF HYDROCHLORIC ACID ON THE DETERMINATION OF SELENIUM BY HYDRIDE GENERATION ATOMIC ABSORPTION SPECTROMETRY

Paramee Pengprecha*, Supawan Hattiya and Nirun Sanoondee

Analytical Chemistry Laboratory, Metrology Testing Service Centre, Thailand Institute of Scientific and Technological Research

E-mail Address: paramее@tistr.or.th

Abstract: The concentration of HCl used to reduce Se(VI) to Se(IV) is a crucial step for hydride generation atomic absorption spectrometry. It is found that when increasing the concentration of HCl from 0.6 to 12 N then the % recovery increases from 32% to 108.8% and at the concentration of 12N gives a good precision. Biological samples CRM DORM2 digested by HNO_3 - HClO_4 gives a good accuracy of 95.04% compared to the mixture of HNO_3 - HClO_4 - H_2SO_4 - H_2O with the recovery of 86.96%.

C0161-MANGANESE DIOXIDE ON SILICA GEL AND MANGANESE DIOXIDE ON ALUMINA: SELECTIVE AND EFFICIENT MILD OXIDIZING AGENTS

Khomsan Thiansomjit¹, Narongdate Wattanavichian, Teerasak Seisba and Parinya Theramongkol^{2*}

¹Graduate School, Department of Chemistry, Faculty of Science, Mahidol University, Bangkok,

²Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand,

E-mail address: parthe@kku.ac.th

Abstract: Allylic and benzylic alcohols could be selectively and rapidly oxidized to the corresponding carbonyl compounds in the appropriate solvents at room temperature by precipitated manganese dioxide on either silica gel or alumina. The overall efficiency of these reagents is much better than the one prepared without solid supporting agent.

C0162-CAPILLARY ELECTROPHORESIS FOR DETERMINATION OF (-) HYDROXYCITRIC ACID: APPLICATION TO *Garcinia atroviridis* Griff EXTRACT

Cherwana Rungwanitcha¹, Wachiraphon Sinthavathavorn¹, Monpichar Sirsa-art¹, Kanyarat Kalpakorn¹, Amorn Petsom^{2,3} and Thummoon Nhujak^{1*}

¹Chromatography and Separation Research Group, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, 10330 Thailand

²Research Centre for Biorganic Chemistry, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, 10330 Thailand

³Institute of Biotechnology and Genetic Engineering, Chulalongkorn University, Bangkok, 10330 Thailand

Abstract: Capillary electrophoresis (CE) has been developed for quantitative determination of (-)-hydroxycitric acid (HCA) and related compounds in *Garcinia atroviridis* Griff. extract, using isocitric acid as internal standard. Resolution

optimization was investigated by varying type, concentration and pH of background electrolyte (BGE) containing 0.5 mM tetradecyltrimethyl ammonium bromide (TTAB). The mixture of 25 mM $\text{Na}_2\text{H}_2\text{O}_7$, 25 mM NaH_2PO_4 and 0.5 mM TTAB, adjusted to pH 9.2, was found to give achieved baseline resolution ($R_s > 1.5$) and good peak shape of analytes. Limit of detection was obtained to be 2.3 ppm for HCA. Advantages of the developed CE method include no sample preparation, fast analysis time within 5 min and high accuracy and precision. Using CE analysis, a commercial sample of the *Garcinia atrovirens* Griff. extract was found to contain 14.8 % w/w HCA, 0.43 % w/w citric acid and unknown which is expected to be hydroxycitric acid lactone in the comparable amount of HCA.

C0163-CHIRAL SEPARATION IN CAPILLARY ELECTROPHORESIS USING DUAL CYCLODEXTRINS: THEORETICAL MODELS OF ELECTROPHORETIC MOBILITY DIFFERENCE

Thumnoon Nhujak^{1*}, Chatsadee Sastryavaha¹, Chamida Palanuvej¹ and Amorn Petsom²

¹Chromatography and Separation Research Group, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

²Research Centre for Bioorganic Chemistry, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

³The Institute of Health Research Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Equations and theoretical models of the difference in electrophoretic mobility ($\Delta\mu$) of enantiomers in capillary electrophoresis (CE) using dual cyclodextrins (CDs) have been developed, based on enantioselectivity (α) and dimensionless quantity of $\bar{K}C$, where C is the CD concentration, α the ratio of binding constant (K) and $\bar{K}$ the average K for enantiomers. The models were used to predict and explain a change in $\Delta\mu$ of enantiomers in a wide range of C . Experiment was carried out using dual CDs as β -CD and DM- β -CD and test analytes as five pairs of amphetamine drug enantiomers. A change in observed $\Delta\mu$ of enantiomers in dual CDs was found to be in excellent agreement with the theoretical models.

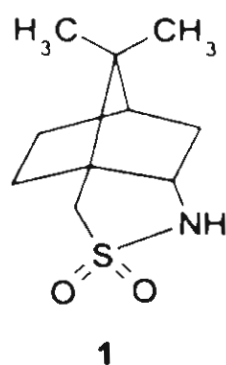
C0165-LOW RESOLUTION NMR AND CHEMISTRY OF (-)-CAMPHOSULTAM

Sukij Thongban, Somsak Aramrangsri and Weerachai Phutdhawong¹

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand

²Department of Chemistry, Faculty of Science, Maejo University, Sangsri, Chiang Mai, 50290, Thailand, email address: weerachai@ju.ac.th

Abstract: Low resolution NMR and chemistry of known (-)-camphosultam **1** have been studied. The compound obtained by simple synthetic route following by literature. The condition method of NMR operation were 600 MHz ^1H -NMR in CDCl_3 using TMS as internal standard with acquisition parameter of 8 scan in 5.0 sec pulse interval and 20 micro sec pulse width respectively. The result was obtained using Bruker JEOL NMR. Comparison with the high resolution



C0169-COMBINED QUANTUM MECHANICS AND MOLECULAR MECHANICS (QM/MM) STUDY ON THE ENZYMIC REACTION IN THE ACTIVE SITE OF HIV-1 REVERSE TRANSCRIPTASE

Thanyada Rungrotmongkol¹, Adrian Mulholland² and Supa Hannongbua¹

¹Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

²School of Chemistry, University of Bristol, Bristol, UK

E-mail address: g4484013@ku.ac.th

Abstract: HIV-1 RT catalyses the reverse transcription of viral genetic material (RNA) into double stranded DNA, and is an important target of antiviral therapy in the treatment of AIDS. In this study, mechanisms of deprotonation from 3'-hydroxyl group of terminal primer to Asp185 or an A-phosphorus oxygen atom served as general base, followed by nucleophilic attack to A-phosphorus oxygen atom on dTTP substrate have been modelled by the QM/MM method (AM1/CHARMM) with the aims of studying the dTTP substrate and the active site of HIV-1 RT complex structure, a virally-encoded enzyme based on an adiabatic mapping procedure treated to calculate approximate energy barriers to reaction. The obtained results indicate that deprotonation can be occurred as observed by O3'-PA distance closed to 1.8 Å, giving the stable pentacovalent intermediate. This reaction can be followed by the PA-O3A bond departure to gain the phosphate diester and pyrophosphate

as final products. However, the PES indicate that the pyrophosphate is unstable as observed by the energy barriers in the range of 40-55 kcal/mol. We proposed that there is a hydrogen-transfer reaction, after the deprotonation, from one of nonbridging oxygens to oxygen O3A of pyrophosphate which should be helpful to stabilize the product.

C0171-The electrochemical behavior of some ketone and quinone compounds.

Chanwit Photicunapat¹, Pipat Chooto¹, Panit Sherdshoophongse¹, Wilawan Mahabusarakam¹ and Norita Mohamed²

¹Department of Chemistry, Faculty of Science, Prince of Songkla University, Songkhla 90112, Thailand.

²The School of Chemical Science, Universiti of Sains Malaysia, Penang 11800, Malaysia.

E-mail : photicunapat@yahoo.com

Abstract: The electrochemical behavior of some ketones and quinones was investigated. Quinones show two redox couples. α -Tetralone gives the most negative potential due to the fact that the least stable radical product is obtained. In the case of Anthrone, the reduction potential is more positive than other ketones due to resonance effect. The presence of hydroxyl group makes the reduction potential more positive, indicating the more prominent inductive effect than the resonance one of the OH group. Tetrahydroxybenzoquinone exhibits the best reduction within this group. The ratios of ketones to silver complexes are 1 : 1 while those of quinones are 2 : 1. The compounds with more positive reduction potential are better modifiers for silver stripping analysis.

C0173-The Investigation Oxygen Addition by Silver and Quinone Compounds

Ekkachai Ruangdam, Pipat Chooto, Walailuk Poetpaiboon, Udom Jingit

Department of Chemistry, Faculty of Science, Prince of Songkla University, Hatyai Songkla 90110, Thailand.

E-mail address: s4522100@maliwan.com

Abstract: The epoxide compounds are used to synthesize other compounds such as amino alcohol, glycol, halohydril. Synthesizing oxiran rings is difficult due to the product are easy to further react. There are many investigations of catalyze epoxidation reactions. In this research, silver and quinone are used for catalyze epoxidation.

C0174 -ANALYSIS OF THIAMINE AND RIBOFLAVIN BY CAPILLARY ELECTROPHORESIS CHIP

Somsak Sirichai

Department of Chemistry, Faculty of Science, Burapha University, Chonburi 20131;

e-mail address: sirichai@buu.ac.th

Abstract: Analysis of thiamine (B_1) and riboflavin (B_2) in B-complex vitamin using capillary electrophoresis chip is described. For simultaneous detection of both vitamins under identical experimental conditions, a 10 mM borate buffer of pH 9.2 is used. Under these conditions, both vitamins can be analysed within 10 sec. The limits of detection for thiamine and riboflavin are 2.0 mg L⁻¹ and 0.6 mg L⁻¹, respectively. The method is also applied to carry out of the vitamins in B-complex vitamin.

C0175-A STUDY OF CLEAN-UP PROCESS FOR PAHS DETERMINATION IN EDIBLE OIL BY USING VARIOUS SOLID PHASE SORBENTS

Nattawan Kuppithayanant

Chemical Research Institute, Rajamangala Institute of Technology, Prathumthani, Thailand,

E-mail address: kuppithayanant@yahoo.com

Abstract: Various solid phase sorbents for clean-up are available for the analysis of PAHs namely Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene and Benzo(a)pyrene in edible oil. After cleaning-up of sample, the solvent from loading and elution steps were then analysed those PAHs by GC-MS. The capacity of PAHs retention on each sorbent was investigated from the spiked edible oil recoveries. It was found that, PAHs were retained on silica sorbent better than phenyl and octadecyl sorbents whereas the cleansing ability of silica sorbent from oil matrices was lower.

C0176 -Solvation Structures of the 18-Crown-6 in Carbon Tetrachloride Solution Studied by Monte Carlo Simulation Based on *Ab Initio* Potential Models

Sripajak Kongsuk^{1,2}, Teerakiat Kerdcharoen^{1,2}, Michael Kiselev³, and Supot Hannongbua^{4,*}

¹Physics Department, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

²Capability Building Center for Nanoscience and Nanotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

³Institute of Solution Chemistry, Akademicheskaya st.1, 153045, Ivanovo, Russia.

⁴Chemistry Department, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Solvation structure of the 18-crown-6 molecule in carbon tetrachloride (CCl₄) solution has been investigated by Monte Carlo simulation technique using *ab initio* pair potential function. The 18-crown-6 – CCl₄ and CCl₄ – CCl₄ interaction energies were calculated by using the Gaussian 98 program at the HF/D95** and MP2/6-31G** levels for developing the potential models. The simulation have been carried out for a system consisting of 259 CCl₄ molecules plus one 18-crown-6 molecule. The simulation results show that there are two CCl₄ molecules in the first solvation shell; one lies above the ligand plane and one lies below it. The CCl₄ molecules prefer to approach closer to C-atoms than O-atoms of the

18-crown-6 molecule. The two carbon atoms of the two nearest neighbors are coordinated with the carbon atoms of the 18-crown-6 via interacting with C1 and C10, respectively. The entire solvation structure around the 18-crown-6 has been observed although 18-crown-6 – CCl₄ interaction is rather weak.

C0177-ANALYSIS OF PHENOLIC COMPOUNDS IN FRUIT SEEDS BY SOLID PHASE EXTRACTION AND HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Jirasak Threeprom¹, Richard L. Deming²

¹ Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 44150, Thailand

² Department of Chemistry and Biochemistry, California State University at Fullerton, USA

E-mail address: jirasak_three_prom@hotmail.com

Abstract: High performance liquid chromatography (HPLC) was successfully used to determine 13 phenolic compounds (PCs) in three types of fruit seeds, namely Ma Kiang seed, Ma Mao seed and grape seed. The proposed gradient profile permitted short analysis time (71 minutes) and good resolution. Nitrogen purge and solid phase extraction were used in sample preparation steps before analysis by HPLC. The results obtained presented various types of PCs contained in these samples revealing the high potential of these samples as good source of PCs.

C0178 -SIMPLEX OPTIMIZATION VERSUS UNIVARIATION METHOD: WHICH IS CORRECT?

Nuchanart Kitjaviset, Rattapon Meekabsorn, Jirasak Threeprom

Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 44150, Thailand

E-mail: nuchanart.kitjaviset@gmail.com

Abstract: The optimum conditions for the determination of nitrite in waste water sample were studied by using three types of optimization methods, namely fixed size simplex, variable size simplex and univariation method. The global optimum was found after starting the simplexes to vertex number 6 for fixed size simplex and vertex number 8 for variable size simplex. Meanwhile, more than 15 experiments were done for univariation method to arrive the same global. Univariation method can be used if relatively few factors are to be investigated and time is available to do the necessary experimentation.

C0179-THEORETICAL STUDY OF MODE OF ADSORPTION OF WATER DIMER ON H-ZSM-5 AND H-FAUJASITE ZEOLITES

Siriporn Jungstuwong¹, Jumras Limtrakul², and Thanh N. Truong³

¹Department of Chemistry, Faculty of Science, Ubon Ratchathani University, Thailand

²Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

³Henry Eyring Center for Theoretical Chemistry, Department of Chemistry, University of Utah, Salt Lake City, USA.

E-mail address: jsiriporn_2000@yahoo.com, fscljrl@ku.ac.th, and truong@chemistry.utah.edu

Abstract: The Mode of adsorption of water dimer on H-ZSM-5 and H-Faujasite zeolites have been investigated by quantum cluster and embedded cluster approaches, using B3LYP (d, p) level of theory. The 7T models employed in this study is sufficiently large to avoid a possibility for interactions of water dimer with capped hydrogen atoms. Our results indicate that the formation of water dimer complex adsorbed on a Brønsted acid site can be originated from two separate pathways, which yield two different adsorption structures. In one pathway, dimer adsorption complex is formed by adsorbing one water molecule at a time on a Brønsted site in a step-wise process. In the other pathway, the dimer adsorption complex is formed by adsorption of water dimer on a Brønsted site in a concerted process. We found that including Madelung potential, the protonated species are present in both H-ZSM-5 and H-Faujasite zeolites when two water molecules adsorb on Brønsted acid site.

C0180-Removal of Chromate Ion in Aqueous Solution by Red Clay

Weerasak Chomkitichai and Sumrit Mopoung

Department of Chemistry, Faculty of Science, Phitsanulok, Thailand

e-mail address : keng521@hotmail.com

Abstract: The objective of research was to study the efficiency of chromate ion {chromium VI; Cr(VI)} removal from the aqueous solution with the Red Clay. The Red Clay were obtained from 3 locates: Doisaket, Nakornsawan and Kamchanaburi. The condition of pH level, time of adsorption and types of Red Clay were studied for removal of chromate ion in aqueous solution. The result revealed that the optimum of adsorption effective is 93% chromate ion in aqueous solution for pH of the aqueous solution 2 with 2.00 g of Doisaket Red Clay. In additionally, the rate adsorption was high in 1 hour initial and then it was decreased. When pH value was increased, adsorption efficiency of chromate ion in aqueous solution was decreased. The adsorption efficiency of Nakornsawan and Kamchanaburi Red Clay for remove the chromate ion in aqueous solution were 13% and 11.9% per 2.00 g of Red Clay; 50 ml 100 ppm chromate ion, respectively.

C0181-DETERMINATION OF HYDROGEN PEROXIDE BASED ON ELECTROCATALYTIC OXIDATION USING A CHROMIUM (III) HEXACYANOFERRATE (II) MODIFIED BORON-DOPED DIAMOND THIN FILM ELECTRODE

Surudee Treetepvijit, Wijitar Duanchai, Reweeworn Bunnium and Orawon Chailapakul*

Department of chemistry, Faculty of science, Chulalongkorn university, Bangkok 10300, Thailand

e-mail address: corawon@chula.ac.th

Abstract: This work has illustrated the modification of boron-doped diamond thin film electrode with chromium hexacyanoferrate for determination of hydrogen peroxide. The modified electrode was prepared by generating a chromium (III) hexacyanoferrate (II) cluster on the surface of boron-doped diamond thin film electrode using electrodeposition. The potential condition for cyclic voltammetry was setting between -0.2 to +0.95 V with scan rate 0.01 V/s. The modified electrode showed catalytic effect on the oxidation of hydrogen peroxide in aqueous solution. Optimum conditions for the determination of hydrogen peroxide such as pH and scan rate were studied by using cyclic voltammetry. The modified electrode provided well-resolved oxidation irreversible cyclic voltammograms of hydrogen peroxide, high signal and low background current when compared with the non modified electrode. The modified electrode can be applied to determine hydrogen peroxide by flow Calibration graph was linear over the concentration range of 10 to 5000 μM and the limit of detection was 0.5 μM injection analysis coupled with amperometric detection. Optimum potential was 0.85 V vs. Ag/AgCl.

C0184-SOLID-PHASE SYNTHESIS OF 89 POLYAMINE-BASED CATIONIC LIPIDS FOR DNA DELIVERY TO MAMMALIAN CELLS

Boon-ck Yingyongnarongkul^{a,b}, Mark Haworth^c, Tim Elliott^c and Mark Bradley^b

^aDepartment of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand; e-mail address: boonck@raml.ru.ac.th

^bDepartment of Chemistry, University of Southampton, Highfield, Southampton, SO17 1BJ, UK

^cImmunology and Immunotherapy, School of Medicine, Southampton General Hospital, Southampton, SO16 6YD, UK

Abstract: In recent years much effort has been focused on the development of a variety of DNA carriers for gene therapy application, and cationic liposome have become the most common non-viral gene delivery system. Solid-phase synthesis was used to produce three libraries of polyamine-based cationic lipids with diverse hydrophobic tails. These were characterised, and structure-activity relationships were determined for DNA binding and transfection ability of these compounds when formulated as cationic liposome. Two of the cationic lipids produced high-efficiency transfection of human cells. Five lipids were identified as active transfection agents. These cationic lipids are promising reagents for gene delivery and illustrate the potential of solid-phase synthesis methods for cationic lipids discovery.

C0185-SYNTHESIS OF INTEGRISTERONE A

Saowanee Kumpun, Boon-ck Yingyongnarongkul and Apichart Suksamran

Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand; e-mail address: pinnata@hotmail.com

Abstract: Integristerone A, a rare ecdysteroid from plant origin, has been partially synthesized from 20-hydroxyecdysone. Sharpless asymmetric dihydroxylation of the key intermediate, 2-deoxy-1,2-didehydroanalogue, using osmium tetroxide and a chiral ligand afforded integristerone A and its C-1,C-2-epimer. High diastereomeric excess of integristerone A was obtained when the chiral ligands dihydroquinin 9-phenanthryl ether was employed. Integristerone A exhibits lower moulting hormone activity than 20-hydroxyecdysone.

C0186-THE PREPARED MONO-ALKYL NITRATES AS A CETANE IMPROVER

Chantadech Khositcharoenkul¹, Somchai Pengprecha², Chaturong Boontanjai³

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Payatai Rd, Patumwan, Bangkok 10330, Thailand; e-mail addresses: chantadech@hotmail.com,

²Department of Chemistry, Faculty of science, Chulalongkorn University, Payatai Rd, Patumwan, Bangkok 10330, Thailand; e-mail addresses: somchai.pe@chula.ac.th

³Thai Petrochemical Industry Public Company Ltd, Sukhumvit Rd, Rayong 21000; e-mail addresses: chaturong@tpigroup.net

Abstract: Some gas oils do not have sufficiently high cetane number. Some refineries have added organic cetane improver to boost the cetane number of based diesel fuel. Mono-alkyl alcohols are synthesized to nitrate compounds by nitration reaction using a mixture of conc. sulfuric acid and conc. nitric acid. The effects of different alkyl chain length of mono-alkyl nitrate compounds are compared with those of the commercial organic cetane improver, 2-ethyl hexylnitrate, by blending the compounds with diesel based in the range of 0.05%, 0.10%, 0.15%, 0.20%, 0.25%, 0.30%, 0.35%, 0.40% and 0.50% by weight, respectively. Measurement of the cetane number followed the ASTM D613.

C0187-DETERMINATION OF CAFFEINE IN ENERGY DRINKS AND INSTANT COFFEE MIXED DRINKS BY HPLC

Waradoon Chutrong¹, Yongyuth Tundulawessa¹, Parichutr Paungmanee²

¹Department of Chemistry, Faculty of Science Srinakharinwirot University, Bangkok.

²Samsenvittaya, Bangkok.

Abstract : The research is the procedure of quantitative analysis of caffeine in energy drinks and instant coffee mixed drink local brands by HPLC. The sample were analyzed by using a Agilent Hypersil ODS 5 μm (4.0 x 125 mm) and mobile phase was a mixture of phosphate buffer 25 mM (pH 2.6) : acetonitrile (9 : 1) with a flow rate of 1 mL/min. Detection was detected

by Diode Array detector absorption at a wavelength 210 nm. The calibration curve as linear over the range of 10 – 40 mg/L with a linearity of correlation coefficient(r) was 0.9997. The detection limit was (LOD) 0.26 mg/L ($S/N = 3$). The range total quantity of caffeine in energy drinks were 48.94 – 70.19 mg/container. The instant coffee mixed drinks found more than Three time 150.05 – 156.85 mg/ container.

C0188-DETERMINATION OF LEAD IN WATER SAMPLE BY STRIPPING POTENTIOMETRY TECHNIQUE

Waradoon Chutrtong¹, Likhit Khawngam¹, Tossapon Ruttanasit¹, Napaporn Sansila¹

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok

Abstract: The electrochemical analysis has been developed by using the potentiostatic reduction of lead-analytes to become amalgam at working electrode. The specific voltage potential of oxidative lead related to the time and concentration of analytes when the lead metal, reoxidized, presented in potential-time curve.

This stripping potentiometry (SP) technique was validated using atomic absorption spectrometry(AAS). The results found the linear range of potential-time curve of lead and detection limit were 10-30 ppm($r^2 = 0.9966$) and 0.5 ppm($s/n = 3$) respectively.

C0193-DEVELOPMENT OF FLOW INJECTION SPECTROPHOTOMETRY FOR DETERMINATION OF ETHANOL IN BEVERAGES

Sila Kittiwachana, Jaroorn Jakmunee, Supaporn Kradtap, Somchai Lapanantnoppakhun and Kate Grudpan

Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50202 Thailand.

E-mail address: sila2@hotmail.com; scijjkmn@chiangmai.ac.th

Abstract: Flow injection (FI) spectrophotometric systems for ethanol determination based on the reaction between potassium dichromate and ethanol, resulting in a blue-greenish product which exhibits a maximum absorption at 600 nm have been developed. A simple single line manifold and a double line manifold with PTFE membrane for separation of ethanol from sample matrices were investigated. Conditions for each manifold were optimized. In the first manifold, a linear calibration graph in range of 1.00-20.00 %v/v and precision of 1.5 % ($n=5$, 6.00 %v/v ethanol) were obtained. The second manifold gave a linear calibration graph in range of 1.00-10.00 %v/v with a precision of 0.7 % ($n=5$, 6.00 %v/v ethanol). The results for determination of ethanol in beverages by the proposed method were compared well with labeled values and those by gas chromatographic method.

C0194 -SYNTHESIS AND COMPLEXATION STUDY OF CALIX[4]ARENE CONTAINING STILBENE AND CROWN ETHER

Arisa Jaiyu¹, Mongkol Sukwattanasinitt^{1*}, Palangpon Kongsaree², Samran Prabpai²

¹Department of Chemistry, Faculty of Science, Chulalongkorn University

²Department of Chemistry, Faculty of Science, Mahidol University

e-mail: smongkol@chula.ac.th

Abstract: Calix[4]arenes **1** containing a stilbene as a photoisomerization unit and a crown ether as a metal binding units were synthesized. The stilbene unit was synthesized through McMurry coupling reaction between two aromatic aldehydes. The crown ether was assembled from the reaction between the remaining two phenolic OH on calix[4]arene with tetraethylene glycol di-*p*-toluenesulfonate. The binding properties of these compounds toward alkali metal picrate were studied by UV-visible spectroscopy. The results showed that **1** can bind with Na, K and Cs picrate and the decomplexation can occur upon UV irradiation. Decomplexation mechanism and binding constants of this compound are currently under investigation.

C0195-SYNTHESIS AND PROPERTIES OF NEW CALIX[4]ARENE TUBE CONTAINING DIACETYLENE

Chantana Sae-Lim and Mongkol Sukwattanasinitt*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

e-mail address: janglim@hotmail.com and smongkol@chula.ac.th

Abstract: The new calix[4]arene tube **1** was synthesized in good isolated yield by copper catalyzed coupling reaction of *p*-tert-butyl-25,26,27,28-tetrakis(acetylene) calix[4]arene with 1-iodo alkynes in pyrrolidine. The hydroxy end groups on the top of the tube required for a formation of the tube structure were converted to urethane to provide hydrogen bonding units.

C0196-Constituents and Antimicrobial Activity of *Diospyros rubra* Lec

Puttirat Saraban¹, Supaluk Prachayasittikul¹, Rungrot Cherdtrakulkiat², Virapong Prachayasittikul² and Somsak Ruchirawat³

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

²Department of Clinical Microbiology, Faculty of Medical Technology, Mahidol University, Bangkok 10700, Thailand

³Laboratory of Medicinal Chemistry, Chulabhorn Research Institute, Bangkok 10210, Thailand

Abstract: *Diospyros rubra* Lec., a Thai medicinal plant has been used as indigenous medicine for antimicrobial, diuretic and analgesic actions. Chemical investigation on crude ethyl acetate extracts of the stem of *Diospyros rubra* Lec. was carried out using chromatographic methods. There were lupeol acetate **1**, lupeol **2**, a mixture of stigmasterol and β -sitosterol **3**, 28-acetyl betulin **4**, betulin **5** and β -sitosteryl-3-*O*- β -D-glucopyranoside **6**. Their structures were determined by spectroscopic methods.

The isolates and fractions were evaluated for antimicrobial activity using agar dilution method against 28 strains of microorganisms. The results showed that the betulin completely inhibited the growth of *S. pyogenes* at 85 µg/mL. The semi-purified fraction E6.2 completely inhibited the growth of *C. diphtheriae* NCTC 10356 at 64 µg/mL. Additionally, the E6.2 exhibited very strong antigrowth activity against *S. pyogenes* at the same concentration.

C0197-CHARACTERIZATION OF SUPPORTED QUASI-PLANAR GERMANIUM WAVEGUIDE SENSORS WITH SYNCHROTRON IR RADIATION

Jitraporn Vongsivut¹, Jason Fernandez², Sanong Ekgasit¹, Mark Braiman^{2*}

¹Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

²Chemistry Department, Syracuse University, Syracuse, NY 13244-4100, USA

E-mail address: JitrapornV@hotmail.com

Abstract: Quasi-planar Ge waveguides are being developed as evanescent-wave sensors for chemical microanalysis. The only non-planar surface is a cylinder section having a 600 mm radius of curvature. This confers a symmetric taper, allowing for direct coupling into and out of the waveguide's 1-mm² end faces while obtaining multiple reflections at the central <30-m-thick sensing region. Ray-optic calculations indicate that the propagation angle at the central minimum has a strong non-linear dependence on both angle and vertical position of the input ray. This results in rather inefficient coupling of the input light into the off-axis modes that are most useful for evanescent-wave absorption spectroscopy. Mode-specific performance of the quasi-planar waveguides has also been investigated experimentally. As compared to a standard Global™ source, the much greater brightness of synchrotron-generated IR radiation allows a higher energy throughput with a much narrower range of propagation angles. However, angle-selective excitation results in a strong oscillatory interference pattern in the transmission spectra. These spectral oscillations are the principal technical limitation on using synchrotron radiation to measure evanescent-wave absorption spectra with the thin waveguides.

C0198-CONCENTRATION OF DYE-LABELED NUCLEOTIDES INCORPORATED INTO DNA DETERMINED BY SPR-SPFS BIOSENSOR

Sanong Ekgasit¹, Chuchaat Thammacharoen¹, Gudrun Stengle², Wolfgang Knoll³

¹ Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

² The Scripps Research Institute, 10550 North Torrey Pines Rd, La Jolla, CA 92037, USA

³ Max-Planck-Institut für Polymerforschung, Ackermannweg 10, D-55128 Mainz, Germany

E-mail address: sanong.e@chula.ac.th, chuchaat.t@chula.ac.th

Abstract: Surface-plasmon field-enhanced fluorescence spectroscopy (SPFS) exploits the strong surface-plasmon-resonance-generated evanescent field at the metal dielectric interface to excite the fluorophores near the metal surface. SPFS is proven to be a complementary technique to the surface plasmon resonance (SPR) where additional chemical information at the molecular level can be collected. The strong and concentration dependent SPFS-fluorescence was observed even at an extremely low concentration of fluorophore where SPR does not show reflectance minimum shift. In general, SPFS-fluorescence cannot be directly employed for the quantitative analysis due to the distance-dependent fluorescence quenching via the non-radiative resonance energy transfer near the metal surface, well-defined and reproducible sensor architecture enables SPR-SPFS for such analysis. The specific position of Cy5-labeled dCTP incorporated into the complete DNA double-strand was achieved via an enzymatic reaction. The fraction of DNA with Cy5-dCTP was determined from the SPR-SPFS signals. The sample-to-sample variations associated with the optical property of the metal film are corrected by the evanescent field integration over the DNA layer. The exponential-type relationship between the fraction of DNA with Cy5-dCTP and the mole fraction of the Cy5-dCTP the mixed dNTPs solution indicates the preferential enzymatic reaction towards the non-labeled nucleotide.

C0199-Novel Diamond ATR Sensor

Anan Jean-Anong, Chuchaat Thammacharoen, Sanong Ekgasit

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

E-mail: nun_infinity@hotmail.com, chuchaat.t@chula.ac.th, sanong.e@chula.ac.th

Abstract: A novel infrared sensor based on attenuated total reflection phenomena has been developed. The sensor employed diamond or cubic zirconia (CZ) as an internal reflection element (IRE). The small size of the tip of the cut diamond enables ultimate contact between IRE and the sample. The novel sensor enables characterization of small solid samples, samples with rough surface, thin film and those having trouble analyzing by conventional infrared sampling techniques. The newly developed sensor head is much cheaper than the ATR objective available commercially. It is easy to use and contamination free since the diamond IRE can be easily taken out and cleaned.

C0200-CHARACTERIZATION OF FACETED-GEMSTONES AND JEWELRY USING FOURIER TRANSFORM INFRARED SPECTROSCOPY

Pimthong Thongnopkun, Chuchaat Thammacharoen, Sanong Ekgasit*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

E-mail address: pimthong.t@student.netserv.chula.ac.th, chuchaat.t@chula.ac.th, sanong.e@chula.ac.th

Abstract: A novel approach for identification and characterization of loose and mounted faceted-gemstone has been developed. By adjusting the table of the faceted gemstone perpendicular to the propagating direction of the infrared beam the infrared beam from infrared microscope can be focus without difficulty. The specular reflected beam or the total-internal reflected beam can be collected. The technique can also be applied for mounted faceted gemstone without removing the stone from the jewelry body. Individual identification of faceted gemstones on the complex jewelry setting can be rapidly performed. The technique can be employed for gem identification, separation of natural gems from synthetic gems, characterization of treated gemstone and inclusion.

C0201-THERMODYNAMICAL AND CONFORMATIONAL INVESTIGATIONS OF 2,6-BIS(2'-MERCAPTOPHENYL)THIODIMETHYLEPYRIDINE AND ITS ZINC COMPLEX

Tawatchai Keying, Banchob Wannin and Nithaya Ruangsornwattana*

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, 10330 Bangkok, Thailand, e-mail address: t_keying@yahoo.co.uk

Abstract: The geometries of various conformations of 2,6-bis(2'-mercapto-phenyl)-thiodimethylepyridine (MP1DMP) (H₂) and its deprotonated species (H⁻ and L⁻) were obtained by potential energy surface scan (PES) at B3LYP/6-311G(2d,p)/214Z level of theory. Three deprotonated and four neutral forms of MP1DMP and two stable conformations of 1:2 MP1DMP complexes (ZnL) have been found. Binding and complexation energies of ZnL²⁺ and its corresponding thermodynamic quantities were computed using frequency calculations of B3LYP/6-311G(2d,p) method. Due to complexation of the bis(2-mercapto-phenyl) complex, reaction enthalpy and Gibbs free energy, binding energy and complexation energy, are $\Delta H^\circ_{\text{bind}} = -62.754$, $\Delta G^\circ_{\text{bind}} = -4.74$, $\Delta E^\circ_{\text{bind}} = -626.47$ and $\Delta E^\circ_{\text{comp}} = -683.10$ kcal/mol, respectively.

C0202-THE ADSORPTION OF BENZENE ON INDUSTRIALLY IMPORTANT NANOSTRUCTURED CATALYSTS (H-ZSM-5, H-FAU, AND H-FAU) CONFINEMENT EFFECTS

Ratana Rungsrisakun, Ravornpon Jansang and Jintara Jintarakul*

Laboratory for Computational & Applied Chemistry, Physical Chemistry Division, Kasetsart University, Bangkok 10900, Thailand, e-mail address: jtsakul@ku.ac.th; Jintarakul

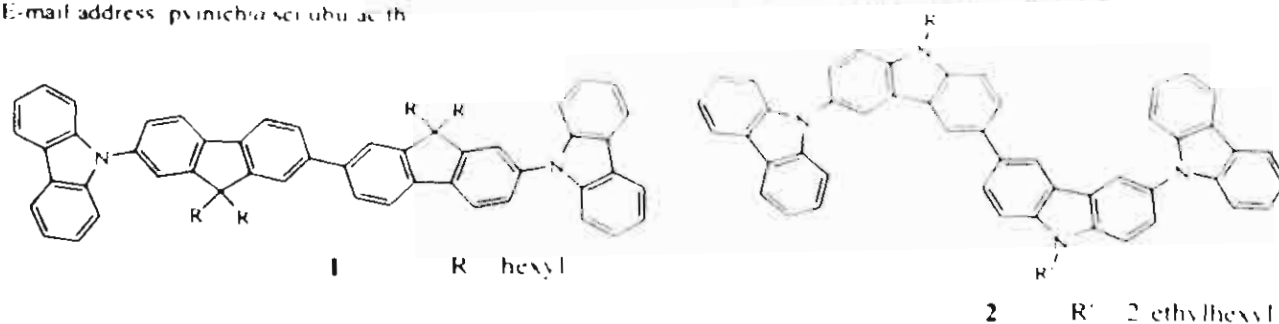
Abstract: The structure of industrially important Zeolite framework (H-ZSM-5 and H-FAU) and its interactions with benzene have been investigated within the framework of our own 8-layered integrated molecular orbital + theoretical mechanics (ONIOM) approach utilizing three-layer ONIOM schemes (B3LYP/6-311g(d,p)/HF/3-21G(d,p)/HF) in comparison with single results made for H-ZSM-5 and H-FAU site (ONIOM) results. Inclusion of the extended zeolite framework differentiation of different types of zeolite, unlike the small cluster models which are not able covering the nanoscale, has an effect on adsorption properties and leads to make this differentiation. The ONIOM adsorption energies of benzene on ZSM-5, H-FAU and FAU zeolites are 19.23, 16.11 and 15.22 kcal/mol, respectively, which agrees well with the known adsorption trend of these three zeolites. On the other hand, the small cluster models yield remarkably low adsorption energies (8.09, 8.48 and 6.78 kcal/mol) for these three zeolites and even yield an unreasonable trend of adsorption energies for these zeolites (6H) complexes. With the inclusion of basis set superposition error (BSSE) and the MP2 corrections, the ONIOM+MP2/6-311G(d,p)/HF/3-21G(d,p)/HF adsorption energies are predicted to be 21.00, 19.49 and 15.41 kcal/mol, the latter can be compared well with the experimental data (18.31 kcal/mol) for benzene adsorption on a FAU zeolite. The results derived in this study suggest that the ONIOM+MP2/6-311G(d,p)/HF/3-21G(d,p)/HF scheme provides a more accurate method for investigating the adsorption of aromatic hydrocarbons on these zeolites.

C0203-SYNTHESIS AND CHARACTERISATION OF NOVEL BLUE LIGHT-EMITTING MATERIALS

Vinich Promarak

Department of Chemistry, Faculty of Science, Ubon Ratchathani University, Warinchamrap, Ubon Ratchathani, 34190

E-mail address: pvinich@serubu.ac.th



Abstract: Organic light-emitting diodes (OLED) have recently attracted a large amount of attention due to their promising applications in flat-panel displays as well as being a perspective of academic research.¹ To develop a full-colour display, blue light-emitting organic material with high luminescent efficiency and high performance in the devices is required. In this paper, synthesis and characterization of novel blue light-emitting hole-transporting materials based on bifluorene and bicarbazole capped with carbazole were reported. In these compounds, 9-position of hole-transporting carbazole moieties was attached to both terminal ends of bifluorene and bicarbazole core structures by using Ullmann annulation of carbazole and the corresponding dibromo compounds.

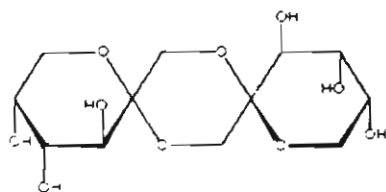
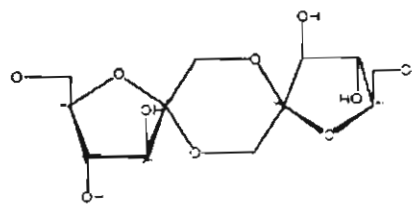
C0204 -Synthesis of Potential Radioprotective Agents, derivatives of 1-(4'-aminophenyl)-1-propanolChote Jitrangsi^{1*}, Robert T. Blickenstaff²¹ Department of Chemistry, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani 34190, Thailand; email address: jchote@sci.ubu.ac.th² Department of Biochemistry and Molecular Biology, Indiana University School of Medicine, Indianapolis, Indiana 46202-5122, U.S.A.

Abstract: Several groups of organic compounds have been shown to possess radioprotective properties, they can play the important role in the protection of radiation-infected population, in cases of radiation accidents, terrorist attack, or major casualty from international conflicts. In common cases, the protection of normal tissues without protecting tumor is also one way to increase the therapeutic gain in cancer therapy. From previous investigation, it was expected that derivatives of para-aminobenzophenone, para-aminopropiophenone, and their ketals may also possess radioprotective properties. Three compounds were synthesized, their structures are confirmed by conventional methods. Further investigation into their radioprotective properties will be carried out.

C0205-SYNTHESIS AND CHARACTERIZATION OF DIHEXULOSE DIANHYDRIDES AND RELATED COMPOUNDSSarphon Chanpaka¹, Adrian E. Flood², Kenneth J. Haller¹ and Athit Dathong³¹ School of Chemistry, Faculty of Science, Suranaree University of Technology, Nakhon Ratchasima, 30000, Thailand.² School of Chemical Engineering, Faculty of Engineering, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand.³ Department of Chemistry, Faculty of Science and Technology, Ubon Ratchathani Rajabhat University, 34000, Thailand.

E-mail address: adrianf@ccs.sut.ac.th, haller@ccs.sut.ac.th and schanpaka@yahoo.com

Abstract: Dihexulose dianhydrides (DHAs) are intermolecular cyclic acetals formed by the condensation of two hexulose molecules with the elimination of two water molecules, and the formation of two linkages involving the 2- and one other position of each component (Manley-Harris & Richards, 1994). Example structures of dihexulose dianhydrides are shown below: α -D-fructopyranose 1,2':2,1'- α -D-fructofuranose 1,2':2,1'- β -D-fructopyranose dianhydride β -D-fructofuranose dianhydride. Due to the stability of the intermolecular dioxane ring, the molecule is not hydrolyzed in the stomach. This stability makes DFAs stable, even at high temperature (Park, Kim & Choi, 1996). It is because of this reason that DFAs are expected to be promising sweeteners for people with diabetes. DFAs are attractive materials as a low calorie sugar, non- or anti-tooth decaying sweetener, stabilizer, and as building blocks for the preparation of liquid crystals and polymers in the food and pharmaceutical industries (Saito, Hira, Suzuki, Hara, Yokoda & Tomita, 1999). Characterization of dihexulose dianhydrides by x-ray crystallographic studies may be the best way to determine the stereochemical features, including absolute stereochemistry, that are important to understanding saccharide interactions. This study concerns the synthesis of new dihexulose dianhydrides and related compounds. The products were characterized by standard analytical techniques.

 α -D-fructopyranose 1,2':2,1'- β -D-fructopyranose dianhydride α -D-fructofuranose 1,2':2,1'- β -D-fructofuranose dianhydride**C0206-SUPRAMOLECULAR STRUCTURE OF [(ImH)+]2[Co(H2O)6]2+[Co(TMA)2(H2O)4]4-**Kittipong Chainok^{1*}, Kenneth J. Haller¹, Herman H.-Y. Sung² and Ian D. Williams²¹ School of Chemistry, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand² Department of Chemistry, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong, China

e-mail address: kchainok10@yahoo.com

Abstract: Preparation of [(ImH)+]2[Co(H2O)6]2+[Co(TMA)2(H2O)4]4- by hydrothermal synthesis, and characterization by single crystal x-ray diffraction is reported. The supramolecular structure is dominated by a three-dimensional O-H...O and N-H...O hydrogen bonding network, supplemented by π - π stacking interactions between the imidazolium cations and the trimesate anions.

C0207-FAST EXTRACTION FOR ORGANOCHLORINE PESTICIDES DETERMINATION IN WATER SAMPLES BY GAS CHROMATOGRAPHY WITH ELECTRON CAPTURE DETECTION

Pulaporn Woasamneang, Teerayuth Liworncharoenwong, Sunan Chainakul and Nirand Pongpun

Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand.

E-mail address: nirand@swu.ac.th

Abstract: A fast and simple method for single-step extraction of organochlorine pesticides in water samples has been developed and compared with standard liquid-liquid extraction. In this work, the determination of 0.5–2.5 ppm of organochlorine pesticides, lindane, aldrin, dieldrin, β -endosulfan and p,p'-DDT were investigated employing gas chromatographic technique equipped with an electron capture detector (GC-ECD) and pentachloronitrobenzene was used as an internal standard. The single-step extraction has shown comparable results to the conventional liquid-liquid extraction in terms of correlation coefficients, percent recoveries, percent relative standard deviation, limit of detection as well as limit of quantitation. This is a preliminary work for the development of decreasing in analysis time which the advantages of performing an internal standard technique together with the single-step extraction will be discussed.

C0208-XANTHONES FROM THE YOUNG FRUITS OF *GARCINIA MANGOSTANA*

Orapin Komutiban¹, Sunit Suksamran^{1*}, Pinit Ratananukul², Nitrat Chumnoi¹ and Apichart Suksamran⁴

¹Department of Chemistry, Faculty of Science and Technology, Suan Dusit Rajabhat University, Bangkok 10300, Thailand

²Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

³Chulabhorn Research Institute, Bangkok 10210, Thailand

⁴Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand

Abstract: Fourteen xanthones, hwaiteoxanthone, demethylcalabaxanthone, 8-desoxygartanin, gartanin, gartanone, 1, 4-mangostin, γ -mangostin, gartanone D, gartanone C, 11-hydroxy 1-isomangostin, gartanone H, 1,6-dihydroxy-7-methoxy-8-(3-methylbut-2-enyl)-6',6'-dimethylpyranos(2'':3'')-3,2-xanthone, mangostinone and mangostannin were isolated from the young fruits of *Garcinia mangostana* L. (Clusiaceae). Among these xanthones, hwaiteoxanthone (1) and 11-hydroxy 1-isomangostin (2) have not been previously reported from this plant species. The structure of all xanthones were elucidated by analysis of their spectroscopic data.

C0209-Molecular Packing Study of D-Phenylglycine in the Cationic and Zwitterionic Forms

Aimon Tongpenyai¹, Samran Prabpai¹, Palangpon Kongsaeetee²

¹Department of Chemistry and ²Center for Protein Structure and Function, Faculty of Science, Mahidul University, Bangkok 10400

Abstract: D-Phenylglycine, an important starting material of semi-synthetic drugs, was studied in terms of molecular packing in different ionization states. In acidic conditions, D-phenylglycine, crystallized in ethanol/HCl, existed in the form of $C_6H_5COOHNH_3^+Cl^-$ (the cationic form). The crystal structure, consisting of alternating hydrophobic and hydrophilic zones, was stabilized by hydrogen bonds involving Cl, O, N, and H atoms. In the presence of ammonium hydroxide, D-phenylglycine crystallized in ethanol existed in the form of $C_6H_5COONH_4^+$ (the zwitterionic form). The crystal structure also consisted of alternating hydrophobic and hydrophilic zones (but different arrangement in details). The structure was stabilized by hydrogen bonds involving O⁺, N⁻, and H atoms. There were two major conformers in the zwitterionic form classified by the dihedral angles between $NC^{\alpha}C^{\beta}$ plane and $CX^{\alpha}C^{\beta}$ plane, while there was only one conformer observed in the cationic form. An investigation of D-phenylglycine structure in NaOH, existing as an anion is in progress. Structural comparison of the three crystal forms of D-phenylglycine will be discussed.

C0210-NEW ANTIPLASMODIAL CYCLOPEPTIDE ALKALOIDS FROM *ZIZIPHUS OENOPLIA* VAR. *BRUNONIANA*

Sunit Suksamran^{1*}, Narisara Suwannapoch¹, Nathachai Aunchai¹, Mayuso Kuno³, Pinit Ratananukul¹, Rachada Haritakun², Chawewan Jansakul¹ and Somsak Ruchirawat⁴

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand

²National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, Paholyothin Road, Pathumthani 12120, Thailand

³Department of Physiology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90112, Thailand

⁴Chulabhorn Research Institute, Bangkok 10210, Thailand

Abstract: Bioassay-guided fractionation of the EtOAc extract of the roots of Thai *Ziziphus oenopia* var. *brunoniana* (Rhamnaceae) resulted in the isolation of four new 13- membered cyclopeptide alkaloids of the S(13) type, ziziphine N, O, P and Q. The structures of the new metabolites were elucidated on the basis of spectroscopic analyses. Ziziphine N and Q exhibited significant antiplasmodial activity against the parasite *Plasmodium falciparum* with the inhibitory concentration (IC₅₀) values of 3.92 and 3.5 μ g/mL, respectively. Ziziphine N and Q also demonstrated weak antimycobacterial activity against *Mycobacterium tuberculosis* with the same MIC value of 200 μ g/mL.

C0211-SYNTHESIS OF A BIPYRIDYL DERIVATIVE AS SENSITIZER FOR THE DYE-SENSITIZED SOLAR CELL SYSTEM

Chalermrat Akarawitoog¹, Apichat Chaicharnattee¹, Chaiyuth Sae-kung², Narong Pungwiwat¹, Surin Laosooksathit¹

¹Department of Industrial Chemistry, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Thailand

²NSTDA, Thailand

E-mail address: apichat26@thai.com

Abstract: 4,4'-Dimethyl -2,2'-bipyridine is an important ligand and used as the starting material for the synthesis dye sensitizers for making dye-sensitized solar cell. The synthesis begins with 4-picoline, which was reacted with sodamide to give a crude brownish material. The crude product was further purified by extraction with toluene and the organic layer was dried and redistilled under reduced pressure to give 2-Amino-4-picoline as yellowish solids, m.p. 96-98 °C in 64.4 % yield. Diazotization of 2-Amino-4-picoline, followed by potassium iodide to give brownish mixture, which was further purified by extraction with chloroform to give yellowish solids of 2-Iodo-4-picoline, b.p. 45-48 °C in 50.8 % yield. Coupling of 2-Iodo-4-picoline was accomplished by the use of copper(I) bromide to afford a green mixture which was purified by steam distillation, followed by extraction with diethyl ether to afford white solids of 4,4'-Dimethyl -2,2'-bipyridine, m.p. 174-177 °C in 42.1 % yield.

C0212-Gas/ Particle Partitioning Constant(Kp) of Nicotine in Tobacco Smoke

Yongyuth Jundulawessa¹, Waradool Chutitong¹, Wanphen Boonruksa²

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok 10110

²Banmungpitayakom, Banmung District, Skonaecon Province

Abstract: Tobacco smoke are composed of gas phase and particle phase, can be parameterized (3) in term of gas/particle constant $K_p = C_p/C_g$, where C_p (ng/μg) is the concentration in particle phase and C_g (ng/m³) is the concentration in gas phase. This research were carried out by collecting the tobacco smoke, using aquarium pump which connected the sucker substituted the normal air flow. The air sample was trapped by filter holder and double layer of glass overflow gaseous trapping that contained oxalic solution, connected to our handmade aquarium pump. The desorption and extraction of nicotine contents were injected to HPLC which calibrated in microscale. The results show the efficiency of our handmade aquarium pump is not different from the expensive cost peristaltic pump. To try out the efficiency by comparing with the previous maximum $\log K_p = 5.02$ and our $\log K_p = 4.3 (4.798 \times 10^{-5})$, the percentage shown 85.65. This research were used a mixture of CH₃CN : CH₃OH (95 : 5 v/v) as isocratic mobile phase, flow rate 1.0 mL/min, detection limit 2.08 μg/g. The method were validated by obtaining a retention time 4.5 min of nicotine, highly precision (%CV < 5), moderate percent recovery about 74.71-83.45 and the correlation coefficient (r) over 0.997.

C0213-ANTHOCYANINS, TOTAL PHENOLICS, AND ANTIOXIDANT CAPACITY OF BLUEHONEYSUCKLES

Arusa Chaovanakul

Division of Food Science and human nutrition, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand. Email address: arusag@swu.ac.th

Abstract: Total anthocyanins and total phenolic compounds of 10 bluchoneysuckle (*Lonicera caerulea edulis*) cultivars were extracted and quantified by spectrophotometric method. Bluchoneysuckles contained total monomeric anthocyanins (116-593 mg/100 g fresh weight), total phenolics (440-1142 mg gallic acid equivalent/g fresh weight), ORAC (18-104 μmole Trolox/g fresh weight), and FRAP (38-94 μmole Trolox/g fresh weight). Antioxidant capacity was correlated with anthocyanin and total phenolic content.

C0214-SEQUENTIAL INJECTION ANALYSIS WITH A COST-EFFECTIVE FLUORESCENCE DETECTOR FOR DETERMINATION OF AMMONIUM

Jaroon Jaknuee,a,b*, Jianzhong Li, Kate Grudpana,b and Purnendu K. Dasguptae

^aDepartment of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand.

^bInstitute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand. e-mail address: seijkimng@chiangmai.ac.th

^cDepartment of Chemistry and Biochemistry, Texas Tech University, Lubbock, TX 79409-1061, USA

Abstract: Sequential injection analysis for determination of ammonium using a cost-effective home-made detector was developed. The detector was built using light emitting diode (LED) as an excitation source, a colored plastic sheet as an emission filter, and an integrated circuit of photodiode + operational amplifier as a light sensor. Ammonium standard or sample solution was aspirated in to the system and mixed with o-phthaldehyde and sulfite solutions in a heated reactor to accelerate the reaction. After that the mixed solution was sent to fluorescence detector. Linear calibration graphs of ammonium in concentration range of 1-10 and 10-100 μM can be achieved. Detection limit of about 0.1 μM ammonium was obtained, with a relative standard deviation of 1.2% (10 μM ammonium, n=10).

C0215-SYNTHESIS, ABSOLUTE CONFIGURATION AND MOULTING ACTIVITY OF 26-HALOPONASTERONE A

Arnon Jankum¹, Boon-ek Yingyongnartongkul^{1,2}, Saowanee Kumpun¹, Nitirat Chimnoi² and Apichart Suksamrarn¹

¹Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand; e-mail address: boonek@ramit.ru.ac.th

²Chulabhorn Research Institute, Vipavadee-Rangsit Highway, Bangkok 10210, Thailand

Abstract: Two C-25 epimers of 26-chloro, 26-bromo and 26-iodoponasterone A have been synthesized from the respective C-25 epimeric mokosterone, the absolute configuration of which has been determined. Moulting activity of these compounds has been evaluated using the *Musca* bioassay and it was found that the (25S)-26-halo analogues were more active than the corresponding (25R)-26-halo analogues. Among the 25S series, increase in activity with increase in the size of the halogen atom was observed, indicating that the steric factor was more important than the electronic factor in binding of these ecdysteroids analogues to the receptor. On the other hand, decrease in activity with increase in the size of the halogen atom

was noted in the 25R series, suggesting that the steric factor was less important than the electronic factor. The results indicated that the configuration at C-25 and the substituent at C-26 have significant influences on the interaction of ecdysteroids with their receptor.

C0216-THE EFFECT OF Cr IONS ON PROPERTIES OF Cr-SUBSTITUTED M-TYPE BARIUM FERRITES

Pongtip Winotai¹ and Suriya Ounnunkad^{2*}

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand,

²Department of Chemistry, Faculty of Science, Chiang Mai, Chiang Mai 50200, Thailand,

*e-mail address: sounnunkad@yahoo.com

Abstract: Cr-doped M-type barium ferrites, $\text{BaFe}_{12-x}\text{Cr}_x\text{O}_{19}$, with $x = 0.0-0.8$ prepared by the nitrate-citrate gel combustion process were systematically investigated by a powder x-ray diffractometer (XRD), magnetometer, Mössbauer spectrometer (MS), and a scanning electron microscope (SEM) respectively. XRD patterns show the formation of pure hexagonal magnetoplumbite phase. The lattice parameters decrease with increasing Cr content. The site preference of Cr^{3+} and magnetic properties of the ferrites were studied by measuring Mössbauer subspectra and magnetic hystereses. The saturation magnetizations decrease but coercivities increase with increasing Cr concentration. The magnetization and Mössbauer results show that the Cr^{3+} ions preferentially occupy the 12k and 4f_{VI} sites. The average grain size of hexagonal platelets obtained by SEM tends to decrease with respect to the Cr content.

C0217-Synthesis of a new triazene ligand and a precursor for the paddlewheel Ni(II) triazenido complex.

Phimphaka Klanginsirikul* and David James Harding

School of Chemistry, Institute of Science, Walailak University, Thasala, Nakorn Si Thammarat, 80160

E-mail address: kphimpha@wu.ac.th and hdavid@wu.ac.th

Abstract: The new triazene ligand (RNNHR; R = 3,5-dimethylphenyl) **1** was made by an adaptation of the synthetic method for RNNHR when R = *p*-tolyl. The reaction between this ligand and NiBr_2 yielded a paramagnetic complex namely $[\text{NiBr}_2(\text{RNNHR})_2]$ **2**. This complex may be a useful precursor in the synthesis of the new paddlewheel complex $[\text{Ni}(\text{RNNHR})_4\text{Ni}]$ (R = 3,5-dimethylphenyl).

C0218-Synthesis of a potential N or S donor ligand and metal complexes with Ni(II).

David James Harding* and Phimphaka Klanginsirikul

School of Chemistry, Institute of Science, Walailak University, Thasala, Nakorn Si Thammarat, 80160

E-mail address: hdavid@wu.ac.th and kphimpha@wu.ac.th

Abstract: The novel ligand tris(thiazolyl)phenylborate lithium $[\text{PhB}(\text{thz})_3]\text{Li}$ has been synthesized. The ligand may bind to a metal through either the nitrogen or sulfur donor atoms. The ligand reacts with the $\text{NiX}_2(\text{PPh}_3)_2$ (X = Cl, Br) to produce the octahedral complexes $[\text{NiX}(\text{PPh}_3)_2\{\text{PhB}(\text{thz})_3\}]$ (X = Cl, Br).

C0219-CONFORMATIONS AND TAUTOMERIZATION REACTIONS OF THIOSEMICARBAZONE DERIVATIVES: A DENSITY FUNCTIONAL THEORY INVESTIGATION

Kirawit Supakornchailert, Chumanan Tungchitpienchai, Banchob Wanno, Vithaya Ruangpornvitsuti

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University 10330, Bangkok, Thailand;

e-mail address: banchobw@hotmail.com, vithaya.r@chula.ac.th

Abstract: The optimized structures of five thiosemicarbazone derivatives (R1-TCS, R2-TCS, R3-TCS, R4-TSC, R5-TSC) are obtained by geometry optimization using density functional theory (DFT) calculation at the B3LYP/6-31G(d) level of theory. Each of derivatives has 6 thioamino and 24 thioimino conformers. Six tautomerization reactions between thioamino and thioimino tautomers have occurred via transition states. Tautomerization reaction between the most stable specie of thioamino (R1-TSC-Atctcc) and thioimino (R1-TSC-Itctct) tautomers is an endothermic reaction with enthalpy of reaction, $\Delta H^\circ = 19.30 \text{ kcal mol}^{-1}$.

C0220-Theoretical investigation of geometrical conformation, protonation of tetraamino-*p*-tert-butylthiacalix[4]arene and complexation with zinc. A comparative theoretical method

Banchob Wanno, Vithaya Ruangpornvitsuti *

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University 10330, Bangkok, Thailand; e-mail address: vithaya.r@chula.ac.th

Abstract: The geometries of various conformations of tetraamino-*p*-tert-butylthiacalix[4]arene (L) were optimized using the semiempirical AM1, HF/3-21G, density functional theory (DFT) at B3LYP/6-31G(d) level and various two-layered ONIOM(B3LYP/6-31G(d): MO) methods. In decreasing order, the relative stability of four characteristic conformations obtained from different MO calculations is cone, partial cone, 1,3-alternate and 1,2-alternate conformers. The B3LYP/6-31G(d) and two-layered ONIOM (B3LYP/6-31G(d): AM1) optimized geometries of 1,3-alternate (0101-CCCC) show excellent agreement with the x-ray crystallographic structure. The geometry optimization of various protonated species of L and its zinc complex were carried out at ONIOM (B3LYP/6-31G(d): MNDO), ONIOM (B3LYP/6-31G(d): PM3), ONIOM (B3LYP/6-31G(d): AM1) and ONIOM (B3LYP/6-31G(d): HF/3-21G) levels of theory. The energies of protonation, preorganization of L and complexation with zinc were derived from total energies at various ONIOM(B3LYP/6-31G(d):

MO) levels. The electrostatic potential surface of cone (0000-CCCC) and 1,3-alternate (0101-CCCC) conformers were presented.

C0221-A DENSITY FUNCTIONAL THEORY investigation OF Tautomerization and Zinc complexation REACTIONS of phenylthiosemicarbazone

Banchob Wann, Vithaya Ruangpornvitsuti

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University 10330, Bangkok, Thailand.

e-mail address: banchobw@hotmail.com, vithaya.r@chula.ac.th

Abstract: The geometrical structures of phenylthiosemicarbazones (HAPhTSC) conformers have been obtained by geometry optimizations using density functional theory (DFT) calculations at B3LYP/6-31G(d) and B3LYP/6-311G(d,p) levels of theory. Six thioamino and twenty four thioimino tautomers of HAPhTSC have been found. Six tautomerization reactions between thioamino and thioimino tautomers occurring via transition states. Tautomerization between the most stable species of thioamino (Atttec) and its thioimino (Itttect) tautomer is an endothermic reaction, $\Delta H^\circ = 18.17 \text{ kcal mol}^{-1}$ and its $\log K = -13.74$, at 298.15 K. Thermodynamic quantities of Zinc complexation reaction are reported. Geometry of zinc complex with HAPhTSC found as $\text{Zn}(\text{HAPhTSC})_2\text{Cl}_2$ structure has been obtained using B3LYP/6-31G(d) calculation.

C0222-Rotatable Potential Energy of Poly(3,4-ethylenedioxythiophene) (PEDOT), Obtained from Quantum Chemical Calculations

Kanjana Rotpradit¹, Supa Hannongbua¹, Potjaman Poolmee¹

¹Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand.

E-mail address: piyasornce@hotmail.com, fsccspha@ku.ac.th

Abstracts Rotatable potential energy of poly(3,4-ethylenedioxythiophene) (PEDOT) were investigated on the torsion angle between the two monomer by using quantum chemical calculations. Conformational analysis was performed, based on semiempirical (AM1), *ab initio* (at HF/3-21+G* and HF/6-31+G* levels) and density functional theory (at B3LYP/3-21+G* and B3LYP/6-31+G* levels). The obtained results indicate that PEDOT shows anti conformation with the dihedral angle (S1-C2-C7-C15) equals to 180 degrees. However, it was found that the PEDOT geometry, calculated by semi-empirical (AM1) method was distorted and the dihedral angle was located around 106.9 degrees.

C0223-A Concise Synthesis of Functionalized 7-Oxa-[5]-helicenes.

Jetsuda Areephong, Nopporn Ruangsapapichart and Tienthong Thongpanchang*

Department of Chemistry, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400 Thailand.

Abstract: Acid mediated cyclization of 7,7'-disubstituted-2,2'-binaphthol (**3**) furnished the corresponding helicenes (**4**) in good yield

C0224-DETERMINATION OF GUAIPHENESINE IN PHARMACEUTICAL PREPARATION BY DERIVATIVE SPECTROSCOPY

Winai Oungpipat*, Salinee Husen

*Division of Analytical Chemistry, Department of Chemical Technology, Rajamangala Institute of Technology, Bangkok Technical Campus, 2 Nang Linchi Road, Sathron, Bangkok, 10120 Thailand.

Email: owin@access.rit.ac.th

Abstract: Development of derivative spectrophotometric method for the determination of guaiphenesine in pharmaceutical preparations was described. The guaiphenesine was determined by measuring the derivative values between 220 – 320 nm. The best signal-to-noise ratio was found when the fourth derivative of the spectrum was used. Chemical and spectral variables were optimized for the determination of analyte. Calibration graph was linear over the concentration range 1.0 - 160.0 $\mu\text{g ml}^{-1}$. Relative standard deviation was found to be 1.53% ($n = 10$). Detection limit (3SD) of 0.6 $\mu\text{g ml}^{-1}$ was achieved. The recovery of 99.9% was obtained by the standard addition method. The proposed method was successfully applied to the assay of commercial syrup. In addition, the procedure was rapid and simple.

C0225-DEVELOPMENT OF BATCH INJECTION ANALYSIS SYSTEM FOR DETERMINATION OF ASCORBIC ACID

Winai Oungpipat*, Lop Pathimapornlert, Wansiri Pitakkiattikul

Division of Analytical Chemistry, Department of Chemical Technology, Rajamangala Institute of Technology, Bangkok Technical Campus, 2 Nang Linchi Road, Sathron, Bangkok, 10120 Thailand.

Email: owin@access.rit.ac.th

Abstract: Development of batch injection analysis (BIA) system for amperometric determination of ascorbic acid in pharmaceutical preparations was described. The technique involves injection of microliter samples into a large-volume stirred bulk solution, at a fixed location above the working electrode center. The effects of various experimental variables on the BIA operation are described. Two linear concentration ranges of 3.97×10^{-3} - 8.52×10^{-5} and 1.14×10^{-2} - $4.54 \times 10^{-3} \text{ M}$ were obtained. The proposed system possess satisfactory reproducibility. Rapid analysis time of 8 second per sample was achieved.

C0226-The Development of Appropriate Thinners for Plastic Printing

Nathee Phattae^a, Pipat Chooto^a, Udom Jingit^a, and Ankana Patomsakul^b.

^aDepartment of Chemistry and ^bDepartment of Polymer Science, Faculty of Science, Prince of Songkla University, Songkla 90110, Thailand.

E-mail address : s4622043@maliwan.psu.ac.th.

Abstract: The appropriate solvents for plastic printing were studied due to the fact that the currently used solvents are volatile therefore hazardous to workers and unnecessarily high cost. The solvent samples were selected with the consideration of solubility, expense and toxicity. Also, the ratios of solvents are varied, both the new and currently used ones. The evaporation rate was studied by GC analysis. The adhesion properties of the paints with those solvents were also investigated. The results, i.e., the suitable solvents from those preliminary studies are to be reported.

C0227-DETERMINATION OF ZINC IN WATER SAMPLE BY COMPLEXOMETRIC SPECTROPHOTOMETRY

Phanu Poonsawus, Anucha Munchaidee, Prakai Sesto, Prissana Junyuha, Jirasak Threeprom
Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 44150, Thailand
E-mail address: pcq_cp@hotmail.com

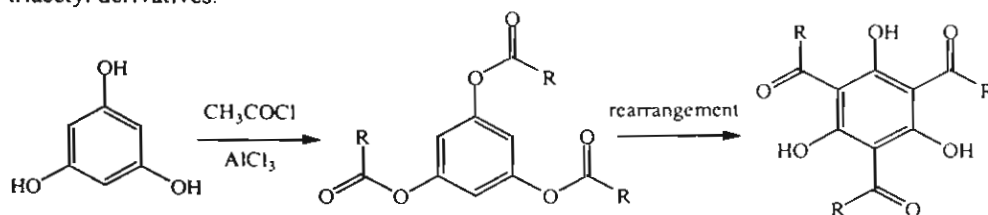
Abstract: The simple and reliable method for the determination of Zn^{2+} in water sample has been presented. The proposed method was carried out based on the complex formation of Zn^{2+} and 4-(2-pyridylazo) resocinol (PAR), resulted in the red-orange complex compound. This compound was quantitatively detected by spectrophotometry. From the study, it was found that the determination of Zn^{2+} ranging from 0.03-0.5 mg/l could be successfully achieved by using 1×10^{-5} M PAR and detection at 525 nm without controlling the pH and temperature of the reaction system (pH 9.5-9.8 and 25 °C). Under these experimental conditions, the good and acceptable characteristics of the method were obtained. The linearity was ranged from 0.03-0.5 mg/l ($r^2=0.9993$) with good reproducibility (%RSD=0.97, $n=8$). The detection limit and averaged percent recovery were found to be 0.02 mg/l and 100%, respectively. The proposed method has been readily applied to determine Zn^{2+} in water sample collected from 3 sources at Mahasarakham University. The amount of Zn^{2+} contained in these samples ranged from 0.09-0.4 mg/l, which did not exceed than that of permission level.

C0228-SYNTHESIS OF HEXASUBSTITUTED BENZENE DERIVATIVES FROM PHLOROGLUCINOL

Saowanaporn Choksakulporn and Yongsak Sritana-anant*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: This research was directed toward the synthesis of hexasubstituted benzene derivatives from phloroglucinol (1,3,5-trihydroxybenzene) as starting material. Esterification to triple *O*-substituted intermediates with acid chlorides, followed by Fries rearrangement yielded the desired hexasubstituted benzene products. The 2,4,6-triacetyl phloroglucinol product was analyzed by ¹H-NMR spectroscopy and found the chemical shift of the signal of hydroxy groups was unusually downfield to δ 17.2 ppm. For 2,4,6-tribenzoyl phloroglucinol, preliminary result also showed a similar rearrangement occurred with the triacetyl derivatives.

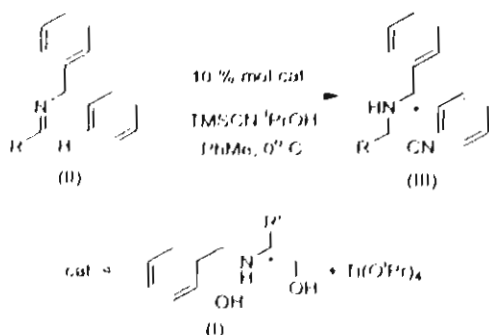


C0229-A HIGHLY ENANTIOSELECTIVE STRECKER REACTION CATALYZED BY TITANIUM-*N*-SALICYL- β -AMINO ALCOHOL COMPLEXES

Vorawit Banphavichit, Worakul Mansawat, Worawan Bhanthumnavin, Tirayut Vilaivan*

Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

e-mail address: vtirayut@chula.ac.th



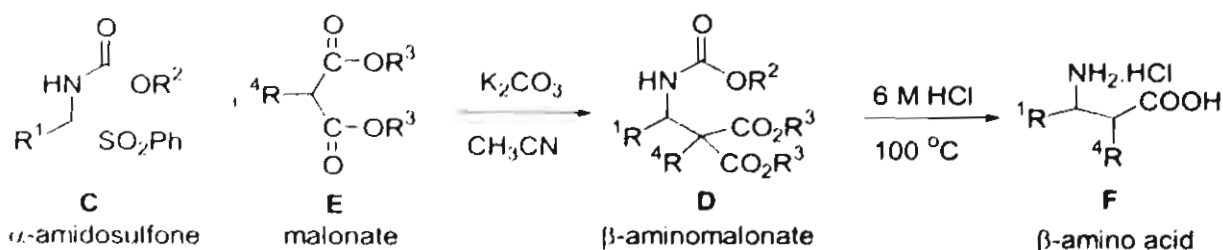
Abstract: *N*-salicyl-β-amino alcohols (I) were synthesized and evaluated as ligands for catalytic asymmetric Strecker reactions. *N*-Benzhydrylaldimines derived from aromatic and aliphatic aldehydes reacted with trimethylsilyl cyanide in the presence of 10 mol % Ti-(I) complex to give the Strecker products in excellent yields with up to > 98% *ee*. The reaction condition is simple and the stereochemical outcome is predictable from the configuration of the ligands, which are readily synthesized in both enantiomers. The presence of a protic additive is essential to ensure good conversion and reaction rate.

C0230-SYNTHESIS OF β-AMINO ACID DERIVATIVES BY NUCLEOPHILIC ADDITION TO IMINES

Cheeraporn Ananthanawat, Vorawit Banphavichit, Tirayut Vilaivan*

Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand,

e-mail address: vtirayut@chula.ac.th

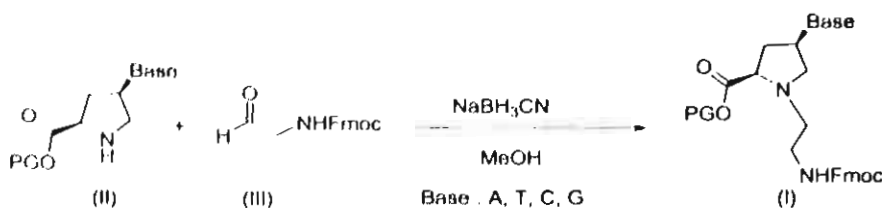


Abstract: The objective of the research is to develop an efficient synthetic method of β-amino acids based on nucleophilic addition to imines. The optimum condition for the synthesis of β-aminomalonate intermediate from α-amidosulfone and malonate was to use K_2CO_3 as base and CH_3CN as solvent under N_2 . A variety of β-aminomalonate derivatives were obtained in moderate to high yields. After hydrolysis of these derivatives with 6 M HCl, the racemic mixtures of β-amino acids were obtained as hydrochloride salts.

C0231-SYNTHESIS OF PEPTIDE NUCLEIC ACID MONOMERS CONTAINING AMINOETHYL LINKERS

Patcharee Ngamvinyavong, Chaturong Suparpprom, Tirayut Vilaivan*

Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok.



Abstract: A general synthetic method for monomers of Peptide Nucleic Acid (PNA) containing aminoethyl linkers (I) has been developed. These monomers will be used for the synthesis of a PNA system whereby the entire deoxyribose phosphate was replaced by a deoxyglycyl-D-proline dipeptide units. The proline ring is modified by nucleobases at C-4 position in a *cis*-relationship to the carbonyl group. The key reaction is the coupling of proline derivatives (II) and aminoacetaldehyde (III) by reductive alkylation. The reaction condition is simple and provides higher yields than the previously reported method¹ for the synthesis of (I) via aziridine.

C0232-Synthesis and nucleic acid binding studies of novel pyrrolidinyl PNA carrying 2-aminocyclohexane carboxylic acid spacers

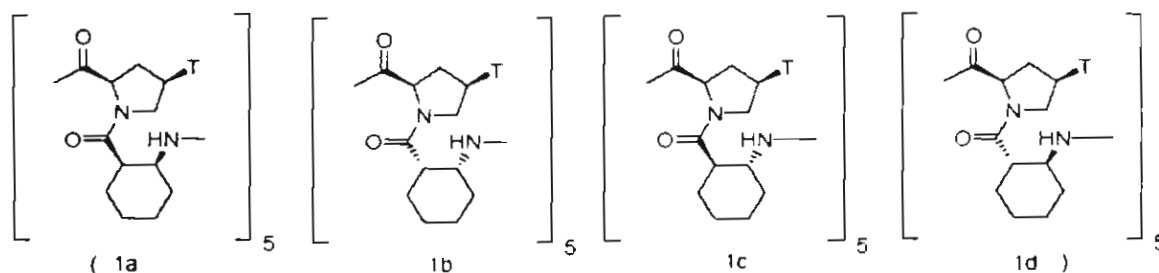
Panuwat Padungros, Chaturong Suparpprom and Tirayut Vilaivan*

Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

E-mail address: vtirayut@chula.ac.th

Abstract: Peptide nucleic acids (PNAs) are DNA/RNA mimics in which the sugar-phosphate backbone is

replaced by peptide. PNA binds to complementary DNA/RNA with high sequence specificity and selectivity, therefore possessing great potential in medicinal chemistry and biological applications). PNAs modification becomes an attractive research for our group. The objective of this work is to synthesize new PNA systems with aminocyclohexane carboxylic acid spacers **1a-d**. The synthesis of optically pure β -amino acid spacers, *cis*-(1*R*,2*S*/1*S*,2*R*) and *trans*-(1*R*,2*R*/1*S*,2*S*)-2-aminocyclohexane carboxylic acids **2a-d**, was achieved by asymmetric reductive amination of chiral enamine. Novel pyrrolidinyl PNA oligomers comprising alternate sequences of nucleobase-pyrrolidinyl monomers and the β -amino acid spacers were synthesized *via* solid-phase peptide synthesis yielding PNA **1a-d**. Hybridization studies of the four novel pyrrolidinyl PNAs to complementary DNAs are being carried out by UV titration.



C0233-STUDY OF STRUCTURE AND MOLECULAR MOTION IN HIGHLY DRAWN POLYETHYLENES USING SOLID-STATE ^{13}C NMR TECHNIQUE

Nattawut Chaivut¹, Tawechai Amornsakchai^{1*}, Hironori Kaji², and Fumitaka Horii²

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand;

²Institute for Chemical Research, Kyoto University, Japan

*e-mail address: sctam@mahidol.ac.th

Abstract: The structure and molecular motion of highly drawn polyethylene have been studied by solid-state ^{13}C NMR spectroscopy. Polyethylenes with different molecular weights and draw ratios were used. $T_{1\rho}$ relaxation time for crystalline component was found to compose of 4 components. Three from four components can be normally seen in isotropic samples and another one component having the chemical shift close to orthorhombic crystalline phase but having very short $T_{1\rho}$. This component was suggested to be all-*trans* conformation. From $T_{1\rho}$ and $T_{2\rho}$ relaxation times for noncrystalline component, interfacial and rubbery amorphous components can be assigned. The above results can be confirmed by lineshape analysis of fully relaxed spectra. In addition, the effect of draw ratio and molecular weight on molecular motion of some components are also reported.

C0234-DFT STUDY ON REACTION MECHANISM OF DEHYDRATION OF PROPYLENE GLYCOL

Chompoonut rungnim, Vithaya Ruangpornvisuti

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University 10330 Bangkok, Thailand;

e-mail address: chompoonut.ru@chula.ac.th, vithaya.r@chula.ac.th

Abstract: The mechanism of dehydration of propylene glycol has been investigated using density functional theory (DFT) at B3LYP/6-31G(d) level. Two possible mechanisms have been proposed as the reaction of propylene glycol dehydration, pinacol rearrangement and elimination. The DFT calculations show that the pinacol process has lower activation energy. Therefore, acid catalyst has affected to the pinacol pathway with activation energy (ΔE_a) = 20.74 kcal/mol. The solvent effects of water have been studied as hydration model by adding certain water molecules in the calculations.

C0235-ALLYLIC OXIDATION OF CYCLOHEXENE CATALYZED BY METAL STEARATE COMPLEXES

Pataraporn Eutrarak¹ and Warinthorn Chavasiri²

¹Program of Petrochemistry and Polymer Sciences, Faculty of Science, Chulalongkorn University;

²Department of Chemistry, Faculty of Science, Chulalongkorn University; Tel:02-2187625

Abstract: Metal stearate complexes coupled with *tert*-butylhydroperoxide (TBHP) could catalyze the allylic oxidation of alkenes affording carbonyl compound in the absence of extra solvent at 70°C. The optimum conditions were influenced by the amount and type of catalysts, solvents, reaction time and temperature. Under optimum conditions, cyclohexene as a model substrate could convert to the desired products by chromium(III) stearate catalyst in good yields high selectivities. The allylic oxidation products could be utilized in several applications as intermediates for the manufacture of useful chemicals.

C0236-CHEMICAL CONSTITUENTS OF THE ROOTS AND THE LEAVES OF *Mansonia gagei* Drumm. AND THEIR BIOACTIVITIES.

Pimonporn Tiengtham¹, Pattara Sawasdee¹, Warinthorn Chavasiri^{1*} and Hideaki Otsuka²

¹Natural Products Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

²Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine, 1-2-3 Kasumi, Minami-ku, Hiroshima 734, Japan

Abstract: From the preliminary antihistamine activity, the extracts of the roots and the leaves of *Mansonia gagei* Drumm. were chosen for further investigating their constituents and activities. Nine compounds could be isolated from the roots of *Mansonia gagei* Drumm.; 2,5-dimethoxy-1,4-benzoquinone (1), mansonone G (2), vanillic acid (3), mansonone H (4), mansonone C (5), mansonone E (6), compounds 7, 8 and 9 are being in progress. Among isolated compounds, mansonone C showed the high antihistamine activity 92% at 0.1 mg/ml and 12% at 0.01 mg/ml.

C0237-SELECTIVITY OF THE OXIDATION OF SATURATED HYDROCARBONS CATALYZED BY METAL STEARATES

Julaluk Phunnol¹ and Warinthorn Chavasiri²

¹Petrochemistry and Polymer Sciences Division, Faculty of Science, Chulalongkorn University Bangkok 10330;

²Department of Chemistry, Faculty of science, Chulalongkorn University Bangkok 10330; Tel: 0-2218-7625

Abstract: The oxidation of various saturated hydrocarbons using metal stearates as a catalyst was explored yielding the various corresponding ketone and alcohol. Cyclohexane, tert-butylcyclohexane, hexane and adamantane were selected substrates in this study. Cr(III)stearate was found to be the most effective catalyst and giving high selectivity. Moreover, the utilization of co-catalyst of metal stearate for oxidation of saturated hydrocarbons was conducted.

C0238-Investigation of an Imidazole Derivative as an Electrolyte in dye-sensitized solar cell

Surin Laosooksathit¹, Narong Pungwiwat¹, Chaiyuth Sae-kung², Prancharee Teerathanakit¹ and Thanwa Udom-piriyasak¹

¹Department of Industrial Chemistry, Faculty of Applied Science, KMIT'NB, Bangkok 10800, Thailand,

²NSTDA, Thailand

E-mail address: slssurin@hotmail.com

ABSTRACT: 3-Methyl-2-oxazolidinone (NMO) was used as an additive on the dye-sensitized solar cell, with Eosin Y as a sensitizer. NMO has effects on both decreasing the dark current, as well as increasing the stability of electrolyte system, consists of $\text{LiI}/\text{I}_2/\text{acetonitrile}$. It was found that the electrolyte system produced the short circuit current (J_{sc}) up to 0.69 mA. NMO was synthesized from dimethyl carbonate reacted with 2-methylaminoethanol in the presence of sodium methoxide as a catalyst, the bp. of the product is 239-242 °C. Another electrolyte, used in this system, was synthesized from imidazole and bromoethane to provide a clear liquid, bp. 201-203 °C. This electrolyte was proved to stabilize the electrolyte system better than NMO, but it produced J_{sc} less than NMO, (only 0.25 mA).

C0240-Dynamic properties of NH_4^+ in water studied by *ab initio* QM/MM molecular dynamics simulation

Pathumwadee Intharathap, Anan Tongraar, Kritsana Sagarik

School of Chemistry, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand,

Email address: patumwadee@yahoo.com, anan@ccs.sut.ac.th, kritsana@ccs.sut.ac.th

Abstract: A combined *ab initio* quantum mechanical/molecular mechanical (QM/MM) molecular dynamics simulation has been performed to evaluate the dynamics of the NH_4^+ in aqueous solution. The chemically most relevant region, the first solvation sphere of NH_4^+ , was treated by Born-Oppenheimer *ab initio* quantum mechanics using DZV basis sets, while the rest of the system was described by classical pair potentials. Dynamical properties, such as the translational and librational motions of ammonium and water molecules were evaluated by means of velocity autocorrelation functions (VACFs). The results show fast translation and rotation of NH_4^+ in the environment of water molecules. The rate of water exchange processes was evaluated by means of mean residence time (MRT) using a 'direct' method, showing the "structure-breaking" ability of the NH_4^+ .

C0241-QUALITY CONTROL OF *Gynostemma pentaphyllum* Makino

Virasak Chuamanochan, Suwanna Vejabhikul, Dammrong Santiarwarn, and Surapol Natakankitkul

Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, 50200 Thailand;

e-mail address :surapoln@pharmacy.cmu.ac.th

Abstract: The objectives of this research work are to determine the pharmacognostic value and constant value of *Jeokulan* (*Gynostemma pentaphyllum* Makino) and to analyze the amount of gypenoside using spectrophotometry and high performance liquid chromatography methods. *Jeokulan* were cultivated at 5 areas in Chiang Mai province i.e Maejo, Sarapee, Maekuang, Sunrai and Doisaked and *Jeokulan* products of 7 brands sold in Chiangmai were studied. It was found that the appearances of 5 cultivated plants were not different. The basic tissues of the leaves were investigated under the microscope. The constant values of 5 cultivated plants and 7 *Jeokulan* products were as follows respectively: Loss on drying 4.66-5.81% and 3.02-11.07%;Ethanol soluble extractive 7.45-11.94% and 8.18-11.75%;Total ash content 15.86-23.50% and 10.71-18.26% and Acid insoluble ash content 3.37-10.26% and 1.70-2.96%The amount of gypenoside of 5 cultivated plants and 7 *Jeokulan* products analyzed by spectrophotometry was 3.08-5.22% and 3.72-8.81% respectively. Chromatographic fingerprint of gypenoside was analyzed by high performance liquid chromatography using C18 as a stationary phase and

gradient acetonitrile 5 to 70 percent in water within 18 minutes as mobile phase. Peak of gypenoside was separated with the retention time of 15.25 minutes. Quantitative analysis could not be performed so was considered. This research could be used as a guide line for standardization of the raw materials and the products of Jeokulan

C0242-CONVERSION OF WATER AND ALKYNES TO KETONES USING ORGANOMETALLIC GOLD (III) CATALYSTS.

Tadtanu Shanyib, Vithaya Ruangpornvisuti

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of science, Chulalongkorn University 10330 Bangkok, Thailand; e-mail address realcecil@hotmail.com

Abstract: A study of conversion reaction between water and alkynes to ketone products using organometallic gold (III) catalysts. Structural optimization of related compounds and their energies have been obtained at HF/LANL2DZ level of theory for all reaction steps. We found that $[\text{Au}(\text{C}_6\text{F}_5)_2\text{Cl}]_2$ can be used as catalyst for this conversion reaction and Au(III) oxidation number has not decomposed to Au (I)

C0243-INVESTIGATION OF KETO-ENOL ISOMERIZATION OF ACETALDEHYDE AND ACETONE IN H-ZSM-5 BY DFT AND ONIOM METHODS

Attasak Rattanasumrit and Vithaya Ruangpornvisuti*

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University 10330 Bangkok, Thailand,

e-mail address : attasakthailand@hotmail.com

Abstract: This study is focused to the Keto-Enol Isomerization of acetaldehyde and acetone inside H-ZSM-5 zeolite. The clusters of H-ZSM-5 of 3T and 5T have been studied using a density functional theory (DFT) at B3LYP/6-31G(d) Level of theory for the enlarging cluster of 72T, we have used the two-layer ONIOM2(B3LYP/6-31G(d).AM1) and ONIOM2(B3LYP/6-31G(d):MND0) approaches, and its active site (cluster 3T and 5T) were treated as high theoretical area. We found the reaction energy of HZ(enol), which decreased from transition state but still higher than HZ(keto). Due to the 3T cluster model, activation energy and rate constant of complex reactant are 20.39 kcal/mol and $\log k = 38.87$, respectively.

C0244-THE DETERMINATION OF GOLD IN GEOLOGICAL SAMPLES BY CONSTANT CURRENT-FILM STRIPPING POTENTIOMETRY

Bundit Siriket^{1,2}, Nipaporn Meeapun¹, Saravut Dejmancee² and Roongroje Ratana-ohpas²

¹Department of Chemistry, Faculty of Science and Technology, Phuket Rajabhat University, Phuket, Thailand

²Department of Chemistry, School of Science, Walailak University, Nakhon Si Thammarat, Thailand.

E-mail address: 46300083@wu.ac.th

Abstract: A method for routine determination of gold in geological samples was utilized by the constant current - film stripping potentiometry with applied constant current (+6 A) through a working glassy carbon electrode. The 0.05 M HCl was performed as a supporting electrolyte. The potential was set at -0.800 V (vs saturated calomel electrode) for 90 second. The results indicated that the stripping peaks were shown around +0.800 to +0.850 V, related to the concentration of gold from 10 ppb to 50 ppm. The peak were detected in well reproducibility and they gave the high accuracy about 4.48%

C0245-CATALYTIC OXIDATIVE CLEAVAGE OF TERMINAL OLEFINS BY METAL STEARATE COMPLEXES

Suekanya Jarupinthusophon¹ and Warinthorn Chavasiri^{2*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

²Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

E-mail address: Suekanya.J@student.netserv.chula.ac.th and warintho@sc.chula.ac.th

Abstract: We present here the development and optimization of new synthetic methodology for oxidative cleavage of terminal olefins. By using metal stearate complexes as the catalyst, terminal olefins were transformed to the corresponding carbonyl compound in high yield under mild conditions. In this research -methylstyrene was selected as a model substrate. Various factors that affect the oxidation including the amount and type of catalyst, solvent, oxidant, amount of substrate, reaction time and temperature were explored and disclosed that. These parameters were important factors affecting the reaction yield. Chromium(III) stearate was shown to be the best catalyst to convert -methylstyrene to acetophenone in 85% yield. Application of this method in the oxidative cleavage of other terminal olefins such as methylmethacrylate, styrene, and 4-chloro-1-methylstyrene will also be demonstrated.

C0246-Palladium Catalysed Cascade Reactions and Selective Monohydration of Malononitrile Derivatives

Anuch Hasakunpaisarn¹, Ronald Grigg², Ngampong Kongkathip¹ and Boonsong Kongkathip¹

¹Natural Products and Organic Synthesis Research (NPOS) Unit, Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand.

²Molecular Innovation, Diversity and Automated Synthesis (MIDAS) Centre, School of Chemistry, Leeds University, Leeds LS2 9JT, UK.

Abstract: Malononitrile derivatives were synthesized by three-component cascade reaction involving aryl iodide, allene and benzyl malononitrile in the presence of a palladium catalyst, with good to very good yield (75-87%). Further selective monohydration of the malononitrile derivatives was achieved under reflux condition using $\text{KF} \cdot \text{H}_2\text{O} \cdot \text{Al}_2\text{O}_3$ in *t*-BuOH and yield of the monoamide product was 57-75%.

C0247-Synthesis of aziridine derivatives

Kunlayanee Hansuthirakul¹, Anawat Ajavakom², Mongkol Suwattanasinit²

¹Department of Petrochemistry and polymer science, Faculty of Science, Chulalongkorn University, Bangkok,

²Department of chemistry, Faculty of Science, Chulalongkorn University, Bangkok,

E-mail address: kungku59@hotmail.com, anawat77@hotmail.com

Abstract: Aziridine derivatives are three-membered-ring heterocycles (Fig.1) and highly reactive and volatile compounds. They are considered as a direct-acting alkylation agent due to their strained ring systems, and they are also very useful intermediates to synthesize many natural product compounds and medicines. Herein, we showed the efficient synthetic route to aziridine derivative **6**. The structure of them was characterized by ¹H NMR, ¹³C NMR spectroscopy. The influence of the reaction conditions on the yield of the compound has been investigated.

C0248-DIRECT SYNTHESIS OF PHENYL SUBSTITUTED 4-CHLORO-2,5-DIPHENYLOXAZOLES

Nuttaporn Pimpha¹, Supawan Tantayanon^{1*} and Frank W. Harris²

¹Functional Polymer and Petrochemistry Research Laboratory, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

e-mail address: supawan.t@chula.ac.th

²The Maurice Morton Institute of Polymer Science, University of Akron, Ohio, USA.

Abstract: A series of 4-chloro-2,5-diphenyloxazoles have been successfully synthesized using cyclization reaction of the corresponding benzoyl cyanides with benzaldehydes in one step. The influences of both electron donor and acceptor substituents at the para position on benzene rings of benzoyl cyanides and/or benzaldehydes were investigated. According to this synthetic route, thirteen oxazole compounds were readily prepared as single products in reasonably high yields except the *N,N*-dimethylamino substitution. On the basis of experimental results, a plausible mechanism of this reaction was proposed. These 4-chloro-2,5-diphenyloxazole derivatives were characterized by means of spectroscopic techniques.

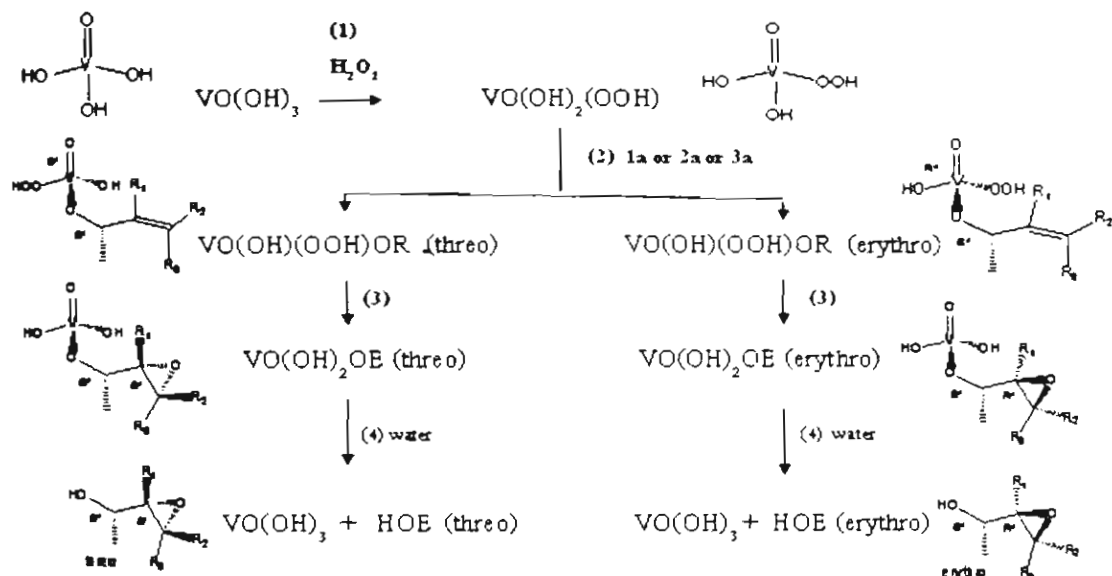
C0249-theoreties study of mechanism for the diastereoselective epoxidation of chiral allylic alcohols by vanadium peroxy complex

Sirichai Lawanvisuth, Vithaya Ruangpornsuti

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University 10330, Bangkok, Thailand

e-mail address: sirichai.l@student.chula.ac.th

Abstract: The epoxidation of methyl-substituted chiral allylic alcohols, namely 3-methylbut-3-en-2-ol (**1a**), trans - and cis - pent-3-en-2-ol (**2a** and **3a**), have been studied by HF and B3LYP/6-31G(d). The epoxidation, by vanadium peroxy complex, has four sub-reactions such as the generation of catalyst by ligand-exchanging with peroxide, the interaction substrates, (**1a** or **2a** or **3a**) and catalyst, the oxygen transfer from peroxide to allylic alcohol (**1a** or **2a** or **3a**), and the ligand exchange (epoxide ligand) by water. The second sub-reaction is the the first path-way to generated of the different diastereoisomer epoxide (*threo* and *erythro*). Structural optimization of related compounds and their energies have obtained and estimated from the computed free energies for the competing *threo* and *erythro* transition states to be 11.5:88.5 (**1a**), 32.3:67.7 (**2a**), and 3.8:96.2 (**3a**).



Scheme 1. Pathway of diastereoselective epoxidation of allylic alcohol by vanadium peroxy complex catalyst

C0250-An Efficient Synthesis of Bisalkylthioarenes: Application in the preparation of aryldioxins and aryldithiins

Pornpip Charoonniyomporn, Patcharee Preedasuriyachai, Tienthong Thongpanchang* and Yodhathai Thebtaranonth
Department of Chemistry, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand

Abstract: Aryldioxins or aryldithiins can be prepared from the reactions of ortho-dihydroxyarenes and diols or dithiols with *p*-toluenesulfonic acid in refluxing benzene or toluene.

C0252-Synthetic Approach to Furofuran Lignans

Attapol Pinsa, Manat Pohmakotr, Patoomratana Tuchinda and Vichai Reutrakul
Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd, Bangkok 10400, Thailand.

Objective To develop a new general synthetic route to furofuran lignans including gmelinol, an antimalarial agent, which was isolated from the heartwood of *Gmelina arborea*.

C0253-COMPARISON OF TITRATION ICP AND XRF SPECTROMETRY METHODS IN DETERMINATION OF CERIU IN LENS POLISHING POWDER

Sumalee Ninlaphruk, Pipat Pichestapong, Harinate Mungpayabal, Thitima Jiyavaranant, Supapan Srisukho and Prapassum Chaisai
Rare Earth Research and Development Center, Office of Atoms for Peace, Bangkok
E-mail address : sumalee47@hotmail.com, harinate@hotmail.com

Abstract: Three analytical from monazite ore for producing lens polishing powder were compared. These methods are titration ICP and XRF spectrometry techniques. The cerium oxide sample with estimated 45% cerium content needed to be digested and converted into solution before the analysis. The methods in determination of cerium in cerium oxide separated analytical results shown significantly no difference between each method. However, the titration method was found to be more convenient and suitable for quality control in the production of cerium oxide as it does not require standard cerium and the complicated analytical instruments.

C0254-PREPARATION OF FLAME-SPRAYED ALUMINIUM - 12 wt% SILICON COATINGS VIA EXPERIMENTAL DESIGN TECHNIQUE

Sukanda Jiansirisomboon and Apakorn Yudee
Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.
E-mail address: sukanda@chiangmai.ac.th

Abstract: Since wear is an important problem found in every industry. In the present, thermal spray technology is widely used as an alternative for wear protection in materials. This technology can be used to improve wear resistance, especially at the surface. Therefore, the technology can significantly reduce the production capital cost, i.e. reduce part changing. In this study, Al-12%wt Si powder [1-2] was sprayed using a flame spraying technique onto mild steel substrate. In order to get output spray parameters which were wear resistance, thickness, hardness and volume fraction of porosity. Calculation for new value of input spraying parameters which were oxygen flow rate, acetylene flow rate and spray distance was done by

Minitap experimental design program [3]. This statistical analysis was used to find out range of the input parameters which could significantly reduce number of experiment and gave very accurate result. The experimental results showed that the most suitable condition for spraying the Al-12%wt Si powder were oxygen flow rate 38 ft³/hr, acetylene flow rate 27 ft³/hr and spray distance 60 mm. This condition provided the coating with the best physical, mechanical properties and wear resistance

C0255-DENSITY FUNCTIONAL STUDY ON CONFORMATIONAL STRUCTURES OF ASPARTIC ACID SPECIES IN AQUEOUS MODEL

Wichien Sang-aroon and Vithaya Ruangpornvisuti *

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University 10330, Bangkok, Thailand; e-mail address: Swichien@student.chula.ac.

Abstract: Conformational structures of aspartic species and their potential energy surfaces have been determined by DFT method at the B3LYP/6-31G (d) level of theory. No stable conformers have been found for Hasp⁻ and H2asp species because of proton transfer between amino and carboxy group. The two species were calculated in 3 water molecules system. ϵL [g+ a] was the most stable conformers from ten were found conformers of Hasp⁻ species. There were βL [g+ a] and βL [g+ g-] the most stable conformers from twelve conformers of asp2⁻. five stable conformers γD [g- g+], δD [g- g+], αD [g+ g-], δL [g+ g-] and γL [g+ g-] from thirteen for H3asp⁺ (endo endo). αD [a g-] was the one of seven conformers for H3asp⁺ (endo exo). δD [g- g-] and αL [g-g-] were the two of eight for H3asp⁺ (exo endo) and γD [g- a], γD [g- g+] and αD [g- a] were three of the most stable conformers from five have been found for and H3asp⁺ (exo exo) species. Ramachandran maps of conformational changes for both H3asp⁺ (endo endo) and H3asp⁺ (exo exo) have no appeared because they were found all nine backbone conformations.

C0256-DETERMINATION OF TRACE AMOUNT OF ALUMINUM IN WATER BY FLOW INJECTION WITH A HOME-MADE PRECONCENTRATION SYSTEM

Somchai Lapanantnoppakhun^a, Kritsana Jitmanee^a, Jaroon Jakmunee^a, Subpachai Jayasvasti^b, Shoji Motomizu^c, Tadao Sakai^d and Kate Grudpan^a

^aDepartment of Chemistry, Faculty of Science and Institute of Science and Technology, Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand . . Fax. +66 5322 2268, Tel. +66 53941910

^b Department of Radiology, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand

^c Department of Chemistry, Faculty of Science, Okayama University, 3-1-1 Tsushimanaka, Okayama 700-8530, Japan

^d Department of Chemistry, Faculty of Science, Aichi Institute of Technology, Toyota 470-0392, Japan.

E-mail address : somchai1@chiangmai.ac.th

Abstract: In recent years, aluminium is found to be implicating in a variety of disorders including hypochromic microcytic anaemia, renal osteodystrophy, Parkinson's dementia and Alzheimer's disease. Aluminium and its salts can be found in soil, natural water and air. Therefore the trace concentration of aluminium in water and drinking water should be determined. A home-made preconcentration (strong cation exchanger) unit was constructed and hooked up to a flow injection system for determination of lower level concentrations of aluminium. The water samples (such as tap water, mineral water and river water) were passed through the unit. The analyte was eluted and reacted with a fluorogenic ligand. The complex formed was monitored spectrofluorometry. The results obtained by the system agree with that of ICP-MS.

C0257-PREPARATION OF DENSE PALLADIUM MEMBRANE SUPPORTED ON POROUS STAINLESS STEEL AND PRELIMINARY INVESTIGATION OF ITS APPLICATION ON METHANE CONVERSION VIA DRY REFORMING

Sutheerawat Samingprai¹, Supawan Tantayanon¹, Yi Hua Ma²

¹ Functional Polymer and Petrochemistry research unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand, 10310;

² Department of Chemical Engineering, Worcester Polytechnic Institute, Worcester, MA USA 01609

E-mail address: s_sutheerawat@yahoo.com

Abstract: Dense Pd membrane supported on porous stainless steel prepared via electroless plating technique is proposed to be used as a catalytic membrane reactor to improve the conversion of methane via dry reforming. The effective surface of the prepared membrane was 20 cm² and its thickness was around 34 μ m. Then it was evaluated its performance at 350°C, 400°C, and 450°C at pressure difference of 1 atm. It found that H₂ permeances of up to 5.9, 7.5, and 8.6 m³/(m²·h·atm^{0.5}), respectively, were obtained. Its selectivity coefficients(α H₂/He) were 78,270 at 350°C, 74,923 at 400°C, and 8,604 at 450°C, respectively. Moreover, It found that the dense Pd membrane was stable at 450°C without deterioration of membrane efficiency during 72 hours.

D0001-ATOMIC FORCE MICROSCOPY IMAGING OF BIOLOGICAL SURFACESRachan Jaroen^{1,2}, Yodsoi Kanintronkul², Kasin Kasemsuwan^{1,2}, and Teerakiat Kerdcharoen^{1,2}¹Physics Department, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400²Capability Building Center for Nanoscience and Nanotechnology

Email: rachanj@yahoo.com, yodsoi@hotmail.com, k001@thaimail.com, and sctkc@mahidol.ac.th,

Abstract: Before the advent of the atomic force microscope (AFM), biological surface studies were limited by the power of the optical microscope, whose light would scatter nanometer-scale particles. With AFM, it has become possible to see the details of living cell, subcellular organelles, molecules, and even individual atoms. In this study, the following biological samples were prepared and then imaged using AFM in liquid in both contact and tapping modes: DNA of *Escherichia coli* bacteria (*E. coli*), lipid membrane, *Bacillus thuringiensis* (*Bt*) protein-forming pore in lipid membrane, and mosquito cells. Cell immobilization techniques and AFM probe coating processes are discussed.

D0002-EXPERIMENTAL STUDY ON CHAOTIC WATER DROPUraivan Petlum^{1*}, Damrongsak Maneepongswadi², Nipon Thangprasert³^{1,2,3}Department of Physics, Faculty of Science, Ramkhamhaeng University, Bangkok 10240;

E-mail address: uraiwanwang@sanook.com

Abstract: In the past few year there has been a growth of interest in studying the behavior of dripping water from a faucet. Many experiments have been performed to measure the time intervals between successive drops. It is well known that the dynamical behavior of a dripping water faucet is not always regular but exhibits complex behavior including transition to chaos. These phenomena show the characteristics of chaotic system such as periodic and nonperiodic attractor, period doubling and Hopf bifurcation. The purpose of our research is to experimentally investigate the dripping dynamics using microcomputer to store and analyse the data. We observe 1T, 2T, 4T periodic motion and chaotic motion which is the characterization of nonlinear system very clearly especially the 4T motion which is very hard to find experimentally.

D0003-MUSIC FROM SET OF JULIANipon Thangprasert^{1*}, Anongnad Charoenruai², Trakool Rummachat³, Panatcha Anusasananan⁴^{1,4}Department of Physics, Faculty of Science, 2Ramkhamhaeng University Demonstration School, Ramkhamhaeng University Bangkok 10240, 3General Science Program, Faculty of Science and Technology, Rajabhat Institute Suandusit, Bangkok 10300

E-mail :Panatchaz@yahoo.com.

Abstract: Chaos is a motion that lies between the regular deterministic trajectories and a state of noise. Chaotic trajectories arise from motion of nonlinear dynamical systems. One of the simplest mathematical expression of chaos is the so – called Julia set, first introduced by Julia, who studied the iteration of polynomial and rational function in the early twentieth century. The behavior of systems of nonlinear dynamical equations has generated interest into their uses as note generation algorithms. In this research we compose the song using a desktop computer and a mathematical entity called the Julia set that is a simple equation better known for generating complex and beautiful images. The song we created sounds like the old style Thai song, so we use it as a sound track in the vcd about Thai dance. After having a few persons to watch this vcd, 90% of the persons suggest that this Thai style song can be put together with old Thai dance quite well. In addition we study how the amplitude and frequency of waveform of this song varied with time. This will help us to have a closer look into the song the same way we study physics and it will be helpful in composing the song in the future.

D0004-ELECTRICAL RESISTIVITY OF ALUMINUM THIN FILM ON INSULATOR PREPARED BY EVAPORATION METHODPanatcha Anusasananan^{1*}, Damrongsak Maneepongswadi², Nipon Thangprasert³^{1,2,3}Department of Physics, Faculty of Science, Ramkhamhaeng University, Bangkok 10240;

e-mail address : Panatchaz@yahoo.com

Abstract: In recent year there has been an increasing application of vacuum technology for coating techniques in industrial production processes. One important area of application is metal coating on plastic web to produce conductive coating for film capacitors in electrical and electronics industry. Metal-coated plastic webs and papers also play an important role in food packing. In this research we investigate the electrical resistivity of aluminum thin film on plastic prepared by evaporation method in high vacuum system. The resistivity of aluminum at various thickness in the range of nm, is measured using the 4 – point probe technique. The relation between the resistivity and aluminum thickness is $\rho = 236.9 d^{-0.72}$, where ρ is the resistivity and d is the aluminum thickness. The minimum thickness of aluminum that can produce very good conductivity is 150 nm.

D0005-Quantum Dynamics of Photons Trapped in Fiber Optic Ring Resonator

Chatchawal Sripakdee, Poramet Chunpang and Preecha P. Yupapin

Nanophotonics Research Group, Lightwave Technology Research Center Department of Applied Physics, Faculty of Science King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

E-mail: schatchawal@hotmail.com and kypreech@kmitl.ac.th

Abstract: We analyze the quantum dynamics of photon trapped in a single mode fiber optic ring resonator. The Hamiltonian of photons trapped and their interaction in term of decoherence, entanglement, parametric amplification and noise can be formed in the continuous variable EPR source i.e. ring resonator. We start from a fundamental Hamiltonian that induces from quantum noise, laser gain and loss, then the output photon density matrix is analyzed. The experimental result obtained is also presented and discussed.

D0006-Comparative Core Analysis of TRIGA Reactor Using Virgin Uranium and Reprocessing Uranium as Nuclear Fuel

Chatchai Pawong^{1*}, Sunanta Patrashakorn², Teerasak Veerapasapong³

¹ Science Division, Faculty of General Education, Rajamangala of Institute of Technology, Bangkok 10120, Thailand

² Bureau of Nuclear Safety Regulation, Office of Atoms for Peace, Bangkok 10900, Thailand

³ Department of Physics, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand

e-mail : mea73110@yahoo.com, sunantap@oae.go.th, and fscitsv@ku.ac.th

Abstract: The 10 MW TRIGA Reactor is a reactor using the UZrH fuel with 45 wt % of uranium in UZrH, 19.7 % enrichment. Both of virgin uranium and reprocessed uranium can be used as nuclear fuel for TRIGA reactor. The comparative of TRIGA core using both types of uranium were analyzed. From details on dimensions and compositions of the major components of reactor core, the 7-group neutron microscopic cross sections were prepared using GTF and GGC-5 codes. The 2- and 3-dimensional models were developed. DIF3D code including utility programs were employed to determine k_{eff} , reactivity, power distributions, neutron flux distributions, power peaking and worth of control rods. Comparing to virgin uranium core, the analysis show that the reprocessed uranium core has a little effect on core parameters. The power distributions and neutron flux distributions are almost the same for both cores. However, at the beginning of life, the reactivity of the reprocessed uranium core is reduced by 0.2 % which has little influence on safety of the reactor.

D0007-A DESIGN AND CONSTRUCTION OF FLASH EVAPORATION APPARATUS

Jiraporn Pongsopa, Buncha Silskulsuk, Nason Phonphok

Department of Physics, Faculty of Science, Srinakharinwirot University, Bangkok.

E - mail address : jira0224@yahoo.com , jira0224@hotmail.com

Abstract: The purpose of flash evaporation apparatus is dropping powdered material onto a heated boat in a vacuum system for making a compound thin film sample. The apparatus composes of two main parts. The first one is a heat source made of two copper electrical poles and 2 bases of copper for holding the boat. The heat originates from a variable transformer and a high current transformer with maximum current of 300 amperes. The second part is dropper working by passing current through an induction coil. Magnetic field from the coil results in vibration of the dropper. One out of two major parts of the dropper, made of 4 pieces of stainless and two pieces of aluminium, is in the vacuum chamber. The role of a stainless pieces is connecting between inside and outside of vacuum chamber. The remainder part of the dropper is a control circuit in which the frequency can be varied such that the maximum dropping rate is 3.38 grams per minute at the frequency of 5 Hz.

D0008-EFFECTIVE NONLINEAR COEFFICIENT OF STRONGLY NONLINEAR SPHERICAL DIELECTRIC COMPOSITES

Jatuporn Thongsri* and Mayuree Natenapit

Department of Physics, Faculty of science, Chulalongkorn University, Bangkok 10330, Thailand

*E-mail address: squidym@yahoo.com ,

Abstract: The effective medium theory is applied for theoretical modeling and studying of the electric field response of strongly nonlinear dielectric composites. These composites consist of strongly nonlinear spherical dielectric inclusions randomly embedded in a strongly nonlinear dielectric host medium of different nonlinear coefficient. Then the effective nonlinear coefficient of the composites is determined by using decoupling techniques. Our results are valid for arbitrary volume packing fraction of inclusions. This work is an extension of the work of Yu and Yuen [1] using dilute inclusion packing fraction approximation. In this research we obtained the upper and lower bounds of effective nonlinear coefficient by using decoupling techniques for the whole range of inclusion packing fraction.

D0009-CRYSTALLIZATION OF THERMALLY GROWN SILICA FROM RICE HUSK.

Chivalrat Masingboon, Rong Rujkorakarn and Ekan Swatsitang

Department of Physics, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand

E-mail address: chivala@hotmail.com, rujkorakarn@kku.ac.th and ekaphan@kku.ac.th

Abstract: Purified silica were prepared by refluxing rice husks in boiling HCl, then sintering for 1, 3 and 5 h respectively at each consecutive temperature of 400, 500, 600, 700 and 800 °C. Only samples obtained from rice husks (which were refluxed by 1N HCl for 15 min) calcined at 600, 700 and 800 °C for 5 h were found to have white ashes. The white ashes of 800 °C, 5 h were found to contain 99.33 wt% of amorphous silica, they were selected to further calcined at various higher temperatures for 10 h. XRD and Raman spectroscopy results indicated structural transitions from amorphous silica to α -quartz at 800 °C, α -quartz to α -tridymite at 1100 °C, and α -tridymite to α -cristobalite at 1200 °C. SEM micrographs also showed silica clusters became denser and smaller at higher temperature phases.

D0010-Electric-field induced piezoelectric PVDF

Abiding Dasaesamoh and Supasarnote Muensit

Materials Physics Research Unit Department of Physics, Faculty of Science, Prince of Songkla University, Hatyai 90112

E-mail address: s4420488@maliwan.psu.ac.th

Abstract: Prepared the mixture of the commercial powders of polyvinylidene fluoride (PVDF) and a solution of N-methyl-2-pyrrolidone (NMP) and used a tape casting method to form the polymer sheets. By a corona poling method, a high DC field 300 - 400 MV/m was applied to the polymer sample which were subsequently annealed at 120 °C for 20 hrs. A phase transformation of the poled polymer was checked by an X-ray diffraction (XRD) method and a piezoelectric β -phase was obtained. A dielectric property was investigated by measuring the complex capacitance as a function of frequency. It was found that at 1 kHz, the dielectric constant of the sample was 4 and the dielectric loss tangent was 0.04. It's anticipated that the phase transformation and dielectric property will be improved if the polymer is prepared in a thin film form.

D0011-A MEAN FREE PATH ANALYSIS OF SOLAR ENERGETIC PARTICLES

Tapanapong Tananchai, Supaluk Mecim and Thiraneek Khumlumert

Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, Thailand

E-mail address: piti2002@hotmail.com, s_mecim@yahoo.com, thiraneek@nu.ac.th

Abstract: In this work, we study the mean free path of the solar energetic particles, which move along the magnetic field line before are scattered by the irregularity of the magnetic field. We use the fundamental of the Fokker-Plank equation to explain the motion of the solar energetic particles (Ruffolo 1995). We find the best mean free path by fitting analysis between the flux data of particle in time from ACE spacecraft and the transport simulation of the solar event on August 24, 2002. The mean free path of particle at high energy is longer than the low energy and arrives the Earth before the low energy because the low energy particles are often disturbed from the interplanetary medium.

D0012-THE SOLAR FLARE EVENT WITH THE CMEs EFFECT

Supaluk Mecim, Tapanapong Tananchai and Thiraneek Khumlumert

Department of Physics, Faculty of Science, Naresuan University, Phitsanulok, Thailand

E-mail address: s_mecim@yahoo.com, piti2002@hotmail.com and thiraneek@nu.ac.th

Abstract: The solar energetic particles (SEPs) are generated from the solar flare or the effect of coronal mass ejections (CMEs) move into the interplanetary medium. Particles in the interplanetary medium can attain more energy again by collision with the particles, which released follow the CMEs. This work, we simulated the propagation of the SEPs, which are released from the gradual flare on October 29, 2003 with the technique of the finite different method. This event has the following CMEs at 20:39 UT. We use the technique of the linear least squares fitting to fit the spacecraft data and the propagation simulation data. We found that, the effect of the CMEs affect to the profile of the particle intensity in time.

D0013-THE INFLUENCE OF INTERPLANETARY FLUCTUATIONS ON FITTING SOLAR FLARE DATA

Ekkachai Jantayod¹, Tanapon Suklim¹, Thidarat Khongton² and Thiraneek Khumlumert¹

¹Department of Physics, Faculty of Science, Naresuan University, Phitsanulok,

² Rajamangala Institute of Technology Tak Campus, Tak

E-mail address: poonin44@hotmail.com, ts_goft_x@hotmail.com,

uom_phy@hotmail.com and thiraneek@hotmail.com

Abstract: The solar flare releases the solar energetic particles, which have important effects to the Earth such as disturbing radio communication, causing electric power failures. In this work, we try to find the uncertainty for each data from the Advanced Composition Explorer spacecraft (ACE) for analysis the solar energetic particle propagation. We fit the solar flare event data on August 24, 2002 with the transport simulation results (Ruffolo 1995). In this work, we analyze two types of data uncertainty. First is the data uncertainty from the spacecraft directly and second is the data uncertainty from the interplanetary fluctuation. The data fitting results with the interplanetary fluctuation uncertainty show the injection duration of each elements close to the particle distribution profile from spacecraft data more than the data fitting result with the spacecraft uncertainty, but the injection duration of both are lightly different.

D0015-ELECTRICAL AND OPTICAL PROPERTIES OF GALLIUM-DOPED ZINC OXIDE THIN FILMS PREPARED BY RF MAGNETRON SPUTTERING

Kittipong Tantisantisom, Chanwit Chityuttakan, Sojiphong Chatraphorn and Kajornyod Yoodee

Semiconductor Physics Research Laboratory (SPRL), Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand,

E-mail address: kittipongdpst@yahoo.com

Abstract: Transparent conductive Ga-doped ZnO (GZO) thin films were deposited on soda lime glass substrates by RF magnetron sputtering using sintered ZnO targets with Ga₂O₃ content of 2, 4 and 6 wt%. The dependence of electrical and optical properties of the films on sputtering conditions and Ga₂O₃ content in the sputtering targets were investigated. It was found that the electrical resistivity, mobility and carrier concentration depend on both sputtering conditions and Ga₂O₃ content. For a given Ga doping and Ar pressure, the resistivity is minimum at RF power of 100 W. At the same condition, the resistivity and optical transmission of the films decrease with increasing Ga doping.

D0016-THE BCC-HCP TRANSITION TEMPERATURE IN TITANIUM AND ZIRCONIUM METALS USING THE CLASSICAL MOLECULAR DYNAMICS METHOD

Jessada Chureemart, Pornjuk Srepusharawoot and Udomsin Pinsook

Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand, E-mail address: chureemart@hotmail.com

Abstract: We examine the vibrational properties of Titanium, Zirconium. All these metals are in-group IVB transition metals. Firstly we choose appropriate model potentials which reproduce some essential macroscopic properties. By using molecular dynamics (MD) simulations, some dynamical behaviors can be investigated. In this work, we are particularly interested in the velocity auto correlation as it leads to the phonon density of states and hence the vibrational entropy. In addition, the internal energy and the vibrational entropy of experimentally observed phases can be determined by using MD. By considering the difference in Helmholtz free energy between those phases, the temperature at the phase transition can be identified. We find agreement and discrepancies between the calculated transition temperature and the experimentally observed one.

D0017-THE SIMULATION OF WATER DROP

Sitthichai Kulsri*, Krisanadej Jaroensutasinee

CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, Nakhon Si Thammarat 80160, Thailand.

E-mail address: 45300076@wvu.ac.th, jkrisana@wvu.ac.th

Abstract: We developed a method based on quasi-molecular modeling to simulate the fall of water drop. This method uses a large number of fluid molecules or quasi molecules. Each quasi-molecule is a group of real particles that interact in a fashion entirely analogous to classical Newtonian molecular interaction. The particles dynamics equations are large systems of second-order, ordinary differential equation. We tested our method on the fall of water drop phenomena with various factors.

D0018-EFFECTS OF NEUTRON IRRADIATION ON DIAMOND PROPERTIES

Chittra Kedkeaw¹, Supanee Limsuwan¹ and Pongtip Winotai²

¹Department of Physics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand

²Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

E-mail address: chittra193@hotmail.com

Abstract: In this research, the impurities in natural diamond and the effects of neutron irradiation on physical properties of diamond have been studied by electron spin resonance (ESR) spectrometer. The ESR spectra of natural yellowish diamond sample before neutron irradiation show that nitrogen was the impurity in diamond because three main ESR absorption peaks were obtained. These peaks arise from the coupling between the electron spin ($S = 1/2$) and nuclear spin ($I = 1$) of nitrogen atom, called hyperfine splitting. And after neutron irradiation, the color of diamond was monitored by the spectrophotometer and it was found that the color of diamond was changed from yellowish to dark green. The peaks of ESR spectra before and after neutron irradiation are similar. But after neutron irradiation the middle peak was higher due to the C-C bonds were broken, called dangling bonds. By calculation of the area under the peaks, the results showed that the amount of nitrogen increased after neutron irradiation.

D0019-MAGNETIC PROPERTIES AND MICROSTRUCTURE OF Co-Ti DOPED IN BARIUM FERRITE (BaFe₁₂-_{2x}Co_xTi_xO₁₉)

Treedej Kittiauchawal¹ and Supreya Kumfu²

¹Physics Program, Faculty of Science and Technology, Thepsatri Rajabhat University, Lopburi, Thailand.

²Faculty of Industrial Technology, Uttaradit Rajabhat University, Uttaradit, Thailand.

E-mail address: K_treedej@hotmail.com

Abstract: The main purposes of this research are to study the magnetic properties and microstructure of Co and Ti - doped barium ferrites. Seven compositions of BaFe_{12-2x}Co_xTi_xO₁₉ were prepared by the ceramics method and calcining at a temperature of 1100 °C. They were then divided into three groups and sintered at different temperatures of 1200, 1300 and 1350 °C, respectively. The sintered products were analyzed by XRD and found that all specimens were of hexagonal structure. Their microstructures by SEM showed that the average grain size decreased with increasing Co and Ti contents, but it increased with the sintering temperatures. The magnetic properties of materials were analyzed by hysteresis loop

measurement. The ratio of M_{sx}/M_{is} and the coercive field were lower as the contents of Co-Ti increased. However, the coercivity decreased as the sintering temperature increased.

D0020-MAGNETIC PROPERTIES OF Sm-Fe-B PREPARED BY MECHANICAL ALLOYING PROCESS

Treede Kittiauchawal¹ and Tanut Jintakosol²

¹Physics Program, Faculty of Science and Technology, Thepsatri Rajabhat University, Lopburi, Thailand.

²Department of General Science, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand.

E-mail address: K_treedej@hotmail.com

Abstract: In this research work, mechanical alloying of Samarium-Iron-Boron powder with the composition of $\text{Sm}_{13}\text{Fe}_{77}\text{B}_8$ was prepared. The magnetic properties of $\text{Sm}_{13}\text{Fe}_{77}\text{B}_8$ powder was studied by x-ray diffractometer, Mössbauer spectrometer and scanning electron microscope. The x-ray diffraction analysis of $\text{Sm}_{13}\text{Fe}_{77}\text{B}_8$ powder after grinding for 48, 200, 400 and 600 hours. The XRD patterns show that for grinding time of 600 hours, $\text{Sm}_{13}\text{Fe}_{77}\text{B}_8$ powder became amorphous structure. Then, the powder was annealed at temperature 750°C for 30 minutes in argon atmosphere and the XRD patterns show the peaks of $\alpha\text{-Fe}$, Fe_3O_4 and magnetite (SmFeO_3). The analysis by Mössbauer spectroscopy show that, for grinding time of 600 hours, the magnetic property of $\text{Sm}_{13}\text{Fe}_{77}\text{B}_8$ powder was changed from ferromagnetic state to paramagnetic state at room temperature. And after the powder was annealed at a temperature of 750°C for 30 minutes, the Mössbauer spectra show the peaks of $\alpha\text{-Fe}$, Fe_3O_4 and SmFeO_3 which satisfied with the results of XRD analysis.

D0021-A STUDY OF ALUMINIUM OXIDE THIN FILM COATINGS

Tanattha Rattana, Artorn Pokaipisit and Pichet Limsuwan

¹Department of Physics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand.

E-mail address: opticslaser@yahoo.com

Abstract: In this work, the deposition of aluminium oxide (Al_2O_3) films produced with a pure Al source in the metallic state in an argon-oxygen gas mixture using reactive d.c. magnetron sputtering. The Al_2O_3 films were prepared on glass and stainless steel 304 substrates under difference process conditions e.g. argon flow rate and oxygen flow rate. The structure and morphology of the films were investigated by X-ray diffractometer (XRD), Raman spectrometer and Atomic Force Microscope (AFM). The XRD diffraction patterns show $\alpha\text{-Al}_2\text{O}_3$ on the plane (012) at $2\theta = 25.4^\circ$ for the argon and oxygen flow rates of 3.0 sccm and 1.2 sccm (standard cubic centimeter per minute), respectively. The formation of Al_2O_3 film is confirmed by Raman spectra.

D0022-A study of Ce as a dopant in PZT ceramics

Supranee Lao-ubol and Laddawan Pdungsap

Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.

E-mail address: g4536509@student.mahidol.ac.th and sclpd@mahidol.ac.th

Abstract: The effect of Ce^{3+} ion on the physical properties of PZT was studied. The $\text{Pb}_{1-x}\text{Ce}_x(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$ was prepared via mixed oxide method and characterized by means of X-ray diffraction (XRD), scanning electron microscopy (SEM) and electron spin resonance spectroscopy (ESR) measurement. The XRD and SEM result indicate that $\text{Pb}_{1-x}\text{Ce}_x\text{ZrTiO}_3$ has a tetragonal crystal structure. The average grain size are in the range 3.18-5.63 μm . Ce ion in an amount not exceeding 1 mol% could enter into the crystalline structure of lead zirconate titanate. The appearance of lines in the ESR spectra suggests the existence of Ce in +3 valence state. Moreover, doping with Ce^{3+} ion has a strong effect on the physical properties of PZT. The volume shrinkage and density were found to be very low.

D0023-Laser-induced Thermal Diffusion Shock Waves

Sorasak Danworaphong¹, Gerald J. Diebold², and Walter L. Craig³

¹School of Science, Walailak University, Nakornsithammarat, Thailand

²Department of Chemistry, Brown University, Rhode Island, USA

³Department of Mathematics, McMaster University, Ontario, Canada

E-mail address: dsorasak@wvu.ac.th, Gerald_Diebold@brown.edu, and craig@math.mcmaster.ca

Abstract: The study of the Ludwig-Soret effect or thermal diffusion, whose effect is the production of concentration gradient caused by a temperature gradient, has been widely studied by using Forced Rayleigh Scattering experiment (FRS)[1]. However, the theoretical model of the effect in sinusoidal temperature distribution has not been derived in detail and an interesting feature, the existence of shock waves, of the model is not yet recognized. In this work, the existence of shock waves is proved theoretically and experimentally.

D0024-EFFECTS OF SUBSTRATE TEMPERATURE ON SURFACE DIFFUSION LENGTH IN A THIN FILM GROWTH MODEL

Soontorn Chanyawadee and Patcha Chatraphorn

Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand;

E-mail address: chanyawadee@yahoo.com

Abstract: In molecular beam epitaxy (MBE) growth, atoms that are deposited on substrates diffuse to appropriate sites before incorporation process. The displacement that a freshly deposited atom can diffuse before being incorporated into a growing film is called surface diffusion length. In this study, a relation between surface diffusion length and a parameter controlling MBE growth, i.e. substrate temperature, was obtained. By using computer simulation based on a 1+1 dimensional MBE model, we found that the surface diffusion length increases exponentially with the increasing of substrate temperature. Moreover, effects of surface diffusion length on film surfaces are shown. It was found that films grown with long surface diffusion length have smoother surface than ones grown with smaller surface diffusion length.

D0025-Non-destructive determination of carrier concentration in heavily doped, MBEgrown, GaAs:C using photoluminescence.

Athikom Manoi and Sathon Vajarnwanna

Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

E-mail address: 1pond411@yahoo.com, 2sathon.v@chula.ac.th

Abstract: A carrier concentration of heavily doped, MBE grown, GaAs:C were determined from photoluminescence (PL) spectra. The samples used have carrier concentration, determined by Hall measurements, of $1.7 \times 10^{18} \text{ cm}^{-3}$ to $3.2 \times 10^{18} \text{ cm}^{-3}$. From photoluminescence spectra, an Energy band gap (E_g) and Fermi energy (E_F) of the materials can be obtained. From these two energies the hole concentration of the material can be calculated. The results show good agreement between hole concentration obtained by Hall measurements and hole concentration obtained from photoluminescence spectra.

D0026-A STUDY OF HETEROEPITAXY GROWTH USING A COMPUTATIONAL MODEL

Piti Panichayunon¹, Patcha Chatraphorn¹ and Seijiphong Chatraphorn¹

¹Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

Tel: 02-2187688

E-mail address: piti_jung@hotmail.com

Abstract: In this work, we study a Solid-On-Solid (SOS) MBE growth model. We varied the substrate temperature and obtained surface morphologies and interface width (W) in homoepitaxy and heteroepitaxy growth. Our study shows that when the substrate temperature is low, the surface is very rough and exhibits fast growing width in homoepitaxy system. For higher temperature, the surface becomes kinetically rough that eventually turns into a layer-by-layer growth at very high substrate temperature. We then expand this model by including effects of strain caused by a lattice mismatch between the substrate and film materials in heteroepitaxy. We find islands appearing on the surface due to effects of strain and the critical value of strain that leads to island formation increases when the substrate temperature is increased.

D0027-IMPACT OF STRESS GENERATION IN DEEP SUBMICRON CMOS TECHNOLOGY ON ELECTRICAL PERFORMANCE

Amporn Poyai¹, Itti Rittaporn¹, Rita Rooyackers², Eddy Simoen² and Cor Claeys^{2,3}

¹Thai Microelectronics Center (TMEC), National Electronics and Computer Technology Center,

National Science and Technology Development Agency, 51-4 Moo 1, Wang-Takien District, Amphur Muang, Chachoengsao 24000, Thailand

²IMEC, Kapeldreef 75, B-3001 Leuven, Belgium

³also at E.E. Dept., KU Leuven, Kasteelpark Arenberg 10, B-3001 Leuven, Belgium

*Email: amporn.poyai@nectec.or.th

Abstract: This paper describes the impact of stress generated by shallow trench isolation (STI) width and spacing on electrical performance. A higher capacitance has been found for a narrow active area width, in the range 0.2 to 3 μm , which is mainly due to a higher compressive stress. The capacitance also increase when reduced STI depth from 400 to 250 nm, which relates to a higher tensile stress from trench bottom. In addition, the capacitance reduction for a narrower trench width is reported. This is an important result since a further down-scaling is needed to precisely control the doping concentration while the stress is expected to increase for smaller and shallower STI.

D0028-STUDY OF SAGNAC EFFECT IN FIBER OPTIC LOOP

Korsakul Punyavardhana¹, Kanokpoj Areekul², Bancha Panacharoensawad³

¹Department of Physics, Faculty of Science, Kasetsart University, Bangkok.

Email-address: trooper_ki@clckta.com, Kanokpoj.A@ku.ac.th and Bancha.P@ku.ac.th

Abstract: Sagnac effect was discovered in 1913. This effect happens when two counter propagation beams, (one clockwise, CW, and another clockwise, CCW) arising from the same source, propagate inside an interferometer along the same closed path. At the output of the interferometer, the CW and CCW beams interfere to produce a fringe pattern. This pattern shift if a rotation rate is applied along an axis perpendicular to the plane of the path of the beam. Thus, the CW and CCW beams experience a relative phase difference which is proportional to the rotation rate. Therefore, we can determine the rotation angle by the rotation rate and phase difference of CW and CCW beams. This effect plays an important role in fiber optic gyroscope (FOG). The fiber optic coil radius R is used in FOG instead of the interferometer. Because of the better quality, performance, resolution ($0.001^\circ/\text{h}$) and the lower manufacturing cost comparing with mechanical gyroscope, this FOG was extensively used in many navigator systems for vehicle (car plane missile etc...) and many machines in factory (CNC CMM etc...)

D0029-Detection of Leptospiral bacteria by Surface Plasmon Resonance Spectroscopy

Jarapat Disrattakit¹, Sirasa Poomkeaw¹, Galayanee Dounghawee², Boonsong Sutapun³, Ratthasart Amarit¹, Toemsak Sriksirin^{1,4*}

¹Department of Physics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand; ²Department of Pathobiology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand; ³Electro-Optics Section, National Electronics and Computer Technology Center (NECTEC), Pathumthani, Thailand 12120; ⁴*Capability Building Unit in Nanoscience and Nanotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand; Phone 0-2201-5851, Fax 0-2201-5843, e-mail address: jaru22@mail.com

Abstract: Conventional diagnostic method of Leptospirosis is based mainly on detection of anti-Laptospira antibodies (Ab). The antibodies are detectable within 4 – 10 days in patient serum after infection, and diagnosis is relied on the rise of antibody titer in paired serum sample taken 7-10 days apart. However, serodiagnostic methods are usually delay and complicate for interpretation. Therefore, this study emphasized the use of surface plasmon resonance (SPR) to detect the leptospiral antigens (Ag) as an immuno-sensor in determination of the refractive index or the thickness of the sample adhering on the gold surface.

D0030-The transport analysis of the low energy cosmic ray particle from ULEIS instrument on ACE spacecraft.

ดร.ธนากร สุทธิกุล

ภาควิชาฟิสิกส์ คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล 65000

E-mail address: kocokeng@hotmail.com, thiraneek@nu.ac.th

Abstract: The energetic particles are generated from the solar flare, which they affect to the Earth such as, the electric failure at the Earth's pole and the aurora phenomena. We often interest the high energy particle, which they can pass the Earth's magnetic field to the atmosphere with their energy are more than 1 GeV. The neutron monitor can detect those particle at the Earth. Furthermore, there is an ULEIS instrument on ACE spacecraft, which detect the low energy particle at 0.02-14 MeV/n. These particles are easy disturbed by the interplanetary medium or the shock wave. In this work, we simulate the solar energetic particle transport of Ruffolo 1995 by the Finite different method for the solar event on June 4th, 1999. We find the longest helix distance of the particle along the magnetic field line, which is 0.569 +/- 0.003, 0.332 +/- 0.021, 0.201 +/- 0.027, 0.137 +/- 0.198 AU, and the injection duration is about 1463, 653, 652, 483 min for C element at 0.24, 0.48, 1.92, 4.9 MeV/n respectively. Finally, this solar event is an impulsive flare because its injection time is less than 1 hr and there is not the CMEs following.

D0031-An Analysis of The Injection Time for the Solar Energetic Particles of the Impulsive Solar Flare Event on May 1, 2000.

Tanapon Suklim, Thidarat Khongthon and, Thirane Khumlumert

¹Department of Physics, Faculty of Science, Naresuan University, Phisanulok, Thailand

²Rajamangala Institute of Technology Tak Campus

E-mail address: ts_golf_v@yahoo.com

Abstract: The some of solar energetic particle or solar cosmic ray are generated from the Sun and solar flare. The effects of these particles associate with the important effects on the Earth, such as radio and communication disturbance, causing electric failures. These are causing for studying the particle acceleration mechanism near the Sun. We use the transport equation of Ruffolo 1995 to explain the motion of the solar energetic particles and fit the data form SIS; Solar Isotope Spectrometer instrument, at ~10 to 100 MeV/n on ACE; Advanced Composition Explorer for the impulsive solar event on May 1, 2000. We solve the transport equation by the technique of finite different method and compare the result with G.C.Ho. et al (2001). They fit the data from ULEIS; Ultra-Low Energy Isotopic Spectrometer at ~0.005 to 10 MeV/n. They got the parallel mean-free path is 1.12±0.004 AU and the injection time is less than 1 hour. However, the fitting results for this work show the injection duration of particles from the Sun to the Earth for He, C, N, O, Ne and Fe. The best radial mean-free path for this event is 0.32-1.14 AU, the injection time is 6–228 min, and the averaged injection time from the Sun to the Earth is 14.3 min, which is different from the injection duration time from the spacecraft 20.56 %. The both of instrument (ULEIS and SIS), there is the overlap energy at 7-14 MeV/n for He, C, and O elements. We got the radial mean-free path is 0.67±0.133 AU, which close to G.C.Ho. et al (2001) is 1.34±0.266 AU. The both of works give the same injection time, which is less than 1 hour.

D0032-Luminescence from copolymer of polyfluorene and anthracene light emitting device

Thitima Matusos¹, Krongkaw Tapsila¹, Kriengsak Sriwichitkamol¹, Prathakon Srisongkam¹, Pairoj Jaidaew³, Somporn Maneetoon^{1,2}, Teerakiat Kerdcharoen^{1,2}, Tanakorn Osotchan^{1,2} and Toemsak Sriksirin^{1,2}

¹Capability Building Unit in Nanoscience and Nanotechnology, Department of Physics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand;

²Institute of Science and Technology for Research and Development, Mahidol University, Nakhon pathom, 71730, Thailand;

³Physics program, Phanakorn Rajabhat University, Bangkok 10220, Thailand

E-mail address: matusos88@yahoo.com

Abstract: Copolymer of 9,9-Di(2-ethylhexyl)-2,7-dibromofluorene (BEH-PF) and dibromoanthracene were used at various compositions as an emissive polymer layer of organic light emitting devices. The device structure consists of indium tin oxide (ITO) coated glass substrate, poly(3,4-ethylenedioxythiophene)/poly(styrenesulfonate) (PEDOT-PSS) layer, polymer layer and aluminium layer. Spectra of photoluminescence and electroluminescence indicate that luminescence peak of copolymer emissive layer are slightly red shift compare with the peak from BEH-PF polymer. The calculation result by density functional theory exhibits the wavelength shift consistent with the experiment result.

D0033-Electrical characteristic of monolayer film of a side chain liquid crystal copolymers studied by scanning tunneling microscopy and atomic force microscopy

Areefen Rassamesard, Tanakorn Osotchan, Toemsak Sriksirin
Capability Building Unit of Nanoscience and Nanotechnology, Department of Physics, Faculty of Science,
Mahidol University, Bangkok 10400, Thailand
E-mail address: fenmu@hotmail.com

Abstract: The monolayer Langmuir-Blodgett (LB) films of a side chain liquid crystal copolymer (cop11) with an 11-methylene spacer and a composition of 50% nitrobiphenyl (NBP) and 50% methoxy ethoxy methoxy biphenyl (MEMBP) were prepared from the gas water interface. This film was subsequently being transferred onto a hydrophobic silicon wafer substrate by horizontal deposition technique. The surface morphology of monolayer film was imaged by atomic force microscope (AFM) in dynamic mode. The current-voltage (I-V) characteristics of monolayer and double layers films were characterized by using scanning tunneling microscope (STM). It should be noticed that the STM tip stays with small distance on the film surface. The electric resistance for the monolayer is smaller than that for the double layer. For measuring the conductance by AFM, the AFM tip has to contact to the film surface. Then the conductive tip was biased by external voltage and current through the tip was measured to extract I-V characteristics from molecules at the local area of the surface. The electric characteristic for the 5 layer film by using conductive AFM exhibits the antisymmetric current between forward and reverse bias.

D0034-ELECTRICAL AND OPTICAL CHARACTERISTIC IMPROVEMENT OF ORGANIC DEVICE OF 8-HYDROXYQUINOLINE ALUMINUM WITH MULTILAYER STRUCTURE

Yingyot Infahsaeng¹, Somporn Maneetoon^{1,2}, Pairote Jaideaw³, Tanakorn Osotchan^{1,2}
and Toemsak Sriksirin^{1,2}

¹Capability Building Unit in Nanoscience and Nanotechnology, Department of Physics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand;

²Institute of Science and Technology for Research and Development, Mahidol University, Nakhon Pathom, 71730, Thailand;

³Physics Program, Faculty of Science and Technology Phranakhon Rajabhat University.

E-mail address: yingyoti@hotmail.com

Abstract: Electrical and optical characteristics for single layer organic devices of 8-hydroxyquinoline aluminum (Alq3) have been improved in multilayer structures by inserting a hole transport layer of N, N'-Bis(3methylphenyl)-N,N'-bis(phenyl)benzidine (TPD) between a transparent anode of indium tin oxide (ITO) and organic layer by spin coated technique. One set of devices was also inserted LiF layer between organic layer and aluminum cathode while the other has no LiF layer. The organic thin films, LiF layer and top electrode were prepared by thermal evaporation under a pressure of 10⁻⁵ Torr. When electrical potential was applied, it was found that the electrical characteristics of devices with and without LiF layer are slightly different. The forward current of devices with LiF layer is lower than that in devices without LiF layer. While the green emission without and with LiF was observed at turn on voltage of 9.90 V and 9.27 V, respectively. It means that the inserting of LiF can also decreased the turn on voltage of device. The peak of both structures occurred at the same wavelength of 539 nm, while the photoluminescence peak exhibits at the wavelength of 530 nm. The electroluminescence light was hardly observed in the previous single layer devices but, by the improvement, much higher brightness can be emitted from the multilayer structures

D0035-FINITE-TIME SHOCK ACCELERATION AND ION SPECTRA FROM INTERPLANETARY SHOCKS

Chanruangrit Channok^{1,2,3,4}, David Ruffolo^{2*}, Mihir Desai³, and Glenn Mason³

¹Department of Physics, Chulalongkorn University, Bangkok, Thailand

²Department of Physics, Mahidol University, Bangkok, Thailand

³Department of Physics, University of Maryland, College Park, Maryland, USA

⁴Permanent address: Department of Physics, Ubon Rajathane University, Ubonratchathani, Thailand

E-mail addresses: physics007@yahoo.com, david_ruffolo@yahoo.com

Abstract: Observations of energetic ion acceleration at interplanetary shocks often indicate a spectral rollover at ~ 0.1 to 10 MeV nucleon⁻¹. We argue that this is best explained by the limited time duration of the process, related to the age of the shock. Therefore an explanation of typical spectra of interplanetary shock-accelerated ions requires a theory of finite-time shock acceleration, which for long times (or a fast acceleration timescale) tends to the steady-state result of a power-law spectrum. We present analytic and numerical models of finite-time shock acceleration. Our models can qualitatively explain the very different spectra produced by a coronal mass ejection (CME) shock when it is near the Sun and in interplanetary space, as well as providing quantitative predictions for the spectra in interplanetary space. These reproduce a power law at low energy followed by a rollover at a critical energy, and predict a different composition dependence of the critical energy than that

obtained for other rollover mechanisms. The results can explain certain puzzling aspects of observed spectra of ions and electrons before and after the passage of an interplanetary shock.

D0036-Universal Lab Interface

Suthisa Leasen, Nuthapol Liengphibul, Sirimas Pongjunla, Puchong Kijumnajsuk, Kanokpoj Areekul
Metrology and Physics of Instrumentation Research Unit, Department of Physics, Faculty of Science, Kasetsart University, Bangkok

Abstract: Development of the Universal Lab Interface is a part of Research for Development of Basic Physics Laboratory System Project.* According to Student Center concept, we develop a modern method for learning Practical Basic Physics. Objectives are emphasizing the experiment process and stimulate the student with interesting modern instruments. The Universal Lab Interface is developed in order to do background check automatically while students process their experiment by hand or in the usual way. The Universal Lab Interface we designed is microprocessor base with 4 analog input, 8 CMOS/TTL input and 8 TTL output. It communicates via USB ports to student's computer and sends data to the laboratory server. The control software system designed to receive standard sensing DC voltage or current from analog sensor via analog input ports. And also can receive digital data via CMOS/TTL input ports and can send command signal via the TTL output ports. All sensors and detector e.g. force sensors, position and velocity sensors, current sensor, temperature sensors, are designed together but in the other projects. Then with the known sensors the ULI is programmed to do correction and the uncertainty can be evaluated.

D0037-SPHERICAL QUANTUM WELL

Suthisa Leasen, Sithichai Pinkanjanaroj, and Noparit Jinuntuya
Metrology and Physics of Instrument Research Unit, Department of Physics, Faculty of Science, Kasetsart University, Bangkok
E-mail address: suthisa_sainub@hotmail.com, fscispr@ku.ac.th, fscinpr@ku.ac.th

Abstract: Particle in a potential well is a basic problem for every physics student. Solving this problem is a good example which provides some quantum characteristics of particles in bound state, especially the quantization of the physical quantities, which come from applying the boundary conditions to the particle wave. The most important case is the existence of the discrete energy level. The rectangular well is always considered for its simplicity. But it is interesting to see what will happen if the well has another shape. In this work the infinite-spherical quantum well was analyzed. From symmetry of the problem, Schrödinger equation in spherical coordinate was solved. It was found that the solution had the form of spherical standing wave. The radial part of the solution is the spherical harmonic. While the radial part is the spherical Bessel function. The total energy has discrete values as expected. However, since the position of node of radial wave function is depend on the value of angular momentum, the energy level depend on both principle and angular momentum quantum numbers, which differ from the rectangular case. Distribution of the particle in the well can be seen once the probability density function is obtained. Visualization of this function, generated from the computer algebra software, is provided.

D0038-Simulation of Multiple beam interference for a confocal Fabry Perot Interferometer

Suvijak Aticomkulchai, Sompak Sutsue, Noparit Jinuntuya, Kanokpoj Areekul
Metrology and Physics of Instrumentation Research Unit, Department of Physics, Faculty of Science, Kasetsart University, Bangkok
Email: Leky20@hotmail.com, Sompak_pang@yahoo.com, Noparit.J@ku.ac.th, Kanokpoj.A@ku.ac.th

Abstract: Today Fabry-Perot Interferometer are various of applications from astronomy, optical measurement and testing, to household security device. The Fabry-Perot Interferometer is Multiple beam interference. In this research, we do a computer simulation of interference on both spatial domain and temporal domain. The simulation result is object to verify calculation results and observed interference result while any parameters are able to adjust. In practical, to do a simulation that close to theoretical result need and exact technique of algorithm design. Also, it need to include some error of practical instrument. The objective of this research are to compare the result among the experiment and the theoretical calculation.

D0039-SYNCHRONOUS MULTI-SPIN-EXCHANGE MONTE CARLO SIMULATION

Wichian Sirprom¹ and Noparit Jinuntuya²
¹Faculty of Resources and Environment, Kasetsart University, Sriracha Campus, Thailand.
²Metrology and Physic of Instrument Research Unit, Department of Physics, Faculty of Science, Kasetsart University, Thailand.
E-mail address: wichian@src.ku.ac.th, fscinpr@ku.ac.th

Abstract: Application of the Boolean algorithm to the conserved-order-parameter Ising model simulation is presented. We use the bits within a w -bit computer word to represent w spin variables on separate lattices so that one Monte Carlo step simultaneously updates spins in w different systems. Then, these independent systems will be glued to make a system w time larger. This can be done using bitwise AND, OR, XOR, NOT, and the bit shift operators provided by the programming language. We have measured an effective increase in the speed of the simulation, using 20-bit word, by a factor around 9, compare with conventional single-spin-exchange algorithm. By this strategy, we can increase the simulation speed by perform parallel processing, using only standard personal computer, and provide the possibility to simulate the larger and/or more complex system.

D0040-THE STUDY OF QUANTITATIVE X-RAY FLUORESCENCE ANALYSIS UNDER THE INFLUENCE OF FRACTION BINDER IN ZIRCON PELLETS

Siriluk Ruangrungrote¹, Arunee Intasorn¹, Sunun Tawceta² and Manoch Hengwattana¹

¹Department of Physics, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand.

²Stripattalung School, Pattalung 93000, Thailand.

E-mail address: sirilukr@swu.ac.th, arunee@swu.ac.th and manoch@swu.ac.th

Abstract: The accuracy of semi-quantitative analysis of zircon using Wavelength Dispersive X-Ray Fluorescence Spectrometer(WDXRFS) was investigated under a consideration of major source which caused an error in analytical result during specimen preparation process, bulk pressed pellet form in particular. Since the limitation of available amount of analyte sample has been encountered, an effect of dilution ratio of analyte sample to binder of boric acid on the analysis was studied. In addition, an influence of strong amount of zirconia in zircon on analytical results of the other minor elements was observed. It is consequently shown that the results can be improved remarkably by using standard addition method of pure SiO_2 , and also adding validity of SiO_2 concentration as input data for the quantitative determination of a composition of zircon. Hence the minimum dilution sample-to-boric acid ratio of the specimen is 65:35 by weight in order to obtain reliable analytical results as well as one with an optimum ratio (95:5).

D0041-THE PROPERTIES OF ALUMINUM-DOPED ZINC OXIDE THIN FILMS PREPARED BY RF MAGNETRON SPUTTERING FROM AN EMBEDDED-ZINC $\text{ZnO}(\text{Al})$ TARGET

Montri Aiempnanakit, Sojiphong Chatraphorn and Kajornyod Yoodee

Semiconductor Physics Research Laboratory (SPRL), Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand,

E-mail address: montri_pak@hotmail.com

Abstract: Recently, Al-doped Zinc Oxide, $\text{ZnO}(\text{Al})$ thin films have drawn a lot of attentions due to its low electrical resistivity and high optical transparency. Thus, it has been used as a window layer for $\text{Cu}(\text{In,Ga})\text{Se}_2$ thin film solar cells. The problem of the ZnO thin films prepared by sputtering technique is that it yields low resistivity and low transparency. This can cause the decreasing in the efficiency of the solar cells. In this work, we prepared $\text{ZnO}(\text{Al})$ thin films by sputtering embedded-Zinc $\text{ZnO}(\text{Al})$ targets. The films prepared by these targets yield low resistivity with significantly increase in transparency for the wavelength greater than 1000 nm. By this technique we can solve the problem of the transparency of the films and can help increasing the efficiency of $\text{Cu}(\text{In,Ga})\text{Se}_2$ thin film solar cells.

D0042A NUMERICAL METHOD TO OPTIMIZE FRONT-CONTACT GRIDS FOR SMALL-SIZE SOLAR CELLS

Charnwit Ruangchalermwong, Sojiphong Chatraphorn and Kajornyod Yoodee

Semiconductor Physics Research Laboratory (SPRL), Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand;

e-mail address: ruangs_c@msn.com

Abstract: In order to obtain high efficiency small-size solar cells, such as CIGS based solar cells with efficiency greater than 18%, the front-contact metallized grid must be optimized to attain the appropriate grid pattern. In this work, an optimization procedure is studied by using a distributed network model of unit cells, Kirchoff's current law and diode current equation, to form a system of equations. A numerical method is used to find the efficiency for an assumed grid pattern. The optimization focuses on the width and the spacing of the two parallel arms of the fork-shape grid pattern for the best cell efficiency.

D0043-DETERMINATION OF η -PRODUCTION BY ANALYZING DATA FROM THE CLAS SPECTROMETER

Wutthikrai Busayaporn and Burin Asavapibhop

Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok, Thailand,

E-mail address: wutthikrai_ba@hotmail.com and burin@sc.chula.ac.th

Abstract: Eta particle (η) is an unstable meson with a rest mass of $547.3 \text{ MeV}/c^2$. Physicists are interested in its decaying because some rare radiative decay channels of eta such as $\eta \rightarrow \pi^+ \pi^- \gamma \gamma$ and $\eta \rightarrow \pi^0 \pi^0 \gamma \gamma$ can supply information on charge conjugation violation. In this work, $\gamma p \rightarrow \eta p$ reaction will be used to determine the number of η -production by analyzing data obtained from CLAS (CEBAF Large Acceptance Spectrometer). The events which have one-proton-signal will be selected. From detectable momentum and energy of proton and incident photon, we can calculate missing mass to identify missing particles. The peak of missing mass located in eta mass region will be selected and its background will be removed. The events corresponded to these criteria are the number of η -production. We hope that with the unique design of the CLAS, which has a large detection acceptance, high data acquisition rates and good resolutions, will provide higher statistics and more precise measurement than the previous bubble chamber experiments.

D0045-Unusual Features of the October 28, 2003 Ground Level EnhancementJohn W. Bieber¹, Paul Evenson¹, Roger Pyle¹, David Ruffolo², and Alejandro Sáiz^{2,3}¹Bartol Research Institute, University of Delaware, Newark, Delaware, USA.²Department of Physics, Mahidol University, Bangkok, Thailand.³Department of Physics, Chulalongkorn University, Bangkok, Thailand.

E-mail addresses: alex@astro.phys.sc.chula.ac.th, david_ruffolo@yahoo.com

Abstract: A ground level enhancement (GLE) occurs when the intensity of solar energetic particles (SEPs) that arrive to the Earth after a solar flare is high enough to originate particle cascades in the atmosphere that increase radiation levels at Earth's surface. This enhancement is observed by ground-based cosmic ray detectors, like neutron monitors. The GLE of October 28, 2003 was unusual in a number of respects. Instead of a single, anisotropic peak from the Sunward field direction followed by an isotropic decay in intensity, this event exhibited two highly anisotropic spikes from very different directions. The earliest onset was seen by the neutron monitor station at Norilsk, Russia, which is surprising because this station at the time was viewing approximately anti-Sunward along the nominal Parker spiral direction. While that spike rapidly declined, another spike was observed by several neutron monitor stations, lasting about 60 minutes. This spike was also not from the Sunward field direction, but rather from a far South latitude. The decay of the event, on the other hand, was unusually slow. In fact, the particle intensity remained at elevated levels until the coronal mass ejection associated with the GLE arrived at Earth and swept the solar particles away.

D0046-Rotation Spectra of Viable and Non-viable *Tetraselmis* sp. Cells in AC Electric Field

Tanawat Wongluksanapan, Pikul Wanichapichart

Biophysics Research Unit, Department of Physics, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, Thailand.

E-mail address: tanawat020@yahoo.com, A.pikul@ratree.psu.ac.th

Abstract: Single cells behave non-homogeneous dielectric particles. When being placed in a low conducting medium under an AC electric field, cell dipole is induced. Interaction between cell dipole moment (μ) and the external field (E) creates a torque which spins the cell at an angular speed (Ω) and direction depends on field frequency. This research found different rotation spectra between viable and non-viable cells.

D0047-Temperature dependent cyclotron resonance in the hybridised electron-hole system in bipolar InAs/GaSb heterostructuresCattleya Petchsingh¹, R. J. Nicholas², K. Takashina¹, N. J. Mason²¹Department of Physics, Thammasat University, Klongluang, Pathumthani, 12121 Thailand²Department of Physics, Oxford University, Clarendon Laboratory, Parks Rd., Oxford, OX1 3PU, U.K.³NTT Basic Research Laboratories, 3-1 Morinosato Wakamiya, Atsugi-shi, Kanagawa-ken, 243-0292, Japan

Abstract: Cyclotron resonance measurements are performed at selected temperatures on InAs/GaSb narrow well structures. The effects of electron-hole hybridisation on cyclotron resonance are found to be strongly temperature-dependent. As the temperature increases, the cyclotron resonance spectra narrow dramatically and multiple splittings due to electron-hole hybridisations disappear. This phenomenon is believed to be associated with both the classical Coulomb interaction of electrons and the thermal excitation of carriers across the minigap. The existence of the minigap in the system is confirmed by comparison of cyclotron resonance spectra at different parallel magnetic fields.

D0048-THEORETICAL INVESTIGATION OF Li⁺/Li AND Li CLUSTERS INSERTION INTO SINGLE-WALLED CARBON NANOTUBESAnurak Udomvech^{1,2}, Tanakorn Osotchan^{1,2} and Teerakiat Kerdcharoen^{1,2}¹Department of Physics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.²Capability Building Center of Nanoscience and Nanotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.

E-mail address: giganu@hotmail.com and g4636510@student.mahidol.ac.th

Abstract: Theoretical investigations on single-walled carbon nanotubes (SWNTs) have been performed using first-principles total energy calculations to explore feasibility of doping Li⁺/Li through the sidewall and open-end of nanotubes. The first

model elucidates the potential energy surface between Li^+/Li and SWNTs as function of distance along a cross section by inserting Li^+/Li through the nanotube's sidewall. These investigations have revealed that $\text{Li}^+/\text{Li@tube}$ systems could enhance the capacity of lithium batteries by using both interiors and exteriors of nanotubes. Second model, the insertion of Li atoms pass through opening mouth of (6,0) single-walled carbon nanotubes have shown no insertion barrier in which the tube's mouth is passivated by hydrogen. The diffusion barrier is small inside the nanotube and Li atoms prefer to reside along the tube axis. For the larger diameter tube, (9,0), it has shown different interaction characteristic if lithium is located at tube axis.

D0049-REFRACTIVE INDEX-BASED FIBER OPTIC SENSOR FOR DETECTION OF ORGANIC CHEMICAL VAPORS

Mayuree Kittidechachan¹, Suppalak Angkaew², Tiwakarn Phansanit and Orawan Cherdchoo²

¹Department of Physics and ²Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140 THAILAND

E-mail: mayuree.kit@kmutt.ac.th, s_angkaew@yahoo.com

Abstract: A new type of fiber optic sensor for detection of volatile organic chemicals was studied. The fiber optic sensor uses poly (vinyl alcohol), PVOH films cladded on the side of optical fiber as the sensing material whose refractive index changes upon an exposure to volatile organic chemicals. It is found that the refractive index of PVOH films changes differently upon exposure to different chemical vapors and this increases the output signal by the leaky-typed optic mode. The change in optical output signal is proportional to the amount of refractive index change, except when there is a chemical taken place. Also the sensor characteristics of PVOH films are different for different chemical vapors, which is useful for developing the sensor that can identify type of the chemicals detected.

D0050-RBS Characterization of Conducting Thin Films Prepared by RF Magnetron Sputtering

Narong Boonyopakorn¹, Somsak Dangtip¹, Tanakorn Osotchan¹, Somsorn Singkarat², Teerasak Kamwanna², Chome Thongleurm³

¹Department of Physics and Capability Building Unit for Nanoscience and Nanotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

²Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

³Institute for Research and Development of Science and Technology, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract: Conducting thin films have been prepared by the home-built radio frequency magnetron sputtering by copper target under argon atmosphere with background pressure of 3×10^{-5} mbar. The films were prepared on 25 sets of four 1×1 cm² glass substrates. Each set were coated with the different RF power of 80, 100, 120, 150 and 180 watts and the various exposure time of 5, 8, 10, 12 and 15 minutes. Rutherford back scattering spectrometry (RBS) of the coated films were measured by 2.13 MeV He⁺⁺ ions at 170 degree. The film thickness as a function of RF power and exposure time can be clearly exhibited by fitting the RBS spectra to NUSAN simulation. The film thicknesses were found to be from 80 to 200 nm. The obtained film thicknesses and roughness were measured by atomic force microscope (AFM). The RBS spectra seem to indicate the present of copper oxide which were also examined by x-rays diffraction patterns.

D0051-RAMAN SCATTERING IN RELAXOR FERROELECTRIC $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$

Tanaporn Tansakul¹, Kageeporn Wongpreedee², Duangmanee La-Orauttapong¹

¹Department of Physics, Faculty of Science, Srinakharinwirot University, Sukhumvit 23, Bangkok 10110

²Division of Material Science, Department of General Science, Faculty of Science, Srinakharinwirot University, Sukhumvit 23, Bangkok 10110

E-mail address: p_mesia@yahoo.com

Abstract: A model relaxor ferroelectric $\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ (PZN) has been studied by micro-Raman scattering at room temperature and over a frequency range up to 1000 cm⁻¹. The experiment allowed assignment of frequencies of Raman active zone at ~ 270 cm⁻¹, 595 cm⁻¹, and 780 cm⁻¹. No usual soft mode has been found, in agreement with other reported.

D0052-Relativistic vision of the moving cube

Napat Sansuthikul, Sitthichai Pinkanjanarod and Noparit Jinuntuya

Department of Physics, Faculty of Science, Kasesart University, Bangkok

E-mail address: b4404021@ku.ac.th, fscispr@ku.ac.th and fscinpr@ku.ac.th

Abstract: In introductory courses on special relativity, many students have the difficulty in imagining how the object changes its appearance when it moves at appreciable fraction of the speed of light. Moreover, a whole picture of the moving object becomes more difficult to imagine if the problem involves the change of three or more dimensional forms of space and time. In order to study the distortion effect of high velocity on the appearance of the common object, we use the cube substitute any common object. The cube may be set out on any position and at any angle relative to the observer, but the relative velocity, $\beta = v/c$ is assumed to be constant corresponding to special relativity condition. By wielding the concepts of light sphere of observation and Lorentz contraction, we can calculate and display the resulting shape of the moving object appearing to the observer.

D0053-THE WAVELENGTH DISPERSIVE X-RAY FLUORESCENCE ANALYSIS IN THICK EMULSION PAINT FILM SPECIMENS.

Siriluk Ruangrungrate¹, Arunee Intasorn¹, and Sumontha Songsom²

¹Department of Physics, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand.

²Khuankhanon School, Pattalung 93110, Thailand.

E-mail address: sirilukr@swu.ac.th and arunce@swu.ac.th

Abstract: A technique of quantitative analysis of multielement in thick film specimens of red emulsion paint using Wavelength Dispersive X-Ray Fluorescence Spectrometer (WDXRFS) was studied. The thick film preparation by painting on two distinct substrates i.e. acrylic plate and galvanizing steel sheet, were provided for inspecting Compton scattering effect on the analysis. In order to check an accuracy of analysis, the bulk pressed pellet specimens were prepared by the paint in form of fine powder, yielding the analytical result which was considered as reference values. Furthermore the according results from thick film specimens show the concentration of zinc in galvanizing steel substrate, which implies the finite thickness of the films. Finally, it was pinpointed that high Compton scattering caused by light elements in acrylic substrate, has an extreme influence on the incorrect result of trace elements.

D0054-PREPARATION OF THIN POLYCARBONATE FILM FOR STUDY NUCLEAR TRACK ETCHED FROM URANIUM-235

Apaporn Thongphud¹, Wichian Ratanatongchai², Benjang Sangchuk³, Pitt Supaphol⁴ and Pinpan Visal-athaphand¹

¹Department of Physic, Faculty of Science, King Mongkut 's University of Technology Thonburi, Bangkok10140,Thailand,² Physics Division, Office of Atomic Energy for Peace, Bangkok 10900, Thailand,³ Department of Chemistry, Faculty of Science, King Mongkut 's University of Technology Thonburi, Bangkok10140,Thailand, ⁴ and Petroleum and Petrochemical college, Chulalongkorn University, Bangkok 10330, Thailand ,

E-mail address: apaponth@hotmail.com

Abstract: A study of the nuclear track in thin Polycarbonate (PC) film that was prepared by using extrusion method with 15 micrometer thickness. The PC film was attached with uranium screen and irradiated by neutron from nuclear research reactor. The irradiated film was etched in the chemical etchants by sodium hydroxide (NaOH), potassium hydroxide (KOH) and lithium hydroxide (LiOH) solutions in the same condition of 6N 70°C for 1 hour. Track diameter from fission fragment of uranium-235 on PC film was 0.5 to 6.2 micrometer and track density are in the range of 9.55×10^4 to 1.19×10^5 track.cm⁻². The comparison of 3 types of etching solution show that the track etched with NaOH solution is the largest track.

D0055-Perturbative Calculation of Quasi-normal Modes of Schwarzschild Black Holes

Suphot Musiri², Gorge Siopsis³

¹Classical and Quantum Gravity, 20(2003), L285-L291

²Department of Physics, Srinakharinwirot University, Bangkok

³Department of Physics and Astronomy, The University of Tennessee, Knoxville, Tennessee, USA

Abstract: We discuss a systematic method of analytically calculating the asymptotic form of quasi-normal frequencies of a four-dimensional Schwarzschild black hole by expanding around the zero order approximation to the wave equation proposed by Motl and Neitzke. We obtain an explicit expression for the first-order correction and arbitrary spin. Our results are in agreement with the results from WKB and numerical analyses in the cases of scalar and gravitational waves.

D0058-Molecular Modeling of *Bacillus thuringiensis* Cry4Aa and Cry4Ba Proteins

Taveechai Taveechoenakool¹, Teerakiat Kerdcharoen¹, Chonticha Suwattanasophon¹, Chanan Angsuthanasombat²

¹Department of Physics and Capability Building Center of Nanoscience and Nanotechnology, Faculty of Science, Mahidol University, Bangkok, Thailand,

²Laboratory of Molecular Biophysics, Institute of Molecular Biology and Genetics, Mahidol University, Salaya Campus, Nakornpathom, Thailand,

E-mail address: g4537104@student.mahidol.ac.th

Abstract: The gram-positive endospore-forming bacterium *Bacillus thuringiensis* synthesizes specific larvicidal protein Cry4Aa and Cry4Ba which are highly active against mosquito-larvae of the genus *Aedes*, *Anopheles*, and *Culex*. Currently, the precise mechanism of toxicity of Cry toxin is not completely understood. To gain molecular structural knowledge of two proteins Cry4Aa and Cry4Ba, Angsuthanasombat, *et al*[1] generated plausible 3D models for the activated forms of these two toxins by homology modeling. Although the predicted structures of these two proteins were generated, they might have lower-energy conformations. In this study, the simulated annealing(global energy minimum search algorithm) results of before-and-after-simulated annealing structures between Cry4Aa and Cry4Ba were studied and compared.

D0059-THE EFFECT OF HEAT TREATMENT ON MECHANICAL PROPERTIES OF COLD WORK TOOL STEEL

Jirapat Ladawan , Chalermwat Wongwanitwattana*

Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Sciences, King Mongkut's Institute of Technology North Bangkok, 1518 Pibulsongkram Rd., Bangsue, Bangkok 10800, Thailand.

Abstract: The use of the cool work tool steel must consider their hardness and residual stress. These properties are affected by the heat treatment during the manufacturing process. This research concentrates in the effect of the heat treatment on mechanical properties of the cold work tool steel. The experiment was done with the sample heating at 300 °C , 400 °C , 500

°C and 600 °C under vacuum. The results show that the highest hardness(61 HRC)occurs at 500 °C and the lowest hardness(48 HRC)occurs at 600 °C. Although these temperatures yield a different hardness, the same residual stress of 359 N/mm² are obtained. However, types of residual stress are different. Heat at 500 °C represents a compressive stress while heat at 600 °C represents a tensile stress. In conclusion, the most suitable temperature used in heat treatment process is 500 °C because it yields both the best hardness and the less residual stress.

D0060-Growth of Molybdenum Trioxide Nanowhiskers by Vapor Transport Method

Surachet Phadungdhithada¹, Pongsri Mangkornong¹, Sripen Towta¹, Sornchai Tanunchai¹, Suwit Wongsila², Supab Choopun¹ and Nikorn Mangkornong¹

¹Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand.

e-mail address: soojasua@hotmail.com

Abstract: Molybdenum trioxide nanowhiskers have been grown by vapor transport method. A molybdenum trioxide pellet from hydrolic pressed powder was put into a tubular furnace and heated to 750°C. Silicon (100) substrates were placed for 10 minutes at the positions of 680°C, 650°C, and 600°C. From scanning electron microscopy results, the whiskers on the substrates at 680°C and 650°C were wider than a micrometer. The whiskers on the substrate at 600°C had many sizes but most of them were nanowhiskers, smaller than micrometer in size.

D0061-Synthesis of ZnO Nanowire by RF Sputtering

Nivom Hongstith^{*}, Sornchai Tanunchai¹, Supab Choopun¹, Torranin Chairuangsr², Pongsri Mangkornong¹, and Nikorn Mangkornong¹

¹Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200

²Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200

* e-mail address: nivom4625059@yahoo.com

Abstract: ZnO nanowires were synthesized by rf sputtering on copper, silicon and alumina substrates. The sputtering time was 60 min, in argon atmosphere pressure of 40 mtorr. The ZnO nanowires were characterized by Scanning Electron Microscopy (SEM), Energy-Dispersive Spectrometry (EDS), and Transmission Electron microscopy (TEM) for morphology, composition and crystal structure, respectively. From these results, it is confirmed that ZnO nanowires on copper substrate are single crystalline hexagonal structure with diameter ranging from 10-150 nm, and the length of several micrometer. The morphology of ZnO nanowire is also influenced by the type of the substrate.

D0062-Fräunhofer Pattern of Josephson Critical Current in Bi-2212 Cross-Whiskers Junction

Patohn Roattjanapanitkit¹, Pongsri Mangkornong¹, Waranont Anukool¹, Suwit Wongsila² and Nikorn Mangkornong¹

¹Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, 50200 Thailand.

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai, 50200 Thailand.

*e-mail: patohner@hotmail.com

Abstract: The magnetic-field dependence of critical current density across a Josephson junction is being studied on Bi-2212 cross-whiskers. The cross-whiskers junction was fabricated by perpendicularly crossing two whiskers, which were then heated at 850 °C for 30 min. In superconducting state, the critical current density was a periodic and its amplitude depended on the magnetic flux density corresponding to the Fräunhofer pattern.

D0063-DC magnetron sputtering for coating substrate that is used in scanning electron microscope

S Panyainkaew, L. Liabchai, V. Dhristhachareon

Dept. of Physics, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand.

ABSTRACT: The objective of this project was to develop the DC magnetron sputtering for coating a substrate that is used in scanning electron microscope. The system had been designed and constructed consists of three major parts: (1) vacuum system, (2) a cathode in circular shape inside which a permanent magnet, and (3) a high voltage switching power supply. The target of the device was gold of thickness 2 mm and diameter 50 mm. This system was used to prepare the films that were coated onto glass substrates. The condition of coating: the pressure range of argon 3×10^{-2} to 4×10^{-2} Torr, operating voltage 350 to 450 V, and deposition time 30 s to 120 s. Consequently, the films had bright color, and thickness 32 nm to 269.9 nm.

D0064-STUDIES ON THE ELECTRICAL AND OPTICAL PROPERTIES OF SnO₂:F THIN FILMS PREPARED BY INTERMITTENT SPRAY PYROLYSIS METHOD

Ngamnit Gaewdang¹, Thitnait Gaewdang¹ and Auppatham Nakaruk²

¹Department of Applied Physics, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Chalokkrung Rd., Ladkrabang Bangkok 10520, Thailand;

e-mail address: tan_physics@yahoo.com

Abstract: SnO_2 :F thin films were prepared by intermittent spray pyrolysis method from homemade setup. $\text{SnCl}_4 \cdot 5\text{H}_2\text{O}$ was used as the precursor of Sn and F doping from NH_4F . The electrical and optical studies on the as prepared films were carried out at room temperature. The sheet resistance and resistivity decrease with increasing doping concentration to minimum of $29.2 \Omega/\square$ and $1.3 \times 10^{-3} \Omega\text{-cm}$ for 10 wt%, but increased thereafter. The Hall mobility is found to decrease whereas the carrier concentration is found to increase with the increase in fluorine doping levels. Optical transmittance percentage in the IR region decreases in the doped films. For the films doped with F 10 wt.%, the lowest percentage of transmittance values in IR region was also elucidated.

D0065-Structure and Electrical Resistivity of $\text{PrBa}_2(\text{Cu}_{0.80}\text{Ga}_{0.20})_3\text{O}_{7.5}$

อุทัยทิพย์¹, ศุภกร ภู่อีก¹, ลี ดดา ตระกูลรั มย์¹, สุปัญญา ภูณนา¹, Tar-Pin Chen².

¹ภาควิชาฟิสิกส์ คณะวิทยาศาสตร์ มหาวิทยาลัยอุบลราชธานี อำเภอวารินชำราบ จังหวัดอุบลราชธานี 34190, email: tipparach_u@yahoo.com

²Department of Physics, University of North Dakota, Grand Forks, ND 58202 U.S.A.

Abstract: We have fabricated metal (M) doped buffer-layer materials, $\text{PrBa}_2(\text{Cu}_{0.80}\text{Ga}_{0.20})_3\text{O}_7$ called Ga-doped PBCO, for $\text{YBa}_2\text{Cu}_3\text{O}_{7.5}$, (YBCO) superconductor-insulator-superconductor (SIS) Josephson junctions. The x-ray data diffraction analysis was performed in conjunction with neutron diffraction data analysis. The data indicate no significant second phase at 20% doping level and the structure and lattice parameters of Ga-doped match with those of YBCO. At 77 K the electrical resistivity of this material is several orders in magnitude higher than that of the $\text{PrBa}_2\text{Cu}_3\text{O}_7$. For these reasons Ga-doped PBCO may serve as improved buffer-layer materials for superconducting electronic circuits and devices.

D0066-Construction of a LIF System Utilizing CCD-Array

Samran Lacharajana*, Anurak Prasatkhetragarn and Chuleeporn Wongtawatnugool

Department of Physics, Faculty of Science, Chiang Mai University Chiang Mai 50200 Thailand.

e-mail address: scphi001@chiangmai.ac.th *

Abstract: In this experiment a laser induced fluorescence (LIF) system was constructed utilizing a large pixel CCD-Array as a light detection device. The CCD spectrometer consists of a 2-inch reflection grating and 2048-pixel CCD-Array of the pixel size $14 \times 200 \mu\text{m}$. A general single slit and a convex lens was used to form a CCD-spectrometer enclosed in a light tight box. The signal output from the CCDArray was synchronized and digitized using an external digitizer. In our experiment we used the IQ300 16-bit 500kHz digitizer to capture the CCD-signal train from the CCD-spectrometer. The CCD-spectrometer system calibration was carried out by measuring the spectrum of some standard spectral lamps. The CCD-spectrometer worked well as a general purpose CCD-spectrometer, and also as part of the LIF system where a nitrogen laser was used as an excitation light source. The microcomputer was interfaced with both laser and the digitizer for control, synchronization, and data acquisition. The spectrum of some samples of interest were also demonstrated to show the LIF system performance.

D0067-LIF Spectroscopy of Teak Chuleeporn Wongtawatnugool and Samran Lacharajana*

Chuleeporn Wongtawatnugool and Samran Lacharajana*

Department of Physics, Faculty of Science, Chiang Mai University Chiang Mai 50200 Thailand.

e-mail address: scphi001@chiangmai.ac.th *

Abstract: It is well known that laser beam can induce a fluorescence spectrum off the illuminated materials. In this experiment the laser induced fluorescence (LIF) system was used to study the fluorescence spectrum of teak wood. A nitrogen laser at 337.1 nm wavelength, 4 ns pulse width at peak power of 75 kW was used as a light source. The results were presented in comparison to the spectra obtain from some noble metal such as silver and gold excited by the same system.

D0068-INSTANT NOODLES MONOSODIUM GLUTAMATE MEASUREMENT USING LASER INDUCE FLUORESCENCE TECHNIQUE

Rakdiaw Maungma, Chuleeporn Wongtawatnugool and Samran Lacharajana*

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200 Thailand.

e-mail address: scphi001@chiangmai.ac.th*

Abstract: The main purpose of this study was to investigate the presence of Monosodium Glutamate (MSG) in instant noodles commercially obtained in the market. Naturally, different elements would be sensitive to an excitation at different wavelength. Laser light could be used as an excitation radiation to activate any sample of interest. In this experiment we introduced laser induced fluorescence (LIF) technique to be use to indicate the presence of MSG in an instant noodle by comparing the fluorescence spectrum obtained off pure MSG and ones off the noodles available in the market. It was found that part of the fluorescence spectrum of plain noodles had the similar intensity profile as off the MSG. This was also true for the case of the seasoning ingredient that come with the instant noodle. There were also some peak, of not yet identified, in the fluorescence spectrum of which need to be further studied. It was clear from this experiment that there are MSG or materials of similar molecular structure present in all samples under studied.

D0070-DENTAL CARIES AS SEEN BY LASER INDUCED FLUORESCENCEAnurak Prasatkhetragarn^{*}, Chuleeporn Wongtawatnugool and Samran Lacharajana^{*}

Department of Physics, Faculty of Science, Chiangmai University, Chiang Mai 50200, Thailand

e-mail address: seph0001@chiangmai.ac.th^{*}

Abstract: There are several methods for identifying dental caries such as vision inspection, radiography, and mechanically explore. Those mentioned procedures usually give different conclusions, from different dentists. In order to standardize dental caries, the Laser Induced Fluorescence (LIF) method was suggested. By studying the fluorescent spectrum of the teeth, comparing between sound and caries teeth which activated by Nitrogen laser beam. We was found that the fluorescent spectra of sound and caries teeth show significantly different spectrum profiles in the range of 540-600 nanometre of fluorescent spectrum.

D0071-THE EFFECT OF TIME CONSTANT ON AC RESISTANCE BRIDGE TEMPERATURE CONTROL SYSTEMKachan Dangdom, Chuleeporn Wongtawatnugool and Samran Lacharajana^{*}

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

e-mail address: seph0001@chiangmai.ac.th^{*}

Abstract: An ac resistance bridge temperature control system uses a thermister as a temperature sensor device. The output voltage from the system ac-bridge depends on the difference between the thermister resistance and setting resistance multiplied by output gain of the resistance bridge setting. For high resolution temperature control, it is necessary to take all environmental effects of the system into account. This work studied the effect of time constant of the heating circuit on the system performance. In the experiment, the Stanford Research SIM 921 ac resistance bridge together with the SIM magnifier SIM 921 interfaced with microcomputer system for data acquisition and control using Quick Basic program. The recorded data was analyzed statistically and the control temperature graph was plotted. Ac resistance bridge model SIM 921 gives maximum voltage output at 1.0 volt. In the experiment the SIM 921 output was fed directly to drive a power transistor to supply a heating current to a heating coil at maximum current of 0.2 Ampere. The SIM 921 output gain was set to 0.05 volt/ohm and varied time constant as 0.3, 1, 3, 10, 30, 100, and 300 second for temperature control of 50oC. It was found from the experiment that at lower time constant the controlled temperature was widely swung and varied rapidly. As approaching bigger time constant setting, the controlled temperature was much more stable. The estimated steadiness of temperature control at 300 seconds time constant was about 5 ± 0.1 mK. This work will play an important role in the suggestion of the environmental effect on the controlled temperature especially ones that need to be better than 5 ± 0.1 mK.

D0072-Lidar Application to Cloud DistributionPiyachati wangmool, Chuleeporn Wongtawatnugool and Samran Lacharajana^{*}

Department of Physics, Faculty of Science, Chiangmai University, Chiang Mai 50200, Thailand

e-mail address: seph0001@chiangmai.ac.th^{*}

Abstract: The light scattering intensity of light passing through a boundary depends largely on the difference in the density of the media. In this experiment the laser beam was sent directly upward to the sky by YAG-Pumped dye laser at the wavelength of 560 nm. The strong back scattering off the cloud was collected by 20-inch telescope parabolic reflector. The back scattered beam were focused onto the Hamamatsu H3164-10 photomultiplier tube (PMT). The light signal from the PMT was amplified by the pre-amplifier (PA) and then directly connected to the multichannel scaler (MCS) unit. The MCS unit is a high-speed counter and counts the incoming PMT pulses in a given time window and transmitted to a computer to collect data. It was found in the experiment that the back scattered photons increase when the laser beam is traveled through the cloud. It was therefore possible to calculate the position of the cloud. It was possible also to find cloud distribution in the sky at night by scanning the laser beam and the receiving optic across the sky. The system was designed to cope with such task by xy-motion step motor controlled 30x30 inches mirror. In the case of 5 nS sample time setting will be equivalent to around 24 km laser path.

D0073-High Voltage Pulse Optical SwitchRoongtham Soeksan, Chuleeporn Wongtawatnugool and Samran Lacharajana^{*}

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.
e-mail address: sephi001@chiangmai.ac.th *

Abstract: An optical switch was constructed by activating an active dielectric substance with a high voltage pulse. When the dielectric such as nitrobenzene is activated by high uniform electric field, it behaves like a uniaxial crystal of which the polarization of the light passes through the medium will be rotated. In this experiment, the He-Ne laser is used as a light source sending the beam through two parallel oppositely charged plates inserted in a glass cell containing nitrobenzene. The sample cell was placed between crossed polarizer and analyzer. No light was transmitted by the analyzer while the EHT was off. When the EHT was on, the liquid behaved like an uniaxial crystal and the light was transmitted. It was found from the experiment that the transmitted intensity depends on the supplied EHT as expected. Switching characteristic property of an optical switching system must be studied carefully in order to use such a system for controlling laser pulse amplitude and timing of the laser beam applied to a laser pulse applications.

D0074-Fluorescence of Gemstone under Nitrogen Laser

Hathaitip Rojsuparat, Chuleeporn Wongtawatnugool and Samran Lacharajana*

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

e-mail address: sephi001@chiangmai.ac.th*

Abstract: Many gemstones show fluorescence under ultraviolet radiation. The fluorescence may modify color appearance of fluorescent gemstone and can be used to assist gem identification. In this experiment, the nitrogen laser was used to irradiate two types of gemstone and also to irradiate two pieces of gemstones of the same kind obtained from the same location. The LIF spectrum of these gemstones were significantly difference under nitrogen laser beam irradiation. The fluorescent spectra obtained show that different gems have different spectra, and the two gems from the same location have the same peak in two range of 630 to 670 nanometres and 320 to 340 nanometres but have different intensity. The different intensity may due to the physical characteristic such as different color. Further detailed study on LIF of gemstone shall be continued.

D0076-AN IMPROVEMENT OF AN AC SUSCEPTIBILITY MEASURING SYSTEM

Chat Pholnak¹, Pongsri Mangkornong², Sripen Towta², Supab Choopun², Sornchai Thananchai², Suwit Wongsila¹ and Nikorn Mangkornong^{2*}

¹Department of Physics, Faculty of Science, Thaksin University, Songkhla 90000, Thailand, e-mail address: chat@tsu.ac.th,

²Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand,

³Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract: This paper presents an improvement of an AC susceptibility measuring system in order to increase system efficiency and sensitivity by using the vacuum system and the closed-cycle cryogenics refrigeration (CCR). The self-constructed probe based on the mutual induction of coupling coils was designed and suited for a cryostat that could generate magnetic field in the range of 0.5-5.0 Gauss. All instruments were controlled, monitored as well as graphical displayed via a computer in conjunction with a software instruction Agilent VEE pro version 6.0. YBa₂Cu₃O_{7-x} superconductors were used to characterize the measuring system in the temperature range of 20-300 K under the pressure of 1.4×10^{-2} mbar. Testing results showed that while lowering the sample temperature down, the complex susceptibility of the sample changed abruptly just above the critical temperature of about 90 K indicating the perfect diamagnetism of the sample and the energy loss in its superconducting state. Furthermore, the measuring system satisfactorily performed with an estimated sensitivity by about 4×10^{-7} Gauss-cm³.

D0077-Laser Spectral Analysis by Fabry-Perot Interferometer

Kanokpoj Areekul, Noparit Jinuntuya and Bancha Panacharoensawad

Metrology and Physics of Instrumentation Research Unit, Department of Physics, Faculty of Science, Kasetsart University, Bangkok.

E-mail: Kanokpoj.A@ku.ac.th, Noparit.J@ku.ac.th, Bancha.P@ku.ac.th

Abstract: The Fabry-Perot interferometer principle is multiple beam interference. The interference fringes are clearer and shaper than other single beam interferometers. It is now widely applied ranging from astronomy to household security devices. An interesting application is in the field of optical measurement and testing especially in an optical spectrum analyzer. It is an important method to study light sources such as lasers. In this research, a confocal Fabry-Perot

interferometer is used. The system consists of two confocal mirror. One mirror is controlled by piezotransducer. The interference pattern is detected by a photo diode and a graphical display via DSO. The aims of the research are the search for the accurate wavelength measurement, which is expected to be in order of 0.1 nm, and the associated experimental uncertainty.

D0078-MATHEMATICAL MODELING FOR TEA NITROGEN LASER

Narong Suwanmanee¹, Yutthana Tirawanichakul² and Warit Werapun³

^{1,2}Department of Physics, Faculty of Science, Prince of Songkla University, Hatyai, Songkhla, 90110, Thailand ;

^{1,2}Department of Physics, Faculty of Science, Prince of Songkla University, Hatyai, Songkhla, 90110, Thailand ;

³Department of Science and Technology, Suratthani college, Prince of Songkla University, Suratthani Campus, Suratthani, Thailand*

Email address: Snarong@psu.ac.th

Abstract: The mathematical model of electrical discharge circuit of Transversely Excited Atmospheric nitrogen laser (TEA nitrogen laser) was used for predicting electrical discharges. The TEA N₂ laser was developed using 2 typed of capacitors. The aluminum foil and high voltage ceramic doorknob capacitor were used in this purpose. In this work, two electrodes of laser channel were made from stainless steel with length of 15 cm and spacing of 2 mm. Nitrogen gas was excited by high voltage pulse discharge technique from Blumlein circuit. The results show that the predicted value had high relation to the experimental results. The output energy was measure by pyroelectric probe. The average output energy was in the range 153-191 μJ at 10-14 kV supply. In addition, the optical efficiency was determined to be 0.02-0.03 % of electrical input energy.

D0079-Study on Structure-Morphology-Properties Inter-Relationships of Poly(ethylene naphthalate) (PEN) and Poly(trimethylene terephthalate) (PTT) Blends by using Small Angle Neutron Scattering Technique

Jipawat Chamchang¹, Somchai Pongkasem¹, Areeratt Kornduangkao^{1*}, Pitt Supaphol², Satoshi Koizumi³ and Hirokazu Hasegawa⁴

¹Physics and Advanced Technology Research Program, Office of Atoms for Peace, Vibhavadi Rangsit Rd., Chatuchak, Bangkok 10900, Thailand,

²The Petroleum and Petrochemical College Chulalongkorn University, Bangkok, Thailand,

³Soft Matter Neutron Scattering Laboratory Advanced Science Research Center, Japan Atomic Energy Research Institute, Japan,

⁴Department of Polymer Chemistry, Kyoto University, Japan.

E-mail address: jipawat@hutma1.com

Abstract: Small Angle Neutron Scattering (SANS) is a widely used technique to investigate microstructures of materials with dimensions between nm to μm. SANS is a non-destructive method providing information about the size, shape and orientation of some component of the sample averaged over all grains of different sizes with high statistical accuracy. SANS using neutrons as the probing particle has the advantage of being sensitive to light elements, in particular hydrogen and deuterium which remains invisible in Transmission Electron Microscopy (TEM) and Small Angle X-ray scattering (SAXS). Moreover, the SANS technique is very sensitive to the phase (size and structure) of the blend polymer. In this work, Poly(ethylene naphthalate) (PEN) and Poly(trimethylene terephthalate) (PTT) Blends were studied and SANS technique will be used to investigate the phase behavior and the morphology of the blends.

D0080-QUANTITATIVE ANALYSIS OF SILICON BY ³⁰Si(n, γ)³¹Si Reaction

Wichian Ratanatongchai^{*}, Wanchai Dharmwanij and Somporn Chongkum

Program of Physics Research and Advanced Technology, Office of Atoms for Peace, Vibhavadee Rangsit Road, Chatuchak, Bangkok, Thailand.

Abstract: The problem of silicon determination by ²⁸Si(n,p)²⁸Al reaction is the interference from ²⁷Al(n, γ)²⁸Al reaction. One solution of this problem is to use ³⁰Si(n, γ)³¹Si. From this study, it was found that this method is suitable for the sample with high silicon content.

D0081-DETERMINATION OF RADIOACTIVITY OF NEUTRON IRRADIATED TOPAZ

Adisak Punyanut¹, Somporn Chongkum¹, Somchai Pongkasem¹, Jipawat Chamchang¹, Areeratt Kornduangkao¹, Piya parakoch², Jirapa Sukhowattanakij²

¹Program of Physics and Advanced Technology, Office of Atoms for Peace, Chatuchak, Bangkok, Thailand 10900

² Department of Physics, Faculty of Science, Thaksin University, Songkhla, Thailand, 9000

Abstract: Natural topaz has clear color. Its natural clear color will turn blue, when irradiated with neutron and increase in value. In the process of topaz coloring by using neutron from nuclear research reactor, the nuclear reaction will produce radioisotopes. Thus, to reach a safety level, which is less than 2 nCi/gram (European standard) before selling, neutron-irradiated topaz shall be stored in place for a period of time in order to reduce its radioactivity. The storage time of radioisotopes is dependant on trace elements in topaz and its original sources. This study was done by measuring radioactivity with HPGe detector. The result of qualitative and quantitative study found that neutron irradiated topaz consist of Sc-46, Mn-54, Co-60, Cs-134 and Ta-182 as trace element and have radioactivity between 0.55-0.69 nCi/gram, which are in standard limit

D0082-Preliminary Study on Color changing in Neutron Irradiated Diamond by HeatingSomchai Pongkasem¹, Areeratt Konduangkaeo¹, Sompanee Petchpraprasert² and Charoen Larppitakpong³¹Project of Physics Research and Advanced Technology, Office of Atoms for Peace²Faculty of Science, Burapa University³Faculty of Science, Mahidol University

Abstract: The objective of this preliminary work is to study color changing in low quality diamonds after irradiated by high energy neutrons from nuclear research reactor. The samples has been irradiated for 60 hours, and recording of color has been carried every 12 hours. After irradiation, the selected samples were heated at 600 °C. The results of the preliminary study show that the color of diamond has turned into yellowish green. For longer irradiation time, color of diamonds will be turned into dark green. After heated, color of the irradiated diamonds has turned into yellow.

D0083-Analysis of Sandstone and Laterite using Nuclear Analytical TechniquesCholnatee Aksornpradit¹, Sunisa Butpak¹, Ratchai Funklin², Sarinrat Wonglee², Sasiphan Khaweerat^{2*}, Wanchai Dharmavanij, Surapong Pimjun² and Somporn Chongkum²¹ Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok² Physics Research and Advanced Technology Program, Office of Atoms for Peace, Bangkok 10900. Tel:0-2579-5230 ext.542 Fax:0-2562-0118

e-mail address: saphankha@hotmail.com

Abstract: Sandstone and laterite samples from different regions in the north-east of Thailand were analyzed by X-ray fluorescence and neutron activation analysis techniques. From the relation of the ratio of iron to scandium with iron to lanthanum, it was found that the samples can be classified into three groups according to the sampling region. This information will be useful in the archaeology study.

D0084-DETERMINATION OF TANTALUM IN TANTALITE ORE BY X-RAY FLUORESCENCE ANALYSIS OF THICK SAMPLEWattana Namchan¹, Lukkana Ngamnasaew¹, Sarinrat Wonglee^{2*}, Sasiphan Khaweerat², Surapong Pimjun² and Somporn Chongkum²¹ Program of Physics, Faculty of Science and Technology, Rajabhat Institute Loei² Project of Physics Research and Advanced Technology, Office of Atoms for Peace, Bangkok 10900. Tel:0-2579-5230 ext.542 Fax:0-2562-0118

e-mail address: mynamekung@yahoo.com

Abstract: The analysis of tantalum in tantalite ore by tube excited X-ray fluorescence with thick sample and standardless calculation method was performed. The result shows high accuracy with the error of 5% and the analysis time of this method is shorter than the neutron activation analysis method. This method can be applied for the analytical service of ore sample to the public sector by the Office of Atoms for Peace.

D0085-VARIATION OF PLASMA ELECTRONS TEMPERATURE MEASURED OF A SMALL PLASMA FOCUS DEVICE FROM X-RAY WITH CHARGE ENERGY

Tititak Kulkoulprakar, Dusit Ngamrungraj, Pirut Kumsing, Rattachat Mongkolnavin

Department of Physics, Faculty of Science, Chulalongkorn University, Tel. 0-22185-138, 0-22185-289

E-mail address: tititak_plasma@yahoo.com

Abstract: A small plasma focus device with a 3.3 kJ energy operating at 15 kV is a source of intense x-ray. Plasma focus produces a pulse of plasma in a time of 3-4 μ s. Therefore, plasma electron temperature can not be measured directly. From the x-ray generated, the temperature of electron in the plasma can be deduced. X-rays generated are multi-wavelength. X-ray yield and x-ray energy from the plasma focus depend on the design and operation parameters of the plasma focus device such as pressure, operating gas, shape, size and material of anode cathode and insulator even the stored energy. This research uses time resolved x-ray measurement. Five channels PIN-diode is used as a x-ray spectrometer. Argon gas is used and the measurement of x-ray with varying charging energy to plasma focus device is made. From the x-ray measurement, the electron temperature in plasma focus is found to vary with charging energy of a small plasma focus.

D0086-PENTAQUARK ANTIDECUPLET WAVE FUNCTIONS BY USING YAMANOUCHI BASIS FUNCTIONSongvudhi Chinchinda¹, Sampart Cheedket², Yupeng Yan¹¹School of Physics, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima, Thailand,²Department of Physics, Faculty of Science, Thaksin University, Thailand,

E-mail address: songvudhi.bucc4.buu.ac.th, sampart@tsu.ac.th and yupeng@ccs.sut.ac.th

Abstract: A pentaquark particle is an exotic hadron, consisting of four quarks and an antiquark. The existence of pentaquark particles has just been confirmed by several experimental groups since last year. It is not straightforward to construct the wave function (which plays a crucial role for any theoretical calculation) of pentaquark states since the symmetry of the five-particle system is rather complicated. In this work we construct the wave function of pentaquark antidecuplet states by analyzing the permutation symmetries of the four quarks in the techniques of the permutation group and SU(m) group, and the Yamanouchi basis.

D0087-The Study of Thermodynamic Properties of D-Wave Superconductors under a Magnetic FieldPornpana Boonma^{1,*}¹Department of Physics, Faculty of Science, Thaksin University, Songkhla, 90000, Thailande-mail address: pornpana@tsu.ac.th

Abstract: This paper presents the study of the thermodynamic properties of d-wave superconductors under a magnetic field on the basis of BCS gap equation together with the Zeeman effect phenomenon. It is found that at near the critical temperature the energy gap increases with increasing magnetic field and decreases with increasing ω_D / T_C , but the critical field and the specific heat difference between the superconducting and normal phases at T_c decrease with increasing magnetic field and ω_D / T_C .

D0088-STRUCTURE DYNAMIC OF AQUEOUS CRY4Ba PROTEIN AS STUDY BY MD SIMULATIONChonticha Suwattanasophon¹, Tanakorn Osotchan², Chanan Angsuthanasombat³, Michael G. Kiselev⁴ and Teerakiat Kerdcharoen²¹Department of Physics, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanuloke 65000, Thailand.²Department of Physics, Faculty of Science, Mahidol University, Rama 6, Bangkok 10400, Thailand³ Institutes of Molecular Biology and Genetics, Mahidol University, Phuttamonthon 4, Nakhon Pathom, 73170, Thailand⁴ Institute of solution Chemistry ,Academy of Sciences, Akademicheskaya st. 1, 153045,RussiaEmail : s_chonticha@yahoo.com

Abstract: The structural dynamic of the Cry4Ba in aqueous solution was investigated using the molecular dynamics simulation method. Energy minimization of the system was performed prior to the simulations. The system was then subjected to 200 ps of positional restrained MD simulations and was carried out for 4 ns with unrestrained MD simulations. The properties of hydration water around Cry4Ba and trend of Cry4Ba elasticity was studied. The solvent accessible surface area (SASA), the root mean square (RMS) of position displacement, total energy and H-bond number were analyzed. It was found that relative SASA of the hydrophobic part has a tendency to increase and the number of hydrogen bonds between water molecules has a tendency to increase as well. The values of the RMSD at each domain were increasing throughout the simulations, indicating that the structure of proteins has a tendency to change. All of the results clearly demonstrate that water may assist in the preliminary process of membrane insertion and pore formation in mosquito-larval gut cell membrane by the Cry4Ba.

D0089-ATWOOD'S MACHINE IN AN ACCELERATING FRAME WITH PC INTERFACES. Denchittacharoen, S. Panyainkaew, P. harmanee, B. Soodchomshom, D. Trikomoot

Dept. of Physics, Faculty of science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand.

Abstract: The use of Atwood's machine to determine the accelerations in an accelerating frame is described. The experimental apparatus categorized as two parts: (1) Atwood's machine, and (2) microcontroller and electronic circuits. Now, microcontroller played an important role in physic experiments. With this device we were able to obtain the accurate measurements. Meanwhile, both parts of apparatuses were used together, the electrical signals were performed. Because of this, the data transferred to a microcomputer. These data were calculated by the visual basic program, and get the accelerations at the final. The average error of the accelerations, which compared with the theoretical calculation, is less than 2.36%.

D0090-Studies of Magnetic Thin Films Prepared by Thermal Evaporation

Yuttanan Pansong and Chitnarong Sirisathitkul

Magnet Laboratory, Experimental Physics Research Unit, School of Science, Walailak University, Nakon Si Thammarat 80160, Thailand; e-mail address: schitnar@wu.ac.th

Abstract: Cobalt films were fabricated by thermal evaporation on silicon and glass substrates. Electron microscope revealed that the film surface on silicon was smoother than that on glass. The cobalt on silicon exhibited anisotropic magnetoresistance (AMR) by showing 0.01-0.08% resistance change in 2.2 kOe magnetic field. Changing the angle between the field and the current (θ) also gave rise to the change in electrical resistance (R_θ). The results agreed with AMR equation since the plot between R_θ and $\cos^2\theta$ could be linearly fitted.

D0091-SOME PROPERTIES OF CADMIUM TELLURIDE THIN FILMS GROWN BY THERMAL EVAPORATIONNgamnit Gaewdang^{1*}, Thitina Gaewdang¹, Sukrit Kirtsang¹, Pakorn Sittiketkorn¹ and Thitikorn Chanyatham¹¹Department of Applied Physics, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Chalokkrung Rd., Ladkrabang, Bangkok 10520, Thailand; e-mail address: kwngamni@kmitl.ac.th

Abstract: CdTe thin films with different thickness have been deposited by thermal evaporation in vacuum on glass substrate without heating substrate. From XRD analysis, CdTe thin films are polycrystalline belonging to cubic structure with a preferential orientation of (111) plane. The peak intensity of XRD increases as the film thickness increases. Energy gap values of the as-deposited films with different thickness were evaluated from the optical transmission spectra. The dark

resistivity value of films decreases when the films thickness increases. It may indicate that the thicker films contribute a larger grain size and lower active defects.

D0093-A STUDY OF SOME PHYSICAL PROPERTIES OF GEM TEKTTITES FROM THAILAND

Pairat Niumpreasert¹, Seriwat Saminpanya², and Fuanglada Veerasai³

¹Kritsanawittaya School, 144 Moo 4, Ban Wang Rong Noi, Kritsana, Sikul, Nakornratchasima, Thailand, 30140

²Department of General Science, Faculty of Science, Srinakharinwirote University, Bangkok 10110

³Department of Physics, Faculty of Science, Srinakharinwirote University, Bangkok 10110

e-mail address : fuanglad@swu.ac.th

Abstract: Thirty samples of tektites from Thailand were investigated for the longitudinal sound velocity (V_l) and transverse sound velocity (V_t) with a technique of echo method. The average results are $6,074 \pm 78$ m/s for V_l and $3,695 \pm 52$ m/s for V_t . The specific gravity for each sample was obtained by hydrostatic method with the use of an electronic balance. The average specific gravity or density (ρ) result is 2.42 g/cm^3 . The V_l , V_t and ρ values from this study were used to calculate the Young's modulus (E) and sheere modulus (μ) which are 80 ± 2 GPa and 33 ± 1 GPa, respectively. The E and μ values of this study are very close to those of Soga and Anderson (1967). The refractive index (R.I.) for each sample was measured by a refractometer obtaining in the range of 1.50-1.51. These values are similar to those of derived from the equation of Durrani (1971) (R.I. 1.49-1.50). The chemical composition (major elements) of sample was analyzed by an energy dispersive X-ray fluorescence spectrometer (EDXRF). The sample have the composition corresponding to Muong Nong tektites which have the parent materials of soil, loess, and rive sediments according to Chassidon and Koeberl (1995).

D0094-NEUTRON SCATTERING STUDY OF PHONON DYNAMICS IN $(1-x)\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - $x\text{PbTiO}_3$ CRYSTALS

Duangmanee La-Orauttapong¹, Oleksiy Svitelskiy², Jean Toulouse³, and Bernard Hennion⁴

¹Department of Physics, Faculty of Science, Srinakharinwirot University, Sukhumvit 23, Bangkok 10110, Thailand

²National High Magnetic Field Laboratory, Florida State University, Tallahassee, FL 32310, USA

³Department of Physics, Lehigh University, Bethlehem, PA 18015, USA

⁴Laboratoire Léon Brillouin, CEA Saclay, 91191 Gif sur Yvette, France

E-mail address: duangmanee@swu.ac.th

Abstract: It is now a well-recognized fact that the dynamical properties of relaxor ferroelectrics are determined by the presence of polar nanoregions (PNR's). In this work, we will present a comprehensive picture of the formation, temperature evolution and dynamics of these regions in $(1-x)\text{Pb}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - $x\text{PbTiO}_3$ (PZN- $x\%$ PT) single crystals with $x = 0$ -15%. The neutron probe was used to detect the internal relaxational dynamics, directly in the form of a central peak $Q(\omega) = \omega h$, or indirectly through their interaction with transverse phonons. A comprehensive analysis of our results allows identification of four phases in the evolution of the PNR's with decreasing temperature.

E0001-EFFECT OF POLYMER COATING ON VARIOUS PAPERS TO COLOR PRINT QUALITIES OF INKJET

Pichit Kajondecha and Suchapa Netpradit*

Department of Printing Technology, School of Industrial Education,
King Mongkut's University of Technology Thonburi, Bangkok, Thailand,
E-mail address: pichit.kaj@kmutt.ac.th and suchapa.net@kmutt.ac.th

Abstract: Effect of polymer coating on various papers to the color print qualities of inkjet was studied by using a polyvinyl alcohol as a coating solution. The aqueous concentration of 10% by weight was stirred in distilled water at 60°C, giving the viscosity of 20 centipoises, and coated on the surface of 4 white paper types; wood-free, gloss-art, card and art-card papers, with a film thickness of 4 microns. A standard test form of IT8.7/3 was then printed on the polymer coated and non-coated papers using an inkjet printer with water-based ink. The results showed that the printing ink was better absorbed, easier dried, less penetrated and less spread on the polymer coated paper. The comparison of color print qualities showed that all 4 types of polymer coated papers had higher color density and color saturation, wider color gamut, more sharpness, and smaller dot size.

E0002-PREPARATION OF SOME ZIRCONATE AND TITANATE COMPOUNDS BY SOL-GEL TECHNIQUE

Autchara Arunrattanapong and Nimit Sriprang

Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok, Thailand.
E-mail address: autchara_arun@hotmail.com, nimitn@nu.ac.th

Abstract: Physical and Chemical properties of preparation of Lead Zirconate Titanate (PZT) by Sol-Gel technique were studied. Lead(II) acetate trihydrate, Zirconium(IV)normalpropoxide and Titanium(IV) isopropoxide bis(acetylacetonate) were used as the starting materials, and 2,2-Dimethyl-1,3-propanediol, 1,1,1-Tris(hydroxymethyl)propane, Ethanolamine, and Ethylenediamine as cross-linking ligands. The mole ratio of Pb : Zr : Ti : cross-linking ligand was 1:0.52:0.48:3, 1:0.52:0.48:3, 1:0.52:0.48:8, and 1:0.52:0.48:2, respectively. The compounds were determined by Fourier Transform Infrared Spectroscopy (FT-IR), Nuclear Magnetic Resonance Spectroscopy (NMR), Scanning Electron Microscope (SEM), and X-ray Diffraction analysis (XRD). It was found that the PZT sols have different molecular structures. The main products of PZT sol-gel were annealed at 700 °C for 30 minutes. The pale-yellow powder of PZT (150-245 nm) with ferroelectric properties was probably obtained.

E0003-EFFECT OF ENR ON MECHANICAL PROPERTIES AND MORPHOLOGY OF NR/CSM RUBBER BLENDS

Anida Petchkaew and Varaporn Tanrattanakul

Polymer Science Program, Faculty of Science, Prince of Songkla University, Hadyai, Songkla 90112 Thailand.
E-mail address: varaporn.t@psu.ac.th

Abstract: This study sought to develop new rubber blends using natural rubber (NR) and cholrosulfonated polyethylene (CSM). Blends were prepared by means of a two-roll mill for various ratios (80/20 - 20/80 NR/CSM). Sulfur vulcanization was performed in a compression mold. Tensile properties and aging resistance were determined according to ASTM standards. NR-rich blends showed promising mechanical properties. Tensile strength of the 80/20 blend was slightly higher than that calculated from the rule of mixture, while the 70/30 blend showed slightly negative deviation from additivity (<10%). Stuktol 60 NS used as compatibilizer slightly increased mechanical properties of the blends. Changes in tensile properties after thermal aging of NR-rich blends were less than 30%, and the 80/20 blend became worse than the 70/30 blend. Addition of epoxidized natural rubber (ENR) to the 70/30 blend increased compatibility of the blends. The morphological examinations with scanning electron microscopy indicated that ENR decreased particle size of CSM.

E0004-State of Cure Measuring Device : Principle, Development and Implementation

Nattapong Nithi-Uthai¹, Kittiphan Techakittiroj², Thitipat Srinual¹

¹Department of Rubber Technology and Polymer, Faculty of Science and Technology, Prince of Songkla University Pattani Campus, Thailand,

²Computer Engineering Department, School of Engineering, Assumption University, Thailand,
E-mail address: Nattapong@cwru.edu

Abstract: State of cure measuring device was developed using a programmable data logger as a platform. Principle of state of cure calculation is based on chemical kinetic of sulfur-rubber reaction. State of cure is one of the most important controlling points of rubber product and needed to be closely watched. The measuring unit was design to be portable and modular. It was found that the measurement and calculation were accurate comparing with calculation

using Excel. The meter can be implemented easily on production line to quality control or using in research and development such as finding blow point.

E0005-Effects of Uniaxial Stress on Dielectric Properties of PZT and 0.95PZT-0.05BT Ceramics

Sawarin Chamunglap*, Supon Ananta and Rattikorn Yimnirun

*Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200

E-mail address : sawarin_c@hotmail.com

Abstract: Effects of uniaxial stress on the dielectric properties of PZT and 0.95PZT-0.05BT ceramics are investigated. The ceramics are prepared by a conventional mixed-oxide method. Phase formation behavior is studied by an x-ray diffraction method. The dielectric properties of PZT and 0.95PZT-0.05BT ceramics are observed under the uniaxial stress at low and high-stress levels using a compressometer. The results show that the dielectric constant of the PZT and 0.95PZT-0.05BT ceramics increases slightly with increasing applied stress while the dielectric loss tangent increases significantly.

E0006-Effect of Poling Conditions on Hysteresis Properties of 0.1PMN-0.9PZT Ceramic

Supattra Wongsanmai, Athipong Ngamjarujana, Rungrat Tipakontitkul, Supon Ananta and Rattikorn Yimnirun

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200

Phone (053) 943376, Fax. (053) 357512, E-mail address: spnuy@hotmail.com

Abstract: PMN-PZT ceramic composite with formula $0.1\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.9\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$ or 0.1PMN-0.9PZT is prepared by a conventional mixed-oxide method. The Phase formation behaviour of these ceramics is studied by an x-ray diffraction method. The effect of poling conditions on hysteresis properties of the ceramics poled at different DC electric fields is studied. The hysteresis properties of the ceramics are measured by a Sawyer-Tower circuit. It is found that the shape of the hysteresis loops does not change significantly with the poling field. However, the remanent polarization (P_r) and spontaneous polarization (P_s) values increase with increasing the poling field while the coercive field (E_c) remains constant.

E0007-Effect of Milling Time on Phase Formation and Particle Size Distribution of Lead Titanate Powders

Rewadee Wongmaneeerung, Rattikorn Yimnirun and Supon Ananta

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

E-mail address: re_nok@yahoo.com

Abstract: Lead titanate (PbTiO_3 or PT) nano-powders have been synthesized by a mixed oxides method. A rapid vibro-milling technique was employed, with the formation of perovskite PT phase investigated as a condition of milling time by XRD. The particle size distribution of the calcined PT powders was determined by laser diffraction technique, and the morphology and phase composition determined via SEM and EDX. It has been found that the single-phase PT powders are successfully obtained when the milling time was more than 1 h after calcination at 600 °C, dwell time 2 h and heating/cooling rate 5°Cmin⁻¹. Furthermore, we have succeeded in producing quite narrow and homogeneously disperse of particle size distribution curve by an appropriate choice of the milling time. Finally, SEM studies also display that the nano-sized PT powders have a size of around 17-109 nm.

E0008-Determination of the hydraulic permeability of chitosan/polyethylene glycol blend membranes

Rattos Wanreak¹, Daranee Bhongsuwan^{2,4} and Surajit Tekasakul^{1,4*}

¹Polymer Science Program, Faculty of Science, Prince of Songkla University, Songkhla, Thailand,

²Materials Science Program, Faculty of Science, Prince of Songkla University, Songkhla, Thailand,

³Department of Chemistry, Faculty of Science, Prince of Songkla University, Songkhla, Thailand,

⁴Membrane Science and Technology Research Center, Faculty of Science, Prince of Songkla University, Songkhla, Thailand,

Abstract: Chitosan/Polyethylene glycol blend membranes were prepared by dissolving chitosan (2.0 wt %) in acetic acid solution then adding 0.75, 0.85 and 1.0 wt.% polyethylene glycol (PEG, MW 10,000 Da). After drying, the membranes were crosslinked with sulfuric acid. Thickness of the membranes ranged from 60 to 80 µm. The hydraulic permeability (L_p) was determined from the slope of pure water flux versus pressure. The water flux was measured using dead-end stirred cell. The L_p of chitosan/PEG blend membranes shows that the membrane with 0.75 wt.% PEG is a nanofiltration or reverse osmosis membrane while the membranes with 0.85 and 1.0 wt.% PEG are ultrafiltration membranes.

E0009-Effect of Uniaxial Stress on Hysteresis Properties of Lead Zirconate Titanate Ceramic

Athipong Ngamjarujana, Supattra Wongsanmai, Supon Ananta and Rattikorn Yimnirun

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200

Phone (053) 943376, Fax: (053) 357512, E-mail address: Athipong@chiangmai.ac.th

Abstract: Lead zirconate titanate ceramic ($\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$ or PZT) is a ferroelectric ceramic, that has been widely used in actuators and transducers applications. However, in these applications the ceramic is often under the influence of the compressive stress. Therefore, this study is carried out to investigate the uniaxial stress dependence of hysteresis properties of PZT ceramic by measuring the ferroelectric parameters, i.e. remanent polarization (P_r), spontaneous polarization (P_s) and coercive field (E_c) as a function of stress. It is found that the uniaxial stress shows marked effects on the hysteresis properties of PZT by significantly reducing the values of remanent polarization (P_r), spontaneous polarization (P_s) when the uniaxial stress increases, while the coercive field is decreased only slightly.

E0010-SAMPLE PREPARATION AND NTC PROPERTY TESTING OF $\text{Mn}_{0.2}\text{Ni}_{0.8}\text{Fe}_2\text{O}_4$ FOR TEMPERATURE MEASUREMENT AND CONTROL SENSOR

Thongchai Panmatarith and Wassana Supmark

Department of Physics, Faculty of Science, Prince of Songkla University, Hat Yai 90112, Thailand.

E-Mail address: pthongch@ratree.psu.ac.th

Abstract: The built sample with the composition of $\text{Mn}_{0.2}\text{Ni}_{0.8}\text{Fe}_2\text{O}_4$ were prepared. The negative of temperature coefficient of the resistance of the sample was measured. The system with computer was designed and constructed for showing the application of temperature measurement and control of the prepared sample in the range of 25 to 900 °C and 0 to -50 °C, successfully.

E0011-Fabrication and Characterization of Dental Porcelain Nanocomposite from Thailand's Raw Materials

Attavit Pisit-anusorn¹, Supon Ananta¹, Rattikom Yimnirun¹ and Sukdiporn Thiansem²

¹Department of Physics, Faculty of Science, Chiangmai University, Chiangmai, Thailand

²Department of Industrial Chemistry, Faculty of Science, Chiangmai University, Chiangmai, Thailand

E-mail address: attavit@chiangmai.ac.th

Abstract: Composition, microstructure and mechanical properties relationships of dental porcelain have been investigated. Appropriated composition, frit-firing and sintering conditions for the fabrication of low-fusing dental porcelain were determined. It is seen that the most promising composition ratio of feldspar/quartz/borax/kaolinite/soda ash for dental porcelain fritting applications is 65/17/12/4/2 (wt%). The optimum firing temperature of 1350°C is identified for frit preparation and appropriated sintering temperature of 980°C in vacuum furnace. By employing a scanning electron microscopy (SEM) together with an energy dispersive X-ray spectroscopy (EDX) techniques, a continuous glassy matrix phase together with dispersed mullite and leucite crystalline phases, particle size 50-200 nm were found. Moreover, measured values of hardness and flexural strength were also higher than those of the dental porcelain specification.

E0012-SILICON PURIFICATION BY ZONE REFINING TECHNIQUE

Prajuk Tamee and Ekaphan Swatsitang

Department of Physics, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand,

Abstract: Zone Refining Technique is an effective method used to purify a material by slowly pull a vessel containing the melting material through the temperature gradient. Most of the impurities will diffuse to the melting part leaving the solidified part more purifier. In this research, the MG-grade silicon powder of purity 97 % was melt at 1420 °C in a graphite crucible (1x1x8 cm³) which was slowly pulled with different pulling rate of 20, 10 and 7 mm/h. The structure and impurities of the obtained samples were analyzed by X-ray diffraction (XRD), X-ray fluorescence (XRF) and ICP-AES respectively. From the experiment SiO_2 was found on the surface of sample. The results from XRD showed that the main structure of Si did not change and SiC peaks were found due to the diffusion of C from the graphite container into the silicon matrix. Fe, Ca, Ti, Zn, Ni, As, Mn and Cr were found to be the majority impurities in the sample by using XRF. The results from ICP-AES showed that most of the impurities were reduced in the zone refined region and it was obvious that these impurities diffused to the melting part which was solidified latter.

E0013-Study the Properties of Concentrated Latex Sludge for using as a Fertilization

Saovane Kovuttikulrangsie¹, Nattawut Nithi-U-thai¹, Wilrat Cheewasectham²,

¹Department of Rubber Technology and Polymer Science, ² Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani, 90400 Thailand; e-mail address : ksaovane@bunga.pn.psu.ac.th

Abstract: The sludged samples were collected from three rubber concentrated factories in Songkhla and Pattani, Thailand. Measure the physical properties of sludged samples such as pH, Density, Total Solids Content, Volatile Solids Content, Moisture content. The nutrient elements component in sludge, for instance N, P, K, Mg, Zn and Ca, were also analysed. The sludge was extracted with de-ionized water. Some elements could be leached and dissolved

in water. Magnesium (Mg) was found to be the most soluble in water at about 3.90 % wet weight whereas the solubility of N, K, Zn, P and Ca were 0.26, 0.25, 0.16, 0.08 and 0.01 % wet weight, respectively. The eluent from sludge extraction was analyzed for BOD₅ and COD using Azide Modification Method and Open Reflux Method. The proportion value of BOD₅ and COD was more than 0.5. This shown that the eluent of sludge extraction was biodegradable materials.

E0014-IMPROVING COMPRESSIVE STRENGTH OF AMORPHOUS SILICA FROM GLUTINOUS RICE HUSKS ADDITION PORTLAND CEMENT

Juthamas Jitcharoen*, Sahachai Kanarkard**, Kittisak Kuntiyawichai ** and Prachak Chantree*

* Department of Chemistry, Faculty of Science, Ubonratchathani University, Ubonratchathani 34190, Thailand;

** Department of Civil Engineering, Faculty of Engineering, Ubonratchathani University, Ubonratchathani 34190.

e-mail address: juthamas@sci.ubu.ac.th.

Abstract: Thailand produces and exports large amount of rice. Our country ranks top five in world production. Rice husks, major agricultural waste, are produced in large quantities as by-product of rice milling in rice-producing. Rice husks are fibrous materials with high silica content which is employed for producing Portland cement, and other silicon compounds. The chemical pre-treatment with 0.5 N HCl and the thermal treatment at 600 °C for soaking time 2 hours were applied for preparing amorphous silica. The percentage of silica in produced amorphous silica was 97 % by weight from gravimetric method. For testing compressive strength of mortar of Portland cement mixed with produced silica, the compressive strength of specimens increased with increased amount of produced silica. The maximum amount of added silica was 10 % by weight. Moreover the values of compressive strength in mixed specimens were 325 – 365 ksc.

E0015-Measurement of Planar Electromechanical Coupling Coefficient (k_p) of Lead Magnesium Niobate -

Lead Zirconate Titanate Ceramics By Resonance Method

Rungrapa Tipakontitukul*, Athipong Ngamjarujana, Supattra Wongsanmai, Supon Ananta and Rattikorn Yimnirun

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200

Phone (053) 943376, Fax. (053) 357512, E-mail : rungrapa@rocketmail.com

Abstract: PMN-PZT ceramic composites with formula $x\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3 - (1-x)\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$ (when $x = 0, 0.1, 0.3, 0.5, 0.7, 0.9$ and 1) are prepared by a conventional mixed-oxide method. Planar electromechanical coupling coefficient (k_p) of the ceramics which are poled with a DC electric field at 30 kV/cm is measured by using a resonance method. It was found that values of k_p increase with increasing an amount PZT in the $x\text{PMN} - (1-x)\text{PZT}$ ceramics as a result of morphotropic phase boundary (MPB), which is between $x = 0.1$ and 0.3 .

E0016-SYNTHESIS OF METAL-CONTAINING POLYURETHANE-UREAS FROM 4,4'-DIHYDROXYSALTREN METAL COMPLEXES

Nittaya Khamma, Nuanphun Chantarasiri*

Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

e-mail address: nittaya_khamm@yahoo.com

Abstract: Polyurethane-ureas containing 4,4'-dihydroxysaltren metal complexes in polymer chain have been synthesized. 4,4'-Dihydroxysaltren metal complexes were synthesized from the reaction between 2,4-dihydroxybenzaldehyde, triethylenetetramine and metal acetates, where the metals are Zn and Ni. The metal complexes were then subjected to polymerization reaction with prepolymers, namely tolylene 2,4-diisocyanate terminated poly(1,4-butanediol) prepolymer (PB900), MW 900 g/mol and tolylene 2,4-diisocyanate terminated poly(propylene glycol) (PP1000), MW 1000 g/mol. The progress of polymerization reaction was monitored using infrared spectroscopy. The polymer property investigated was their thermal stability which was studied by thermogravimetric analysis (TGA).

E0017-Synthesis of Silicon Carbide – Aluminium Tetroxycarbide Nanofibers from Pencil Rod by Current Heating Technique

Pattamaporn Prapitpongwanich, Kamonpan Pengpat and Pisith Singjai

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand

E-mail address: pattamaporn_pat@yahoo.com

Abstract: Silicon carbide – aluminium tetroxycarbide nanofibers were fabricated from EE pencil rod (Steadtler; Germany) by current heating technique under an argon gas atmosphere. The scanning electron microscope (SEM)

images show that the synthesized nanofibers were found to have two types (1) regular type of 80-300 nm in diameters. (2) bead type of 600-1200 nm in the bead diameters and the nanofibers connecting these beads diameters ranging from 200-600 nm. The crystal structure of the nanofibers was also studied by X-ray diffractometry (XRD) technique. The synthesized nanofibers were consisted of cubic silicon carbide (SiC) and orthorhombic aluminium tetroxycarbide ($\text{Al}_4\text{O}_4\text{C}$).

E0018-Crystallization of LDPE-LLDPE blend under INJECTION MOLDING CONDITION

Nattakarn Hongsrirphan, Kasinee Pathomwattanasak, Jakapong Kruamun, Prawpillin Koonsorn

Department of Materials Science and Engineering, Faculty of Engineering and Industrial Technology, Silpakorn University, Sanam Chan Palace Campus, Nakhon Pathom, Thailand

E-mail address: nattakarn@su.ac.th

Abstract: Crystallization of LDPE and LLDPE blends under injection molding condition was investigated. LDPE (MI 5) and LLDPE (MI 2) were blended in ratio and injection molded into specimen under 3 molding conditions designated as reference, higher back pressure, and lower melt temperature condition. Thermal properties of molded specimen were studied using DSC, and mechanical properties were determined according to ASTM D638. From DSC results, it indicated that LLDPE and LDPE separated into two phases during crystallization in mold. LLDPE would crystallize first as they had higher crystallization temperature than LDPE, and these crystals possibly interfered crystallization mechanism of LDPE, causing wider melting temperature of LDPE. Increasing back pressure emphasized the phase separation, while decreasing molding temperature did not change phase separation significantly. As a result from solid-liquid phase separation in molding condition, synergetic tensile properties of polymer blends could be yielded.

E0019-New-Constructed Ancient Thai Glass

P. Dararutana^{1,2,3}, S. Promsean², P. Taowjamnong² and N. Sirikulrat^{2,3}

¹ Chemical Department Royal Thai Army, on leave to work at Bangsai Arts and Crafts Centre, the SUPPORT Foundation of Her Majesty Queen Sirikit of Thailand, Bangsai, Pranakorn Sri Ayutthaya Province, Thailand 13290.

² Glass and Glass Products Research and Development Laboratory, Institute for Science and Technology Research and Development, ChiangMai University, ChiangMai, Thailand 50200.

³ Department of Physics, Faculty of Science, ChiangMai University, ChiangMai, Thailand, 50200.

E-mail address: pisutti@hotmail.com

Abstract: Antique glass can be generally found as one of the architectural components in several heritage places of Thailand, have been widely used for decorating. There are two kinds, *Ancient Thai Glass* and *Ancient China Glass* or *Burma Glass*. The Ancient Thai Glass found in the central region of Thailand, can be classified into two types, Ayutthaya and Ratanakosin. The another one is the Ancient China Glass or Burma Glass which has been widely used for decorating, particularly in the conventional Lanna style. By comparing with the Ancient Thai Glass, the Ancient China Glass which is generally heavier, contains thinner body with thicker plate. They were the same optical properties. The archeological resources showed that the body of the Ancient Thai Glass was made from silica and lead compound, which was the same properties of a high refractive index glass, high refraction or reflection, heavy but flexible. Their structures are divided into three layer, glass body, binder and metal plate. There are many colors, red, green, yellow, blue and white; under the tropical sun, they gave out an artistic harmony of flamboyance and serenity. The Ancient Thai Glass has now disappeared and broken, must be restored to preserve for the future generation. Only thick glass (modern glass) which is difficult to cut is now available.

E0020-Effects of Formalin and Hydrochloric Acid on Properties of Poly (vinyl alcohol) Sponge

Wanrudee Kaewmesri¹, Nitat Jira-arun²

^{1,2} Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand,

Author of correspondence, E-mail address : wanrudee@maildozy.com

Abstract: This research studied about the effects of the ratios of formalin to hydrochloric acid that were used as reacting agent and catalyst in poly (vinyl alcohol) sponge synthesis. In the synthetic process, the ratios of formalin to hydrochloric acid used were 1:1, 2:1, and 3:1 respectively and they were mixed at 60 °C. The mechanical and physical properties of the synthetic sponge were compared with those of the commercial sponge. On comparing, it was found that at all ratios of formalin to hydrochloric acid, water absorption and abrasive resistance of synthetic sponge were better than those of commercial sponge and they trended to increased as the ratios decreased. Moreover, in its wet state the synthetic sponge was softer and had a higher elongation than the commercial sponge.

E0021-EFFECTS OF SOLID CONTENT, pH AND DEFLOCCULANT ON VISCOSITY AND THIXOTROPY OF THAI KAOLINS

Apinon Nuntiya¹, Sitthisak Prasanphan¹, Nongkran Chaiwong¹

¹Department of Industrial Chemistry, Faculty of Science, Chiang Mai University

E-mail address: anuntiya@chiangmai.ac.th, hotsittisak@yahoo.com and
nchaiwg@chiangmai.ac.th

Abstract: Rheological properties of three Thai kaolins (Ranong, Narathiwat and Lampang) have different chemical and mineral compositions were studied. The viscosity and thixotropy of suspensions were measured as a function of solid content, pH and loading of sodium silicate. From rheological measurements, it was found that viscosity and thixotropy increased with the clay solid content. The highest of viscosity of Ranong, Narathiwat and Lampang clays showed at pH 6, 6 and 4 respectively. However, thixotropy of three clays tends to increase with decreased pH. When sodium silicate was added as a deflocculant, the viscosity and thixotropy were gradually decreased. The deflocculant demand of Ranong, Narathiwat and Lampang clays are 0.25%, 1.25% and 0.125% (w/w) respectively.

E0022-ISOELECTRIC POINT DETERMINATION OF THAI KAOLINS

Apinon Nuntiya¹ and Sitthisak Prasanphan¹

¹Department of Industrial Chemistry, Faculty of Science, Chiang Mai University

E-mail address: anuntiya@chiangmai.ac.th and hotsittisak@yahoo.com

Abstracts The heteropolar model of the kaolinite particle has been used to determine the properties of colloidal dispersions of clay minerals. Rheological measurements have been made as a function of pH and sodium chloride concentration of Thai kaolins (Ranong, Narathiwat and Lampang). The results are interpreted in terms of the heteropolar model of kaolinite and edge surface isoelectric points are estimated from common intersection points of Bingham yield stress-pH curves at different ionic strengths. From the experiments, it was found that the isoelectric points of Ranong, Narathiwat and Lampang vary from pH 3.5, 5.6 and 4 respectively.

E0023-EFFECT OF Pr DOPING ON THE SUPERCONDUCTIVITY OF Bi₂Sr₂Ca_{1-x}Pr_xCu₂O₇ (Bi2212)

Thipvan Muangon, Laddawan Pdungsap and Pongtip Winotai

Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.

E-mail address: g4536504@mahidol.ac.th, sejpd@mahidol.ac.th and
sejpw@mahidol.ac.th

Abstract: Structural and properties of Bi₂Sr₂Ca_{1-x}Pr_xCu₂O₇ ($x = 0, 0.005, 0.01, 0.02, 0.1, 0.2, 0.4$ and 0.6) high temperature superconductors were prepared by the standard solid state reaction method. The mixed powders were calcined at 800 °C for 24 h and sintered at 845 °C for 120 h. Before the end of sintering process, flowing oxygen was introduced into the heating chamber to get fully oxygenated samples. The XRD patterns indicated that the Bi₂212 has a major phase of Bi₂212. The superconducting transition temperature (T_c) determined by the four-point probe technique revealed that T_c decreased as the doping concentration was increased. This is due to the fact that the Pr valence is greater than 3+ and thus results in a decrease in hole concentrations in the Cu-O₂ layers.

E0024-THE IDENTIFICATION ON THE COMPONENTS OF CLAY MINERALS IN CLAY SAMPLES UTILIZED FOR CONVENTIONAL CERAMICS WORK BY X-RAY DIFFRACTION TECHNIQUE

Watcharaporn Keankeo¹, Thunyakorn Chuaytukpuan² and Arunee Intasorn³

¹Burapha University, Bangkok 20131, Thailand, ²Science Division, Faculty of General Education, Rajamangala of Institute of Technology, Bangkok 10120, Thailand, ³Department of Physics, Faculty of Science, Srinakharinwirot University, Bangkok 10110, Thailand;

E-mail address: keankeo@buu.ac.th, chuaytukpuan@yahoo.com, arunee@swu.ac.th.

Abstract: In order to establish the relationship between the type of clay components and their physical properties, the qualitative identifications of clay minerals in white clays from lampang and Ranong, and ball clay from Surat-Thani using X-Ray Diffraction (XRD) technique were studied. Prior to XRD analysis, non-clay minerals, quartz and Fe-oxide, were separated from clay minerals by dispersing the bulk clay samples with distilled water and leaving non-clays to settle for 60 minutes. Each sample was treated by glycolation for identification of swelling clay and by heating at 400 °C and 550 °C for the destruction of kaolinite. The XRD results show that the white clay from Lampang consists principally of kaolinite, illite and expansive clay, montmorillonite, whereas that from Ranong only consists of a kaolin group, i.e., kaolinite and metahalloysite. As a consequence, the white clay from Ranong has more strength and less crack after drying. The ball clay from Surat-Thani consists more varieties of 2:1 clay minerals including illite, montmorillonite, vermiculite and sepiolite, resulting in high plasticity and swelling when wet and shrinkage upon drying.

E0025-ATOMIC FORCE MICROSCOPIC INVESTIGATION ON SURFACE MORPHOLOGY OF NR/NBR BLEND FILM

Sombat Thanawan^{1,2} and Phatcharin Thamasirianunt³

¹Institute of Science and Technology for Research and Development, Mahidol University, Salaya Center, Nakhon Pathom 73170

²Rubber Technology Unit, Center of Excellence, Faculty of Science, Mahidol University, Salaya Center, Nakhon Pathom 73170

³Polymer Science and Technology Programme, Faculty of Science, Mahidol University, Salaya Center, Nakhon Pathom 73170

E-mail address: ststwan@mahidol.ac.th and phatcha_th@hotmail.com

Abstract: The morphology of NR/NBR blends was investigated using Tapping mode-AFM, in order to observe the surface morphology of blend films at various blend ratios. The observed structures showed matrix-dispersed formation at all compositions. The ratios up to 50 % weight, NBR formed nodular structure in NR matrix. Phase inversion was observed at blend ratio 5/95 and 25/75. The height and phase data revealed the correlated information, the nodular areas showed the high domains in any case of NR or NBR formed nodules, whereas the phase could differentiate the phase moduli. The increase in phase degree related to the higher modulus domain. The investigation of phase moduli using Rubber Process Analyzer (RPA) confirmed the formation of morphology structure of blends. The surface roughness was found to increase as the blend ratio closed to unity (50/50). The surface stiffness can also be confirmed by such technique.

E0026-TWO-STAGE SURFACE GRAFTING OF HIGH DENSITY POLYETHYLENE FIBER FOR REINFORCEMENT OF EPOXY RESIN

Taweekhai Amornsakchai and Onuma Doaddara

Department of Chemistry, Faculty of Science, Mahidol University, Phyathai, Bangkok 10400

E-mail address: sectan@mahidol.ac.th and onuma_d99@hotmail.com

Abstract: Polyethylene (PE) fiber was functionalized and grafted by 2-stage method. Functionalization was carried out with a peroxy compound, $K_2S_2O_8$. Grafting with acrylamide (AAM) and acrylic acid (AAc) was carried out by ceric ion technique. Adhesion between PE and epoxy resin was studied with pull out test. Both AAM and AAc were found to improve adhesion significantly. An improvement of about 3.5 and 4.8 folds, respectively, over that of the original PE fiber was found. Composite reinforced with chopped AAc-modified PE fibers displayed up to 18, 1.8 and 1.5 folds improvement in impact strength, flexural modulus and strength, respectively, compared with unreinforced epoxy resin.

E0027-A study to improve adhesion between surface grafted polyethylene and epoxy resin

Jitrawadee Phunkum and Taweekhai Amornsakchai

Department of Chemistry, Faculty of Science, Mahidol University, Phyathai, Bangkok 10400

E-mail address: ann_jit@hotmail.com and sectan@mahidol.ac.th

Abstract: This study was aimed to improve the adhesion between polyethylene (PE) surface and epoxy resin. PE was grafted with two types of water soluble vinyl monomers. These were acrylamide (AAM) and acrylic acid (AA). Grafting was carried out using 2-stage method. Hydroxylation by thermal decomposition of potassium persulfate ($K_2S_2O_8$) was first carried out to create hydroxyl groups on PE surface. The second stage is grafting of the monomers onto functionalised surface. The grafting reaction was carried out in aqueous solution by ceric ion technique. Peel test was used to evaluate the interfacial adhesion between PE film and epoxy resin. The peel strength of PE film grafted with AA (PE-g-AA) was found to be over 2 times greater than that of PE film grafted with AAM (PE-g-AAM). However, when PE-g-AAM film was immersed in water at room temperature before assembling with epoxy resin, the peel strength was found to increase by 8 times. An improvement of about 40 times in peel strength was observed when using hot water of 80 °C. This significant improvement is likely to be due to an increase in chain mobility in swelled polyacrylamide. Such higher chain mobility would promote more chemical bonding between the grafted polyacrylamide and epoxy resin.

E0028-Crosslinked polyolefins through the introduction of vinyl silane

Sirinya Chimdist¹, Kalyanee Sirisinha¹

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok

E-mail address: g4536711@student.mahidol.ac.th

Abstract: In this study, the silane-grafting and water-crosslinking of polyolefins was investigated. The studied materials include ethylene-octene copolymer (EOR) and low-density polyethylene (LDPE) and together with their corresponding blends. The polymers were first grafted with vinyl trimethoxysilane (VTMS) in a twin-screw extruder using dicumyl peroxide (DCP) as an initiator. The grafted polymers were subsequently crosslinked in the presence of

water. The influences of grafting formulation, blend compositions and time of crosslinking process on grafting efficiency, degree and rate of crosslinking are reported. The properties of crosslinked products are also included.

E0029-SUITABLE CURRENT FOR THE PREPARATION OF ALUMINIUM – 12 wt% SILICON ARC-SPRAYED COATINGS

Sukanda Jiansirisomboon, Tongchai Choesjai and Panadda Niranatlumpong

¹ Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

² Thermal Spray Lab., The National Metal and Materials Technology Center, Pathumthani 12120, Thailand

E-mail address: sukanda@chiangmai.ac.th

Abstract: Thermal spraying is one of the surface technologies where particles are rapidly melted, accelerated, impacted and solidified onto substrate. Therefore, the coating layer is formed. [1] One of the popularly industrial used thermal spraying techniques is arc spraying. This technique can prevent distortion and dislocation from heating the substrates due to no direct heating from flame as occurred in the other spraying techniques. However, there are many spray parameters such as spray current, spray distance, and spray voltage. These parameters directly affect physical properties, microstructure and other properties of the coating. To obtain the best coating which has suitable properties for further applications, suitable spray parameters must be used. The purpose of this research was to select the suitable current for the preparation of aluminium-12 wt% silicon from wire spraying. The current used was in the range of 70-350 ampere. Then microstructure, percentage of porosity, hardness and wear rate of the coatings were analyzed. The results showed that using the spray current of 300 ampere gave the highest coating hardness and relatively high wear resistance.

E0030-THE PROCESSING OF PZT CERAMIC TAPE CASTING

Netima Sawangwan, Jerapong Tontragoon and Tawee Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Thailand 50200

E-mail address: netima_s@hotmail.com

Abstract: Tape casting method is an utilize ceramic production providing an unlimited length and varies thickness as well as reduce the sintering temperature. The introduced applications are actuator, sensor and transducer. This method is to realize about the ratio between ceramic powders and slip that effect on viscosity, density, roughness and homogeneity. Furthermore, sintering condition is the one of important steps for tape casting process. As controlling crack and bended on ceramic surface. The present work aims to study the suitable composition in powder and slip. In addition to desire the constructive sintering that concluded heating/cooling rates, sintering temperatures and soaking times.

E0031-THE PREPARATION OF BARIUM IRON NIOBATE ($\text{BaFe}_{0.5}\text{Nb}_{0.5}\text{O}_3$) CERAMICS BY SOLID – STATE REACTION TECHNIQUE

Uraivan Intatha, Sukum Eitssayeam, Kamonpan Pengpat, Jerapong Tontragoon and Tawee Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: tawee@chiangmai.ac.th

Abstract: New perovskite-type material, Barium Iron Niobate ($\text{BaFe}_{0.5}\text{Nb}_{0.5}\text{O}_3$: BFN) can exhibit very high values of dielectric permittivity in wide temperature range.[1-5] This ceramic was useful for high voltage capacitor. In this research, BFN ceramic was synthesized by the solid state reaction technique and calcined at 800 - 1200°C for 4 hrs with 5°C/min heating and cooling rate. The phases of calcined powders were investigated by X-ray diffraction technique (XRD). The XRD patterns showed that pure cubic BFN phase could be achieved at 1200°C. After calcination, the powder was then pressed into disc shape. The discs were sintered at 1250 - 1400°C for 4 hrs with 5°C/min heating and cooling rate. The result showed that the density of BFN ceramics increases with increasing sintering temperature from 1250 to about 1330°C. Then the density gradually decreased until the sintering temperature was up to 1400°C. The highest density was about 6.40 g/mL at 1340°C sintering temperature.

E0032-THE PREPARATION OF 0.9PZT – 0.1BFN POWDER BY SOLID-STATE REACTION TECHNIQUE

Sukum Eitssayeam¹, Uraivan Intatha¹, Theerapong Thongkum², Kamonpan Pengpat¹, Jerapong Tontragoon¹ and Tawee Tunkasiri¹

¹Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Department of Physics, Faculty of Science, Narasuan University, Phitsanulok 65000, Thailand

E-mail address: tawee@chiangmai.ac.th

Abstract: Lead zirconate titanate (PZT) exhibits piezoelectric and ferroelectric behaviors. It has dielectric permittivity about 1200 at room temperature.[1] On the other hand, Barium Iron Niobate (BFN) has very high values of dielectric permittivity about 30000 at room temperature.[2-5] To improve the dielectric permittivity of the PZT, therefore, PZT-BFN composites are interested. In this study, the 0.9PZT-0.1BFN composite system was synthesized by the solid state

reaction and calcined at 800-1200°C for 2 hrs with a heating/cooling rate of 5°C/min. The powder processing optimisation was done in order to find out the best quality powder for further ceramic preparation. Phases of calcined powders were investigated by X-ray diffraction technique (XRD). The XRD patterns showed that a pure perovskite phase was occurred > 1000°C.

E0033-A Study on Electrical Properties of Zinc Oxide Modified with Metal Oxides.

Peera Pinetsiri, Suwit Chaisupan and Jerapong Tontragoon

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract: In this study, Zinc oxide was used as base material which was 97% in weight and the rest was modifies metal oxides. The modifier metal oxides were divided into two groupes. Firstly, Zinc oxide was modified with aluminum oxides and magenese oxide. Secondly, Zinc oxide modified with aluminium oxide and chromium oxide. The oxide powders were mixed and pressed into a disc shape, then sintered at 1300 °C for 1 hour. The current and voltage characteristic were examined. It was found that the nonlinear coefficient (α) were 14-16 for aluminium oxide and manganese oxide and 2-8 for aluminium oxide and chromium oxide.

E0034-Phase Formation and Microstructure of Low Firing 0.98BaTiO₃-0.02Ba(Mg_{1/3}Nb_{2/3})O₃ Ceramics with Bi₂O₃/Li₂CO₃-PbO Fluxing Agents

Anocha Munkakdee, Jerapong Tontragoon and Tawee Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand 50200

Abstract: The effect of Bi₂O₃/Li₂CO₃-PbO as fluxing agents on phase formation and microstructure of 0.98BaTiO₃-0.02Ba(Mg_{1/3}Nb_{2/3})O₃ ceramics prepared via mixed oxide method have been studied. The XRD results showed that at the highest amount of fluxing agents added to the ceramic (batch C) at room temperature gave cubic phase of BT. This phase changed to tetragonal BT phase when reducing the amount of fluxing agents. Moreover, the trace of second phase, Bi₄Ti₃O₁₂, was also detected. SEM micrographs show that the grain size of the ceramics was decreased as increasing amount of fluxing agents. Dielectric data shows the highest value about 10000 at room temperature for B sample which is the optimum condition in this study.

E0035- PREPARATION OF HYBRID COMPOSITES BETWEEN PZT AND EPOXY RESIN

W. Thanjarree, W. Nhuapeng and T. Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand 50200

e-mail address: tawee@chiangmai.ac.th

Abstract: In the recent years, composites materials which consist of piezoceramic and polymer were widely used in several applications, such as hydrophones and ultrasonic transducers (1) etc. Lead zirconate titanate or PZT, one of ferroelectric materials which are well-known that exhibits good piezoelectric properties. Since PZT shows high density and acoustic impedance when compared with water and human tissue (2). In this work, hybrid composites between PZT and epoxy resin was fabricated by dice and fill technique. The composite materials were examined the physical, dielectric and piezoelectric properties, respectively.

E0036-EFFECT OF DOPANTS ON THE PROPERTIES OF LEAD ZIRCONATE TITANATE CERAMICS

W. Thanjarree, W. Nhuapeng and T. Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand 50200.

E-mail address: th_wandee@hotmail.com and msrlwt@yahoo.com

Abstract: Lead zirconate titanate (PZT) ceramics were modified by adding dopants- manganese oxide and neodymium oxide. The conventional mixed oxide method was employed for preparing the sample powder. The physical properties such as shrinkage and density are studied. Phase formation and microstructure of PZT ceramics were examined by X-ray diffraction technique and Scanning Electron Microscopy, respectively. Moreover, the dielectric and piezoelectric properties of the modified PZT ceramics were also investigated. It can be concluded that the value of maximum dielectric constant and dielectric loss are in the range of 739-11582 and 0.037-0.075, respectively.

E0037-EFFECT OF ELECTRICAL POLING ON MECHANICAL PROPERTIES IN PMN-PZT CERAMICS

S. Jansirisomboon, K. Songsiri and T. Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

E-mail address: sukandag@chiangmai.ac.th

Abstract: Ferroelectric ceramics such as Lead-Magnesium-Niobate (PMN) and Lead-Zirconate-Titanate (PZT) are widely used in many electronic industries. However, these ceramics have different advantages and disadvantages. PMN has a high piezoelectric coupling coefficient, therefore, it can be used in wide temperature range including room

temperature. Moreover, PMN has a small hysteresis loop and low energy loss compared to PZT. PMN also has lower electromechanical coupling coefficient than PZT, the application of PMN is therefore not well successful. On the other hand, PZT has been widely used in many industries due to its high electromechanical coupling coefficient. But, PZT still has high energy loss and high Curie temperature ($> 400^{\circ}\text{C}$) which is not so convenient for any applications. To gather the advantages and compromise other disadvantages of these ceramics, composite systems of ferroelectric PMN-PZT ceramics have been interested. Also, stresses occur during the use of electronic materials will always cause mechanical degradation. The mechanical properties of these materials which has not yet been well studied, is therefore important and necessary. This research aims to fabricate and study the effect of electrical poling on mechanical properties of different mole ratio PMN-PZT ceramics. The research emphasizes on hardness testing by simple techniques which are Vickers [1-4] and Knoop indentation techniques. Fracture toughness is also calculated from indentation crack lengths.

E0038-THE EFFECT OF HEATING RATE ON THE ELECTRICAL PROPERTIES ON MnO_2 DOPED $\text{Pb}(\text{Zr,Ti})\text{O}_3$ TAPE CERAMICS

Netima Sawangwan, Jerapong Tontragoon and Tawee Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Thailand 50200

E-mail address: netima_s@hotmail.com

Abstract: Lead zirconate titanate, $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$, which is the famous composition for piezoelectric and dielectric devices. Cause of combination between tetragonal and rhombohedral phases at morphotropic phase boundary (MPB) that provides excellent electrical properties. However, PZT tape casting have two majors problems. There are PbO volatility during sintering and high dielectric dissipation factor. Previous papers have reported dielectric loss of MnO_2 doped in PZT is reduced. The aim of the present study was to prepare PZT ceramics by tape casting method and to find the effect of heating rate on the electrical properties.

E0039-Mechanical properties of $(\text{Pb}_{0.90}\text{Ba}_{0.1})\text{ZrO}_3$ ceramics

Theerachai Bongkam, Gobwute Rujjanagul and Tawee Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

e-mail address: rujjanagul@yahoo.com

Abstract: Mechanical properties of $(\text{Pb}_{0.90}\text{Ba}_{0.1})\text{ZrO}_3$ (PBZ10) ceramics were studied. The PBZ10 powder was prepared by a mixed-oxide method. Grain size of the samples is 1 μm . The H_v , H_K , γ and K_{10} values are 4.43 GPa, 4.48 GPa, 140.1 GPa, and $1.79 \text{ MPa m}^{0.5}$ respectively. The results were compared with the previous work. The result were compared with the previous work the calcined powder to improve the compaction behavior. The powders were pressed at 40 MPa into cylindrical pellets with 15 mm in diameter and 2 mm in thickness. The pellets were then sintered at 1200°C for 3 h with a heating rate of $5^{\circ}\text{C}/\text{min}$. In order to minimize the loss of lead due to vaporization, the PbO atmosphere for the calcination and the sintering was maintained using PbZrO_3 as the spacer power. Phase of PBZ10 was investigated by XRD. The density of the sintered samples was measured by Archimedes' method with distilled water as the fluid medium. The mechanical properties of the ceramics was studied by Vicker and Knoop microhardness testers. Indentations were applied on the polished surfaces of PZ ceramics. Applied loads were in the applied on the polished surfaces of PZ10 ceramics. Applied loads were in the range of 200-1000 g with an indentation period of 15 s. Vickers hardness, Knoop hardness of the samples were calculated. Microstructure of the etched samples was again studied by SEM.

E0040-INFLUENCE OF SODIUM OXIDE CONTENT ON THE STRUCTURAL CHANGES OF INDUSTRIAL SODA-LIME-SILICA GLASS

Worapong Thiemsorn¹, Kanchana Keowkamnerd¹, Heiko Hessenkemper², Pichanon Suwannathada³ and Sukon Phanichphant^{1*}

¹ Faculty of Science, Chiang Mai University, Chiang Mai, Thailand 50200

² Institut für Keramik, Glas- und Baustofftechnik, TU Bergakademie Freiberg, Leipziger Strasse 28, 09596 Freiberg, Germany

³ Lambda Nu, Co. Ltd. 29/402 Chaengwattana Rd., Pakkret, Nonthaburi, Thailand 10100

E-mail address: worapong@chiangmai.ac.th

Abstract: The changes of glass structure in multicomponent (industrial) soda-lime-silica glass containing 11-19 mol% Na_2O melted under air atmosphere in an electric furnace at 1450°C for 8 h were studied. The oxygen partial pressure; $p(\text{O}_2)$ was measured during melting process and then the structural change of glass were investigated in three values such as the calculated basicity; Λ_{cal} , the ratio of NBO to tetrahedral cations; NBO/T and the state of oxide (-II) species; $\alpha_{\text{oxide}(-\text{II})}$. It was found that the increased Na_2O content causes the glass to be in the oxidized state, unstable state and to become highly basic. As well as the degree of disconnectivity in the network, slightly increased. These changes are

expected that the glass melt tends to be the reactive solvent for redox reacting of polyvalent elements when increasing the Na_2O content.

E0041-STUDY OF ADHESIVE-FREE BONDING OF SHOE MID-SOLING AND OUT-SOLING MATERIALS AIMING FOR THE IMPROVED MANUFACTURING METHOD AND THE NEW MATERIALS COMPOUNDING

Changchai Thongpin, Nattakarn Hongsrirphan, Nitipong Chotiwiwiyapon, Nilubon Jiampasud, Surawut Choungchod
Department of Materials Science and Engineering, Faculty of Engineering and Industrial Technology, Silpakorn University, Sanam Chan Palace Campus, Nakhon Pathom, Thailand
E-mail address: changchai@so.ac.th

Abstract: Bonding between shoe mid-sole (foam) and out-sole (rubber) without adhesive was investigated in order to reduce manufacturing steps in the present shoe-sole production line. Bonding without adhesive was achieved through crosslinking by UV curing, at which Trimethylolpropane mercapto propionate was used as curing agent and 2,4,6-Trimethyl benzoyldiphenylphosphine oxide was used as photoinitiator. Using a commercial mid-sole and out-sole specification, rubber and foam compounds were formulated to meet the specification and effect of adding UV curing agents into compounds was verified. Bonding by UV curing and thermal curing was employed and determined their bonding strength by T-peel test, which test results indicated that UV curing could bond foam to rubber. UV curing

E0042-PREPARATION OF BENZOTHAZOLE DERIVATIVE BASED CHELATING RESIN

Pakinee Kittisuwannakul, Neramitr Morakot, Wittaya Ngeon-tae and Apichat Imyim
Environmental Analysis Research Group, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand, Tel: 02-218-7607
E-mail: apichat@chula.ac.th

Abstract: Chelating resin is widely used for metal ion separation and preconcentration. A new chelating resin was prepared by covalently linking ethyl 2-benzothiazolylacetate (BA) with amino polystyrene-divinylbenzene resin (NH2-PS-DVB). The latter was prepared by nitration of polystyrene-divinylbenzene resin (PS-DVB) followed by reduction with tin(II) chloride. All derivative resin were characterized by Attenuated Total Reflection Infrared Spectroscopy technique (ATR-IR).

E0043-Preparation derivatives azobenzene Langmuir-Blodgett films of PS and its copolymer with 20% Methacrylic acid and its optical properties

Sukanya Petchsirivej¹, Toemsak Sriksirin^{1,2}, Patrawin Gasemjit¹, Sauvarop Bualek-Limcharoen³, Rojcarin Chantarachindawong¹, and Boonsong Sutapun⁴

¹Department of Physics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

²Capability Building Center in Nanoscience and Nanotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

³Department of Chemistry, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

⁴National Electronics and Computer technology Center (NECTEC), Pathumthani, 12120, Thailand.

⁵ Department of Physical Science, Faculty of Science and Technology, Hauchiew Chalermprakiet University, Samutprakarn, 10540

Abstract: The main objective of this work is to prepare and characterize an optical response of a multilayer film of a side chain azobenzene polymer and copolymer. The azobenzene group possesses a unique optical property which is known as *trans-cis* isomerization. The optical property of the film can be modulated by irradiating the material with light at appropriate wavelength. In this work, a monolayer formation of azopolymer having a different amount of the azobenzene in the side chain is fabricated at the gas-water interface. The multilayer films were constructed by horizontal deposition of the monolayer onto hydrophobic quartz substrate. The UV-Vis absorption spectra indicate that the transferred film is uniform. The multilayer film can undergo *trans-cis-trans* isomerization when a UV light at 385 nm was applied to the sample. A loss of an ordered multilayer structure was observed upon an irradiation of the film with the UV light.

E0044-Controlled crystallization of ZnS:Mn²⁺ nanocrystal by polyelectrolytes

On-uma Nimittrakoolchai^{1,2}, Daraporn Triampo², Toemsak Sriksirin^{1,3}, and Tanakon Osotchan^{1,3}

¹Capability Building Program Nanoscience and Nanotechnology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand

²Polymer science and technology, Department of Chemistry, Faculty of Science, Mahidol University, Nakhon pathom 71730, Thailand

³Department of Physics Faculty of Science, Mahidol University, Bangkok 10400, Thailand.

E-mail: onn_nimit@ yahoo.com OR setsk@mahidol.ac.th

Abstract: The objective of this work is to develop a nanometer size inorganic based light emitting devices. A synthesis of Mn-doped ZnS (ZnS:Mn²⁺) nanocrystal material was carried out by a liquid phase coprecipitation. Poly(4-styrene sulfonic acid-co-maleic acid) (PSS-MA) was used as a polyelectrolyte which was feed directly into the reaction medium to control a crystallization process. A condition of the experiment was adjusted so that a growth of ZnS:Mn²⁺ was limited to a nanocrystallized size. The crystallized size was determined by X-ray diffraction where an average crystallite size was about 2.0 nm. The photoluminescence (PL) intensity of ZnS:Mn²⁺ nanocrystals show an orange emission peak at 595 nm which characterize for the 4T₁ → 6A₁ transition of Mn²⁺ ion in a crystalline ZnS-matrix. The enhance PL intensity was also responsible by a presence of polyelectrolyte as a surface passivating agent. The preliminary study on the electroluminescence of a multilayer device which consist of indium tin oxide (ITO) coated glass substrate, a single layer of ZnS:Mn²⁺ nanocrystals+Poly(N-vinylpyrrolidone)(PVP) and Aluminium layer shows that a typical I-V curve for the diode was observed.

E0045-SYNTHESIS AND PROPERTIES OF POLY(VINYL ALCOHOL) SPONGE

Wanrudee Kaewmesri and Nitat Jira-arun *

* Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Author of correspondence, E- mail address: scici003@chiangmai.ac.th

Abstract: The synthesis of poly(vinyl alcohol) sponge (PVA sponge) was conducted in order to study the effect of ingredient ratios on its physical appearance and properties compared with a commercial PVA sponge. The properties studied were water absorptivity, tensile properties and abrasion resistance. On the comparing of synthetic and commercial sponges, it was found that the appearance and some properties of the synthetic sponge were better than those of commercial sponge. In its dry state, the synthetic sponge was more rigid and had more tensile resistance than the commercial sponge. In its wet state, the synthetic sponge was softer, had a higher abrasion resistance and a higher elongation at break than the commercial sponge. From the effect of varying the ratio of poly(vinyl alcohol) to starch, it can be concluded that the PVA sponges which had the best physical appearance and the best properties were obtained when the ratio of poly(vinyl alcohol) to starch was 4:1.

E0046-HYDROGENATION OF CYCLOOCTENE CATALYSED BY COBALT COMPOUNDS SUPPORTED ON POLYSTYRENE

Warangkana Kanjina, Wimonrat Trakarnpruk*

Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand;

E-mail address: wimonra@hotmail.com

Abstract: In this work, hydrogenation of cyclooctene was performed using cobalt compounds supported on polystyrene. The synthesized catalysts were characterized using FT-IR, XRF, AAS and TGA. The parameters affected the hydrogenation including types of cobalt complex and ligands both Schiff base and non-Schiff base ligands, types of solvent, temperature and hydrogen pressure. From the results, it was found that cobalt containing Schiff base aminopyridine ligand supported on polystyrene (P-L₂-CoCl₂) shows highest activity at the condition tested: 3 hours, 60°C, hydrogen pressure 9 atm. in methanol solvent.

E0047-STUDY OF SYNTHESIS OF POLYSTYRENE HOMOPOLYMER AND POLYSTYRENE-POLY(*ISO*-BUTYL ACRYLATE) BLOCK COPOLYMER USING NITROXIDE-MEDIATED POLYMERIZATION

Supinya Prakanrat¹, Pranee Phinyocheep^{*1,2}

¹Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand,

²Institute of Science and Technology for Research and Development, Mahidol University, Nakornpathom, Thailand,

E-mail address: supinya_um@hotmail.com and scppo@mahidol.ac.th

Abstract: This research aims to study the utilization of 2,2,6,6-tetramethylpiperidinyloxy (TEMPO) as the nitroxide-mediated polymerization (NMP) for preparation of polystyrene homopolymer and polystyrene-poly(*iso*-butyl acrylate) block copolymer. The NMP concept is based on the capture of propagating radicals by nitroxides, resulting in the formation of dormant species having thermally labile alkoxyamines. The dormant species can be fragmented at high temperature, and the released polymeric radicals then react with monomers or comonomers before recombining with the nitroxides, allowing the preparation of polymer with narrow molecular weight distribution. It was found in this study that the reaction time and the amount of initiator as well as TEMPO affected on the percentage yield and molecular weight of the polystyrene homopolymer, which is the TEMPO-terminated polystyrene (PS-TEMPO). For the preparation of the block copolymer, the PS-TEMPO was firstly carried out then *iso*-butyl acrylate was added. It was found that the composition of the block copolymer significantly depended on the reaction time and the initial amount of PS-TEMPO as well as *iso*-butyl acrylate monomers used.

E0048-THE EFFECT OF DOMESTICALLY PRODUCED BLAST-FURNACE SLAG ON COMPRESSIVE STRENGTH OF CEMENT PASTES

Arnon Chaipanich* and Thanongsak Nochaiya

*Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200

Abstract: This paper reports the effect of ground granulated blast-furnace slag (GGBS) on compressive strength of cement paste at 0, 10, 20, 30 and 50% by weight after curing in water for 1, 7, 14 and 28 days as a preliminary investigation into the use of domestically produced blast-furnace slag as a construction material. Blast-furnace slag collected as waste from an iron making factory was prepared before use by grinding to a fineness close to that of Portland Cement. The grinding time required was 24 hours. It was found that GGBS is amorphous and composed mainly of silica (SiO_2), alumina (Al_2O_3), calcium (CaO) and magnesium (MgO) with the highest being silica at 55.04%. Compressive strength results show that compressive strength of paste containing GGBS was found to be reduced marginally when GGBS is incorporated at 10% thereafter a significant reduction in the strength was observed.

E0049-PRODUCTION OF FIBERBOARD FROM WASTE PAPERS REINFORCED WITH EPOXY RESIN

Sudsiri Hemsri, Krungsiam Piri, Nattida Siriwong, and Narunchara Loikaew

*Department of Materials Science and Engineering, Faculty of Engineering and Industrial Technology, Silpakorn University, Sanam Chandra Palace Campus, Nakornpatom, 73000, Thailand.

e-mail address: sudsiri.s@su.ac.th

Abstract: In the present days, waste paper is one of the environment problems, which there are many efforts trying to regain their values by recycling these waste paper. One solution is to recycle the waste paper in form of fiberboard which can replace wood. It does not only increase values of these waste papers added, but also helps to preserve forests. Therefore, the objective of this study was to prepare the fiberboard from waste newspaper by grounding them into fiber pulp and then using epoxy resin to binder these fibers into a panel. Effect of epoxy resin content was investigated by varying the amount of the resin from 0 to 50 percent by weight of paper pulp. Properties of prepared fiberboard, such as water absorption, thickness swelling, bending strength, and tensile strength were determined. It was found that the optimized mixture ratio of the epoxy resin to the fiber pulp that achieved the best properties was 30:70 by weight.

E0050-The Phase Evolution Study of $(\text{Bi}_{0.5}\text{Na}_{0.5})\text{TiO}_3$ - $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ System by X-ray Diffraction Technique

Kamonpan Pengpat¹, Sittiphong Hanpimol¹, Theeraphong Thongkum², Uraivan Intatha¹, Sukhum Eitssayeam¹ and Tawee Tunkasin¹

¹ Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

² Department of Physics, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand

e-mail address: k.pengpat@hotmail.com

Abstract: Bismuth Sodium Titanate: $(\text{Bi}_{0.5}\text{Na}_{0.5})\text{TiO}_3$ (BNT) is one of the promising candidate for lead-free piezoelectric materials.^[1-4] However, the piezoelectric properties of BNT are still in need to be developed. This work has been concentrating on preparing bismuth sodium titanate-bismuth titanate ceramic-composite materials of the composition $(1-x)(\text{Bi}_{0.5}\text{Na}_{0.5})\text{TiO}_3$ - $x\text{Bi}_4\text{Ti}_3\text{O}_{12}$ where $x = 4$ by conventional ceramic method. The $(\text{Bi}_{0.5}\text{Na}_{0.5})\text{TiO}_3$ (BNT) and $\text{Bi}_4\text{Ti}_3\text{O}_{12}$ (BIT) ceramic powders were produced separately via calcination and then the composite mixtures were mixed and sintered in order to produce the ceramics. The calcined temperature of 800°C is employed for forming high purity BNT and BIT powders. The ceramic materials of composition 60mol%BNT-40mol%BIT were sintered from 1000°C to 1100°C. The phase identifications of the BNT-BIT ceramics were performed using X-ray diffraction technique (XRD). It was found that the phases consisting in all ceramic samples sintered at 1000°C to 1100°C are tetragonal $\text{Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3$, rhombohedral BNT and orthorhombic BIT. The density of the ceramic sample increased with increasing sintering temperature. The maximum density of the ceramic from this 60mol%BNT-40mol%BIT system was about 6.68 g cm⁻³.

E0051-EFFECT OF MILLING TIME ON PROPERTIES OF PMN CERAMICS

Somsak Boonjaeng, Arnon Chaipanich and Tawee Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200.

E-mail address: ssoamk@hotmail.com

Abstract: Effect of milling time on properties of lead Magnesium Niobate ($\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$; PMN) ceramics were investigated. The PMN ceramics samples were produced by milling MgNb_2O_6 and PbO together for 24, 48, 72 and 96 hrs. Various distribution mixture powders were calcined at 750 °C for 2 hrs at 10 °C/min. After that the powders were pressed to pellet and sintered at 1275 °C for 2 hrs at 10 °C/min. It was found that PMN ceramics prepared from PMN24 powders by sintering at 1275 °C for 2 hrs and at the rate of 10 °C/min obtained highest dielectric properties.

E0052-EFFECT OF MILLING TIME ON CALCINATION CONDITION OF PMN POWDER

Arnon Chaipanich*, Somsak Boonjang, Kamonpan Pengpat and Tawee Tunkasiri

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200

Abstract: Two series of columbite (MgNb_2O_6 or MN) powders were produced. MN1 from calcining MgO with Nb_2O_5 , and MN2 from $(\text{MgCO}_3)_x\text{Mg}(\text{OH})_2 \cdot 5(\text{H}_2\text{O})$ with Nb_2O_5 . MN samples were then mixed with PbO in ethanol and milled together in a zirconia ball mill for 24, 48, 72 and 96 hours. The results show that the particle size of both MN1 and PbO , and MN2 and PbO particles decreased with increasing milling time. DTA curves show that the effect of milling time is more dominant in MN1 sample where the area covering exothermic peaks decreased with increasing milling time compared to those of MN2 samples where there were no significant changes in the exothermic peaks. The optimum calcination temperature for complete reaction of PMN1 powder was found to be greater than 750°C for 24 and 48 hours milled samples but at lower temperature at 700°C for longer milled samples i.e. 72 and 96 hours samples. For PMN2 powder the optimum calcination temperature was found to be at 700°C for all milling conditions.

E0053-DISSOLUTION BEHAVIOUR OF CALCIUM-SULFATE CEMENT IN THE SBF AND SALINE SOLUTION

Supanee Pathumarak and Numphet Plucksanan

National Metal and Materials Technology Center, Pathumthani 12120

Phone 0-25646500, Fax 0-25646446, E-mail: supanp@mtec.or.th, numphetp@mtec.or.th

Abstract: Calcium-sulfate (CS) cement is a resorbable bone substitute material. However, the main problems associated with the use of CS have been its relatively rapid rate of resorption, together with occasional unpredictable clinical responses. As there have been only few studies on the *in vitro* dissolution behaviour of the cement system, this work was aimed to investigate the resorption behaviour of CS cements from α -CSH and β -CSH in saline and SBF solutions. The effects of the dynamic and the static aging protocols on the cement samples were also investigated. The results demonstrated that during 10 days of aging, the use of different test media was not contributing a significant difference in the dissolution rate of CS cements, both from α - and β -CSH. By comparison, the dynamic weight losses are significantly higher than the static ones. Apatite, calcite, anhydrite CS, and unknown phases were found in the precipitates from both dynamic and static systems. The observations suggest that the dissolution mechanisms of CS cement in saline and in SBF seem different. In saline, CS cement simply dissolves into calcium ion and sulfate ion. On the other hand, in the SBF the process may involve both dissolution and reaction.

E0054-FABRICATION OF ALUMINA-TITANIUM CARBIDE COMPOSITES BY PRESSURELESS SINTERING

Supawan Kasuriya and Duangduen Atong

National Metal and Materials Technology Center, 114 Thailand Science Park, Klong Luang, Pathumthani, 12120, Thailand

E-mail address: supawank@mtec.or.th and duangdua@mtec.or.th

Abstract: The Pressureless Sintering technique was applied to a system of Al_2O_3 -TiC composites that have been used as excellent cutting tool materials in many industries. Al_2O_3 -TiC composites with various amounts of TiC, 10 to 50 wt %, were prepared and sintered at 1900°C for 2h. The effects of the amount of TiC on physical and mechanical properties of composites were examined. The phase formation and microstructure of composites were characterized using X-ray diffraction (XRD) and Scanning electron microscopy (SEM) techniques. The results showed that sintering at 1900°C with a heating rate of $20^\circ\text{C}/\text{min}$ made product possible to obtain 96 % of the theoretical density. The density and Vicker hardness were improved with the addition of TiC particles dispersed in Al_2O_3 matrix. Al_2O_3 doped with 47% TiC displayed the highest value of density and Vicker hardness. The volume shrinkage during sintering was large and porosity was high for composites having small amount of TiC.

E0055-Thermal insulation property of hibiscus fiber

Nimit Lueprasert¹, Goson Dumsim¹, Pattana Rakkwamsuk², Anusara Srisroal^{1*}

¹Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Sciences, King Mongkut's Institute of Technology North Bangkok, 1518 Pibulsongkram Rd., Bangsue, Bangkok 10800, Thailand.

²Division of Materials Technology, School of Energy and Materials, King Mongkut's University of Technology Thonburi, 91 Pracha Utit Rd., Bangmod, Tungkru, Bangkok 10140, Thailand

Abstract: The thermal insulation property of hibiscus fiber was studied in order to replace synthesis fiber with natural fiber. The hibiscus fiber was treated by solution and then made it into the sheet form. The thermal conductivity of the hibiscus fibrous sheet is 0.044-0.048 W/m.K which closes to the commercial insulator. The result shown the hibiscus fibrous insulator is extremely potential to instead of the synthesis fibrous insulator.

E0056-Effect of Sintering Temperature on Physical and Electrical Properties of Lanthanum and Manganese doped Lead Titanate Ceramics

Jutharat Sirisukprasert, Prachya Malasri, Gobwute Rujijanagul and Tawee Tunkasiri
Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
e-mail address: malasri_pra@hotmail.com

Abstract: In this work effect, of sintering temperature on physical and electrical properties of lead titanate ceramics doped with lanthanum and manganese was studied. The samples were prepared by solid-state reaction method. The physical and electrical properties of the samples was found to depend on the sintering temperature. The best properties of samples was found in the sample sintered at 1200 °C.

E0057-SYNTHESIS OF POLYURETHANES CONTAINING SCHIFF BASE METAL COMPLEXES OF NICKEL AND MANGANESE

Thammasinee Jainim¹ and Nuanphun Chantarasiri^{2*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand;

e-mail address: porpal@hotmail.com

²Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Metal-containing polyurethanes have been synthesized by the reaction between Schiff base metal complexes and isocyanate-terminated prepolymers with dibutyltin dilaurate as a catalyst. The metal complexes employed were synthesized from nickel or manganese acetate, 2,4-dihydroxybenzaldehyde and 1,2-diaminocyclohexane. The isocyanate-terminated prepolymers used were tolylene 2,4-diisocyanate terminated poly(1,4-butanediol) (PB), MW 900 and tolylene 2,4-diisocyanate terminated poly(propylene glycol) (PP), MW 1000. The progress of polymerization reaction was investigated using IR spectroscopy. Thermal stability was studied by thermogravimetric analysis. Metal-containing polyurethane-ureas have been synthesized by the reaction between *m*-xylylenediamine, metal complexes and isocyanate-terminated prepolymers. Thermal stability of polyurethane-ureas was compared with that of metal-containing polyurethanes.

E0058-SYNTHESIS OF POLYURETHANES CONTAINING TETRADENTATE SCHIFF BASE METAL COMPLEXES

Wipawee Na Ranong¹, Nuanphun Chantarasiri^{2*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand; e-mail address: wipawee_na@yahoo.com

²Supramolecular Chemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Tetradentate Schiff base zinc and copper complexes (ZnL and CuL) have been synthesized by the reaction between 2,4-dihydroxybenzaldehyde, zinc or copper acetate and 1,2-diaminocyclohexane. These metal complexes were characterized by IR spectroscopy, ¹H NMR spectroscopy and elemental analysis. Metal-containing polyurethanes have been synthesized by polymerization between ZnL or CuL and different prepolymers using dibutyltin dilaurate as a catalyst. The employed prepolymers were tolylene 2,4-diisocyanate terminated poly(1,4-butanediol) prepolymer, MW 900 (PB900) and tolylene 2,4-diisocyanate terminated poly(propylene glycol) prepolymer, MW 1,000 (PP1000). The progress of polymerization reaction was followed using IR spectroscopy. The obtained polyurethanes were characterized by IR spectroscopy and thermal stability of polyurethanes were studied using thermogravimetric analysis.

E0059-DESIGN AND INVENTION OF LANGMUIR'S PROBE

Chakapun Thawornthira, Surasing Chaikakun, Nirun Witit-anun, Sakool Siryanalugsan and Thaneer Bupphakorn
Vacuum Technology and Thin Films Research Laboratory (VTTF), Department of Physics, Faculty of Science, Burapha University, Chon Buri 20131, Thailand;
e-mail address : chakapun@bucc4.buu.ac.th

Abstract: The emphasis of this research was placed on designing and inventing cylindrical Langmuir's plasma probe. In this research we designed the cylindrical probe tip that was able to insert into the plasma from glow discharged process of D.C. magnetron sputtering coating system to perform the experiments to measure localized plasma at probe tip placed on 9 cm. from center of magnetron cathode. As we measured, we regulated D.C. bias voltage to the probe tip. The tip collected the prefer kind of ion (electron when we set the positive voltage and plasma ion when we set the negative voltage) in form of ions current. Finally we plot the relation of ions and electrons currents against probe bias voltages. From the characteristic when we set the probe tip area 0.17 cm². we got localized ions current density of probe tip at 9 cm. from center of magnetron

cathode 1.40 mA/cm². and electron current density of probe tip at 9 cm. from center of magnetron cathode 28.91 mA/cm². From the experiments we concluded that the cylindrical Langmuir's plasma probe was the suitable tools for studying plasma characteristics from D.C. sputtering coating system.

E0060- STUDIES OF THERMAL PROPERTIES AND SURFACE CHARACTERISTICS OF PRETREATED JUTE FIBERS BY BOILING AND SOXHLET EXTRACTION.

Wimonlak Sutapun, Jongrak Kluengsamrong, Yupaporn Ruksakulpiwat, Kasama Jarukumjorn, Nitinat Supakarn, Pranee Chumsamrong

School of Polymer Engineering, Suranaree University of Technology, Nakhon Ratchasima, Thailand. E-mail address: wimonlak@ccs.sut.ac.th

Abstract: Two pretreatment methods (boiling method and soxhlet extraction) were employed to pretreated jute fibers with methanol-benzene 1:1 solvent mixture at various times. Thermal analysis was performed by Thermal Gravimetric Analysis (TGA) and the surface analysis was done by Scanning Electron Microscope (SEM). TGA curves shows that both of the pretreatment methods effectively remove wax or other low molecular weight components of the fibers SEM results show that the boiling method takes a shorter optimum time to clean the fiber.

E0061-The future application of Rare Earth-Ag ductile intermetallic compound

K. Wongpreedee¹, A.M. Russell^{2,3}, K.A. Gschneidner, Jr.^{2,3}

¹ Division of Materials Science (Gems and Jewelry), Faculty of Science, Srinakharinwirot University, Bangkok, Thailand, 10170.

² Department of Materials Science and Engineering, Iowa State University, Ames, IA, 5001, USA

³ Ames Laboratory of the U.S. Department of Energy, Ames, IA 50011, USA

Email: kageeporn@swu.ac.th

Abstract: The astonishing discovery of B₂ intermetallic compound family is ductility at room temperature. In this experiment tensile tests were performed on DyAg, GdAg, and LaAg to study the mechanical properties of these alloys and to perform fractography by SEM. The results indicated that DyAg and GdAg showed minor ductility at room temperature, but LaAg processed by hot swaging had extensive ductility. CIELAB system analysis will need to be performed on the oxide to determine if blue or black color can be produced in the material for future applications in jewelry and other industries. Moreover, the study may provide insights that could potentially improve the performance of aerospace; marine; pumps; boilers and heat exchangers and furnace components.

E0062-A STUDY OF ADHESION BETWEEN NATURAL RUBBER - NITRILE RUBBER AND INVESTIGATION OF SURFACE PROPERTIES BY ATOMIC FORCE MICROSCOPY

Sombat Thanawan^{1,2} and Pimsuda Heamtanon³

¹Institute of Science and Technology for Research and Development, Mahidol University, Salaya Center, Nakhon Pathom 73170

²Rubber Technology Unit, Center of Excellence, Faculty of Science, Mahidol University, Salaya Center, Nakhon Pathom 73170

³Polymer Science and Technology Programme, Faculty of Science, Mahidol University, Salaya Center, Nakhon Pathom 73170

E-mail address: ststw@mahidol.ac.th and pimsuda_h@hotmail.com

Abstract: The chemical structure of natural rubber differs enormously from that of nitrile rubber, hence the poor adhesive strength between them. One of the possibilities to improve the adhesion property is the use of adhesion promoters blended in the rubber formulation. In this work the mix of chlorinated natural rubber (CNR) and chlorosulfonated polyethylene (CSPE) was blended in nitrile rubber cover a range of 0 – 60 phr. It was found that the peel strength increased with CNR and CSPE loading. The cohesive failure was observed at CNR and CSPE 40 – 60 phr. Atomic force microscopic analysis found that the adhesion force between silicon nitrile tip and nitrile rubber surface increased with increasing CNR and CSPE content, which the adhesion force could be measured in nanonewton.

E0063-The chemical modification of polyethylene film for chelating of heavy metal ions in wastewater

Kulsinee Sintasanai¹ and Thirawan Nipithalul²

¹Polymer Science and Technology Programme, Faculty of Science, Mahidol University, Salaya Center, Nakhon Pathom 73170

²Department of Chemistry, Faculty of Science, Mahidol University, Phyathai, Bangkok 10400

E-mail address: kulsinee_028@hotmail.com and scnp@mahidol.ac.th

Abstract: A chelating ion-exchange membrane containing the hydroxamic acid functional group was synthesized from acrylamide-grafted-polyethylene (PE-g-AAm). The grafted polymer was obtained by 2-stage method. The polymer surface was first functionalized by decomposition of $K_2S_2O_8$ and subsequently grafted with acrylamide monomer by ceric ion technique. The chemical composition at the surface was analyzed by Attenuated Total Reflection Fourier Transforms Infrared Spectroscopy (ATR-FTIR) and ninhydrin method. Surface morphology of the grafted sample was characterized by Atomic Force Microscopy (AFM). The grafted polymer was then converted to poly(hydroxamic acid) by reacting with hydroxylamine hydrochloride under optimum condition. The existence of hydroxamic acid functional group was confirmed by ATR-FTIR. When the membranes were immersed in V^{5+} , Fe^{3+} and Cu^{2+} solutions, it was found that the membranes turned dark purple, deep brown and blue-green, respectively. The sorption behavior of the chelating membrane toward metal ions was also studied with UV-Visible spectroscopy. This behavior can not be observed in original PE and PE-g-AAm.

E0065-SYNTHESIS OF PHOPHORYLCHOLINE-CONTAINING POLYMER BRUSHES BY NANOPOROUS SURFACE-INITIATED POLYMERIZATION

Mayuree Srinunthakul¹, Suda Kiatkamjornwong², Yasuhiko Iwasaki³, Vipavee P. Hoven^{4*}

¹Program in Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

²Department of Photoimaging and Printing, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

³Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental University, Tokyo 101-0062, Japan,

⁴Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

E-mail address: vipavee.p@chula.ac.th

Abstract: Chemically grafted tris(trimethylsiloxy)silyl (tns(TMS)) monolayer on the silicon oxide substrate was used as a nanometer-scale template for controlling the graft density of phosphorylcholine-containing polymer brushes. Polymer brushes were synthesized by surface-initiated polymerization of 2-methacryloyloxyethyl phosphorylcholine (MPC) from α -bromoester groups tethered to the residual silanol groups on the surface after creating a range of tns(TMS) coverage via atom transfer radical polymerization (ATRP) using CuBr/bpy as a catalytic system. The solvent, percentage of tns(TMS) coverage and polymerization time significantly influenced the thickness and morphology of PMPC brushes. Protrusions observed from AFM images of PMPC brushes evidently suggested that PMPC brushes distributed nanoscopically on the substrate. The size of protrusion and surface roughness corresponded quite well with the graft density of PMPC brushes.

E0067-Effects of Silane Coupling Agent on Natural Rubber Reinforced by Silica Generated *in situ* from Sol-Gel Process of Tetraethoxysilane in Latex

Nantida Niyompanich¹, Amarawan Intasiri², Varawut Tangpasuthadol^{2*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand 10330

²Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand 10330

E-mail address: varawut.t@chula.ac.th

Abstract: Sol-gel process of tetraethoxysilane (TEOS) was used to generate silica particles in natural rubber for preparing reinforced rubber by adding TEOS directly into concentrated latex. A sulfur-containing coupling agent, bis(3-triethoxysilylpropyl)tetrasulfide (TESPT), was added together with TEOS before the sol-gel step. The influences of the amount of TEOS, TESPT and ammonia on the physical properties of the composite were investigated by a statistical analysis method, namely 'two-level factorial design'. It was found that tensile modulus, tear strength, and hardness were the most significantly affected by TEOS content. The amount of TESPT affected the physical properties somewhat less. But ammonia content showed a negative effect. In other words, the NR composite with high mechanical properties can be obtained when adding a large amount of TEOS and TESPT without adding more ammonia to the latex mixture. In addition, the use of TESPT could reduce sulfur-cure time (t_{90}), compared to the composite without the coupling agent.

E0068-IMMOBILIZATION OF RGD PEPTIDES ON THE SURFACE OF TYROSINE-DERIVED POLYCARBONATE TO IMPROVE CELLULAR RESPONSE

Adisorn Poopattanapong¹, Joachim Kohn², Vipavee P. Hoven^{3*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand,

²Department of Chemistry, Rutgers University, Piscataway, New Jersey 08855-0939, USA

³Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand,

E-mail address: vipavee.p@chula.ac.th

Abstract: Tyrosine-derived polycarbonates having carboxyl pendant groups, poly (desaminotyrosyl-tyrosine ethyl ester-co-desaminotyrosyl-tyrosine carbonate) (poly(DTE-co-DT carbonate)), have been recently introduced as a new series of biodegradable polymer that can be potentially used for biomedical applications. The carboxyl groups can serve as versatile precursors for a wide range of chemical modification including an attachment with bioactive molecules. In particular, this research has focused on chemical immobilization of RGD-containing peptides which are believed to promote cell adhesion on the surface of poly(DTE-co-20%DT carbonate) through a two-step reaction. The first step involved an activation of carboxyl groups by *N*-hydroxysuccinimide (NHS) in the presence of 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (EDCI). The second step was a covalent attachment of RGD-containing peptides. The extent of activation was monitored by ¹H NMR. Preliminary results from *in vitro* cell studies suggested that the alteration of surface functionality has a significant impact on fibroblast adhesion and proliferation. The cytocompatibility of RGD-immobilized surface was slightly improved as compared to the unmodified surface, which is also an excellent substrate for cell attachment and growth.

E0069-Correlation Between Conformations And Photophysics of Conjugated Polymers

Rakchart Traiphol

Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok Thailand

E-mails: rakchartt@nu.ac.th, rtraiph@yahoo.com

Abstract: This research investigated the correlation between the conformations of conjugated poly-2-methoxy-5-(2'ethylhexoxy)phenylenevinylene (MEH-PPV) in solutions and their photophysics by utilizing technique of UV-visible spectroscopy. When the solvent quality was decreased, it was found that the absorption spectra moved to the higher energy region, indicating the shortening of conjugation length. The shrinkage of polymer chains when dispersed in poor solvent attributed to the decrease of the conjugation length. The decrease of solvent quality also caused the polymer aggregation, affecting their optical properties due to the close proximity of the chains within the aggregates.

E0070-INFLUENCE OF DOPING METALS ON MICROSTRUCTURE OF TUNGSTEN OXIDE NANOPARTICLES

Sorachon Yoriya and Sitthisunton Supothina

National Metal and Materials Technology Center, 114 Thailand Science Park,

Paholyothin Rd., Klong Luang, Pathumthani, 12120 Thailand,

E-Mail address: sorachy@mttc.or.th and sitthis@mttc.or.th

Abstract: Platinum (Pt) and palladium (Pd) were incorporated into tungsten oxide (WO₃) nanoparticles by impregnation method at elevated temperature. The metal doping caused drastically change in the microstructure of the WO₃ nanoparticles; spherical, undoped particle having average size of 35 nm changed to disc-like shape having diameter of 180 – 500 nm, depending on the type and content of dopant. The doping also affected the specific surface areas of the final particles. The surface area of the doped powders increased with increasing amount of the metal dopants. Compared with the spherical shape, the disc-like structure was less dense than the spherical powder, leading to enhance porosity and surface area for gas adsorption. However, the doping did not alter crystal structure of the WO₃ powders.

E0071-Mechanical properties of carbon nanofibril-reinforced thermoplastic:

LDPE and PMMA composites

Rungsima Yeetsorn^{*}, Noppavan Chanunpanich

Department of Industrial Chemistry, Faculty of Science, King Mongkut's Institute of Technology North Bangkok,

Bangkok 10800, Thailand; ^{*}e-mail address: rmy@kmitnb.ac.th

Abstract: Polymeric composites are widely used in the aircraft and automotive industries. Their high strength to weight ratio makes significant weight reduction possible. Beside this advantage, the materials also offer a good corrosion resistance but the mechanical properties are not satisfactory. In order to increase these properties, carbon nanofibers (CNF) with high strength can be embedded in the polymeric matrix. In the present work, composites consisting of CNF in different polymers, low density polyethylene (LDPE) and poly(methyl methacrylate) (PMMA) which is a semi-crystalline polymer and an amorphous polymer respectively, have been prepared using a polymer extrusion technique. Experimental conditions such as nanofiber loading, temperature and screw speed of extruder were varied to find the optimum condition. The effects of CNF on mechanical properties and composite morphology have been examined and correlated to establish structure-property relationships. Further more, an addition of CNF to the composites was found to increase the mechanical properties relative to that of polymer/glass fiber composites at the same fiber concentration. The interpretation of the mechanical data for the composites illustrates that tensile strength and modulus were insensitive to the presence of CNF, whereas the impact strength was significantly improved by even small amounts of CNF. In addition to, the improvement of mechanical properties of PMMA composites was higher

than LDPE composites in the same CNF loading. The method proposed here for the dispersion of CNF in polymers shows promise for the preparation of improved engineering composites.

E0072-ELECTORHEOLOGICAL PROPERTIES OF POLYANILINE SUSPENSIONS

Piyanoote Hiamtup¹, Anuvat Sirivat¹, and Alexander M. Jamieson²

¹The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok 10330, Thailand.

²Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland, OH 44106-7202, U.S.A.

E-mail address: piyanooth.a@hotmail.com, anuvat.s@chula.ac.th

Abstract: Polyaniline (PANI) was synthesized via an oxidative coupling polymerization in acid condition and dedoped in ammonium solution. Rheological properties of the PANI silicone oil suspensions were investigated in the oscillatory shear mode to study the effects of electric field strength, particle concentration, and operating temperature on ER characteristics. The PANI based ER fluids exhibit the viscoelastic behavior under an applied electric field and the ER response can be enhanced with increasing electric field strength. The dynamic moduli, G' and G'' dramatically increase by 6 orders of magnitude when the electric field strength is increased up to 2 kV/mm. ER response is enhanced with particle concentration, but is deteriorated with increasing temperature. The sol to gel transition point is determined and found to occur at $E = 100$ V/mm irrespective to an operating temperature.

E0073-The Effect of Time on Crystallisation Behaviour of Glass in the System $\text{Na}_{1-x}\text{Zr}_{2-x/3}\text{Si}_x\text{P}_{3-x}\text{O}_{12-2x/3}$

Anuson Nivompan * Suniya Polsin and Wuthisak Prachamon

Department of Physics, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand.

Email address: anuson@rocketmail.com

Abstract: Glass-Ceramic samples were prepared from parent glass of the composition $\text{Na}_{1-x}\text{Zr}_{2-x/3}\text{Si}_x\text{P}_{3-x}\text{O}_{12-2x/3}$ (where $x = 2.50$) by heat treatment technique at the appropriate temperature. Effect of treatment duration was investigated by varying treatment time from 4 hours to 10 and 20 hours, respectively. The XRD results indicate that the major phase formed during treatment is crystalline $\text{Na}_2\text{ZrSi}_2\text{O}_7$, one that present as the most stable phase in this glass-ceramic system. Increase of treatment time does not lead to higher crystalline phase concentration but introduce melting of the crystalline phase. The result is confirmed by SEM micrograph. Longer treatment time also generate fracture in the crystalline grains and promote roughness of residual glass at the surface region. Loss or shift of chemical composition due to over heating may also responsible for this observation.

E0074-The Effect of Time on Crystallisation Behaviour of Glass in the System $\text{Na}_{1-x}\text{Zr}_{2-x/3}\text{Si}_x\text{P}_{3-x}\text{O}_{12-2x/3}$ doped with Fe_2O_3

Anuson Nivompan * and Sirichai Serksiri

Department of Physics, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand.

Email address: anuson@rocketmail.com

Abstract: This work is aim to investigate the effect of heat treatment time on the crystallisation behaviour of the based glass composition doped with Fe_2O_3 . The effect of this dopant also studied. The glass sample with composition $\text{Na}_{1.25}\text{M}_{1.25}\text{Si}_{2.25}\text{P}_{0.75}\text{O}_{10.50}$ for with and without Fe_2O_3 doping were subjected to heat treatment at the appropriate temperature for 10 and 20 hr. The XRD powder pattern results of heat treated samples indicate that parent glasses crystallised at 910 °C to give $\text{Na}_2\text{ZrSi}_2\text{O}_7$ as a major crystalline phase with tiny amount of $\text{Na}_2\text{Zr}_2\text{Si}_1.5\text{P}_{1.5}\text{O}_{12}$ found in the sample contained Fe_2O_3 and treated for 20 hr. The results also show higher relative concentration of the residual glass for the longer treatment time. SEM results confirmed results observed by XRD. There is no significance effect of the Fe_2O_3 dopant on crystallisation of the glass in this system. The longer treatment time also do not increase relative amount of crystal but rather reduce it.

E0075-The LVDT System for Linear Thermal Expansion Coefficient Measurement of the Materials

Somkid Penshan and Anuson Nivompan*

Department of Physics, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand.

Email address: anuson@rocketmail.com

Abstract: The transducer so-called linear variation differential transformer (LVDT) system was developed for linear thermal expansion coefficient measurement of the materials. The optimized ratio of coil turns is 2.5 with diameter of 0.9 cm. The excitation source is the ac signal with frequency of 20 kHz. The dc output is obtained from demodulation circuit and process through an amplifier circuit. The optimized core length is 2.5 cm for 3 cm long of arrow of three coils. Linearity of the system can be found cover range of 12 mm which sufficiently for the application. This system provides an acceptable precision with sensitivity of 2.89 mV/μm.

E0077-EFFECT OF SINTERING TEMPERATURE ON THE PROPERTIES OF PLZT 7/60/40

W. Nhuapeng, T. Huthayanon, W. Thamjaree and T. Tunkasiri
 Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand 50200.
 e-mail address: nhuapeng@yahoo.com

Abstract: In this work, the lead lanthanum zirconate titanate (PLZT) 7/60/40 was prepared from the oxide compound by solid-state reaction. The mixture was calcined at temperature 500 °C for 0.5 h. Sintering temperatures were varied from 700 °C until 1300 °C (with the increasing temperature step of 100 °C) for 2 h. The electrical properties and physical properties of ceramic samples were examined. It can be observed that the ceramic samples show the good values of physical and electrical properties when the sintering temperature is higher. It has been found that the percentage of shrinkage is in the range of 1.11-31.49. And samples are also the show the higher density at higher sintering temperature.

E0078-Synthesis and Characterization of PVP-Grafted-Starch Hydrogels Using Gamma Radiation

Phiriyatom Suwanmala, Kasinee Hemvichian and Manit Sonsuk

Chemistry and Materials Science Research Program

Office of Atoms for Peace, Bangkok, Thailand

E-mail address: phiriyatom@hotmail.com, kasineeh@yahoo.com and manit@oaep.go.th

Abstract: A series of hydrogels were prepared from gelatinized cassava starch and vinylpyrrolidone by radiation-induced graft copolymerization. Gel fraction, swelling ratio and gel strength of the obtained hydrogels were characterized. The experimental results show that the swelling ratio is inversely dependent on the radiation dose. The results from PVP-grafted-starch were subsequently compared with those of PVP hydrogels and PVP-blended-starch hydrogels. It was found that the PVP-grafted-starch hydrogels, with gel fraction higher than 80%, can be prepared at the dose of 10 kGy, while PVP and PVP-blended-starch hydrogels require at least 30 kGy to obtain gels with more than 80% gel fraction.

E0079-THERMAL AND MECHANICAL PROPERTIES OF PEO- Na^+ /MONTMORILLONITE NANOCOMPOSITE FILMS

Tithinun Puatrakul

Faculty of Engineering and Agro-Industry, Mae Jo University, Chiang Mai 50290

E-mail: tithinun@mju.ac.th

Abstract: In this research, apolymer-clay nanocomposites based on Polyethyleneoxide (PEO) and Na^+ /montmorillonite (MMT) will be obtained by melt intercalation. Polymer nanocomposite is beneficial because PEO is flexible and water-soluble, while Na^+ /MMT clay with nanosized interlayer is abundant in nature. PEO and Na^+ /MMT were mixed in an internal mixer. PEO- Na^+ /MMT films were prepared by compression molding. Thermal properties of PEO- Na^+ /MMT films were determined using Differential Scanning Calorimetry (DSC). The mechanical properties, melt flow index, solubility, moisture absorption ability and biodegradability of PEO- Na^+ /MMT films were studied. It was found that the addition of Na^+ /MMT in PEO yielded an increase in glass transition temperature and a decrease in crystallinity. It was also found that suitable additions of Na^+ /MMT in PEO should be about 5 to 10 weight percent MMT. PEO with 5 weight percent MMT gave the highest stress at break (7.76MPa), the highest percentage of strain at break (1469.08) and a moderate Young's modulus (42.80MPa). PEO with 10 weight percent MMT gave the highest yield stress (12.07MPa), a moderate percentage of strain at break (756.00) and a moderate Young's modulus (51.90MPa). It was also found that the melt flow index of PEO- Na^+ /MMT was lower than that of PEO. The solubility of PEO- Na^+ /MMT in common solvent was similar to that of PEO. PEO- Na^+ /MMT nanocomposite film can absorb moisture and is fully biodegradable.

E0080-HEAT EFFECT ON MECHANICAL PROPERTIES OF HOT WORK TOOL STEEL

Weachsuwan Porban, Chalermwat Wongwanitwattana, Wantana Sukkaew

Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Sciences,

KingMongkut's Institute of Technology North Bangkok, 1518 Pibulsongkram Rd., Bangsue, Bangkok 10800, Thailand.

Abstract: This research is to study the heat treatment of hot work tool steel and a final method of this heat treatment for good mechanical properties. This research is studying in tempering temperature of 300, 400, 500 and 600 °C in a vacuum oven. The result shows that the temperature of 500 °C gives the highest hardness of 56 HRC. The plane spacing is computed by the x-ray diffraction technique and then residual stress is obtained. The result shows that temperature of tempering is high, plane spacing is low. It means that hardness is increased. The residual stress calculated from plane spacing shows that temperature of 500 °C and 600 °C give low residual stress (367 N/mm²) but types of residual stress are different. The heated temperature of 500 °C represents compressive stress whereas the heat temperature of 600 °C represents tensile stress and this reserch finds that compressive stress gives higher hardness than tensile stress. Thus the most appropriate temperature used in the heat treatment process was 500 °C because it offers both the highest hardness and the lowest residual stress.

E0081-Fabrication of Au Doped MoO₃ Gas Sensor for Alcohol Sensing.

Supab Choopun¹, Meechai Tapnurat, Pongsri Mangkornong, Suwit Wongsila^{*} and Nikorn Mangkornong

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

^{*}Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand.

e-mail address : supab@science.cmu.ac.th , jamephy@yahoo.com.

Abstract: Molybdenum trioxide (MoO₃) is a wide bandgap semiconductor with bandgap of 3.2 eV. It has an electrical resistivity of $10^{10} \Omega \text{cm}$ at room temperature. It can be used as a gas sensor. Molybdenum trioxide doping with gold (Au) has less resistance meaning it has high conductivity for better gas sensing. In this work, Molybdenum trioxide powder was mixed with gold powder of the ratio of 10%, 20% and 30% by weight, respectively. Each precursor was fabricated in the form of cylinder with a heater mounted inside for a complete gas sensor. Then molybdenum trioxide gas sensors were tested in ethanol vapor of concentration 4500 ppm. It was found that molybdenum trioxide doped with 30% of gold had highest sensitivity about 22.5 with the response time (τ_{90}) of about 5 sec. Increasing the gold concentration will not affect the response time.

E0082-CO₂ HYDROGENATION OVER Ru/Al₂O₃ CATALYST

Athiya Kaengsilalai, Sabaithip Tungkamani and Monrudee Phongaksorn

Department of Industrial Chemistry, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand, 10800; E-mail address: sbtt@kmitnb.ac.th

Abstract: Recently, research and developments of catalysts used for a conversion of gas pollutant to valuable petrochemical products has become of great interest. To approach this, the project is aimed to study the effect of preparation conditions on the activity of Ru supported Al₂O₃ catalyst used in CO₂ hydrogenation. The preparation conditions such as the droplet rate of precursors and temperatures used for treatments were focused. The results obtained from the characterization of the supports show that Al₂O₃ prepared under the condition of 0.25-0.50 mL/min and the temperature of 400°C gives high surface areas in the range of 380-530 m²/g. Surface morphology illustrates η -Al₂O₃ materials. High surface area Al₂O₃ was used to prepare a series of Ru supported Al₂O₃ catalyst. The loading of Ru designed on each support used was 0.10, 0.25, 0.50, 0.75 and 1.00 %. The catalytic results obtained from TPSR experiment reveal that more than one temperature peaks were observed, indicating the different active sites for the hydrogenation of pre-adsorbed CO₂. Temperature peak (T_{max}) which is used as a measurement of catalytic activity shifts to lower temperature when Ru loading enhances. 1.00 % Ru/Al₂O₃ catalyst was found to give a high activity and maximum yield of methane product.

E0083-PROCESSING AND MECHANICAL PROPERTIES OF HOT-PRESSED ALUMINA/ DIAMOND NANOCOMPOSITE

Santi Maensiri, Paveena Laokul and Vittaya Amornkitbamrung

Materials Research Group, Department of Physics, Faculty of Science, Khon Kaen University, 40002. Email address: sanmac@kku.ac.th

Abstract: The alumina and alumina/diamond nanocomposite powders were prepared by conventional powder processing route. The prepared powders of the alumina with an addition of 0 and 5 vol.% diamond with average particle size of 3.2 nm were hot pressed at 10 MPa in a graphite die for 1 h under argon. The hot pressing temperature was 1450°C. The densities of the hot-pressed alumina and alumina/5 vol.% diamond nanocomposite were 99.49% and 78.45% of theoretical density, respectively. The hardness and fracture toughness of the materials were evaluated by the Vickers-indentation technique using loads of 50, 10 and 200N. The average hardness of the alumina and nanocomposite was 1881 ± 0.48 GPa and 3.35 ± 0.28 GPa, and the average fracture toughness was 2.65 ± 0.06 MPa.m^{1/2} and 3.13 ± 0.33 MPa.m^{1/2} for the alumina and nanocomposite, respectively. It was found that diamond transformed to graphite, as indicated by Raman spectroscopy. The use of nano-sized diamond with high specific surface area and low hot pressed pressure are likely to increase the graphitization in the alumina/diamond nanocomposite, resulting in its low density and low hardness.

E0084-Copolymers of Polysiloxane-Poly(ethylene glycol)

Rutnakornpituk¹*, Paradorn Ngamdee¹ and Pranee Phinyocheep²

¹Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok, Thailand

²Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand

Email address: methar@nu.ac.th

Abstract: This research studies a synthetic method for preparing amphiphilic block copolymers of polysiloxane-poly(ethylene glycol). A series of the polydimethylsiloxane (PDMS) prepolymers with systematically varied molecular weights were first prepared via acid-catalyzed ring-opening polymerization of octamethylcyclotetrasiloxane (D4). They were subsequently functionalized with hydroxyl functional groups at both terminals. The hydroxyl-terminated PDMS can readily

condense with acid-terminated poly(ethylene glycol) (PEG diacid) to form polysiloxane-poly (ethylene glycol) block copolymers. The PEG diacid was prepared from hydroxyl-terminated PEG through the ring-opening reaction of succinic anhydride. The chemical structures of prepolymers and copolymers were characterized using ¹H NMR and FTIR.

E0085-ELECTRICAL CONDUCTIVITY RESPONSE OF POLYPYRROLE-/MOLECULAR SIEVE 13X COMPOSITES TO CH₄, CO₂, CO, AND SO₂: EFFECTS OF CATION TYPE AND CATION CONCENTRATION

Boonchoy Soontornworajit¹, Ladawan Wannatong², Johannes Schwank³, and Anuvat Sirivat¹

¹The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok 10330, Thailand, ²Department of Production Technology, KMIT-NB, Bangkok, Thailand, ³Department of Chemical Engineering, University of Michigan, Ann Arbor, MI 48109-2136, U.S.A.

Abstract: Electrical conductivity sensitivity of polypyrrole(Ppy)/molecular sieve 13X composites exposed to CH₄, CO₂, CO, and SO₂ was investigated. Composites were prepared by a dry mixing and dispersion. Effects of zeolite concentration, cation type, concentration of cation were investigated. The electrical conductivity of Ppy doped with naphthalene-2-sulfonic acid(β) sodium salt varies monotonically with the doping level. There is no electrical conductivity response when Ppy and its composites are exposed to CH₄, CO₂, and CO in contrast to the Ppy exposed to SO₂. Undoped Ppy and doped Ppy composites at 10% v/v of 13X content possess the highest sensitivity to SO₂; the sensitivity is reduced as molecular sieve 13X content increases. Cation-exchanged processes on the molecular sieve 13X were carried out by changing from Na⁺ to Li⁺, K⁺, and Cs⁺ at various amounts. The composites of unmodified 13X in which Na⁺ is fully present give the greatest sensitivity to SO₂. The sensitivity of Ppy/13X composite to SO₂ is reduced by exchanging cation in molecular sieve 13X from Na⁺ to other alkali cations in this decreasing order: Cs⁺, K⁺, and Li⁺.

E0086-PREPARATION OF WOUND DRESSING OF POLYVINYL ALCOHOL/SILK FIBROIN HYDROGELS BY GAMMA RADIATION

Prartana Kewsuwan¹, Suchada Pongpat², Manit Sonsuk¹

¹Chemistry and Materials Science Research Program, Office of Atoms for Peace, Ministry of Science and Technology, Bangkok, Thailand,

²Irradiation for Agriculture Research Program, Office of Atoms for Peace, Ministry of Science and Technology, Bangkok, Thailand.

Abstract: Polyvinylalcohol/silk fibroin (PVA/SF) hydrogels were prepared by γ-radiation. The preparation conditions such as absorbed doses and PVA/SF concentrations were investigated. When exposed to γ-radiation, PVA/SF was crosslinked to yield high water absorption materials with water content of 100 – 1000% of their dried weight depending on the preparation conditions. The crosslinked density seems to be the main factor governing the swelling of these gels. The swelling behaviors in NaCl aqueous solutions were also investigated. The swelling of PVA/SF hydrogels decreases when exposed to electrolyte solution. With an increase of absorbed dose, the gel fraction of PVA/SF increases.

E0087-STUDIES ON THE WATER VAPOR PERMEABILITY AND THE EFFECT ON BACTERIAL GROWTH OF PVA/SF BLEND HYDROGELS PREPARED BY GAMMA IRRADIATION FOR WOUND DRESSING

สุชาดา พงษ์พิพัฒน์¹, ประรตนา คีร์สุวรรณ², สุวิมล เจตนะวิวัฒน์¹ และณัฐธยาน์ เปี้ยแดง¹

¹Irradiation for Agriculture Research Program, Office of Atoms for Peace, Bangkok, Thailand,

²Chemistry and Material Science Research Program, Office of Atoms for Peace, Bangkok, Thailand.

E-mail address: suchadap@oaep.go.th

Abstract: The preparation of hydrogels by gamma irradiation from poly(vinyl alcohol) (PVA) and from blend solution of PVA/silk fibroin(SF) from silk waste and some properties as wound dressing were studied. The thickness of the hydrogel was controlled to be 3 mm. Some properties of hydrogel such as water vapor permeability antibacterial activity, and protection of wound from bacteria were tested. *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* were used as testing cultures. The results revealed that the solution of 7% and 10% PVA and the blend solution containing 10% SF in 7% and 10% PVA (w/w) were induced by γ-irradiation at the dose of 30-60 kGy to form transparent gel with good appearance. The water vapor permeability coefficient of the films was in the range of 1161.12-1527.36 g m⁻² day⁻¹. It was found that the gel showed only an effective wound protection from

bacterial inhibition but not its antibacterial property. However, remarkable reduction of bacterial growth, of about 1-2 log cycles, was also observed on the agar medium covered with the gel.

E0088-EFFECT OF TYPES AND CONTENTS OF COMPATIBILIZERS ON THE CRYSTALLIZATION BEHAVIOUR OF THE TLCP/PP IN-SITU COMPOSITE FILMS

Sayant Saengsuwan Jiravadee Thaisongkram and Uthaiwan Paka

Department of Chemistry, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani 34190, Thailand.
Email: sayant@sci.ubu.ac.th

Abstract: In this work, the effect of types and contents of compatibilizers on the crystallisation behaviour of the thermotropic liquid crystalline polymer (TLCP)/polypropylene (PP) in-situ composite films was investigated by using differential scanning calorimetry (DSC). Four types of compatibilizers; namely, SEBS1650, SEBS1652, SEP1701 and MA-g-SEBS, were added at 1, 3 and 5 wt% into the 10wt%TLCP/PP composite films. It was found that the melting temperatures for all compatibilized films were approximately 2°C higher than that of the uncompatibilized one. This suggested that the crystalline part of PP phase became more thermally stable. However, the crystallisation temperatures of PP fraction for all compatibilized films were not significantly affected by addition of all four compatibilizers. It was also found that all four compatibilizers exhibited the similar effect on the melting temperature and degree of crystallisation of the compatibilized films. This indicated that there was no significant effect among four types of compatibilizers on the crystallisation behaviour of PP component. Nevertheless, the supercooling temperatures (ΔT) of PP portion for all compatibilized films strongly increased about 7-9°C over that of the uncompatibilized one. This meant that the crystallisation rate of PP component in all compatibilized films was retarded. This behaviour was realized due to the presence of compatibilizer phases located in the interfaces which might hinder the nucleation effect of TLCP phase.

E0089-FLUORINE DOPED TIN OXIDE THIN FILM PREPARED BY SIMPLE PYROSOL METHOD: A POTENTIAL ELECTRODE FOR SOLAR ENERGY HARVESTING

Theerayooth Theapsiril¹, Suparerk Aukkaravittayapun² and Waret Veerasail

¹Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Rd., Bangkok 10400, Thailand

²National Metal and Materials Technology Center, 114 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120, Thailand,

E-mail: g4636333@student.mahidol.ac.th, suparerk@mtec.or.th, scwvr@mahidol.ac.th

Abstract: Transparent Conducting Oxide (TCO) thin film is a most importance component in various kinds of solar cell. However, production cost is still high. In this research Fluorine doped Tin Oxide (FTO) thin films were prepared by a simple and low cost pyrosol process. The mixture solutions consist of SnCl₂·2H₂O, NH₄F, DI water, ethanol and HCl was atomized by ultrasonic generator into aerosols. The aerosols were brought to hot (300 oC -500 oC) aluminosilicate glass substrates by air. Substrate temperature was varied in a range from 300 oC to 500 oC. The effect of substrate temperatures and precursor compositions were optimized through the Haake's parameter (ϕ_{TC}) [2]. The highest value of Haake's parameter of FTO, prepared from 0.2 M SnCl₂·2H₂O + 0.1 M NH₄Cl in 95% Ethanol/ deionized water at 450 oC is $6.4 \times 10^{-3} \Omega^{-1}$, which is reasonable value for a potential application in solar energy harvesting [3].

E0090-NANOFIBRES OF POLYMERS AND CERAMICS FABRICATED BY ELECTROSPINNING

Wiwat Nuansing, Saisunee Nilmaung and Santi Maensiri

Materials Research Group, Department of Physics, Faculty of Science, Khon Kaen University, 40002. E-mail address: sanmae@kku.ac.th

Abstract: An electrospinning system has been designed and set up to use in the fabrication of polymer and ceramic fibres. In this work we demonstrate the use of electrospinning technique to prepare nanofibres of polymers i.e. polyethylene oxide (PEO), polyvinyl alcohol (PVA), polypolyacrylonitrile /N, N-dimethyl formamide (PAN/DMF) and polyvinyl pyrrolidone (PVP). The nanofibres (diameter size of 20-300 nm) were characterized by SEM, AFM, X-ray diffraction, Raman spectroscopy, FT-IR and UV-VIS-NIR spectroscopy.

E0091-Characterization of Some TiAl Alloys with 800 °C Nitridation

Kittichai Sopunna¹, Titipun Thongtem¹, Michael McNallan² and Somchai Thongtem¹

¹Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

²Department of CME (M/C : 246), College of Engineering, University of Illinois at Chicago, Chicago, IL 60607-7023, U.S.A.

E-mail : ksopunna@yahoo.com, sthongtem@hotmail.com

Abstract: The nitridation of Ti-47%Al-2%Nb-2%Cr and Ti-47%Al-2%Nb-2%Mn-0.8% TiB₂ was studied in purified NH₃. The flow rate of the gas was kept constant at 10 ml.s⁻¹. The nitridation process was done at 800 °C for 10 h. The

alloys were then characterized using a pin-on-disk wear tester and a microhardness tester. Hardness and wear resistance of the alloys were successfully improved.

E0092-Investigation of Kidney Stones by X-ray diffraction Method

Putsadee Muhamud, Bunsit Wattanathai, Sain Baowkacw and Duangrudee Muakthong

Central Equipment Division, Faculty of Science, Prince of Songkla University, Hatyai, Songkla, Thailand.

E-mail address : mputsadee@ratree.psu.ac.th

Abstract: An investigation of 39 male kidney stone samples and 11 female kidney stone samples obtained from Songklanakarind Hospital was carried out. Most samples were obtained from patients with the age over 40 years old. By means of X-ray diffraction (XRD), kidney stones can be classified according to their structures and compositions into 3 groups e.g. 1. uric acid ($C_5H_4N_4O_3$) and ammonium acid urate ($C_5H_7N_5O_3$) 2. oxalates ; whewellite ($C_2CaO_4 \cdot H_2O$ CaC₂O₄·H₂O) and weddellite ($C_2CaO_4 \cdot 2H_2O$) 3. phosphates ; struvite ($NH_4MgPO_4 \cdot 6H_2O$) and calcium phosphate hydrate ($Ca_3(PO_4)_2 \cdot xH_2O$). External and internal environments such as occupation, dietary habits, lack of water-drinking etc. are the major factors for kidney stone formation. Results from this study are very useful for the patients to prevent recrystallization of kidney stones by avoiding some elements or some organic compounds which are main components of kidney stones formed in the human urinary system.

E0093-Effects of Some Additives on the Optical Property of Polythiophene Derivative

Wanna Bannarukkul¹, Yongsak Sritana-anant², and Worawan Bhanthumnavin^{2*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, and

²Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

E-mail address : yongsak@chula.ac.th, bworawan@chula.ac.th

Abstract: The addition of additives on conjugated polymers or doping helps increase the conductivity of the polymer. The frequently used doping agents are acids or oxidizing agents. Our study showed that the addition of trifluoroacetic acid on solutions of poly (3-hexylthiophene) decreased the absorbance of the polymer at λ_{max} 441 nm while the absorbance at 824 nm appeared at ratios that corresponded to the amount of added trifluoroacetic acid. The novel calculation, AC-index was used to monitor the structural change of the conjugated- π system of the polymer that was presumed to structural change of the simultaneous change of the absorbance at various wavelengths. The AC-index values dramatically increased within one minute and then leveled off toward a set of constant values, which well corresponded to the amount of added trifluoroacetic acid until the ratios between polymer and acid were 1:10. These AC-index values were also varied in accord with the increase of the absorbance at 824 nm.

E0094Incorporation of substituents on thiophene and polythiophene derivatives

Peerayost Somchinda,¹ Nititad Thirasart,¹ Worawan Bhanthumnavin^{1,2*} and Yongsak Sritana-anant^{1,2*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University. ²Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

Abstract: This research studied the incorporation of substituents on thiophene and polythiophene derivatives. The two reactions under investigation were acetylation and bromination. The acetylation used acetyl chloride and aluminium chloride as the reagents. The product from the acetylation of thiophene was found to give mostly unseparable and unidentifiable mixture. The ¹H NMR spectrum of the mixture indicated some signals that could correspond to protons of acetyl group. The acetylation of polythiophene yielded insoluble brown solid, which could be characterized only by the presence of acetyl carbonyl peak in IR spectroscopy. The bromination used N-bromosuccinimide (NBS) in 1 : 1 mixed solvent of dichloromethane and acetic acid. The product obtained from bromination on thiophene was identified to be deep red liquid of 2,5-dibromothiophene in 60% yield. The crude product was relatively pure with no detectable trace of other brominated products.

E0095-Improvement of Mechanical Properties of Polystyrene by Pineapple Leaf fibres

Nanthaya Kengkhetkit¹ Jantrawan phumchusak²

^{1,2} Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand,

Author of correspondence E-mail address : K_nanthaya@hotmail.com

Abstract: In this research the improvement of mechanical properties of polystyrene by using unidirectional continuous pineapple leaf fibres as a reinforcement was studied. The studied factors were the effect of fibre content and benzoylation of pineapple leaf fibre on mechanical properties of the composite. Experimental results were found that mechanical properties of polystyrene composites increased with the increasing of fibre content and mechanical properties of benzoylated fibre/PS composite was better than untreated fibre/PS composite.

E0096-SEPARATION OF RARE EARTH ELEMENTS FROM MONAZITE ORE DECOMPOSITION PROCESS BY ION EXCHANGE COLUMN

Ampika Apichibukol, Pipat Pichestapong, Uthaiwan Injarean and Supattra Visetpotjanakit
Rare Earth Research and Development Center, Office of Atoms for Peace, Bangkok.
E-mail address : Ampika_Noi@yahoo.com

Abstract: Separation of rare earth elements from monazite ore decomposition process was studied by using ion exchange columns filled with Dowex 50 WX8 resin. Mixed rare earth chloride from monazite composed of La, Ce, Pr, Nd, Y, Sm, Gd and Dy was adsorbed by resin in the column and 0.015 M EDTA was used to elute adsorbed rare earth elements through columns of Cu^{+2} adsorbed resin at linear flow rate of 0.636 and 0.212 cm/min. It was found that rare earth elements were eluted respectively by their atomic weight from heavy to light elements except Y which are Dy, Y, Gd, Sm, Nd, Pr, Ce and La. Ion exchange column has shown a potential method in separation and purification of individual rare earth elements.

E0097-Dynamic vulcanization from reclaimed tire rubber and high density polyethylene

Panu Punnarak⁽¹⁾, Varawut Tangpasuthadol⁽²⁾, Pasaree Laokijcharoen⁽³⁾ Supawan Tantayanon⁽²⁾

⁽¹⁾Program of Petrochemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

⁽²⁾Functional Polymer Laboratory, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.

⁽³⁾National Metal and Materials Technology Center, Klong Luang, Pathumthani, 12120, Thailand.

Abstract: The effect of blend ratio and dynamic vulcanization using sulfur, MA/DCP, mixed system on dynamic mechanical properties of RTR/HDPE blends were investigated. Impact strength increases with increasing RTR loading up to 50 pbw. Sulfur and mixed system proved to be most suitable for dynamic curing which showed highest in impact strength and tensile strength at 50:50 (RTR:HDPE). The phase structure of the thermoplastic elastomer at composition of RTR:HDPE at 50:50 ratio was assessed by differential scanning calorimetry (DSC) and scanning electron microscopy (SEM). Rheological behavior of the blends was also studied.

E0098-Preparation of PMN powder via rapid vibro-milling technique

A. Udornporm¹ and S. Ananta²

¹Department of Physics, Faculty of Science, Mahasarakham University, Mahasarakham, Thailand, au_wow@yahoo.com

²Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

Abstract: Perovskite powders of PMN have been prepared by a solid-state reaction via a rapid vibro-milling technique. Phase formation of the calcined powders has been investigated as a function of calcination conditions by TG-DTA and XRD techniques. Moreover, morphology and particle size evolution have been determined via SEM technique, respectively. It has been found that monophasic PMN powders were successfully obtained for calcination conditions of 800 °C/min for 1 h with heating/cooling rates of 20 °C/min. Higher temperature clearly favoured particle growth and the formation of large and hard agglomerates.

E0099-Wear Resistance of Silicon Carbide Nanofiber Reinforced Aluminium-12 wt% Silicon Composite Coating Prepared by Thermal Spraying

Arrak Klinbumrung^a, Sitthichai Wirojnupatump^b, Pisith Singjai^a and Sukanda Jiansirisomboon^a

^aDepartment of Physics, Faculty of Science, Chiang Mai University, Thailand, 50200

^bDepartment of Chemistry, Faculty of Science, Chiang Mai University, Thailand, 50200

e-mail address: arraklin@hotmail.com

Abstract: This research was aimed to investigate hardness and wear resistance of SiC nanofiber reinforced Al-12wt%Si coating prepared by thermal spraying technique. The SiC nanofiber was produced by current heating technique [1]. The SiC nanofiber was mixed into Al-12wt%Si powders at 4, 8, 12 and 16wt%. The results showed that the hardness of the coating containing 8 wt% SiC nanofiber was highest and higher than that of the unreinforced by 74.8 %. The coating containing 12wt% SiC nanofiber had highest wear resistance with a decrease of wear rate at approximately 52 percent compared to an unreinforced coating.

F0001-ANALYSIS OF OFFSET PRINT QUALITIES BY USING SUNFLOWER OIL-BASED INKTanatorn Tongsumrit¹, Phongyut Juntong and Suchapa Netpradit*

Department of Printing Technology, School of Industrial Education

King Monkut's University of Technology Thonburi, Bangkok, Thailand

E-mail address: tanatorn.ton@kmutt.ac.th, phongyut.jun@kmutt.ac.th and suchapa.net@kmutt.ac.th

Abstract: The sunflower oil-based ink was produced to analyze the print qualities and compare with the mineral oil-based ink from the petroleum distillation. In this study, both sunflower oil-based ink and mineral oil-based ink were produced with the same offset ink formula, but difference in oil type for varnish mixing and ink viscosity improvement. Both inks were then used to print on gloss-art paper by offset printing system in the same condition. The print qualities were analyzed, showing that the tone reproduction was similar, but the sunflower oil-based ink had more advantage in gloss, ink trapping, color gamut and color saturation. However, its disadvantage was slow drying due to the larger molecular size. Therefore, the sunflower oil, which is produced in Thailand and non-toxic, should be developed to substitute the mineral oil in the production of offset printing ink for food package.

F0002-Effect of temperature on minimally processed of carrot, tomato, red cabbage and head lettuce during storage

Duangjai Noiwan, Nutakamol Triboon and Sompoch Gomolmanee

Department of Postharvest Technology, Faculty of Engineering and Agro-industry, Maejo University, Chiang Mai, Thailand

E-mail address: sompochg@mju.ac.th

Abstract: The carrot, tomato, red cabbage and head lettuce were sliced or shred, packed on trays and wrapped with PVC film. They were stored at 5, 10, 15 or 25°C. It was found that at 5°C the changed in weight loss, color ($L^* a^* b^*$ and $\sqrt{a^{*2} + b^{*2}}$), carbon dioxide and oxygen were minimized. The ethylene production of carrot and tomato could determine. While head lettuce and red cabbage could not determine. The storage life of carrot, tomato, red cabbage and head lettuce at 5°C were 14, 17, 17 and 25 days respectively.

F0003-MOISTURE DESORPTION ISOTHERM OF FOI TONG

Panuwat Suppakul

Department of Packaging Technology, Faculty of Agro-Industry,

Kasetsart University, Bangkok, Thailand

E-mail address: fagipasa@ku.ac.th

Abstract: Moisture desorption isotherm of Foi Tong was determined at 29 °C. The equilibrium moisture contents at different water activity values were used to fit different sorption isotherm models including the GAB, Smith and Lewicki models. The ranges of water activity for the different sorption isotherm models were reported. The Lewicki model was found to be the better-fitted model for Foi Tong.

F0004-UTILIZATION TREND OF EPOXIDIZED SUNFLOWER SEED OIL FOR BIODEGRADABLE LUBRICANTPairote Klinpituksa¹, Nutchalee Khawnol² and Prawit Kongjan¹

^{1,2} Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani, 94000 Thailand e-mail address: kpairote@bunaga.psu.ac.th

Abstract: The objective of this research was aimed at investigating the utilization trend of epoxidized sunflower seed oil for biodegradable lubricant product. The epoxidation reaction of sunflower seed oil with performic acid generated *in situ* from formic acid and hydrogen peroxide was studied at 50, 60, 70 and 80 °C for 10 hrs. It was found that the level of epoxidation increased with the increasing of temperature at the first hour of reaction. From kinetic and thermodynamic parameters studies, the rate of reaction constant of $406.21 \times 10^{-4} \text{ l mol}^{-1} \text{ s}^{-1}$, activation energy (E_a) of $41003 \text{ kcal mol}^{-1}$, enthalpy (ΔH) of $-55.52 \text{ kcal mol}^{-1}$, entropy (ΔS) of $0.021 \text{ kcal mol}^{-1} \text{ K}^{-1}$ and free energy (ΔF) of $-56.150 \text{ kcal mol}^{-1}$ were found. The lubricant properties of sunflower seed oil (SSO) and epoxidized sunflower seed oil (ESSO) were investigated. The result showed that the color of ESSO was slightly changed compared to SSO. The specific gravity and viscosity increased with the increasing of epoxidation level. In addition, the flash point of ESSO was decreased while its pour point increased and became constant at -15°C with the increasing of the epoxidation level. The lubricant property of the epoxidized sunflower seed oil is likely to be superior to sunflower seed oil and could be used as a lubricant.

F0005-Combining Yeasts and Chitosan Treatment to Reduce Anthracnose Fruit Rot of MangoesParinya Chantarasri¹, Uraporn Sardud² and Vicha Sardud³¹ Institute for Science and Technology Research and Development, Chiang Mai University² Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai³ Department of Plant Pathology, Faculty of Agriculture, Chiang Mai University, Chiang Mai, ThailandE-mail address: sdxxo003@chiangmai.ac.th

Abstract: 'Choke Anan' and 'Nam Doe Mai' mangoes were wounded and treated with one of two yeast antagonists (*Candida* sp. strain NS5 and NS9) for 12 h before soaking with chitosan (0.25 and 0.50 %) and followed by inoculation with the anthracnose pathogen *Colletotrichum gloeosporioides*. Treated fruits were stored at 25°C for 7 days. The results revealed

that anthracnose lesions were decreased on fruit where wounds had been allowed to colonized by the antagonistic yeasts before inoculation with the pathogen. The combination of antagonistic yeast with chitosan was more effective in the reduction of anthracnose incidence than yeast or chitosan alone. *Candida* sp. NS9 in combination with 0.5% chitosan was the most effective in controlling anthracnose fruit rot in 'Choke Anan' and 'Nam Doc Mai' mangoes which the average percentage of disease incidences were 6.7 and 13.3 %, respectively, compared with 93.3 and 100 % infection in the control fruit. As for hot water (55 °C for 5 min) treated fruits, the disease incidences were 73.3 and 86.7%, respectively.

F0006-STUDY AND COLLECTION OF NUM PU FORMULAR FOR PRODUCT DEVELOPMENT

Nitaya Boomtim¹, Sompop Boontim² and Saisamorn Lumyong³

¹Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai, Thailand

²Department of Anatomy, Faculty of Medicine, Chiang Mai University, Chiang Mai University, Chiang Mai, Thailand

³Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

E-mail address: sdonbntm@chiangmai.ac.th

Abstract: Fifteen samples of num pu from different local markets were used for sensory evaluation. The evaluation was done with 20 panelists using 9-point Hedonic scale. The result indicated that num pu from Mae vang District, Chiang Mai had the best acceptance score. The best formular consisted of rice-field-crabs, lemon grass and curcumin. The amount of *Escherichia coli* in num pu was less than 3 MPN/g but yeast, molds and *Salmonella* sp. were not appeared. Num pu contained 31.67% protein, 2.54% lipid, 12.68% carbohydrate, 22.52% ash and 1.70% fiber. The amount of iron, sodium, calcium and zinc in num pu were 0.1%, 3.25%, 0.87% and 0.01%, respectively. The amount of vitamin A and vitamin B1 were 35.53 µg and 0.04 mg were found but vitamin C was absented in 100 grams of num pu. The result of amino acid analysis showed that at least 17 kinds of amino acids were found. Glutamic acid was obtained as the highest amount follow by glycine and alanine. Many kinds of organic acids such as acetic acid, citric acid, lactic acid, succinic acid and pyroglutamic acid were found in num pu.

F0007-COMPARISON OF VOLATILE AROMA COMPOUNDS OF FRESH GUAVA, GUAVA JUICE AND PICKLED GUAVA

Sasitorn Khamlhek and Griangsak Chairote^{1*}

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai

Abstract: Comparison of volatile aroma compounds from fresh guava, guava juice and two different recipe of pickled guava were done. The compounds were obtained by distillation under reduced pressure and solvent extraction followed by concentration by distilling out the solvent and sweeping with nitrogen gas. The concentrated aroma solutions were used for identification using gas chromatography-mass spectrometry. Identified compounds in fresh guava were 4-Pentenal, *trans*-2-Hexenal, *cis*-3-Hexenal, Nerolidol, β-Selinene, and α-Copaene whereas the same compounds with different amount were also found in guava juice. The two recipes of pickled guava gave different result from fresh guava and guava juice. The recipe number one containing more salt with the presence of citric acid and vinegar differed from recipe number two. It still had some compounds formerly presented in fresh guava and guava juice with the addition of α-Copaene, Isobutanol, β-Caryophyllene and Globulol while we found less compounds in the recipe number two.

F0008-Biodiesel : Preparation and Properties of Some Esters from Vegetable Oil

Wae-asae Wachamad^{1*}, Orathai Lalee² and Pattharavot Ruangrak³

^{1,2,3}Chemistry Division, Department of Science, Faculty of Science and Technology, Prince of Songkla University, Pattani, 94000

Abstract: Esters from coconut oil or palm oil was prepared by reactions between fatty acid and alcohol using sulfuric acid as a catalyst. The experiment started from refluxing the edible oil with 7 M sodium hydroxide at the ratio of 5:6 v/v and the temperature of 75 °C for 9 hours to form soap. Fatty acid was then prepared by adding 4 M hydrochloric acid to soap. It was further reacted with either methanol, ethanol or isopropanol in the present of sulfuric acid for 8 hours to obtain esters with the percentage yield of more than 80 %. *t*-Butyl ester, however, was prepared by a different route. *t*-Butanol was reacted with fatty acid chloride to give *t*-butyl ester. *t*-Butyl ester prepared has the characteristics of having low ash and low viscosity. It has a boiling point in the range of 160-210 °C which is lower than the other esters and a specific gravity of 0.8593 Kg/L which is comparable to that of methyl ester. It is expected that *t*-butyl ester prepared from palm oil is able to use for better diesel oil.

F0009-Effect of chitosan and sodium bicarbonate/chitosan coating on quality and shelf-life of sapodilla fruits

Pasuree Littilert and Warin Pimpa

Department of Agro-Industry, Faculty of Agriculture Bioresource and Environment, Naresuan University, Phitsanulok, 65000

Tel. 055-261000-4 Fax. 055-261987 e-mail: g46060158@nu.ac.th

Abstract: Sapodilla fruits have a delicious and very sweet taste, which can be cultivated in all part of Thailand. After harvesting, the mature sapodilla fruits are overripe about 2-3 days at room temperature by a respiration process. Thus, the objective of this research was to extend the storage life of sapodilla fruits by retarding the ripening process and inhibiting the growth of the spoilage-causing microorganisms through chitosan and sodium bicarbonate/chitosan coating. The effect of chitosan and sodium bicarbonate/chitosan coating on storage quality of mature sapodilla fruits at 15°C and 50% RH was

evaluated. The results showed that at 12 days of storage, no decay incidence was observed on both coated fruits. They had significantly better quality as evaluated by general appearance, titrable acid content and firmness compared to noncoated-control fruits. Thereafter, sodium bicarbonate/chitosan coated fruits were slower decay than chitosan coated fruits.

F0010-Drying processing of sapodilla

Saranya Sribariwut and Warin Pimpa

Department of Agro-Industry, Faculty of Agriculture Bioresource and Environment, Naresuan University, Phitsanulok, 65000

e-mail: g46060160@nu.ac.th

Abstract: The drying characteristics of mature sapodilla, a tropical fruit crop, were studied as a prelude to its processing into value added products. Fruits were cut in size of 3, 5 and 7 mm thick-slices and dried at temperature of 60 and 70°C in convection air oven. Drying of sapodilla was strongly dependent on the temperature of drying and the sample size. With increase in temperature and decrease in sample size, drying was faster. Samples dried at 60°C were better than that at 70°C with regard to appearance and aroma of the fruits.

F0011-Maillard reaction products from porcine plasma protein-sugar model system: Characteristics and antioxidative activity

Wittayachai Lertittikul,¹ Soottawat Benjakul,^{1*} and Friedrich Bauer²

¹Department of Food Technology, Faculty of Agro-Industry

Prince of Songkla University, Hat Yai, Songkhla, Thailand, 90112

² Institute of Meat Hygiene, Meat Technology and Food science

University of Veterinary Medicine, Vienna, Austria

*Corresponding author: soottawat.b@psu.ac.th Phone: 074-286334 Fax: 074-212889

Abstract: Maillard reaction products (MRPs) were prepared by heating 2% porcine plasma protein (PPP) and reducing sugars (glucose, fructose and galactose) at a level of 1 or 2% at 100°C up to 5 h without pH control. Browning and intermediate products as monitored by absorbance at 420 nm and absorbance at 294 nm increased as heating time increased ($P < 0.05$). However, fluorescence (Ex 347 and Em 415 nm) sharply increased within 1 h and decreased subsequently when heating time increased. Increase in browning and formation of intermediate products was observed with a concomitant decrease in free amino groups. Among sugars and concentrations used, galactose at 2% rendered the highest browning and intermediate products. MRPs derived from galactose, especially at a level of 2% possessed greater reducing power and DPPH radical scavenging activity than those prepared from fructose and glucose

F0012-Effect of phosphate compounds on setting and gelling properties of surimi from bigeye snapper (*Priacanthus tayenus*) and threadfin bream (*Nemipterus bleekeri*)

Orawan Julavittayanukul¹, Soottawat Benjakul¹, Wonnop Visessanguan^{2*}

¹Department of Food Technology, Faculty of Agro-Industry, Prince of Songkla University, Hat Yai, 90112, Thailand.

²National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, 113 Phaholyothin Rd., Klong 1, Klong Luang, Pathumthani, 12120, Thailand.

*CORRESPONDING AUTHOR: soottawat.b@psu.ac.th, PHONE: 074-286-334

FAX: 074-212-889

Abstract: The properties of surimi gel from bigeye snapper and threadfin bream added with various phosphate compounds (Sodium Pyrophosphate; PP, Sodium Tripolyphosphate; TPP and Sodium Hexametaphosphate; HMP) at different concentrations (0, 0.05, 0.1, 0.3 and 0.5 %) and heated under various conditions were studied. Kamaboko and directly heated gel from bigeye snapper and threadfin bream surimi added with 0.05% PP had the increase in breaking force by 17.35%, 7.70% and 6.39%, 6.45%, respectively. Addition of TPP and HMP at the same concentration had no effect and exhibited the detrimental effect on breaking force, respectively. However, the breaking force decreased ($P < 0.05$) with the coincidental increased expressible moisture and whiteness ($P < 0.05$) when concentration of phosphate compounds added increased.

F0013-FRACTIONATION AND CHARACTERIZATION OF CYSTEINE PROTEINASE INHIBITOR FROM CHICKEN PLASMA

SAROAT RAWDKUEN¹, SOOTTAWAT BENJAKUL^{1*}, WONNOP VISESSANGUAN², AND TYRE C. LANIER³

¹DEPARTMENT OF FOOD TECHNOLOGY, FACULTY OF AGRO-INDUSTRY, PRINCE OF SONGKLA UNIVERSITY, HAT YAI, 90112, THAILAND.

²NATIONAL CENTER FOR GENETIC ENGINEERING AND BIOTECHNOLOGY, NATIONAL SCIENCE AND TECHNOLOGY DEVELOPMENT AGENCY, 113 PHAHOLYOTHIN RD.; KLONG 1, KLONG LUANG, PATHUMTHANI, 12120, THAILAND.

³DEPARTMENT OF FOOD SCIENCE, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NC 27695-7624, USA.

*CORRESPONDING AUTHOR: E-MAIL: SOOTTAWAT.B@PSU.AC.TH TEL: 66-7428-6334 FAX: 66-7421-2889

Abstract: CYSTEINE PROTEINASE INHIBITOR (CPI) WAS FRACTIONATED FROM CHICKEN PLASMA USING AMMONIUM SULFATE (AS) OR POLYETHYLENE GLYCOL (PEG-4000). ADDITION OF PEG AT A LEVEL OF 40% BASED ON THE ORIGINAL VOLUME OF PLASMA PROTEIN EXHIBITED THE MOST EFFECTIVE METHOD TO FRACTIONATE CPI WITH A HIGH YIELD AND PURITY. CPI

ENRICHED FRACTION CONSISTED OF 46 kDa CPI CONTAINING INTRAMOLECULAR DISULFIDE BOND. CPI ENRICHED FRACTION WAS COLORLESS AND HAD NO ABSORBANCE IN THE RANGE OF 700 TO 360 NM. CPI IN THE FRACTION WAS STABLE AT 90°C UP TO 60 MIN. NaCl AT THE CONCENTRATION OF 0-3.0% DID NOT AFFECT THE INHIBITORY ACTIVITY OF CPI ENRICHED FRACTION. THE INHIBITORY ACTIVITY OF FRACTION WAS STABLE AT pH 8.0 AND HAD THE MINIMUM ACTIVITY AT pH 5-6.

F0014-PHYSICO-CHEMICAL PROPERTIES, GEL-FORMING ABILITY AND MYOGLOBIN CONTENT OF SARDINE AND MACKEREL SURIMI PRODUCED BY CONVENTIONAL METHOD AND ALKALINE SOLUBILIZATION PROCESS

MANAT CHAIJAN¹, SODHAWAL BENJAKUL^{1*}, WONGNOP VISESSANG² AND CAMERON FAUSTMAN³

¹DEPARTMENT OF FOOD TECHNOLOGY, FACULTY OF AGRO-INDUSTRY, PRINCE OF SONGKLA UNIVERSITY, HAT YAI, SONGKHLA, 90112, THAILAND

²NATIONAL CENTER FOR GENETIC ENGINEERING AND BIOTECHNOLOGY, NATIONAL SCIENCE AND TECHNOLOGY DEVELOPMENT AGENCY, 113 PABOYAYOTHIN RD., KLONG 1, KLONG 1 LANG, PATHUMTHANI, 12120, THAILAND

³DEPARTMENT OF ANIMAL SCIENCE, UNIVERSITY OF CONNECTICUT, 3636 HORSEBARN ROAD EXT., STORRS, CT 06269-4040, USA

*CORRESPONDING AUTHOR: sodhawal.b@psu.ac.th, PHONE: 074-286-334, FAX: 074-212-889

Abstract: Characteristics and gel properties of sardine and mackerel surimi produced by conventionally washed process were compared with those of surimi prepared by alkaline solubilizing process. Conventional surimi, washed with distilled water or NaCl solution, showed the greater breaking force and deformation than that from alkaline process ($p < 0.05$). Myosin from both species underwent denaturation after alkaline treatment as evidenced by the decrease in Ca^{2+} -ATPase activity (ps: 0.05) with a concomitant increase in the surface hydrophobicity. However, no difference in myosin heavy chain (MHC) band intensity between surimi produced with both processes was observed. The higher expressible moisture was found in the gels of surimi prepared by alkaline process, compared with those produced by conventional process. For sardine surimi gel, the higher whiteness with the lower myoglobin content was found in sample prepared by alkaline process but the highest whiteness was found in the gel of mackerel surimi washed with distilled water.

F0016-QUALITY CHANGES OF OKRA *Abelmoschus esculentus* (L.) Moench PODS STORED IN VARIOUS PLASTIC FILM BAGS

YAWADEE SRIMAKE¹ and PANPIM VONKHORPORN²

Department of Botany, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

E-mail addresses: g4737389@student.mahidol.ac.th¹, ajarnpanpim@yahoo.com²

Abstract: Postharvest quality changes in pods of 2 okra lines, 'Hit 9701' and a local line, were studied. Pods were placed in 4 different kinds of plastic bags, namely, high-density polyethylene (HDPE), low-density polyethylene (LDPE), OPP20 DL L-LDPE50 (OPP), NY15 PE20 L-LDPE75 (NY), and kept at 2 different temperatures: 10 and 14°C. Appropriate storage period and temperature of pods kept in various plastic bags were found to be: HDPE, 12 days, at 10 and 14°C, LDPE, 12 days, at 10°C, and OPP, 9 days, at 10°C. All pods kept in plastic bags exhibited significantly less change in their appearance, size, weight, and water content than those of the control. Vitamin C content decreased significantly in 3 days, with that in bagged pods decreased at a slower rate. Carbon dioxide content in the bags increased throughout the storage period, with that in HDPE bags having the least amount and the lowest increase rate. No significant differences in pod firmness and contents of total soluble solids, fiber, and pectin were observed.

F0017-SIMPLE SEPARATION OF PAPAIN FROM FRESH FRUIT SKINS OF *CARICA PAPAYA* BY PRECIPITATION

Itsara Khandikaew^{1*}, Kwanjai Kanokmedhakul² and Jatuporn Phaopongthai¹

¹Chemical Research Institute, Rajamangala Institute of Technology, Pathumthani, Thailand,

²Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand,

E-mail address: itsara@rit.ac.th

Abstract: Papain provides many applications and has high economic value; therefore, it is interesting to separate papain from papaya fruit skins. In this research, papain was separated from the fruit skins by extracting with acetic-acetate buffer pH 5.0 followed by precipitating with cold solvents. In the separation step, cold methanol and ethanol were more suitable than cold acetone. Both methanol and ethanol afforded the good yields of the papain precipitates with the ratio of filtrate buffer and alcohol at 1.6 to 1:10. Ethanol afforded higher yields than methanol.

F0018-EFFECTS OF CROCODILE BLOOD CONSUMPTION ON BIOCHEMICAL CHANGES IN RATS

Win Chaeychomsri¹, Jindawan Siruntawinetti¹, Anuttara Pokharatsiri¹, Boongee Vajarasathira¹, Noknong Chitchuankij¹ and Yosapong Temsiripong^{2*}

¹Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand

²R & D Laboratory, Sriracha Crocodile Farm Co., Ltd., Chonburi, Thailand

³Crocodile Management Association of Thailand (CMAT)

E-mail address: fsciwecc@ku.ac.th, fscijws@ku.ac.th and paramoeba2@hotmail.com

Abstract: The safety for consuming crocodile blood as traditional medicine has not been scientifically reported. To evaluate the effect of crocodile blood consumption on biochemical values, both sexes of Wistar rats were divided in 5 groups. The

crocodile blood, either in fresh or in freeze dry form, was orally administered for 7 weeks. The rat sera were collected before having the blood and 12 weeks after feeding. The biochemical values including alkaline phosphatase (ALP), aspartate transaminase (AST), alanine transaminase (ALT), blood glucose, blood urea nitrogen (BUN) and albumin were not significantly different among experimental groups throughout the study time. These results indicated no adverse effects of crocodile blood on liver and kidney functions. However, chronic effects of crocodile blood should be taken into account prior to long-term usage.

F0019-CROCODILE BLOOD AS FOOD SUPPLEMENT: ITS EFFECTS ON HEMATOLOGICAL VALUES IN WISTAR RATS

Jindawan Siruntawin¹, Win Chaeychomsri¹, Anuttara Pokharatsiri¹, Boongee Vajarasathira¹, Noknong Chitchuankij¹ and Yosapong Tamsiripong^{2,3}

¹Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand

²R & D Laboratory, Sriracha Crocodile Farm Co., Ltd., Chonburi, Thailand

³Crocodile Management Association of Thailand (CMAT)

E-mail address: fscjws@ku.ac.th, fscwcc@ku.ac.th and paramecha2@hotmail.com

Abstract: Siamese crocodile, *Crocodylus siamensis*, is a medicinal animal that has been reported for its blood anti-microbial activity. Effects of crocodile blood as food supplement on hematological values were determined in Wistar rats. Groups of five rats of each sex were orally administered (300 µl of fresh blood or 50 mg of freeze-dried blood/animal) for 45 consecutive days. The blood ingestion had no effect on rat behavior and survival. After taking the crocodile blood 2, 4, 8, and 12 weeks, the rat blood was collected from tail-vein for hematological investigations. The hematological values did not reveal differences between the treated and the control groups. The significantly lower hematocrit values were found in females treated with freeze-dried blood. However, these changes were within normal range. These data suggest the safety of crocodile blood as food supplement in animal.

F0020-EXTRACTION OF VOLATILE OIL FROM *Jasminum sambac*

Woraluck Kaewyoo¹ and Sutatip Bhamaraprayati²

¹Dept. of Plant Science, Faculty of Science, Mahidol University, Bangkok, Thailand

²Dept. of Graduate Studies, Faculty of Medicine, Thammasat University, Pathumthani, Thailand

E-mail address: sutatip_b@yahoo.com

Abstract: This investigation compared the quality and main components of volatile oil from *J. sambac* obtained from different extraction method. *J. sambac* flowers were processed through enfleurage extraction of volatile oil using whale's fat as absorbent eluted out using EtOH. Gas chromatography was performed on the alcohol sample from enfleurage and hexane extract using Omegawax column between 200-260 Celsius degree utilization He as a carrier gas. Peaks of benzyl alcohol, benzyl acetate and linalool, three major components of *J. sambac* oil, were quantified. All three peaks showed up in hexane sample but only benzyl benzoate and linalool showed up in enfleurage sample with linalool as a minor peak. It is notable that enfleurage sample contains more base notes volatile oil. Assessment by 25 volunteers all identified the jasmine alcohol absolute and its hexane partition as more closely resemble fresh Thai jasmine fragrance.

F0021-DEVELOPMENT OF CITRUS FRUITS OIL EXTRACTION PROCESS BY USING STEAM DISTILLATION

Suchada Chaisawadi^{1*}, Darawan Thongbutre¹, Sorasak Kulamai¹ and Suwaree Sompong¹

¹Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: darawan@pdti.kmutt.ac.th

Abstract: Development of citrus oil extraction process in commercial scale was proposed. The main objective in this study was process development in oil extraction that caused high productivity. The waste utilization process that cause high production have been developed. The developed oil extraction process in this study consists of peeling, pressing the peel, steam distillation for essential oil, grinding the peel and drying and aromatherapeutic products development. This developed process showed the zero discharge by the end of the process. This citrus oil extraction process has been set up and implemented at Industrial Park, KMUTT. The oil extraction processes in this study, were compared between the in house-developed steam distillation unit and Rotary Evaporator. The citrus fruits in this study were kaffir lime and orange. The in house-developed steam distillation unit showed higher productivity of kaffir lime and orange essential oil (65% and 31%, respectively) than Rotary Evaporator. The optimized condition on essential oil extraction process by using Rotary Evaporator on kaffir lime and orange are in further studied. The high productivity and low environmental impact of this developed process were conclude. The preliminary study on financial analysis showed feasible on commercial production.

F0022-CLEAN PRODUCTION ON PILOT SCALE FREEZE DRIED ORANGE POWDER PROCESSING

Suchada Chaisawadi^{1*}, Waraporn Methawiriyasilp¹, Sorasak Kulamai¹, Darawan Thongbutre¹ and Suwaree Sompong¹

¹Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: suchada@pdti.kmutt.ac.th

Abstract: Development of pilot scale production on freeze dried orange powder processing to meet the zero discharge criteria were proposed. The main objective in this study was waste utilization on freeze dried orange powder processing that

caused high productivity. Addressing the clean production system can improve environmental protection, increase productivity and decrease operating cost. The clean production using clean technology on pilot scale freeze dried orange powder production have been designed. The clean production on freeze dried orange powder processing in this study consists of freeze dried orange powder process, orange seed processing process, pulp and peel processing process and orange essential oil extraction process. The designed production process had considered the wastes from orange powder processing, which are the pulps, peels and the filtered off seeds. The waste utilization process has been divided to produce three processes. The first one is orange seed processing process, this has been done by grinding the seeds, followed by tray drying and can be used as biorepellent. The second process is orange peel and pulp processing by using some part of peels and pulps to produce jam. The third process is orange peel essential oil extraction process followed by aromatherapeutic products development. This designed process showed the zero discharge by the end of the process. The designed clean production on freeze dried orange powder processing, has been implemented by Freeze dried Pilot Plant at Industrial Park, KMUTT. The results showed high productivity and low environmental impact. The preliminary study on financial analysis showed feasible on commercial production.

F0023-Isozyme variation in *Elaeagnus latifolia* Linn. in the upper north of Thailand.

Pratoomporn Yingthongchai¹ and Pornrat Sirikhum²

¹ Institute for Science and Technology, Research and Development, Chiang Mai University, Chiang Mai, Thailand,

² Department of Horticulture, Faculty of Agriculture, Chiang Mai University, Chiang Mai, Thailand,

E-mail address : sdopkntpt@chiangmai.ac.th

Abstract : *Elaeagnus latifolia* Linn., an endemic native fruit plant distributed in the upper north of Thailand, were studied. Eighty samples were randomly selected for isozyme patterns analysis using PAGE system. Seven enzyme systems: diaphorase (DIA) glutamate dehydrogenase (GLD) malate dehydrogenase (MDH) malic enzyme (ME) peroxidase (POX) shikimate dehydrogenase (SKD) superoxide dismutase (SOD) were applied in the banding patterns analysis and polymorphism construction. Results showed that frequencies of banding types of each enzyme were polymorphic and were different among some populations. Coefficients of genetic similarity were used to estimate the degree of relationship which indicated that *Elaeagnus latifolia* Linn. populations have considerable genetic variations not only within but also between populations

F0024-MORPHOLOGICAL CHARACTERISTIC OF *IN VITRO* GINGER PLANTLET CULTURED UNDER DIFFERENT ENVIRONMENTAL CONDITIONS

Cattarin Theerawitaya¹, Chalermpol Kirdmancee^{2*}, Kanyaratt Supaibulwatana^{1*} and Morakot Tontichareon²

¹Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok, Thailand, 10400

²National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, Science Park, Bangkok, Thailand, 12120

E-mail address: ck@biotec.or.th and seks@mahidol.ac.th

Abstract: Ginger (*Zingiber officinale* Rose.) is one of the important herbs that commercially cultivated throughout Southeast Asia, including Thailand. Nevertheless, the productivity is consecutively decreased due to the severity of disease susceptibility and further affected to the lack of aseptic stock plant. Plant tissue culture has been applied as an alternative strategy for high multiplication rate with disease-free property. Since it has been well known that the growth and development of *in vitro*-derived plantlet is strongly depended on *in vitro* environmental conditions. In this present study, investigation of morphological development of ginger plantlet was observed after various factors such as plant bioregulator i.e. cytokinin concentration (6-Benzyladenine, BA and 6-(γ,γ -Dimethylallylamino) purine, 2iP), temperature and Photosynthetic Photon Flux (PPF) were applied to the cultures. The highest numbers of shoot (7.8 shoot/clump) was obtained on Murashige & Skoog (MS) medium containing 2% (w/v) sucrose and 8 mg L⁻¹ BA. It was found that these shoots produced high dry mass. When incubated the cultures under low temperature (15 or 20 °C) and dark condition (0 μ mol m⁻²s⁻¹), the shoots performed bigger root although lower shoot numbers were obtained. Sucrose, glucose and fructose derived from this particular root part were two-time higher than shoots. It was obviously demonstrated that different culture conditions affected to different morphological development of *in vitro* ginger plantlets. Plantlets with vigorous root may possibly give a higher percentage of survival after transfer to *ex vitro*. Conditions used for *in vitro* culture not only effect to shoot multiplication, but the development also varies and concerns on plant quality.

F0026-DETERMINATION OF SOME ALKALI AND ALKALINE EARTH METALS IN NATURAL SALTS BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY

Teraboon Pojanagaroon¹, Saisunee Liawruangrath¹, Prasert Prasertkithwattana¹ and Vichitr Rattanaphani²

¹Water Research Centre (WRC), Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

²School of Chemistry, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima, Thailand

E-mail address : scislwrn@chiangmai.ac.th

Abstract: An inductively coupled plasma atomic emission (ICP-AES) procedure has been carried out for the quantitation of some alkali and alkaline earth metals namely Na, Ca, Mg, K, Ba and Sr in natural salt samples available in Thailand before and after purification. Optimum conditions for these metal determinations were investigated. The optimum viewing heights for both monochromators (A and B) were 12-16 mm, while the optimum flow-rates in the nebulizer were 0.6-1.0 L.min⁻¹. Maximum emission measurements were made at 588.995, 393.366, 280.270, 766.490, 455.403 and 407.771 nm for Na, Ca,

Mg, K, Ba and Sr respectively. Linear calibration graph over the range 2-100 mg.L⁻¹ of each metal was established. The method was found to be reproducible, accurate, rapid and sensitive. The RSD values were less than 1% and the detection limits were 0.72, 0.84, 1.80, 1.02, 0.06 and 0.39 mg.L⁻¹ respectively.

F0027-Scoville Heat Units Determination from Chili

Chongrak Kaewprasit and Nipapan Kumngan

Chemistry, Department of Science, Faculty of Liberal Arts and Science, Kasetsart University, Kamphaeng Saen, Nakhon Pathom, Thailand, E-mail address: rdcrk@ku.ac.th

Abstract: Scoville Heat Units, SHU was investigated from Thai chili : Chinda, Chifa and Keenu by extraction of capsaicin in acetone for 22 hours. Capsaicin quantity was analysed by HPLC Walter 600E, YMC-Pack ODS-A, S-5 12 µm, 12 nm, 50 x 4.6mm I.D. column, UV detector 280 nm and mobile phase, MeOH : Ultrapure water 75 : 25 with flow rate 1.0 mL min⁻¹. It was found that SHU of Chinda is 28,050 – 40,200 SHU, Keenu is 19,500 – 28,050 SHU and Chifa is 7,500 – 16,500 SHU. Percentage of recovery for this experiment is 81.13.

F0028-EFFICACY OF OZONATED WATER AGAINST SOME MICROORGANISMS RELATED WITH BLACK TIGER PRAWN

Jirapa Setjintanin, Romane Sa-nguandeekul and Sumate Tantratian

Department of Food Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand 10330

Abstract: The ozonated water with total ozone concentration (TOC) 217.6-1132.27 mg/l or residual ozone concentration (ROC) less than 0.1-0.25 mg/l were evaluated against total bacteria, psychrotrophic bacteria, and coliform which were bacterial flora in black tiger prawn and pure culture of *E. coli*, *V. parahaemolyticus* and *S. anatum*. For antimicrobial effect, it was found that ozonated water with concentration of 548.53 mg/l TOC (0.13 mg/l ROC) was the minimum concentration for destroying 5 log cycle of all 6 tested bacteria after they were contacted for 1 minute. The reduction pattern of all tested bacteria after exposed to ozone was the same and depended on the concentration of ozone.

F0029-ISOLATION AND CHARACTERISATION OF ACID AND PEPSIN-SOLUBILISED COLLAGEN FROM BROWNSTRIPE RED SNAPPER (*LUTJANUS VITTA*) SKIN

Akkasit Jongjareonrak¹, Soottawat Benjakul^{1*}, Wonnop Visessanguan², Munehiko Tanaka³

¹Department of Food Technology, Faculty of Agro-Industry, Prince of Songkla University, Hat Yai, Songkhla, 90112, Thailand.

²National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, 113 Paholayothin Rd., Klong 1, Klong Luang, Pathumthani, 12120, Thailand.

³Department of Food Science and Technology, Tokyo University of Marine Science and Technology, Kanan4, Minato-KU, Tokyo, 108-8477, Japan.

Abstract: Acid-solubilised collagen (ASC) and pepsin-solubilised collagen (PSC) were successfully extracted from the skin of brownstripe red snapper (*Lutjanus vitta*) with the yields of 9% and 4.7% on the basis of wet weight, respectively. Both ASC and PSC comprised two different α chains (α1 and α2), and were characterised to be type I with no disulfide bond. PSC contained a lower content of high molecular weight cross-links, compared with ASC. Peptide maps of ASC and PSC hydrolysed by V8 protease and lysyl endopeptidase showed some differences in peptide patterns between two fractions and were totally different from those of calf skin collagen type I, suggesting the differences in amino acid sequences and collagen conformation. Maximum solubility in 0.5 M acetic acid was observed at pH 3 and 4 for ASC and PSC, respectively. Maximum temperature (T_{max}) of both collagen fractions were similar and shifted to a lower value in the presence of acetic acid, suggesting some changes in the collagen structure caused by acid induction.

F0030-A PRODUCTION OF EDIBLE FILM FROM ISOLATED RED KIDNEY BEAN PROTEIN

Winai Oungpipat*, Santad Sriyota, Prapitsri Borisoodtikoon

Division of Analytical Chemistry, Department of Chemical Technology, Rajamangala Institute of Technology, Bangkok Technical Campus, 2 Nang Linchi Road, Sathorn, Bangkok, 10120 Thailand.

Email:owin@access.rit.ac.th

Abstract: A production of edible film from isolated red kidney bean protein was described. Separation of protein from red kidney bean was carried out by using 0.1 N sodium carbonate. Precipitation of separated protein was achieved by adjusted pH with 0.1 N hydrochloric acid. The efficiency of protein separation from red kidney bean and the efficiency of protein precipitation from solution were found to be 96.28% and 71.02%, respectively. The extracted protein was subsequently used for film preparation. Mixture of extracted protein and carbohydrate (cassava starch) with the ratio of 1:0.15 was mixed with plasticizer (sorbitol) at a fixed concentration of 15%. Thin brown film was ultimately obtained. The properties of the resulted film i.e. moisture, film thickness, water vapor transmission rate, tensile strength and elongation and water solubility index were studied. The film was successfully applied to use as a wrapping material for some typical Thai sweetmeats such as kalamae and kuaykuan.

F0031-Effects of Herbal Feed Additive, Banana (*Musa sapientum* LINN O. Kutze.) in Native Crossbred Chicken Diets on Growth Performances and Caecal Coccidiosis Control.

ทัศนพงษ์ อธิสวดี¹, เปรมจิตร บุญสาย¹, ศรีน้อย ชุ่มคำ², บวรกร นพผล³

¹ วิทยาศาสตร์ศึกษา บัณฑิตวิทยาลัย มหาวิทยาลัยราชภัฏวไลยอลงกรณ์ ในพระบรมราชูปถัมภ์

² คณะเทคโนโลยีการเกษตร มหาวิทยาลัยราชภัฏวไลยอลงกรณ์ ในพระบรมราชูปถัมภ์

³ ภาควิชาสัตวแพทย์ สาธารณสุข คณะสัตวแพทย์ มหาวิทยาลัยขอนแก่น

Abstract The present experiment aimed at studying, effects of green banana as herbal feed additives at different concentrations in the native crossbred chicken diet on growth performance and caecal coccidiosis control. Day old chicks, a total of 315 were divided into 21 experimental units including 7 treatments- 3 replications in the CRD experiment. Two formulations of diets were provided for starting (0-6 weeks) and finishing (6-12 weeks) chickens. Basal diets were supplemented with green banana powder at 0, 2, 4, 6, 8 % compared with basal diets with chlortetracycline (CTC) at 0.01 % and tannic acid at 0.01%. Results were noted below. It was found that body weight gained of starting (0-6 weeks) chickens showed that chickens fed with diets containing green banana powder had highest weight gained comparing among green banana powder supplemented groups. The fed diets supplement with banana powder at 6% higher (461.44 g/h, $p>0.05$). During the finishing period (6-12 weeks), chickens fed with green banana powder 4% gained higher weight (734.44 g/h, $p<0.05$) than that of tannic acid treated and control groups. The figure was similar to that of CTC treated groups. During the starting (0-6 weeks) periods, green banana powder 6% treated groups had the best feed conversion ratio which was better than that of control (2.32 vs 2.66, $p<0.05$) and finishing 6-12 weeks. The feed conversion ratio of the banana powder 6% tandem to be heavier than those of the control (2.62 vs 2.69, $p<0.05$).

Considering the feed cost per 1 kg gained, there was a highly significant different ($p<0.01$) cost for starting (0-6 weeks) and finishing (6-12 weeks) periods. The 6% green banana powder supplemented group had a lowest production cost for both periods (15.33 baht/kg and 17.60 baht/kg, respectively). The effect of diets containing green banana powder on caecal coccidiosis control illustrated that at 2% and 6% green banana powder supplemented. Nevertheless, no significant difference was encountered. At the same time, tannic acid treated groups showed a remarkably lower lesion score (1.00).

Results from the workshop of green banana powder as feed additives on growth performances and caecal coccidiosis control among participants indicated that farmers gained better knowledge than they formerly do. Especially knowledge concerning native crossbred chicken productions, green banana powder preparations, feed formulations, addition of green banana powder in chicken diets, techniques and feeding exercises ($p<0.05$).

G0001-GEOCHEMISTRY OF SEDIMENTS ASSOCIATED WITH DINOSAUR DEPOSITS IN THAILAND

Benjavun Ratanasthien, Boontrika Srithai, Wutti Uttamo, Withaya Kandharosa, Sayan Chareontham, and Pantip Wongtui
 Department of Geological Sciences, faculty of Science, Chiang Mai university, Chiang Mai, Thailand 50200
 E-mail: scgli008@chiangmai.ac.th

Abstract: Soils and rocks associated with dinosaur deposits at Chiang Muan District Payao Province, and Phu Kum Khao, Sahusakhan District, Kalasin Province, were studied. It was found that they both are in Sao Khua Formation, Khorat Group. They consist similarly in physical properties, mineralogy and chemistry with limited differences. Major mineral is quartz range from 55.22-91.46 %, minor minerals are calcite 0-34.78 % illite 8.58-22.10% plagioclase 4.60-18.15% and montmorillonite 0.0-9.01 % and trace of hematite and kaolinite. The mineral acid extraction shows the concentration of elements accordingly. Apart from that, the soil from Chiang Muan District Payao Province shows more clays than that of the Sahusakhan soils. From petrographic and mineralogical studies include the volcanic ash in the sediments could indicated that during the fall of those dinosaur there was some volcanic eruption in the vicinity, resulted in deposition of volcanic ash in the basins. There is no evidence, however, that the sediments deposited in the basins and their possibly toxic was resulted from volcanic eruption and caused the death of dinosaur which deposited in Sao Khua Formation. It should have further intensive investigation for more details.

G0002-THE INTERPRETATION OF SEISMIC REAFACTION DATA USING GENATIC ALGORITHM BASED ON THREE PARALLEL AND SMOOTH LAYERS

Chaiwat Lersviriyantakul, Pattara Aiyarak, Warawutti Lohawijarn
 Department of Physics, Faculty of science, Prince of Songkla University, Songkhla 90112, Thailand;
 E-mail address: drk91110@yahoo.com

Abstract: The exploration of geophysics using seismic refraction technique is the method for surveying underlying rock structure, by analytical velocities of rocks. We will show the properties of rocks. The analysis of seismic travel-time data requires experienced geologists, therefore this research will study the method of computer called Genetic Algorithm for seismic refraction interpretation for the simplicity, the structure is based on three parallel and smooth layers. The result shows the velocity and depths of the layers which received from the model.

G0003-A preliminary report on subfossil canids from the Noi River, Ayutthaya Province, Central Thailand

Rattanaphorn Hanta¹, Yutaka Kunimatsu², Benjavun Ratanasthien¹, Chavalit Vidthayanon³
¹Department of Geological Sciences, Faculty of Science, Chiang Mai University, 239 Huai Keaw rd., Muang, Chiang Mai, 50202, THAILAND; ² Primate Research Institute, Kyoto University, Inuyama, Aichi, JAPAN; ³ Fisheries Museum Division, Department of Fisheries, Jatujak, Bangkok, 10900, THAILAND

E-mail address: rttnp11@yahoo.com

Abstract: A number of skeletal remains of mammals, including canids, were unearthed from the bottom of the Noi River in Ayutthaya Province. 25 crania of those canids were studied on morphology. These crania have not been described, before this study. The identification of these crania was carried out through comparison with *C. aureus* and *Cuon*, which are native wild canids of Thailand, as well as with *C. lupus* and *C. familiaris* (domestic dog). The results were that these crania show high variation, but their dental morphology is similar to each other. The dental configuration is closest to that of *C. familiaris*. The metric data of these crania, show a relatively larger size than *C. familiaris*.

G0004-Preliminary Tungsten ore investigation in stream sediments of Chiang Mai basin, Thailand

Suntree Rincome¹, **Sarunya Promkotra**²
¹Rajamankala Institute of Technology, Northern Campus, Muang, Chiang Mai 50002 Thailand
²Department of Geotechnology, Faculty of Technology, Khon Kaen University, Khon Kaen 40002 Thailand
 E-mail address: sarunya@kku.ac.th

Abstract: Regional geochemical survey was investigated tungsten ores in stream sediments from the Ping River, Chiang Mai Basin, in Chiang Mai and Lamphun province. Bulk sediment samples from 31 locations along the Ping River were collected and examines. Tungsten from stream sediments was analyzed by colorimetric method. The results showed the maximum value of 400 mg/L at the junction of Mae Chaem River. The results showed that tungsten ores have high potentials in some locations of the Ping River.

G0005-Total Phosphate on Surface Water in the upper Ping River, Chiang Mai province, Thailand

Thitirat Insalee, Marut Saelim, Sarunya Promkotra
 Department of Geotechnology, Faculty of Technology, Khon Kaen University, Khon Kaen 40002 Thailand
 E-mail address: ithiti@kku.ac.th, marsac@kku.ac.th, sarunya@kku.ac.th

Abstract: The total phosphate ($\text{PO}_4^{3-} - \text{P}$) on surface water of the upper Ping River was determined by the flow injection analysis (FIA). The water quality-monitoring project had examines since 1995, 1997, 2000 and 2003. Phosphorus was formed a blue

G

complex to the phosphorus molybdenum blue. Concentrations of the total phosphate were found in the range of 1.0-5.0 mg/L, which indicated the possibility of cultural eutrophication and algal blooms. Highly amount of the total phosphate was shown at the intermittent streams of Amphoe Mae Taeng and Hang Dong. Both locations were mainly polluted from run-off in the agricultural areas and domestic sewage.

H0001-HISTOPATHOLOGICAL ALTERATIONS OF A SINGLE LOW- OR HIGH-DOSE *Schistosoma mekongi* INFECTIONS IN MICE

Wannee Jiraungkoorskul^{1*}, Somphong Sahaphong^{1,3}, Prasert Sobhon², Suda Riengroipitak¹, Niwat Kangwanrangsan¹

¹Department of Pathobiology and Department of Anatomy², Faculty of Science, Mahidol University, Rama VI road, Bangkok 10400, Thailand.

³Mahidol University International College, Mahidol University Salaya Campus, Nakhonpathom 73170, Thailand

E-mail address: tewjr@mahidol.ac.th

Abstract: *Schistosoma mekongi* infection is one of the Asian schistosomiasis forms. Not many studies were done on this infection until 1992 when a focus of schistosomiasis mekongi was rediscovered in the Northeast of Cambodia. The purpose of this study is to investigate pathogenesis of experimental schistosomiasis mekongi in mice given in high (30 cercarias) and low (10 cercarias) intensity infections at various time interval. The results showed that the longer exposure time and higher cercarias infection resulted in significant decrease ($p < 0.05$) in body weight, increase in lung, liver, and spleen index, decrease hematological parameters, increase serum aspartate and alanine aminotransferase and alkaline phosphatase. Total protein level was unaffected while albumin level increased. The main histopathological alterations in the liver were the deposition of the eggs and egg granulomas, proliferation of fibrosis tissues in the portal areas and infiltration of the inflammatory cells. Spleen showed large numbers of megakaryocytes, thickening of capsule, fibrosis around splenic arteries, congestion with marked dilatation of the splenic sinus. These results revealed that *S. mekongi* infection might suggest invasion of the mice immunity system.

H0002-Modulation of Multidrug Resistance Related Protein 1 (MRP1) function by curcuminoids purified from Turmeric powder

Wanida Chearwae¹, Suresh V. Ambudkar² and Pornngarm Limtrakul¹

¹Department of Biochemistry, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand 50200.

²Laboratory of Cell Biology, Center for Cancer Research, National Cancer Institute, NIH, DHHS, Bethesda, MD 20892-4254, USA,

E-mail: s4467227@mail.med.cmu.ac.th

Abstract: Multidrug resistance (MDR) is a major cause of unsuccessful treatment of cancer in patients. One of the resistance mechanisms that has been characterized is the overexpression of the P-glycoprotein (Pgp) and MRP1 protein. Previously, we reported that curcuminoids are able to modulate the P-gp function and expression. In this study curcuminoids purified from turmeric; curcumin I, II and III were tested for their potential ability to modulate the function and expression of MRP1. We found that curcuminoids increase the sensitivity of etoposide drug as well as the accumulation of MRP1 fluorescent substrates; calcein-AM and fluo-4AM, in drug resistant and not in drug sensitive cell lines. In addition, curcuminoids stimulate ATP hydrolysis of MRP1, suggesting the interaction of curcuminoids with the transporter. However after treatment with curcuminoids, the level of MRP1 protein was not significantly different indicating that the modulatory effect of curcuminoids on MRP1 occurred at the functional but not expression level. Curcumin I is the most active form following by curcumin II and III indicating that the methoxyl group in the structure of curcuminoids may play an important role in this inhibitory effect. However this effect is comparable with curcumin mixture. Therefore economically, curcumin mixture is the best form to develop for more efficacious chemotherapeutic drug in combination with conventional chemotherapy.

H0003-DETERMINATION OF VITAMIN B-COMPLEX IN PHARMACEUTICAL PREPARATIONS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Chonlayut Raweeewan¹, Boonsom Liawruangrath¹, Chalermpon Thongpoon¹, Theeraphan Machan¹

¹Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: g4530202@hotmail.com, boonsom@pharmacy.cmu.ac.th

Abstract : A reverse-phase ion-pair high performance liquid chromatographic method (RP-IPC) for the determination of vitamin B1, B2, B3 and B6 in sample injection was developed. An appropriate volume of samples was filtered by means of nylon filter membrane (0.45 μm). The amount of each vitamin B was quantified by HPLC using ODS (C18) column. The mobile phase was a mixture of acetonitrile and 10 mM solution of sodium-1-hexanesulfonate which was adjusted to pH 2.8 with 10% solution of orthophosphoric acid (24:76 v/v). The detection was made at UV 280 nm. The limits of detection (LOD) for vitamin B1, vitamin B2, vitamin B3 and vitamin B6 were 0.50, 0.10, 2.00 and 0.07 $\mu\text{g mL}^{-1}$ with the limits of quantitation (LOQ) 1.50, 0.30, 5.00 and 0.30 $\mu\text{g mL}^{-1}$ for vitamin B1, vitamin B2, vitamin B3 and vitamin B6 respectively. The % labelled amount of vitamin B1, vitamin B2, vitamin B3 and vitamin B6 were 114.00, 129.90, 107.35 and 125.80 respectively.

H0004-DETERMINATION OF DICLOFENAC SODIUM BY HIGH PERFORMANCE THIN LAYER CHROMATOGRAPHY

Wisanu Thongchai^{1*}, Boonsom Liawruangrath¹, Duangporn Winijkul¹, Surapol Natakankikul¹, Chalermpon Thongpoon¹ and Theeraphan achan¹

Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, 50200, Thailand

E-mail address: g4530203@cmu.edu, boonsom@pharmacy.cmu.ac.th

Abstract: A high performance thin layer chromatographic method was developed for the determination of diclofenac sodium in pharmaceutical preparations. The drug was extracted from the sample then various aliquots of this solution were applied on a silica gel plate, using toluene:ethyl acetate:glacial acetic acid (60:40:1, v/v/v) as mobile phase. The spot areas were quantified by densitometry at 282 nm. Linear calibration curve was obtained over the range 100.80-604.80 mgL⁻¹ ($R^2 = 0.9993$). The method was applied to the determination of diclofenac sodium in Diclogel[®], Votalen[®] Emulgel and Dosanac[®] Emulsiongel with the percentage recovery of 104.21, 112.41 and 101.27 respectively and the % labelled amount of 94.61, 97.87 and 94.81 respectively. This method was suitable for routine analysis, more rapid, low-cost and low reagent consumption.

H0005-Composition and antituberculosis activity of the volatile oil of *Heliotropium indicum* Linn.

Theeraphan Machan¹, John North², Boonsom Liawruangrath¹, Saisunee Liawruangrath¹ and Stephen G. Pyne²

¹Department of Pharmaceutical Science, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, 50200, Thailand.

²Department of Chemistry, University of Wollongong, NSW, 2522, Australia.

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand.

E-mail address: theeraphan@hotmail.com, boonsom@pharmacy.cmu.ac.th

Abstract: The volatile oil from the aerial parts of *H. indicum* was isolated by hydrodistillation and analyzed by a combination of gas chromatography (GC-FID) and gas chromatography-mass spectrometry (GC-MS). The essential oil was obtained in 0.004% yield as a light brown liquid. The major constituents of the volatile oil of *H. indicum* were phytol (49.1%), 1-dodecanol (6.4%) and β -linalool (3.0%). In addition, the volatile oil showed significant antituberculosis activity against *Mycobacterium tuberculosis* H37Ra in the alamar blue assay system with an MIC of 20.8 μ g/ml.

H0006-FLOW INJECTION CHEMILUMINESCENCE DETERMINATION OF CEFADROXIL IN PHARMACEUTICAL PREPARATIONS

Chalermporn Thongpoon¹, Saisunee Liawruangrath², Alan Townshend³ and Boonsom Liawruangrath^{1*}

¹Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand;

²Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand;

³Department of Chemistry, The University of Hull, Hull, HU6 7RX, UK.

E-mail address: Boonsom@pharmacy.cmu.ac.th

Abstract: A simple flow injection chemiluminescence (FI-CL) method was developed for the determination of cefadroxil in pharmaceutical preparations. The method is based upon its chemiluminescence (CL) induced by potassium permanganate in sulfuric acid medium and sensitized by formaldehyde. Under the optimum conditions, linear calibration graphs over the ranges of 0.05–0.8 μ g ml⁻¹ and 1.0–10.0 μ g ml⁻¹ were obtained. The proposed method has been applied to the determination of cefadroxil in pharmaceutical sample with a detection limit (3σ) of 25 ng ml⁻¹ and RSD ($n=20$) less than 2% at 0.4 and 4.0 μ g ml⁻¹ cefadroxil. One hundred and twenty injections per hour can be carried out, which means a sample throughput of 40 h⁻¹ if three injections per solution are performed. No interference encountered from some common excipients used in pharmaceutical preparations.

H0007-HIGH PERFORMANCE THIN LAYER CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF PARACETAMOL AND CHLORPHENIRAMINE MALEATE IN COLD PREPARATIONS

Boonsom Liawruangrath¹, Saisunee Liawruangrath², Chalermporn Thongpoon¹, Theeraphan Machan¹ and Piyaporn Srisom¹

¹Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, 50200, Thailand.

²Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand.

E-mail address: boonsom@pharmacy.cmu.ac.th

Abstract: High performance thin layer chromatographic (HPTLC) method for the determination of paracetamol and chlorpheniramine maleate in cold preparations was developed. Paracetamol in formulation was separated on a silica gel 60G plate, using butyl acetate: chloroform: 85% formic acid (6:4:2 v/v) as mobile phase, while chlorpheniramine maleate was separated on a silica gel GF₂₅₄ plate, using methanol as mobile phase. Developments were made in an automated multiple development chamber. The chromatograms were viewed under short wavelength UV and the spot areas were quantified by densitometry at 254 nm. The detection limits for paracetamol and chlorpheniramine maleate were 1 μ g/20 μ l and 2.5 μ g/20 μ l with the quantitation limits of 3.5 μ g/20 μ l and 7.6 μ g/20 μ l respectively. Linear calibration curves over the ranges of 5 – 25 μ g for both drugs were established with the correlation coefficients of 0.9955 for paracetamol and 0.9846 for chlorpheniramine maleate. The percentage recoveries of the spiked paracetamol and chlorpheniramine maleate in cold preparations were found to be 98.78 ± 0.54 and 98.68 ± 0.55 with the relative standard deviations of 0.55% and 0.56% respectively. The proposed method have been applied to the determination of paracetamol and chlorpheniramine maleate in pharmaceutical formulations. The method was simple, accurate, reproducible and suitable for routine analysis.

H0009-Determination of antioxidant in phytocosmetic

Chairoj Pintukanon, Suwipa Pattarameteewong, Lalana Kongkaneramttra and Narisa Kamkaen

Faculty of Pharmacy, Srinakharinwirot University, Ongkharak, Nakhon-Nayok, 26120, Thailand

E-mail address: narisa@swu.ac.th

Abstract: The purpose of this study was to estimate the phenolic content and evaluate the anti-oxidant activity of green tea and vitamin E in a peel-off face mask cream. The percent recovery of the active ingredients from the methanolic extract was 95.57%. The total phenolics in the green tea/ vitamin E mix, as percent yield of gallic acid equivalent (GAE), was 80.78 mg/g dry weight. Antioxidant activity was assessed by measuring the cream's capacity to inhibit free radical formation. The cream containing both green tea and vitamin E resulted in 87.54% inhibition of free radical formation compared with the control. This study demonstrates that a face cream containing both green tea and vitamin E has both high phenolic concentration and high antioxidant activity.

H0010-Study on Antioxidant of Extracts from Rice Bran Tablets compared with others

Aroonsri Priprem^{1,4}, Padungkwan Chitropas^{1,4}, Pramote Mahakunakorn^{2,4}, Chidchanok Khamlert⁴, Bungorn Sripanidkulchai⁴

¹Department of Pharmaceutical Technology, Faculty of Pharmaceutical Science, Khon Kaen University, Khon Kaen, Thailand

²Department of Toxicology, Faculty of Pharmaceutical Science, Khon Kaen University, Khon Kaen, Thailand

³Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Science, Khon Kaen University, Khon Kaen, Thailand

⁴Center for Research and Development of Herbal Health Products, Khon Kaen University, Khon Kaen, Thailand

Abstract: A comparative study of antioxidant activities of soft rice bran tablets (sRBT), which was formulated and processed for future use as a health product, defatted rice bran (dRB), crude rice bran oil (cRBO) and refined rice bran oil (rRBO) by analyzing of scavenging effect on 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radicals. The formulation of sRBT selected for investigations contained 200 mg of sRB and mixed with microcrystalline cellulose (MCC) at a ratio of 1:1. Then, 15% of poly(vinyl pyrrolidone) and 1.5% of a glidant and a lubricant were added and thoroughly mixed with the mixtures prior to subjected to tableting by a machine. In average, the sRBT were 12.09 mm. in diameter, 3.58 mm. in thickness and 5.92 Kp in hardness, and possess a scavenging activity upto 95% of sRB. While rRBO demonstrated the lowest antioxidant activity and 3 times lower than that of cRBO. Powder forms of sRB and dRB showed some similarity in conc dependent antioxidant activity. The antioxidant of the sRBT developed was more or less in the same range as current consumer available products and could be further developed for product improvement.

H0011-TESTING TIMESERIES FORECASTING MODELS FOR INCIDENCE OF INFLUENZA IN NAKHONSITHAMMARAT

Sangtien Youthao*, Mullica Jaroensutasinee, Krisanadej Jaroensutasinee

CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, 222 Thasala District, Nakhonsithammarat 80160, Thailand.

Email address: 46300075@wu.ac.th, jmullica@wu.ac.th, jkrisana@wu.ac.th

Abstract: Using *Mathematica*, this study tested seven timeseries forecasting models for monthly influenza cases in Nakhonsithammarat over a period of 120 months between 1994 and 2003. Forecasting and error values from each model were calculated, and error values compared by using analysis of variance (ANOVA) tests. Post-tests were then calculated by using Student Newman Keuls method for determining the best-fit model. The result showed that Single Exponential Smoothing Model using constant value of 0.8 (SES0.8) gave the minimum error value. On the other hand, the Global Linear Trend Model (GLT) gave the maximum error value. Therefore, of these seven timeseries models, the SES0.8 is the most appropriate forecasting model for the study.

H0012-SKIN PERMEATION STUDY OF BIOACTIVE COMPOUNDS FROM GEL FORMULATION CONTAINING THE EXTRACT OF WHITE KWAO KRUA (*Pueraria mirifica*)

Aranya Manosroi^{1,2}, Somsak Tharata¹, Pisit Jainonthee¹ and Jiradej Manosroi^{1,2}

¹Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand

²Pharmaceutical-Cosmetic Raw Materials and Natural Products Research and Development Center (PCRNC), Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai, Thailand

E-mail address: pmpti005@chiangmai.ac.th

Abstract: The objective of this study was to study rat skin permeation of bioactive compounds in White Kwao Krua extract. These bioactive compounds were puerarin, genistein, daidzein and miroestrol. Gel formulations containing 0.005, 0.01, 0.05 and 0.01% w/w of the extract and the 0.01% w/w solution of the extract in water were prepared. Skin from abdomen of Sprague-Dawley rats was freshly prepared and the permeation study of the bioactive compounds was investigated using Franz Diffusion Cells. Gel or solution was put in the donor chamber and PBS was placed in the receiver chamber. The cells were controlled at 37°C and withdrawn at 2, 4, 6 hours. The bioactive compound contents in the skin and the receiver chamber were extracted and assayed by HPLC comparing to the standard references of Sigma Company. It has demonstrated that daidzein and genistein can pass through the skin and the amounts found depend on the concentration of the extract in the sample. But, no puerarin and miroestrol were found in the receiver chamber. The result from this study can be preliminary used for the differentiation of the product types (pharmaceuticals or cosmetics) for the products containing extract of White Kwao Krua.

H0013-INCLUSION COMPLEXATION OF AZELAIC ACID WITH HYDROXY PROPYL-β-CYCLODEXTRIN

Aranya Manosroi¹, Maria Goretti Aprivani², Kuncoro Foe², Jiradej Manosroi¹

¹Pharmaceutical-Cosmetic Raw Materials and Natural Products Research and Development Center, Institute for Science and Technology Research and Development, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand
²Faculty of Pharmacy, Widya Mandala Surabaya Catholic University, Surabaya 60265, Indonesia
 E-mail address: pmpti005@chiangmai.ac.th

Abstract: This study aimed to improve the dissolution of azelaic acid in water by the formation of inclusion complexes with hydroxypropyl- β -cyclodextrin (HP β CD). Solid inclusion complexes of azelaic acid-HP β CD (1:1 in molar ratio) were prepared by coevaporation and freeze-drying methods. Two types of coevaporation methods were performed, namely, coevaporation using 80% (v/v) ethanol and coevaporation using mixture of HP β CD in water and azelaic acid in absolute ethanol the same as the freeze-drying method. The solid inclusion complexes were characterized by differential scanning calorimetry, X-ray diffractometry, infrared spectroscopy and dissolution studies. Coevaporation method using 80% (v/v) ethanol gave the true inclusion complex of azelaic acid in the HP β CD cavity. The dissolution rates of azelaic acid were increased by the complexation with HP β CD. Solid inclusion complex obtained by coevaporation method using 80% (v/v) ethanol exhibited the highest dissolution rate of azelaic acid.

H0014-THE RELEASE STUDY OF AZELAIC ACID FROM AZELAIC ACID-HYDROXYPROPYL- β -CYCLODEXTRIN INCLUSION COMPLEX THROUGH SYNTHETIC MEMBRANES

Jiradej Manosroi¹, Maria Goretti Apriyani², Kuncoro Eoe², Aranya Manosroi¹

¹Pharmaceutical-Cosmetic Raw Materials and Natural Products Research and Development Center, Institute for Science and Technology Research and Development, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

²Faculty of Pharmacy, Widya Mandala Surabaya Catholic University, Surabaya 60265, Indonesia

E-mail address: pmpti005@chiangmai.ac.th

Abstract: The aim of this study was to compare the release rate of pure azelaic acid and azelaic acid-hydroxypropyl- β -cyclodextrin (HP β CD) inclusion complex through three types of the synthetic membranes, namely a cellophane, silicone and elastomer membrane. The solid azelaic acid-HP β CD inclusion complex was prepared by coevaporation method at the molar ratio of 1:1. Release studies of azelaic acid through the synthetic membranes were conducted, using vertical Franz diffusion cell at 30°C for 7 days. The pure azelaic acid flux of azelaic acid through a cellophane, silicone and elastomer membrane were 0.0165; 0.0031 and 0.0152 mg/cm²/h, respectively, while azelaic acid-HP β CD inclusion complex exhibited the enhanced flux through those membranes of 0.2706; 0.2516 and 0.1737 mg/cm²/h, respectively. The release rate of azelaic acid through the synthetic membranes were improved by the formation of inclusion complex with HP β CD at the molar ratio of 1:1, with the increasing flux in the order of elastomer, silicone and cellophane. The result from this study can be applied for the development of azelaic acid for topical use.

H0015-DENGUE VIRUS PRODUCTION IN A LIVER CELL LINE

Maneerat Ekkapongpisit, Lukkana Suksanpaisan, Duncan R. Smith

Institute of Molecular Biology and Genetics Mahidol University

Abstract: Infections with dengue virus represent one of the major reasons for hospitalization amongst children in Southeast Asia. There are many cell types that have been considered as cellular targets of dengue viral infection. However, while the virus is able to replicate and propagate in a wide range of both target and non-target cells, the exact nature of the propagation is cell type specific. As the liver is known to be one of the major target tissues in cases of human infection, it is interesting to investigate the factors that control the speed of replication of virus within the cell. This study aimed to determine the production profile of all four serotypes of the dengue virus in Hep3B cells. Virus production profiles were determined by the infection of cells with dengue virus at multiplicity of infection of 1 and virus titer was determined by the plaque assay technique. The results show that Hep3B cells were able to support the propagation of all four serotypes with mature viruses being produced by 15 hours for dengue serotype 4 and 18 hours for serotype 1 and 3 and 22 hours for serotype 2. These results suggest that the viral production is serotype specific and might be controlled by the different viral machinery.

H0016-CHEMICAL CONSTITUENTS OF *ERYTHRINA FUSCA* AND *ERYTHRINA SUBEROSA* STEM BARK AND THEIR BIOLOGICAL ACTIVITIES

Pranorm Khaomek,¹ Nijsiri Ruangrungrasi,^{2,*} Ekarin Saifah,² Nongluksna Sriubolmas,² Hiroaki Kiyohara³ and Haruki Yamada³

¹ Faculty of Science, Rangsit University, Pathumthani 12000, Thailand

² Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok 10330, Thailand

³ Kitasato Institute for Life Sciences, Kitasato University, 5-9-1 Shirokane, Minato-ku, Tokyo, 108-8641, Japan

E-mail address: kpranorm@rsu.ac.th, kpranorm@yahoo.com

Abstract: Phytochemical study of the stem bark of *Erythrina fusca* Lour. led to the isolation of a new pterocarpin, 3-hydroxy-10-(3-hydroxy-3-methylbutyl)-9-methoxypterocarpin, together with 11 known compounds: sandwicensin, lupinifolin, citiflavanone, lonchocarpol A, erythriscene galone, liquiritigenin, daidzein, 8-prenyldaidzein, cerinic acid, 1-octacosanol and erythrinassinate B. Phytochemical study of the stem bark of *E. suberosa* Roxb. yielded 6 known compounds, erythrabyssin II, sandwicensin, erythrinassinate B, 5,7,4'-trihydroxy-8,3',5'-triprenylflavanone, erythratidinone, and a mixtures of β -sitosterol and stigmasterol. The structures of all these isolates were determined by extensive spectroscopic studies, including comparison of their UV, IR, MS and NMR properties with previously reported data. Some of these compounds were evaluated for its antimalarial activity, antimicrobial activity, free radical scavenging activity,

antituberculosis activity and cytotoxic activity against cancer cell. All of the tested compounds showed weak antimicrobial activity except lonchocarpol A and lupinifolin which were strongly active against *Bacillus subtilis* and moderate active against *Enterococcus faecalis* and *Staphylococcus aureus*. Lonchocarpol A showed the highest *in vitro* antimalarial activity against K1 strain (EC_{50} 1.6 μ g/ml), when compared with 8-prenyldaizein, erythrabyssin II and citflavanone (EC_{50} 3.9, 5.0 and 5.0 μ g/ml, respectively). However, lonchocarpol A exhibited no *in vivo* antimalarial activity (at 20 mg/kg). In addition, all of tested compounds showed marginal free radical scavenging activity. Almost all of the tested compounds showed weak antituberculosis activity against H37Ra strain, whilst erythrisenegalone and lupinifolin displayed strong cytotoxic activity against breast cancer (BC) cell line.

H0017-DISTRIBUTION OF *Aedes aegypti* AND *Ae. albopictus* IN BUDDHIST AND MUSLIM HOUSEHOLDS IN TWO DIFFERENT TOPOGRAPHICAL LOCATIONS IN NAKHONSITHAMMARAT PROVINCE.

Siriwan Wongkoon^{1,2}, Mullica Jaroensutasinee², Krisanadej Jaroensutasinee²

¹ Faculty of Science and Technology, Nakhonsithammarat Rajabhat University, CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, Thasala District, Nakhonsithammarat 80160, Thailand, E-mail address: 45203254@wu.ac.th, jmullica@wu.ac.th, jkrisana@wu.ac.th

Abstract: This study investigated the effect of topographical and religion on distribution and abundance of *Ae. aegypti* and *Ae. albopictus* in Nakhonsithammarat Province, southern Thailand. Data were collected by using a stratified simple random sampling with the total sample size of 400 households. The results showed that Muslim differed from Buddhists including long-sleeved blouses and trousers/long skirts, higher number of family member, lower income and wood for construction material. Houses near the sea had more water jars but fewer mosquito larvae per jar than houses in the mountainous area. Greater numbers of *Ae. aegypti* larvae were found in larger jars and smaller jars which were $< \frac{1}{4}$ full. Greater numbers of *Ae. albopictus* larvae were also found in larger jars which were $\frac{1}{4}$ full.

H0018-BREEDING SITE OF VECTORS SURVEY OF DENGUE HAEMORRHAGIC FEVER IN NAKHON SI THAMMARAT.

Suppawan Promprou¹, Mullica Jaroensutasinee², Krisanadej Jaroensutasinee³

¹ Nakhon Si Thammarat Rajabhat University, ^{1,2,3} CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, 222 Thasala District, Nakhon Si Thammarat, 80160, Thailand; e-mail address: 45300050@wu.ac.th, jmullica@wu.ac.th, jkrisana@wu.ac.th

Abstract: In this study, the association between water storage containers and vectors (*Aedes* sp.) of dengue haemorrhagic fever (DHF) were investigated. Sampling surveys were carried out during March and April 2004 in 400 households selected by systematic stratified random sampling from six districts of Nakhon Si Thammarat province in southern Thailand. The districts were categorised into two groups: high and low DHF risk areas. The water storage containers were composed of 29 types of containers. The mosquitoes larvae presence in containers used for storing drinking and washing water indoor and outdoor of households were measured. The results showed that key breeding sites of *Ae. aegypti* and *Ae. albopictus* in high risk areas were a jar that was used to keep preserved arecas. On the other hand, in low risk areas, *Ae. aegypti* larvae was found the most in plastic box, and *Ae. albopictus* larvae was found the most in earthen jar. In addition, high DHF risk areas had a greater proportion of containers with larvae than low DHF risk areas.

H0019-CHARACTERISTICS OF AZELAIC ACID ENTRAPPED IN NANOPARTICLES

Aranya Manosroi^{1,2}, Atchara Panyosak², Yongyut Rojanasakul¹ and Jiradej Manosroi^{1,2}

¹ Pharmaceutical-Cosmetic Raw Material and Natural Products Research and Development Center (PCRNC), Institute for Science and Technology Research and Development, Chiang Mai 50200, Thailand

² Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

³ Department of Basic pharmaceutical Sciences, West Virginia University, Morgantown, West Virginia, USA

E-mail address: pmpti005@chiangmai.ac.th, atchara_pys@hotmail.com,

yrojanasakul@hsc.wvu.edu, pmpti006@chiangmai.ac.th

Abstract: The aim of this study was to characterize the entrapment of azelaic acid (AA) in nanoparticles. The nanoparticles were prepared by hydrating the mixtures of phospholipid (dipalmitoyl phosphatidylcholine, DPPC) or non-ionic surfactants (Polyoxyethylene sorbitan monostearate, Tween61) with cholesterol (CHL). AA has poor solubility in water and is irritate to the skin. AA was entrapped in nanoparticles in order to decrease irritation and increase the absorption through the skin for topical application. The composition of the nanoparticles in molar ratio were DPPC/CHL = 7/3, Tween 61/CHL = 1/1 and Tween61/CHL/dicetyl phosphate = 10/10/1. The vesicle formation was characterized by transmission electron microscope (TEM). The photograph demonstrated multilamellar vesicles with the particles sizes ranging from 0.02 to 0.08 μ m. The formulation of Tween 61/CHL (1/1) with the entrapped AA seemed to demonstrate higher stability than other formulations, since it showed the least formation of sediment and layer separation (stored at 4, 30 and 45°C for 3 months). The pH values of all nanoparticle formulations were in the range of 4.0–4.5 while the formulations without the entrapped AA were in the range of 5.5–6.0. The AA contents in nanoparticles were analyzed by derivatizing AA with 2,4-dibromoacetophenone and N-ethyl-diisopropylamine, and determined by HPLC with UV detection at 254 nm. The percentages of the entrapment of AA in all nanoparticle formulations were more than 80%.

H0020-THE ENTRAPMENT OF DNA PLASMID LUCIFERASE IN NANOPARTICLESAranya Manosroi^{1,2}, Korakot Thathang¹, Rolf G. Werner³, and Jiradej Manosroi^{1,2}¹ Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand 50200² Pharmaceuticals/Cosmetic Raw Material and Natural Product Research and Development Center, Institute for Science and Technology Research and Development, Chiang Mai University, Thailand 50200³ Boehringer Ingelheim International GmbH 55216 Ingelheim am Rhein, Germany.

E-mail address: pmpt005@chiangmai.ac.th, kora_a@hotmail.com

Abstract: The objective of this study was to entrap plasmid DNA luciferase (pLuc) in nanoparticles (liposomes and mesosomes). Cationic and neutral liposomes were prepared using phospholipids (DPPC), cholesterol and/or stearylamine. The mesosomes (non-ionic surfactant vesicles) were composed of sorbitan monostearate (Span 60) or polyoxyethylene sorbitan monostearate (Tween 60) and cholesterol. Nanoparticles were prepared using freeze dried empty liposomes (FDEL) method. DNA of luciferase plasmid was propagated in *Escherichia coli* by transformation and the quantity of luciferase plasmid DNA was determined using gel documentation and spectrophotometer. Characteristics and particle sizes of liposomes and mesosomes were investigated by Transmission Electron Microscope (TEM 1200S JEOL). The entrapment efficiency of plasmid DNA luciferase in nanoparticles was determined by gel electrophoresis. Results from this study can suggest the selection of the appropriate formulation to entrap other genes in nanoparticles for gene therapy.

H0021-THE SCREENING OF FREE RADICAL SCAVENGING ACTIVITY OF EXTRACTS FROM THAI MEDICINAL PLANTS IN GUTTIFERAE AND SCHISANDRACEAE FAMILYJiradej Manosroi¹, Rujda Wilairat¹, Anake Kijjoa¹, and Aranya Manosroi^{1,2}¹ Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand² Pharmaceutical-Cosmetic Raw Materials and Natural Products Research and Development Center (PCRNC) Institute for Biomedical Sciences Abel Salazar, University of Porto, Portugal

Abstract: The objective of this study was to screen free radical scavenging activity of extracts from Thai medicinal plants in family Guttiferae and Schisandraceae. Six Thai medicinal plants (*Hypericum hookerianum*, *Garcinia speciosa*, *G. verticillata*, *Cratogeomys formosum* ssp. *Pruniflorum*, *C. polyanthum* and *Schisandra verruculosa*) were extracted by methanol and chloroform. The extracts were screened for free radical scavenging activity using DPPH (1,1-diphenyl-2-picrylhydrazyl) as a stable radical. All extracts showed a dose dependence activity relationship with the lowest IC₅₀ value of the methanol extracts from wood of *G. speciosa*. This IC₅₀ value was less than those of the standard antioxidants (ascorbic acid and α -tocopherol) of 2.5 and 5.3 folds, respectively. Similar free radical scavenging activities were also observed for extracts from other plants. This study indicated the potential of these plants for further development as pharmaceuticals. We are now in the process of isolation of bioactive compounds from these extracts.

H0022-IMMUNOMODULATORY ACTIVITY STUDY OF ARTOCARPUS INCISUS, LINN. F. HEARTWOOD EXTRACTAurasorn Saraphanchotiwithaya¹ and Pattana Sripalakit²¹ Department of Pharmaceutical Technology, Faculty of Pharmaceutical Science, Naresuan University, Thailand.² Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmaceutical Science, Naresuan University, Thailand.

E-mail address: aurasorns@nu.ac.th, pattanas@nu.ac.th

Abstract: To study immunomodulatory effects of *Artocarpus incisus* heartwood extract on macrophage and splenocytes of ICR mouse. The phagocytic activity of peritoneal macrophages and splenocyte proliferation in the absence and presence of mitogens (phytohemagglutinin, concanavalin A, lipopolysaccharide and pokeweed mitogen) were assayed. The extract effected to the enhancement of lysosomal enzyme activity but had no effect on the superoxide anion production on phagocytosis. Antiproliferative activity of spleen T- and B-lymphocytes was also presented. The extract with PWM gave the maximum suppression of B-lymphocyte proliferation, suggesting specificity towards T cell dependent pathway the same as PWM. The results showed immunomodulatory effect of *A. incisus* to mouse immune system and may prove the folklore remedy of this plant relating to human immune system.

H0023-CHARACTERIZATION OF ION CHANNELS IN THAI CHOLANGIOCARCINOMA CELL LINESPrattana Samasilp¹, Wattana B. Watanapa², Adisak Wongkajornsilp³, Prasit Watanapa¹¹ Department of Physiology, ² Department of Pharmacology and ³ Department of Surgery

Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, 10700, Thailand.

e-mail address: Wattana B. Watanapa <siwatt@mahidol.ac.th>

Abstract: Cholangiocarcinoma (CCA), or bile duct carcinoma, is an important public health problem in northeastern Thailand. The carcinogenesis of CCA, however, is still uncertain. Interestingly, it appears that the carcinogenic mechanism of CCA in Thailand may be different from that in other countries, since CCA risk factors and clinical features are different. On the other hand, some ion channels are reported to be involved in regulating proliferation and apoptosis in some cancer cells. The objective of this work was to characterize ion channels in Thai cholangiocarcinoma cell lines using whole-cell patch clamp technique. Average cell diameter, cell capacitance and series resistance were (mean $\pm$ S.E.M.) 22.25 ± 0.42 μ m, 30.41 ± 1.73 pF and 1.00 ± 0.83 M Ω , respectively. Basal current response could be separated into three patterns, according

to voltage dependence. First, outwardly rectifying pattern (38%) consisted of two currents with different kinetics: The time-independent (TI) current was inhibited by 250 μM DIDS but not effected by 10 mM TEA, 2 mM Ba^{2+} and external Cl^- ion substitution. The slowly activating (SA) current was found in a small number (6%) and the ionic basis was not tested. The other two current patterns were the linear pattern (LP, 54%) and the inwardly rectifying pattern (8%). The latter can be further classified by kinetics to time-independent (TIir) and inactivating (IN) forms. Both LP and TIir were not affected by 250 μM DIDS, 10 mM TEA, 2 mM Ba^{2+} and external Cl^- ion substitution. Furthermore, when CCA cells were exposed to 600 μM ATP, the outward and inward currents were increased by 4.4 times ($p=0.0024$, $n=8$) and 3.3 times ($p=0.0156$, $n=8$) in 53.33% of patched cells. ATP-activated outward current were blocked by 250 μM DIDS ($p=0.0016$, $n=5$) and 10 mM TEA ($n=1$). These findings indicate that some cells of Thai cholangiocarcinoma cell lines may possess a voltage-gated Cl^- channel and ATP-sensitive Cl^- and K^+ channels. The discrepancies between CCA cells from Thai patients and those from patients in other countries, in both the current pattern response and ATP sensitivity, may reflect the differences in the carcinogenic mechanism, risk factors and / or causes. Therefore, the roles of ion channels in carcinogenesis in Thai cholangiocarcinoma need further investigation with possible therapeutic implications in the future.

H0025-EFFECTS OF MICROWAVE DIATHERMY ON ELECTROCARDIOGRAM SIGNALS

Weerasak Ussawongaraya, Theera Leeudomwong, Budsapapat Natwong, Prasong Tosranon and Sonthaya Bunluechokechai

Department of Industrial physics and Medical Instrumentation, Faculty of Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand; e-mail address: weerasak_ussawa@hotmail.com

Abstract: Although microwave diathermy is used in physical therapy rehabilitation by electromagnetic radiation, there is substantial scientific data that establish negative health effects associated with exposure to microwave radiation. The purpose of this study is to investigate effects of microwave diathermy on electrocardiogram. Results obtained from 15 subjects show that the amplitude of the R-wave and S-wave decrease after exposure to pulse mode 2450 MHz microwave diathermy. This is because the sodium channel-protein membrane is denatured, however, blood pressure and heart rate are not changed significantly.

H0026-Electrosurgical Unit

Sompote Im-erb and Sonthaya Bunluechokchai

Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand 10800

E-mail address: sbc@kmitnb.ac.th

Abstract: In an operating room, an Electrosurgical Unit (ESU) is one of the important instruments for cutting tissue and controlling the amount of bleeding. In this study, the ESU is designed and constructed with the purpose of using the appropriate technology and materials available in Thailand. This designed ESU provides an adequate power output of 200 watts, covering a wide range of surgical needs ranging from simple to moderate surgical procedures. It has two electrosurgery modes, a monopolar mode and a bipolar mode. In the monopolar mode, the ESU provides the surgical effects such as cutting, blend, and coagulation. In the bipolar mode, it provides coagulation only. The surgical performances of the ESU were tested by cutting a piece of meat and a bar of soap. Results showed that the ESU can provide the surgical effects for both monopolar and bipolar modes. In addition, this ESU was tested for electrical safety and it satisfied the requirements of the safety standard.

H0027-THE DESIGN AND CONSTRUCTION OF A PULSE OXIMETER TESTER

Budsapapat Natwong, Theera Leeudomwong, Prasong Tosaranon, Weerasak Ussawongaraya and Sonthaya Bunluechokechai

Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand; E-mail address: bpn@kmitnb.ac.th

Abstract: At the present, many manufacturers for medical instrumentation are developing the testing instruments for a pulse oximeter known as a pulse oximeter tester with different systems. Since these instruments are very expensive, some hospitals have no an opportunity to use them due to the limited budget. The objective of this research is to design and construct the pulse oximeter tester utilizing the available components in Thailand, in order that the imported medical instruments are reduced. The designed and constructed pulse oximeter tester consists of the several analog circuits such as the power supply, amplifier, pulse conditioning, pulse rate generator and display circuits. In addition, a microcontroller is also used to handle the operation of the display circuit. Two vital sign monitors (the Welchallyn model Atlas and the Mennen model Enmove) are taken to evaluate the constructed system for testing. The obtained results from testing have shown that the pulse oximeter tester is able to generate the content of oxygen saturation in the blood, generate three pulse rates, simulate the condition of color of skin or thickness of tissue, regulate the amplitude of signal applied to pulse oximeter and use the LCD to display in a digital format.

H0028-ELECTROENCEPHALOGRAM MEASUREMENT SYSTEM

Theera Leeudomwong, Budsapapat Natwong, Prasong Tusaranon, Weerasak Ussawongaraya, and Sonthaya Bunluechokchai.

Department of Industrial physics and Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand

e-mail address: trl@kmitnb.ac.th

Abstract: The main objective is to acquire the brain signal in an analog form that can be taken into the analyzing and processing sections with a mathematic method for the development of a diagnostic procedure. The key part of the electroencephalogram (EEG) measurement system consists of: electrodes, electrode junction box, and amplifier and filter circuits. The electrode placement system is configured as the international 10-20 method. Lead wires connected to each electrode are collected into an electrode junction box to determine the position of each electrode for linking to an input of the amplifier. There are sixteen channels of the amplifier and filter circuits. Each channel can independently adjust the voltage gain and frequency response in the various levels according to the desired EEG signal. The constructed system is arranged for the EEG measurement. The measured EEG signals are displayed by the oscilloscope. The result shows that each channel of the constructed EEG measurement system provides good quality of biopotential signals originated from the brain at the interesting site

H0029-High Resolution Electrocardiogram System

Sonthaya Bunluechokchai, Weerasak Ussawawongaraya, Prasong Tosranon, Theera Leeudomwong and Budsapapat Natwong

Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand 10800

E-mail address: sbc@kmitnb.ac.th

Abstract: A High Resolution Electrocardiogram (HRECG) system is served as a noninvasive tool for detecting very small cardiac signals called Ventricular Late Potentials (VLPs) from patients with heart diseases. VLPs are caused by conduction abnormalities of the damaged myocardium. Many studies have reported that VLPs are correlated with the presence of Ventricular Tachycardia which is the major cause of the patient's death. In this paper, a HRECG system is designed and constructed to detect the presence of VLPs. It includes the ECG amplifier, isolation amplifier, baseline restoration circuit, low pass filter, and high pass filter. The voltage gain of the ECG amplifier can be adjusted from 1 to 50,000. The HRECG system was tested by recording the simulated ECG and real ECG signals. Preliminary results showed that the HRECG system can measure and display three leads of ECG signals with an appearance of small power line interference in the ECG tracing

H0030-A teaching-aided module for an Electrocardiograph

Prasong Tosranon, Theera Leeudomwong, Budsapapat Natwong, Weerasak Ussawawongaraya and Sonthaya Bunluechokchai

Department of Industrial Physics and Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand 10800

E-mail address: ptn@kmitnb.ac.th

Abstract: This study presents a teaching-aided module for an Electrocardiograph (ECG). The module is used as an aid to learning in the biomedical instrumentation course at the Department of Industrial Physics and Medical Instrumentation, King Mongkut's Institute of Technology North Bangkok. It consists of main and necessary components of the modern ECG such as a patient cable, a right leg driver, an instrumentation amplifier, a low pass filter and a high pass filter. Students can take benefits from this module to gain a better understanding of the concept and the principle of operation of the Electrocardiograph. When tested in the laboratory with the BIO-TEK model AS-1 Arrhythmia/ECG Simulator, the module can measure and show ECG waveforms on an oscilloscope. The displayed ECG signals are of good quality for the objective of teaching the students in the biomedical instrumentation course.

H0031-ANTIDIABETIC ACTIVITY OF THE METHANOLIC EXTRACT

FROM *Erycibe expansa* WALL.

Yutana Pongpiriyadacha¹, Patcharin Nuansrithong¹, Patcharakorn Rattanapumee¹, Narumon Sirintaraweek²

¹Department of Chemistry, Rajamangala Institute of Technology, Faculty of Agriculture Nakhonsithammarat, Nakhonsithammarat 80240, Thailand.

²Department of Chemistry, Rajamangala Institute of Technology, North-Eastern Campus, Nakhonratchasima, 30000, Thailand.

*e-mail address: yutanap@hotmail.com

Abstract: Antidiabetic properties of 80% methanolic extract from *Erycibe expansa* were investigated. The extract exhibited the inhibition of α -glucosidase activity, sucrase and maltase activities, with IC₅₀ values of 95 and 290 μ g/ml. Furthermore, the extract also significantly inhibited the increased of serum glucose levels in rats after oral administration of 20% sucrose at 30 and 60 min. These findings suggest that this plant may contribute for the treatment of diabetes mellitus as α -glucosidase inhibitors and lowering of the blood glucose level.

H0032-The Isolation of Pathogenic Bacteria From The Sinusitis Patients, Phramongkutklao Hospital in year of 2003.

Yupa Phonphok*, Sudaluck Chantaratchda, Apichat Suwas, Greetha Mounghthong

Phramongkutklao College of Medicine, Bangkok 10400, Thailand

Abstract: Sinusitis is the inflammation of one or more paranasal sinuses and occurs with obstruction of the normal drainage mechanism. It is commonly found as a respiratory disease caused especially by bacterial infection. A doctor

usually prescribes antibiotics that affect all of β -lactamase producing bacteria as initial treatment. However, such practice is not really recommendable because micro-organisms become resistant to antibiotics and that it is only a wasteful expense. This study was undertaken with the objective of learning the prevalence of the pathogenic bacteria in sinusitis and β -lactamase producing bacteria. The specimens, fluids taken from the maxillary aspiration of 20 acute sinusitis patients at Phramongkutklao Hospital during May to October, 2003 were sent to the microbiology laboratory for aerobic and anaerobic culture. β -lactamase activity was determined by the cephalosporin analog 87/312 method. In this study, 9 pathogenic bacteria were found from the 20 specimens. The predominant isolates were *Haemophilus influenzae* (8 isolates) about 42.1%, *Klebsiella pneumoniae* (3 isolates) about 16.79% and *Citrobacter sp.* (2 isolates) about 10.5%. Anaerobic bacteria were not found in any of the specimens. Only 3 β -lactamase producing bacteria in about 30% of the determined bacteria were found. They were *Haemophilus influenzae*, *Moraxella catarrhalis* and *Staphylococcus aureus*. Therefore, the result of this study may be used a guideline for doctors to select and to prescribe a narrow spectrum antibiotic to patients suffering from sinusitis. This part of the research was granted by Phramongkutklao Hospital Foundation.

H0033-Bcl-xL activation by different risk groups of Human papillomavirus (HPV) E7

Putthiporn Choupywech¹, Siriphatr Chamutpong¹ and Mathurose Ponglikitmongkol¹

¹Department of Biochemistry, Faculty of Science, Mahidol University, Bangkok, 10400, Thailand

Abstract: Human papillomaviruses (HPVs) are associated with cervical diseases and cancer. According to malignant progression of the lesion, HPVs can be divided into three groups; the high risk group such as HPV16, the intermediate risk group such as HPV59 and the low risk group such as HPV6. These viruses produce an important early protein, E7, which plays crucial role in tumor formation and contributes to apoptosis pathway. There has been evidence showing that the high risk group has stronger transforming activity than the low risk group does. We are interested in comparing the transcription activation activity of different types of HPVs E7 on anti-apoptotic genes in Bcl-2 family. The expression vector, pcDNA3 containing E7 cDNA from various types of HPV was individually transfected into a cervical cancer cell line, C33a, and monitored for the transcription activation of Bcl-2 and Bcl-xL genes. Only HPV16 E7 was shown to activate the expression of Bcl-xL gene. In contrast, none of the three HPV E7 can up-regulate the transcription of Bcl-2 gene in this cell line.

H0034-Effects of Prenatal Stress on Calbindin D-28K Immunoreactivity in Neonatal Rat Brain

Maturot Boonchareon¹, Nuanchan Jutapakdeegul², Pansiri Phansuwan-Pujito², Piyarat Govitrapong¹

¹Neuro-Behavioural Biology Center, Institute of Science and Technology for Research and Development, Mahidol University, Thailand; ²Department of Anatomy, Faculty of Medicine, Srinakharinwirot University, Thailand

E-mail address: cocoa_1306@hotmail.com

Abstract: Evidence from animal studies shown that prenatal stress may be a risk factor for psychopathology. In the offspring of prenatal stress animals, overactivity and impaired negative feedback regulation of the hypothalamic-pituitary-adrenal axis are consistent finding and may reflect a pathophysiological mechanism involved in the development of psychopathology later in life. Calbindin D28k (CALB), a member of the superfamily of calcium binding proteins, has received a great deal of investigative attention in the past several years. CALB not only play an important role in buffering intraneuronal calcium levels and served as a putative neuroprotective molecule against excitatory amino acids and apoptosis, but also have an important role in neurogenesis of the central nervous system. Moreover, selective losses of CALB immunoreactivity in the brain has been reported to correlated with cortical GABAergic deficit in neuropsychopathology. An impact of prenatal stress on the level of CALB immunoreactivity in several brain areas such as, hippocampus and prefrontal cortex, may alter several steps of brain development and may be related to neuropsychopathology later in life.

H0035-3D QSAR ANALYSIS OF FLAVONES AS HIV-1 REVERSE TRANSCRIPTASE INHIBITORS

Weerasak Samee¹, Jiraporn Ungwitayatorn²

¹Department of Pharmaceutical Chemistry and Pharmacognosy, Faculty of Pharmacy, Srinakharinwirot University, Bangkok, Thailand.

²Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Mahidol University, Bangkok, Thailand.

E-mail address: Weerasak@swu.ac.th

Abstract: Flavones are natural compounds, abundant in food and flowers, and relatively low toxicity. The hydroxyl groups at certain positions of flavone structures are important for HIV-1 reverse transcriptase (HIV-1 RT) inhibitory activity. To further understand the relationships between flavone structures and their HIV-1 reverse transcriptase inhibitory activity function, the three-dimensional quantitative structure-activity relationship (3D QSAR) study was conducted on a series of 10 flavone analogues. Predictive 3D QSAR models were established using molecular alignment obtained by docking the compounds into the active site of HIV-1 RT. The best 3D QSAR models gave non-cross-validated (r^2) and cross-validated (q^2) coefficients of 0.991 and 0.902 for CoMFA, and 0.988 and 0.907 for CoMSIA, respectively. A test set of 4 compounds was used to evaluate the predictive utility of both CoMFA and CoMSIA models. The calculated (predicted) and experimental inhibitory activities were well correlated. The CoMFA, CoMSIA contour maps, and the docking results were integrated to propose a binding mode for the flavone inhibitors at the active site of HIV-1 RT.

H0036-TRANSLATION OF LANNA MEDICINAL PLANT RECIPES FOR RESEARCH AND DEVELOPMENT OF MODERN PHARMACEUTICALS

Jiradej Manosroi^{1,2}, Aranya Manosroi^{1,2}, Subin Arnon², Panpen Kruathai³, Udom Rungruangsi⁴.

Faculty of Pharmacy, Chiang Mai University, Chiang Mai, Thailand
 Pharmaceutical-Cosmetic Raw Materials and Natural Products Research and
 Development Center (PCRNC), Institute for Science and Technology Research and
 Development (IST)
 Institute for Social Science Research, Chiang Mai University, Chiang Mai, Thailand
 Faculty of Humanities, Chiang Mai University, Chiang Mai, Thailand
 E-mail address: praput006@chiangmai.ac.th

Abstract: The objective of this study was to translate Lanna medicinal plant recipes for research and development of modern pharmaceuticals. A number of 190 copies of the old Lanna medicinal plant recipes were surveyed and collected from 4 provinces of the Lanna region, Thailand. These recipes were written in Lanna script on dried palm leaves, mulberry-pulp paper or strapless asper books. The 3 most reliable and complete recipes from each provinces were selected and translated into Thai. The translation comprised of 2 steps, first, Lanna to Thai (Lanna meaning) and second, Thai to the common understandable Thai. The medicinal plants appeared in the recipes were collected, prepared and arranged as scientific monographs. Therapeutic indications appeared in Lanna recipes were also included. For example, a recipe from Chiang Mai province contained 1,344 formulae. The medicinal plant which appeared in high frequency of 103 formulae was Oi Dang (*Isodonium officinarum* Lindl., family GRAMINEAE). Oi Dang was one of the ingredients in the recipes for the treatment of malaria, stomach ache, chest pain and malarial fever. The information of medicinal plants and therapeutic indications obtained from this study will be an important data which can be applied for the research and development of Lanna medicinal plant to modern medicines. Also, the Lanna folk wisdom will be beneficial for the conservation of the Lanna wisdom as well.

H0037-AUDITORY PREATTENTIVE PROCESSING OF CLUSTER VS. NONCLUSTER INITIAL CONSONANTS PERCEPTION IN MONOSYLLABIC THAI WORDS

Wichan Sittirapaporn*, Chinn Chitcaduangnam and Naphanich Kotchabakdi

Neuro-Behavioural Biology Center, Institute of Science and Technology for Research and Development Mahidol University, Salaya, Nakhonpathom 73170, THAILAND

E-mail: stweed@mahidol.ac.th, chinn@mahidol.ac.th, and senko@mahidol.ac.th

Abstract: As the MMN seems to reflect cortical memory traces for individual language elements, it may possibly allow for investigating even fine-grained properties of neural systems that realize these elements. We therefore set out to use it to explore the processing of functional elements of language in the human brain, in particular memory traces for cluster and noncluster initial consonant forms in Thai lexically. We chose to record the MMN elicited by the noncluster *ka ng* and cluster *ka ng* initial consonant forms in monosyllabic Thai words, and to compare the responses evoked by these initial consonant forms. The MMN was elicited by either a noncluster or cluster initial consonant form, phonetic contrasts being identical in both conditions. Using this approach, we found evidence for specific brain signatures of initial consonant forms in monosyllabic Thai word. The topography of the mismatch responses showed clear left-hemispheric laterality in both conditions. However, the MMN to the cluster initial consonant form occurred later than that for the noncluster one. Furthermore, the cluster initial consonant stimulus produced MMN maximal in temporoparietal sites, whereas the noncluster initial consonant stimulus elicited MMN was more profound at more frontal sites. We suggested that these features of the MMN to cluster initial consonant form indicate delayed activation of left-lateralized perisylvian cell assemblies that function as cortical memory traces of initial consonant form in monosyllabic Thai words.

H0038-AUDITORY PREATTENTIVE PROCESSING OF SHORT VS. LONG VOWELS PERCEPTION IN MONOSYLLABIC THAI WORDS

Wichan Sittirapaporn*, Chinn Chitcaduangnam and Naphanich Kotchabakdi

Neuro-Behavioural Biology Center, Institute of Science and Technology for Research and Development Mahidol University, Salaya, Nakhonpathom 73170, THAILAND

E-mail: stweed@mahidol.ac.th, chinn@mahidol.ac.th, and senko@mahidol.ac.th

Abstract: As the MMN seems to reflect cortical memory traces for individual language elements, it may possibly allow for investigating even fine-grained properties of neural systems that realize these elements. We therefore set out to use it to explore the processing of functional elements of language in the human brain, in particular memory traces for short and long vowel forms in Thai lexically. We chose to record the MMN elicited by the short *ka at* and long *ka a* vowel forms in monosyllabic Thai words, and to compare the responses evoked by these vowel forms. The MMN was elicited by either a short or long vowel form, phonetic contrasts being identical in both conditions. Using this approach, we found evidence for specific brain signatures of vowel forms in monosyllabic Thai word. The topography of the mismatch responses showed clear left-hemispheric laterality in both conditions. However, the MMN to the long vowel form occurred later than that for the short one. Furthermore, the long vowel stimulus produced MMN maximal in temporoparietal sites, whereas the short vowel-elicited MMN was more profound at more frontal sites. We suggested that these features of the MMN to long vowel form indicate delayed activation of left-lateralized perisylvian cell assemblies that function as cortical memory traces of vowel form in monosyllabic Thai words.

H0039-Construction of a Breath Alcohol Analyzer Using SnO₂ Gas Sensor

Pattarong Katsuraw, Pongsri Mangkornmong, Supah Chonpun, Suwit Wongsila², Thamarat Bunsoong³, Kampol Rayachonget⁴ and Niam Mangkornmong

¹Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand. ; e-mail address: k_chonn@yahoo.com

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand.

³Division of Radiation and Medical Devices, Regional Medical Sciences Center
Chiang Mai 50180, Thailand.

Abstract: In this work a breath alcohol analyzer was studied and constructed for screening test by using tin dioxide (SnO_2) semiconductor Model 822, manufactured by Figaro Engineering, as a gas sensor. The signal from the sensor was controlled and processed by a micro-controller 68HC11 of Motorola in conjunction with an Alcohol Simulator Model 34C of GUTH LABORATORIES for alcohol vapor concentrations of 20 mg%, 50 mg%, 80 mg%, 110 mg%, 150 mg% (mg% equivalents to mg/100 ml), respectively. 5 samples were employed for each concentration. The average of alcohol concentrations observed from the experiment were $20.5 \pm 6\%$, $49.9 \pm 2\%$, $73.5 \pm 11\%$, $100.2 \pm 13\%$, $144.9 \pm 11\%$, respectively. It was observed that for the 50 mg% alcohol vapor concentration, the measurement error was very low, that is in accordance with the breath alcohol testing required by law for drunken driving. So it is convinced that this instrument can be used for screening test for law enforcement purpose. However, more rigorous testing may required prior to really use in practical work.

H0040-CONSTRUCTION AND TESTING OF AN ANALOG BREATH ALCOHOL METER.

Suwit Wongsila^{*}, Sa-nga Usa, Pongsri Mangkornong, Supab Choopun and Nikorn Mangkornong

^{*}Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand.

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.

E-mail address : w_suwit@hotmail.com

Abstract: The key component of the analog breath alcohol meter is SnO_2 gas sensor model TGS-822 from Figaro company. The change of its conductivity due to the alcohol vapor was employed as the means for driving the movement of a moving coil analog meter. Calibration of the meter with a Fuel cell breath analyzer model Sensor IV made by Alco has been carried out at room temperature in the concentration range of 0-100 mg%. The reference alcohol standard solutions of 30, 50, 80, 100 and 150 mg% were used in the calibration and testing process. It was found that average deviation for the whole range of interest was about $\pm 4\%$.

H0041-EFFECT OF MECHANICAL LOAD ON ELASTIC DEFORMATION OF COATED CARTILAGE SURFACE

Boonyong Punantapong^{1,2}, Somchai Thongtem¹, Michael J. Fagan³, Chiroj Soorapanth⁴

¹ Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

² Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand

³ Centre for Medical Engineering and Technology, University of Hull, United Kingdom

⁴ Department of Orthopedic Surgery, Bangkok Metropolitan Administration Medical College and Vajira Hospital, Bangkok, Thailand

E-mail address : bpp@kmitnb.ac.th

Abstract: Articular cartilage has a limited capability for self-repair. The consequence of injuries to articular cartilage tissue is typically degeneration until surgery becomes necessary. However, isolated chondrocytes lose very rapidly their phenotypic expression in the absence of their extracellular matrix environment. Cartilage engineering offers new possibilities to prepare chondrocyte/matrix constructs that can reproduce a cartilage-like biomaterial, suitable to be injected into the defect area. The aim of research is to analyse behaviour of the tissue, which is affected by mechanical load such as the stresses to which it is subjected and the boundary conditions that govern its response. One of interest is the load condition of applied stress on the cartilage surface. Advantage of this research has to assist in the diagnosis of osteoarthritis and contribute to the longevity of articular cartilage in diarthrodial joint.

H0042-FEED-BACK REGULATION OF PROSTAGLANDIN METABOLITES ON PGE_2 SYNTHESIS AND THE EXPRESSION OF cPLA_2 , COX-1 AND COX-2 IN MOUSE LUNG FIBROBLAST CELLS

Chotika Suyarnsestakorn, Vanicha Vichai, Kanlayanee Sriklung and Kanyawim Kirtikara

The National Center for Genetic Engineering and Biotechnology,

National Science and Technology Development Agency, Pathumtani, Thailand 12120

Abstract: Prostaglandins (PGs) are cell mediators essential for maintaining physiological functions in the body. The synthesis of PG precursor, PGH_2 , is controlled by the rate-limiting enzyme called cyclooxygenase (COX). There are two isoforms of COX, COX-1 and COX-2. It is known that COX-1 is a constitutive isoform, while COX-2 is highly inducible by inflammatory stimuli. Previous study demonstrated compensatory regulation between the two isozymes [1]. To investigate whether PG levels are the factors that control the compensatory regulation between COX isozymes, we investigated the effects of PG metabolites, including PGE_2 , 15-deoxy- $\Delta^{12,14}\text{-PGJ}_2$ (15d-PGJ₂), 6-keto $\text{PGF}_{1\alpha}$ and $\text{PGF}_{2\alpha}$, on PGE_2 synthesis and the expression of cytosolic PLA_2 (cPLA_2), an upstream enzyme in the PG synthesis pathway, COX-1 and COX-2 enzymes in the mouse lung fibroblast cell line. We observed the positive feedback regulation of COX-2 protein and mRNA expression in a dose-dependent manner by high concentrations of PGE_2 , 15d-PGJ₂, 6-keto $\text{PGF}_{1\alpha}$ and $\text{PGF}_{2\alpha}$, which was correlated with the increased production of PGE_2 . On the other hand, COX-1 and cPLA_2 protein and mRNA expression was not affected by all of these PG metabolites. These data demonstrated positive feedback regulation of COX-2 by PG

metabolites, indicating that PG levels do not play an important role in the compensatory regulation between the two COX isozymes. Moreover, we examined specific PG products secreted by the mouse lung fibroblast cells treated with these four PGs. Our data showed that these PG metabolites had differential effects on the level of each PG production, suggesting their roles in the regulation of PG synthases, the enzymes responsible for PG isomerization.

H0043-PRELIMINARY STUDY OF RELATIONSHIP OF HUMAN PAPILLOMA VIRUS INFECTION IN ASCUS LESIONS OF PAPANICOLAOU SMEARS

Nopphanant Lathulee¹, Charnsak Juengmankong², Nicharat Swadipan¹

¹Department of Biological Science, Faculty of Science, Ubonratchathani University.

²Department of Obstetrics and Gynecology, Sappasittiprasong Hospital, Ubonratchathani, Thailand

E-mail address: nopcyto22@yahoo.com and nswadipan@yahoo.com

Abstract: Human papilloma virus (HPV) plays a role in development of cervical cancer or precancerous lesion. Cytological report of ASCUS categories based on The Bethesda System 2001 contained 5 subclasses: Atypical with immature squamous intermediate type cytoplasm (AMI), Atypical squamous cell in the setting of atrophy (ASA), Atypical parakeratosis (APK), Atypical repair (ARC) and Atypical cell due to compromised specimen (ASC). This study tested the correlation of HPV infection and subclass of ASCUS by using immunocytochemistry techniques with monoclonal antibody against HPV types: 6, 11, 16, 18, 31. The studies were performed using 90 Papanicolaou smears, representing 5 normal cervix smears, 5 cervical carcinoma and 80 ASCUS smears. All of the normal cervical smears were not stained with HPV antibody while all cervical carcinoma revealed strongly positive immunoreactivities. ASCUS cervical smears revealed 21 smears of positive immunoreactivities from total of 80 smears which equaled to 16.8%. The percent of positive cases revealed 15% for AMI, 38% for ASA, 25% for APK and 33% for ARC. However, ACS slides were not stained. This result supported the correlation of HPV infection and subclasses of ASCUS lesions. Interestingly, ASA which mainly found in menopause women had the highest percentage of HPV infection.

H0044-SYNTROPHIN BINDING TO AQUAPORIN-4 WATER CHANNEL PROTEIN AND POTASSIUM CHANNEL (Kir4.1 SUBUNIT): ROLE IN WATER HOMEOSTASIS IN MICE RETINA

Moghaddam²

¹Neuro-Behavioural Biology Center, Institute of Science and Technology for Research and Development, Mahidol University, Salaya, Nakorn Pathom 73170, Thailand

²Center for Molecular Biology and Neuroscience, Institute of Basic Medical Sciences, University of Oslo

E-mail address: o.p.ottersen@medisin.uio.no, scnk@mucc.mahidol.ac.th

Abstract: AQP4 water channel and the inward rectifying potassium channel Kir4.1 are co-expressed in a highly polarized manner at the perivascular and vitreal endfeet of the retinal Müller cells. The anchoring mechanisms responsible for their expression at the Müller cell endfeet are unknown. Both AQP4 and Kir4.1 contain PDZ-domain binding motifs at their C-termini, making them able to interact with the PDZ domain containing proteins present at these membrane domains. Syntrophin are PDZ-domain containing scaffold proteins attached to the dystrophin complex that is present in the Müller cells. Study of mice with targeted disruption of the dystrophin gene (mdx mice) shows impaired clustering of AQP4 and Kir4.1 at the Müller cell endfeet. The expression of AQP4 at perivascular astrocyte endfeet in brain depends on alpha-syntrophin. Moreover, recent biochemical studies have shown an association between Kir4.1 and alpha-syntrophin pointing at alpha-syntrophin as the main candidate for anchoring of AQP4 and Kir4.1 in retina.

H0045-Development of ECG System Monitor via Mobile Telephone

S.Noimane¹, J.Tuntrakoon², G.Rujjanakool³, S.Sophonthummarak,MD⁴, S.Chaisupun⁵

¹Currently P.h.D. student in Material Science, Department of Physics, Chiang Mai University, Chiang Mai.

²Department of Physics, Chiang Mai University, Chiang Mai.

³Department of Physics, Chiang Mai University, Chiang Mai.

⁴Faculty of Medicine, Print of Songkla University, Songkla.

⁵Department of Physics, Chiang Mai University, Chiang Mai.

E-mail address: suranan@chiangmai.ac.th, j-rapong@chiangmai.ac.th, gobwute@chiangmai.ac.th, ssomkeat@ratree.psu.ac.th, suwit.c@chiangmai.ac.th

Abstract: This paper is partial of a real-time patient monitoring system through the HLAN (Hospital Local Area Network) which using electrode are attached to the patient's bodies. Then the electrocardiogram signals from patient's bodies are sent by a electronic card through the HLAN to let the patient's work as an agent card connected to the server of the computer network. The system enables the physicians to monitor the patient's ECG signal condition and other database in real-time. It can be enable the physicians to use mobile telephone to check the patients conditions 24 hours each day. And we can develop this system through LAN and the internet.

H0046-GENDER DIFFERENCES BETWEEN MALE AND FEMALE SPRAGUE-DAWLEY RATS IN THE PONTINE NUCLEI: AS THE STUDIES BY THREE-DIMENSIONAL COMPUTER GRAPHIC SYSTEM

Khantichat Khankasikam, Dollada Srisai, Rungpiyada Tipyasang, and Naiphinich Kotchabhakdi

Neuroanatomy Laboratory, Neuro-Behavioural Biology Center,

Institute of Science and Technology for Research and Development,

Mahidol University, Salaya, Nakornpathom, 73170 Thailand

E-mail address: scnk@mahidol.ac.th

Abstract: Many brain areas show dimorphic gender differences. The study using MRI showed that the human cerebellum had the differences in size between male and female. The pontine nuclei in the brainstem are an important relay system for the cerebro-cerebellar interactions. Pontine nuclei received direct projection from specific cerebral cortical areas and project their axons as mossy fiber afferents to specific areas of the cerebellar hemisphere. Twelve male and female Sprague-Dawley rats (Six males and six females), weighting between 250-320 gm were used in the experiments. The rat brains were perfused and cut on freezing microtome. Brain tissues were stained with Luxol Fast Blue/Neutral red. The complex organization of the cerebro-ponto-cerebellar projection system has been studied by 3 dimensional computer graphic and morphometric system (Micro 3D). The data showed that there were significant differences in volume and neuronal distribution between male and female rats in different areas of the pontine nuclei ($p < 0.05$).

H0047-FREE RADICAL SCARVENGERS FROM *MACLURA AMBOINENSIS* BL. ROOTS.

Jantana Yahuafai¹, Pongpun Siripong^{1*}, Rittichai Chanpai¹, Suratsawadee Piyaviriyagul¹, Kwanjai Kanokmedakul²

¹Natural Products Research Section, Research Division, National Cancer Institute, Bangkok 10400, Thailand.

²Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen 42000, Thailand.

*E-mail address: pongpun@health.moph.go.th; pongpun8@yahoo.com.

Abstract: As part of our search for potential antitumor constituents from Thai traditional plants used for the treatment of cancer of the National Cancer Institute, the active plants have been selected and investigated for bioactive compounds using bioactivity-guided isolation. The *n*-hexane and chloroform extracts isolated from the roots of *Maclura amboinensis* Bl. (family Moraceae) were also exhibited potent DPPH free radical scavenging activity. Chromatographic purification of these active extracts afforded four main xanthenes: macluraxanthone (1), gerontoxanthone-I (2), gerontoxanthone-G (3), gerontoxanthone-C (4); one flavanone: cycloartocarpesin (5); one triterpenoid: butyrospermol acetate (6) and one long chain ester (7). Their structures were elucidated on the basis of spectroscopic and chemical evidences. All xanthenes (1-4) and cycloartocarpesin (5) displayed potent free radical scavenging activity with IC_{50} values in range of 0.023-0.084 mM using 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical assay. Among of them, gerontoxanthone-I was the most active compound whereas butyrospermol acetate and long chain ester had no activity. Our findings can be concluded that *M. amboinensis* Bl. and its active compounds are interesting candidates for development of cancer chemopreventive agents and/or treating diseases associated with excess free radicals.

10001-WET DEPOSITION IN THE WESTERN REGION OF THAILAND

Mallika Panyakapo¹, Dirakrit Buavait² and Pongsri Paopuree³

Department of Environmental Science, Faculty of science, Silpakorn University, Nakhon Pathom. 73000 Thailand
e-mail: ¹mallika@su.ac.th, ²dirakrit@su.ac.th, ³ppongsri@chaiyo.com

Abstract : The study on acid deposition in the western region of Thailand is a part of "The Acid Deposition Monitoring Network in Thailand", organized by Pollution Control Department. The monitoring period is between April 1, 2003 to March 31, 2004. Wet and dry depositions are included in this project, however, wet deposition is presented in this paper. Sampling site was located at Nakhon Pathom meteorological station. Precipitation samples were collected on a daily basis using a wet-only collector. Samples were analyzed for pH, electrical conductivity, NH_4^+ , Na^+ , K^+ , Ca^{2+} , Mg^{2+} , SO_4^{2-} , NO_3^- and Cl⁻. The total precipitation is 918.8 mm/year. pH and electrical conductivity are in the range of 4.61-6.52 and 0.45-9.07 mS/m, respectively. The annual weighted average concentrations of SO_4^{2-} , nss- SO_4^{2-} and NO_3^- are 22.40, 21.20 and 11.04 $\mu\text{eq/L}$, respectively. Wet depositions of the important acid species: SO_4^{2-} and NO_3^- are 19.03 and 9.38 meq/m²-year, respectively. The ratio of $\text{NH}_4^+ + \text{Ca}^{2+} + \text{Mg}^{2+} / \text{nss-SO}_4^{2-} + \text{NO}_3^-$ which indicates a neutralizing capacity, are in the range of 0.91-4.48. The ratio of $\text{NO}_3^- / \text{nss-SO}_4^{2-}$ is in the range of 0.27-3.60, which shows that the concentrations of both ions fluctuate along the year. Therefore, the emission sources of both ions have to be carefully monitored.

10002-ACUTE TOXICITY AND EFFECT OF ENDOSULFAN ON GLUTATHIONE-S-TRANSFERASE ACTIVITY IN *Macrobrachium lanchesteri*

Saifon Archanachai, Pranee Damrongphol* and Malceya Kruatrachue

Department of Biology, Faculty of Science, Mahidol University, Bangkok, Thailand

E-mail address: g4536201@student.mahidol.ac.th, sepdri@mahidol.ac.th and

Abstract: Endosulfan is an organochlorine pesticide often used in paddy fields by Thai farmers for snail eradication. The 96-h LC_{50} of rice land shrimp, *Macrobrachium lanchesteri* was 2.00 $\mu\text{g/L}$. Study on the glutathione-s-transferase activity (GST) in whole body of rice land shrimp showed that the activity of GST significantly increased after exposure to 0.35, 0.7 and 1.4 $\mu\text{g/L}$ endosulfan; and the activities increased up to 96 h and were positively related to the endosulfan concentrations. Furthermore, bioaccumulations of endosulfan by *M. lanchesteri* from surrounding freshwater were 1.34 and 1.31 ng/g-wet weight in those exposed to 0.7 and 1.4 $\mu\text{g/L}$ endosulfan for 24 h. The results suggested that the GST level in Rice land shrimp can be used as indicator for organochlorine insecticide contamination.

10003-STUDY OF FINE PARTICULATE MATTER IN PHITSANULOK HOMES

Phattharaphol Imkrajang, Witchaya Imkrajang and Pajaree Thongsanit*

Department of Civil Engineering, Faculty of Engineering, Naresuan University, Phitsanulok

E-mail address: ptprikj@yahoo.com, witchayaia@yahoo.com and pajareeta@hotmail.com

Abstract: Particulate Matter with an aerodynamic diameter less than 10 microns (PM10) was collected from six living rooms in three roadside and three non-roadside homes located in central Phitsanulok. The samples were analyzed using Energy Dispersive X-ray (EDX) for 10 elements and Scanning Electron Microscopy (SEM) for morphology. The PM10 from roadside samples were mostly higher than the standard of 150 $\mu\text{g/m}^3$ and were also higher than PM10 from non-roadside home samples. The roadside samples were found to be from diesel and gasoline engine emissions, spongy and non-geometric in shape, and contained primarily the elements, C and O. The non-roadside samples were found to be from soil and construction dust, sharp-edged and dense, and contained primarily the element, Si. Questionnaires were used to obtain data on the conditions, location and background of the homes and activities of occupants.

10004-TREATMENT OF WASTE COOLANT EMULSIONS BY COAGULATION AND FLOCCULATION

Pakawan Kamoncharvanich¹, Tanaporn Tanupabrunsun¹, Sangobtip Pongstabodee^{1,2*}

¹Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand.

E-mail: Pakawan.K@student.chula.ac.th, Tanaporn.T@student.chula.ac.th, and psangob@sc.chula.ac.th

Abstract: Treatment of waste coolant emulsions from metal-autopart industry was studied. The treatments were coagulation and flocculation using synthetic ferric chloride, ferric chloride, and aluminium sulphate as coagulants and using anionic and cationic polymers as flocculants. The effects of coagulant dose, flocculant dose, pH, turbidity, BOD, speed of rapid and slow mixing were considered. Electrophoresis measurements indicated that initial oil droplets had a negative zeta potential. When adding a coagulant to the emulsions, the zeta potential became more positive. The coagulants were shown to be effective in reducing the zeta potential of the oil droplets but in increasing oil droplet size. At optimum pH condition (pH = 6), the turbidity and BOD of the wastewater were reduced by 99.65 and 99.5 percent, respectively. In addition, oil separated from waste coolant emulsions was recycled as a fuel, then heat content of the oil was also investigated. The experimental results showed that heat content of oil separated from waste coolant emulsions was about 34,493.82 J/g.

10005-REMOVAL OF STABILIZED OIL IN WASTEWATER EMULSIONS BY INDUCED AIR FLOTATION

Chuleekorn Chooklin¹, Sangobtip Pongstabodee^{1,2*}

¹Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand,

²The National Research Center for Environmental and Hazardous Waste Management (NRC - EHW), Faculty of Science, Chulalongkorn University, Bangkok, 10330, Thailand.

E-mail address: tooktick007@hotmail.com and psangob@sc.chula.ac.th

Abstract: The removal stabilized oil in wastewater emulsions was studied by means of induced air flotation technique. The effect of several parameters on induced air flotation efficiency for removal of the emulsified oil was examined, namely: (a) the presence of nonionic surfactant (Polyoxyethylenesorbitan monooleate, Tween 80) used for the stabilization of the emulsions and for long-life of bubble, (b). concentrations and types of electrolyte, (c). air flow rate, (d). gas bubble size and (e). flotation time. Zeta - potential, turbidity and UV-absorbance measurements were also monitored. At the optimum defined experimental conditions (1 CMC of Tween 80, pH 7, aluminium sulphate 160 mg/l, 8 ml/sec of air flow rate, 40 -100 μ m of gas bubble size and 5 min of flotation time) more than 99 % of the stabilized oil in wastewater emulsions was effectively removed from an initial concentration of 500 mg/l.

10006-REMOVAL OF HEAVY METALS FROM WASTEWATER BY ADSORPTION ON ACTIVATED CARBON **Kannika RUKKID¹, Sangobtip PONGSTABODEE^{1,2}, Tharapong VITITSAN¹**

¹Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, 10330, Thailand,

²The National Research Center for Environmental and Hazardous Waste Management (NRC-EHWM), Faculty of Science, Chulalongkorn University, Bangkok, 10330, Thailand

E-mail address: kannika088@hotmail.com, psangobti@sc.chula.ac.th

Abstract: The aim of this research is to study removal of copper ion from wastewater by adsorption on activated carbon. Effect of several factors has been investigated as a function of pH, contact time, concentration of copper ion in aqueous solution and type of activated carbon. The experimental results indicated that different type of activated carbon gave a different optimal condition of copper removal. Optimal pH when using Carbokarn to adsorbed copper was around 4. Meanwhile optimal pH when using C-gigantic, stream-activated 60 min and stream-activated 30 min was around 5. At the same pH condition, it was found that copper removal by adsorption on Carbokarn was higher than C-gigantic, stream-activated 60min and stream-activated 30min respectively. Increasing in copper ion concentration leads to reducing an adsorption efficiency of all activated carbon used in this work. To reach equilibrium, Carbokarn had shorter contact time than other.

10007-PRELIMINARY STUDY OF CONSERVATION IN A WORLD HERITAGE SITE: HUAI KHA KHAENG WILDLIFE SANCTUARY

Seriwat Saminpanya, Chaichart Dhamgrongartama, Jatuporn Bavornkraisri, Chuchart Thiengtham, Chanon Koonnon, Chatchai Chaitragul, and John Middleton

Department of General Science, Faculty of Science, Srinakharinwirot University Sukhumvit 23, Watthana, Bangkok 10110, Thailand

E-mail address: seriwat@hotmail.com

Abstract: This work aims to study the existing condition of some physical and biological resources, human resources, tourism, and management of the Huai Kha Khaeng wildlife sanctuary. The methods were collecting secondary data and doing field work in the wildlife sanctuary. The geological data include rock types and soil texture. The data of water quality, DO, pH, conductivity, transparency and temperature of a stream were collected. Sampling plot in the forests were examined. 170 people living in 3 villages near the border of the wildlife sanctuary were interviewed with the use of questionnaires on the environmental and conservation items. Comments from tourists were investigated. Now (2004 AD) the Huai Kha Khaeng wildlife sanctuary is under the National Park, Wildlife and Plant Conservation Department, Ministry of Natural Resources and Environment, Thailand. The results of this study give rise to knowing the existing condition and problems of the Huai Kha Khaeng wildlife sanctuary. The solutions for the problems have been suggested.

10008-Utilization of Distillery Slop for the Rice Production in Khon Kaen Province

Tasane Thitakamol¹, Somboon Kaewpinthong²

¹Division of Environmental Science, Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand

²Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand

Abstract: Distillery slop is the wastewater from distillery process of liquor which has to be treated before discharge at a very high cost. However, as it contains large quantities of organic matter and plant nutrients, especially potassium, it can be used to improve soil fertility and increase crop yield without destroying environment. This research is therefore aimed to study the appropriate doses of distillery slop that gives the optimal yield of jasmine scented rice or Khao-Dawk-Mali 105 planted on Sida Soil Series in Khon Kaen Province under the application of fertilizer, and to study the effect of distillery slop on chemical properties of soil and on the number of microorganisms as well as the effect on methane emission in paddy field. The result of the experiments, especially that of the second crop year, indicated that application of 20 m³/rai of distillery slop along with 30 kg/rai of fertilizer grade 16-16-8 gave the optimal rice yield. Application of increasing doses of distillery slop could increase the contents of some chemical properties of soil especially Potassium and Magnesium, but it had no significant effect on the number of bacteria and mold, especially at pre-planting and panicle-initiating periods. Utilization of distillery slop did not cause the increase of methane emission from the rice field.

10009-PREDICTING TIDE CHARACTERISTICS ON THE COASTLINE OF THE ANDAMAN SEA BY NON-HARMONIC METHOD

Kanatawan Aungsakul*, Krisanadej Jaroensutasinee

CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, Nakhonsithammarat 80160, Thailand;

E-mail address: 44200020@wu.ac.th, jkrisana@wu.ac.th

Abstract: This study was based on water level prediction data downloaded from the website of the Hydrographic Department, Royal Thai Navy, for the year 2002 at Ranong, Phuket, Phangnga, Krabi, Trang, and Satun stations. A non-harmonic method was used to determine tide types and compared them with the known published data. It was found that the F ratios at six stations were 0.161, 0.240, 0.229, 0.226, 0.199, and 0.249 respectively. The mean ranges were highest at Ranong station and lowest at Phangnga station. The maximum and minimum of the mean sea level were found at Krabi and Satun stations respectively. The tides at all six stations on the coastline of the Andaman Sea were semidiurnal. The result can be used to accurately predict tide characteristics of the area being studied.

10010-COMPUTATION OF D8 FLOW LINE AT RON PHIBUN AREA, NAKHONSITHAMMARAT PROVINCE

Oranong Boonklong*, Krisanadej Jaroensutasinee, Mullica Jaroensutasinee

CX-KURUE & Computational Science Graduate Program, Institute of Science, Walailak University, Nakhon Si Thammarat 80160, Thailand;

E-mail address: 44300044@wu.ac.th, jkrisana@wu.ac.th, jmullica@wu.ac.th

ABSTRACT: We developed a flow line computational technique based on the D8 method by using *Mathematica*. The technique was applied to Ron Phibun area, Nakhonsithammarat Province. This area is highly contaminated with arsenic 3 and 5. We found that our technique using *Mathematica* can produce similar results to those obtained from GRASS v 5.0.2.

10011-ELEVATION MODEL (DEM)

Chairote Yaiprasert*, Krisanadej Jaroensutasinee

Institute of Science, Walailak University, Thasala, Nakhonsithammarat, 80160, Thailand,

E-mail address: id45203221@yahoo.com, jkrisana@wu.ac.th

Abstract: The objective of the study was to develop a computational technique for generating a Digital Elevation Model (DEM). Contour lines, scanned from the 1:50,000 scale map of the Royal Thai Army Survey Department, were used to estimate the values of adjacent data points on continuous contour lines for computation of a DEM by means of Delaunay triangulation. The technique was found to be an economical way of converting continuous analogue data signals into a digital format of "x, y" or "x, y, z" coordinates.

10012-FLASH FLOODING PREDICTION BY RAIN EXPOSURE INDEX (REI) BASED ON GOES-9 SATELLITE DATA

Watcharee Ruairuen*, Krisanadej Jaroensutasinee Computational Science Graduate Program, Institute of Science, Walailak University, Nakhonsithammarat, Thailand 80160.

E-mail Address: 46203881@wu.ac.th, jkrisana@wu.ac.th

Abstract: A new geocomputing Rain Exposure Index (REI), which can predict flash flooding resulting from a series of heavy rainfalls, was constructed and tested. The index was constructed by computing data from GOES-9 satellite using combinations of image processing and functional constructs. The hypothesis was tested by two events of flash flooding in Prachuapkhirikhan, Phetchaburi, and Tak Provinces in Thailand as well as one event in Southern Leyte Province in the Philippines. The results indicated that REI was capable of accurate prediction of flash flooding 1-2 days in advance of the event.

10013-REMOVAL OF CHROMIUM FROM CONTAMINATED SOIL BY SOIL WASHING METHOD

Phornsuang Markmanee, Pimpimol Kongjinda, Passakorn Srijew, Pitsamai Chairatu-tai and Wiboon Praditweangkum*

Department of Chemistry, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520, Thailand

E-mail address: wiboon44@hotmail.com

Abstract: This research aims to study the removal of chromium from contaminated soil by washing with water, ethylenediamine tetraacetic acid (EDTA) solution and sodium dodecyl sulfate (SDS) solution. The samples employed in this research once had been used in the previous research—Remediation of Chromium-Contaminated Soil by Planting the Broad Leaf Plants. The soil was divided into two groups. The first group was spiked with 100 ppm of chromium solution/10 grams of soil (0.10 mg Cr/1 g of soil), while the second group was not. The Broad Leaf Plants have been planted in both groups of soil for 60 days. After that, the second group of sample was spiked with chromium solution at the same concentration as spiked in the first group. Both groups were processed the experiments in order to compare the results. The outcomes demonstrated the same tendency. The soil washed with SDS solution at concentration of three times of chromium concentration in soil shows the best efficiency, while the soil washed with water adjusted to pH = 2, and the soil washed with EDTA solution adjusted to pH = 2 at concentration of two times of chromium concentration in soil show respective efficiency.

10014-EFFECT OF OZONATION ON BACTERIA AND PHYTOPLANKTON IN THE WATER FROM SHRIMP POND

Benjamas Paibulkichakul^{1,2*}, Weena Jitnirat¹, Tamsiri Kawinphan¹, Chalee Paibulkichakul³ and Sorawit Powtongsook⁴

¹Program of Environmental Science, Faculty of Science and Technology, Rajanagarindra Rajabhat University, Chachoengsao, Thailand

²Science and Applied Science Center, Faculty of Science and Technology, Rajanagarindra Rajabhat University, Chachoengsao, Thailand

³Faculty of Marine Technology, Burapha University, Chantaburi Campus, Thailand

⁴Marine Biotechnology Research Unit (at Chulalongkorn University), National Center for Genetic Engineering and Biotechnology, Thailand

E-mail: bpaibulkichakul@mail.nrc.ac.th

Abstract: Effect of ozonation on bacteria and phytoplankton in the low salinity water from shrimp pond in Chachoengsao Province was evaluated in this study. For the first trial, it was found that ozonation for 60 minutes could reduce 97.1% of bacteria in the water. After mixing the water with shrimp feed and aerated for 5 days, ozonation could also reduce the number of bacteria and turbidity in the water. However, the efficiency of bacterial treatment was less than the first experiment. This was possibly due to high concentration of organic and inorganic compounds in the water. For the second trial, water from shrimp pond was mixed with phytoplankton (*Chaetoceros* sp.) before ozonation. The results showed that 95% of phytoplankton cells were reduced after 60 minute ozonation.

10015-A STUDY OF SORPTION OF HEAVY METALS USING *PADINA HAITIENSIS* THIVY

Sunanta Wangkarn¹, Sirirat Chanvarit² and Akaradet Mingmuang¹

¹Department of Chemistry, Faculty of Science, Chiang Mai University, Chiangmai 50200, Thailand

²Department of Chemistry, Faculty of Science, Burapha University, Chonburi 20131, Thailand

e-mail address: sunanta@chiangmai.ac.th

Abstract: Conditions for adsorption of lead (Pb), cadmium (Cd) and chromium (Cr) in contaminated water samples using *Padina haitiensis* Thivy were investigated. Variables affecting the metal adsorption were studied which included types and times of shaking, pH of solution and interfering metals. From these experiments, the optimum condition was found to be the shaking time of 3 hours and solution pH of 3.0. In case of the interfering metals, lead and chromium affects the adsorption of cadmium dramatically. This optimum condition is applicable to the adsorption of heavy metals in wastewater samples. The amounts of lead, cadmium and chromium adsorbed were found to be 146-314, 13-175 and 76-133 µg/g, respectively.

10016-DEGRADATION OF LEAD COMPLEX BY PHOTOOXIDATION IN THE PRESENCE OF HYDROGEN PEROXIDE

Duangkamon Jiraroj, Fuangfa Unob*

Environmental Analysis Research Group, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand,

E-mail address: fuangfa.u@chula.ac.th

Abstract: The degradation of PbEDTA in aqueous solution by a photooxidation process (H_2O_2/UV) was studied. The effect of H_2O_2 content, pH of the solution and the presence of nitrate were investigated. PbEDTA degradation by a H_2O_2/UV process was shown to be accompanied by simultaneous lead precipitation. PbEDTA was decomposed rapidly in acidic solutions while lead precipitation was achieved only when the pH of the solution was higher than 6. The presence of nitrate in significant amounts (0.04 M) inhibited remarkably the degradation of the complex and metal precipitation. It was found that the decomposition of metal-EDTA complex and metal removal by the H_2O_2/UV process depend greatly on the nature of the metal. CdEDTA and ZnEDTA were decomposed rapidly but metal precipitation was not achieved. The major by-products of the degradation of metal-EDTA complexes observed were nitrilotriacetic acid (NTA), iminodiacetic acid (IDA), oxalic acid and nitrate.

10017-INVESTIGATION OF A VARIETY OF CLAY MINERALS FOR THE ADSORPTION OF ZEARALENONE

Komkrich Pimpukdee

Department of Veterinary Public Health, Faculty of Veterinary Medicine, Khon Kaen University, Khon Kaen 40002, Thailand;

e-mail address: kompim@kku.ac.th

Abstract: Zearalenone (ZEN) is a hazardous mycotoxin that contaminated food and feedstuffs worldwide. ZEN contamination of commodities results in economic and health costs, creating a need to research to allay these problems. The objective of this research was to evaluate the ability of different types of clay minerals (e.g., kaolinite, smectite, mica), to adsorb ZEN *in vitro*. Clays utilized in this study were selected to represent a wide range of different physical and chemical characteristics, including unit cell configuration, organic and trace metal composition, surface area, swelling ability, and cation exchange capacity (CEC). The results indicated that various clay minerals possess a distinct structure that can bind ZEN differently. Important structural differences provide unique functional and chemical characteristics. The extent of sorption was dependent on the chemical and physical characteristics of the clays. Among tested clay minerals, smectite clays are suitable for ZEN sorption, because smectite clay minerals possessing high surface area, high cation exchange capacity, small particle size, and access to the interlayer region. These characteristics cause smectite clay minerals having higher capacities for ZEN adsorption as compared to other clay minerals.

10018-COMPOSTING BY LOCAL COMMUNITY IN COMMERCIAL SCALE USING AERATED STATIC PILE SYSTEM

Teeapong Sawangpanyangkura¹, Samerkhwan Tantikul¹, and Chanawat Nitawichit¹

¹Department of Agricultural and Food Engineering, Faculty of Engineering and Agro-Industry, Maejo University, Chiang Mai 50290, Thailand;

E-mail address: teesawang@yahoo.com

Abstract: In this research three full-scale piles were studied. Each pile consisted of 6 m³ of shredded leaves and 3 m³ of cow manure, and was piled on opened ground in prism-like shape with the dimensions of 2.5x3.5x1.0 m (width x length x height). Urea fertilizer, phosphate rock, and seeding activators of 400, 200, and 90 grams, respectively, were added. The moisture content was controlled at 45-55 %. The air was forced twice a day (at 8.00 hours and 16.00 hours), 15 minutes each, through 4 inches perforated PVC pipe by a 3 hp blower at air flow rate of 0.118, 0.147, and 0.155 m³/sec for each pile. It took approximately 30 days to complete the composting and the suitable air flow rate was 0.155 m³/sec. Only 1.9-3.2 % of the materials were not completely decayed. The average electricity expense was 0.07 baht per kilogram of raw material per month. From the technology transfer, the Aerated Static Pile system was found to be a potential system in producing compost in commercial scale by local community because of its simple procedure, no turnover needed, low costs and less use of energy.

10019-EFFECT OF HEAT TREATMENTS ON HECTORITE FOR THE ADSORPTION OF AFLATOXIN B₁

Komkrieh Pimpukdee

Department of Veterinary Public Health, Faculty of Veterinary Medicine, Khon kaen University, Khon Kaen 40002, Thailand

e-mail address: kompim@kku.ac.th

Abstract: The objective of this research was to evaluate the effect of heat treatments on hectorite for the adsorption of aflatoxin B₁ (AfB₁). Each heated hectorite was prepared by heating the sample at each specified temperature for 1 hr. There were 11 different heating temperatures from 100°C to 1000°C (in increments of 100°C). The results indicated that among the heated hectorites, hectorite heated at 700°C for 1 hr demonstrated the highest AfB₁ adsorption (65.52 ± 0.92%). No significant difference in the increase in the adsorption of AfB₁ was observed when hectorite was heated at temperatures of 100°C, 200°C and 300°C when compared to the parent clay. The binding capacity was increased when temperature was increased to 400°C, 500°C or 600°C. A significantly lower binding was shown at 900°C (40.25 ± 3.11%) and at 1000°C (10.47 ± 6.83%) when the interlayer of clay was collapsed. This study indicates that hectorite clay could be effective for adsorption of AfB₁ and heating hectorite at proper temperature could increase binding capacity.

10020-STUDY OF TOXICITY SITUATION OF FRESHWATER RESERVOIRS BY DETERMINATION OF MICROCYSTIN IN BLUE-GREEN ALGAE USING HPLC

Sombat Chowwanapoonpohn¹, Siwaree Ruangrattanakul², and Weerachai Phutdhawong²

¹Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Chiang Mai University, Chiang Mai, 50202, Thailand : e-mail address: sombach@pharmacy.cmu.ac.th

² Department of Chemistry, Faculty of Science, Maejo University, Sansai, Chiang Mai, 50290, Thailand; e-mail address: weerachai@mju.ac.th

Abstract: Cyanobacteria, or blue-green algae, represent a serious problem in freshwater reservoirs in Thailand where all these reservoirs are contaminated with toxic cyanobacteria, *Microcystis aeruginosa* Kutz. The toxic compounds have been isolated and identified as microcystins, a cyclic heptapeptides. In this studies, the reversed-phase HPLC was used for detection and quantitation Microcystin LR which is one of microcystin analogues in samples of dried *Microcystis aeruginosa* cells. The methanolic solvent (60% MeOH) was used for elution of the toxic peptides. The HPLC condition were C18 ODS column, flow rate 1.0 ml/min, UV 238 nm detector. The HPLC chromatogram of the Microcystin LR identified in the microcystic cyanobacteria extract revealed the retention time of 2.12, which was fully compatible with the standard sample. The quantity of Microcystin LR was quantitated as 0.586 mg (0.0585% yield)

10021-Cadmium Removal from Wastewater by Applying Natural Materials as Sorbents

Prawit Nuengmitcha¹, Piyawan saimanophan¹, Duangmanee Machimawong¹, Amonrat Sawat¹, Supenpon Pakuang¹, Jirapon Luamduppang¹, Ongsa pongpitakduamlong¹, Panittha rithiprad¹

¹ Department of Chemistry, Faculty of Science, Rajabhat Nakhon Si Thammarat University

Abstract: The objective of this research was to study the efficiency of cadmium removal from wastewater using coconut husk, betel nut husk, palmyra husk and oil palm husk. The effect of initial pH of wastewater, initial concentration of cadmium, temperature of wastewater, time required for equilibrium, particle size of adsorbents were investigated and determined adsorption capacity of adsorbents. It was found that the suitable pH for cadmium adsorption onto coconut husk, betel nut husk, palmyra husk and oil palm husk were 4.0, 4.0, 5.0 and 6.0, respectively. The most suitable initial cadmium concentration was 100 mg/L, temperature 30°C, time required for equilibrium 24 hours, particle size 60 mesh. Adsorption capacity for coconut husk, betel nut husk, palmyra husk and oil palm husk were 1.04, 0.54, 0.71 and 0.69 mg/g respectively After being applied the optimum condition found from the research for cadmium removal from wastewater, it was found that cadmium was adsorbed as followed: coconut husk(80.95%), betel nut husk(71.43%), palmyra husk (80.95%) and oil palm husk (76.19 %).

10032-THE MEASUREMENT OF CHEMICAL OXYGEN DEMAND (COD) WITH NO MERCURIC AND STANDARD PROCEDURES: A COMPARISON

Suchada Chaisawadi¹, Waraporn Methawiriyasilp¹, Sorasak Kulamai¹ and Yingsak Kraipinit¹

¹Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: waraporn@pdti.kmutt.ac.th

Abstract: Chemical Oxygen Demand (COD) is one of qualitative indicator that uses for evaluate organic pollution in water and wastewater. To develop the appropriated analytical method that reduce the amount of hazardous waste in environmental laboratory, no mercuric COD reagent has been focused. No mercuric COD closed reflux was compared with COD closed reflux, colorimetric standard method. These had been studied on KHP standard solution, spiked samples and 100 industrial wastewater samples including 20 of agroindustrial factories, 20 of feed and farm factories, 20 of tuna can factories, 20 of starch and modified starch factories and 20 of domestic wastewater. Recoveries of KHP 1,000 mg/L, spiked KHP 1,000 mg/L by COD standard method were $101.7 \pm 3.06\%$ and $99.8 \pm 2.74\%$ respectively. COD standard method on agroindustrial factories, feed and farm factories, tuna can factories, starch and modified starch factories and domestic wastewater showed 256-6,293 mg/L, 350-17,241 mg/L, 264-5,645 mg/L, 296-15,732 mg/L and 113-25,336 mg/L, respectively. No mercuric COD closed reflux showed 358-7,186 mg/L, 421-47,387 mg/L, 304-5,516 mg/L, 316-18,298 mg/L and 222-39,875 mg/L, respectively. The correlation (r^2) of no mercuric COD closed reflux and COD standard method on agroindustrial factories, feed and farm factories, tuna can factories, starch and modified starch factories and domestic wastewater were 0.98, 0.99, 0.93, 0.98 and 0.998, respectively. When compared the results of no mercuric COD closed reflux and COD standard method from various kinds of wastewater, no significant difference was found at the 99% confidence interval. The correlation coefficient (r^2) of no mercuric COD closed reflux and COD standard method from all kinds of wastewater in this study were 0.93-0.998. The use of no mercuric COD closed reflux has been found to be suitable for COD measurement on various kinds of wastewater in this studied.

10033-DEVELOPMENT OF MINIATURIZED CHEMICAL OXYGEN DEMAND (COD)

Suchada Chaisawadi¹, Waraporn Methawiriyasilp¹, Yingsak Kraipinit¹, and Sorasak Kulamai¹

¹Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail: kyingsak@hotmail.com

Abstract: To developed the appropriated analytical method that reduce the amount of hazardous waste in environmental analysis laboratory, the miniaturized closed reflux method for the determination of chemical oxygen demand (COD) that reduced 5 time of reagents and sample amount used from standard method has been developed. To evaluate the miniaturized closed reflux method, the developed method was compared to closed reflux, standard method. The procedure was evaluated by analysis of KHP standard solution (500 mg/L), spike and various kinds of wastewater (COD range 425-4242.2 mg/L) in the total of 98 samples. The developed method showed COD of KHP, spike and various kinds of wastewater were 504.4-548.5 mg/L, 720.2-843.6 mg/L and 445.0-4242.2 mg/L, respectively. The COD from standard, closed reflux method were 512.4-537.8 mg/L, 460.4-621.6 mg/L and 278.6-3894.7 mg/L, respectively. Recoveries of KHP and spike by developed method were $105.0 \pm 4.4\%$ (100.9-109.7%) and $101.9 \pm 11.1\%$ (89.0-108.3%) and standard closed reflux method were $104.3 \pm 2.8\%$ (102.5-107.6%) and $100.3 \pm 9.0\%$ (91.2-108.2%), respectively. When compared the results of wastewater from developed and standard closed reflux, no significant difference between the two methods was found at the 99% confidence interval. And the correlation coefficient (r) of the two methods was 0.84. The use of miniaturized COD closed reflux method has been found to be suitable for the determination of COD in wastewater.

10034-Effect of Chlorpyrifos on DNA damage in Haemocyte of Black Tiger Shrimp (*Penaeus monodon*)

Tassanee Eamkamon¹, Narongsak Puanglarp², Wichase Khonsue¹, Kumthorn Thirakhupt¹ Piamsak Menasveta^{2,4}

¹National Research Center for Environmental and Hazardous Waste Management, Faculty of Graduate School, Chulalongkorn University, Bangkok 10330, Thailand

²Marine Biotechnology Research Unit, National Center for Genetic Engineering and Biotechnology (Biotec), National Science and Technology Development Agency (NSTDA), 113 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120, Thailand

³Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

⁴Department of Marine Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract: Extensive use of organophosphorus pesticides has become the great concern on their effects to aquatic invertebrates. Black tiger shrimp (*Penaeus monodon*) is one of aquatic invertebrates that can be adversely affected by the pesticides. Therefore, the development of the sensitive and precise indicator for assessing the toxic effect of pesticides on the shrimp is needed. The single-cell gel electrophoresis (comet assay) has been conducted to test genotoxicity of chlorpyrifos on the shrimp haemocytes (10^4 cells) from each treatment was exposed to chlorpyrifos at the concentration of 0, 0.01, 0.05, or 0.25 $\mu\text{g/L}$, respectively ($N = 3$). After 6 hours of exposure, the significant increase of comet tail moment was detected ($P < 0.05$) at the chlorpyrifos concentration of 0.05 and 0.25 $\mu\text{g/L}$ compared to control. Moreover, the severity of DNA damage coincided with the increase of chlorpyrifos concentration. It can be concluded from the result that chlorpyrifos has genotoxic effect on shrimp haemocytes.

I0035-Biodiversity and bioactivity in hydrocarbon contaminated sediments

Poonsuk Pothiruckit-Prachyanusorn¹, Jeremy R. Mason²

¹Department of Biology Faculty of Science and Technology Rajabhat Surathani University Surathani Thailand 84100

²Division of Life Science King's college University of London UK

Abstract: One strain of *Arthrobacter* sp. was eventually selected as most appropriate for a bioaugmentation study due to its high solvent tolerance and ease of detection using molecular techniques. The study performed over a period of two hundred days involved assessing and monitoring bacterial species in a microcosm contaminated soil laboratory environment. The indigenous microbial community were monitored by means of both PCR, PCR-DGGE, RT-PCR-DGGE analysis of 16S rDNA and 16S rRNA. In addition, bioactivity and detection of degradative genes involved in benzene degradation were studied. Throughout the study, successive changes were observed amongst the microbial population, which was correlated to the changes in environmental conditions applied to the microcosm. Enumeration of both heterotrophic and benzene degraders were observed to fluctuate. In addition, the ratio of bioactivity measurements using radiolabelled [¹⁴C]-benzene could not be correlated to bacterial counts. Despite the continuous detection of the *Arthrobacter* sp. via PCR-DGGE of 16S rDNA analysis, RT-PCR analysis only detected the strain on day 114. The ability of the inoculant strain to be sub-cultured and identified by the end of the study indicated that the latter was capable of survival. The detection of both DNA and RNA transcripts of the *bedC1* gene throughout the study period indicates that the biodegradation of benzene can be attributed to the presence of the benzene dioxygenase enzyme involved in the initial microbial degradation pathway of benzene.

I0036-Removal of Heavy Metal in Wastewater by Silica Gel Produced from Rice Husk Ash

Kongsak Pattarath

Department of Chemistry, Faculty of Technology and Sciences, Phranakhon Si Ayutthaya Rajabhat University, Thailand

E-mail address: k.pattarath@yahoo.com

Abstract : This research is to study how to produce silica gel from rice husk to remove heavy metal from wastewater. Removing organic compounds from rice husk by acid and burning always leads to the formation of rice husk ash (the content of SiO₂ to be 94.15 %W/W). Silica gel produced from rice husk ash has been characterized by several techniques. The optimized conditions for Chromium(Cr), Cadmium(Cd) and Lead(Pb) adsorption were studied. The appropriated pH and equilibration time were 5.0 and 6 hours, respectively. The adsorption capacity obtained from the batch method for Cr, Cd and Pb were 3.63 , 6.76 and 11.22 mg g⁻¹, respectively. It also found that the adsorption capacity will be decreased when there was other cation in the solution. The studies of column method found that the amount of Cr, Cd and Pb adsorption were 4.09 , 7.12 and 12.05 mg g⁻¹, respectively. The removal of Pb in wastewater using silica gel was studied both in the batch and column methods. The result showed that the removal of Pb obtained from the batch and column methods was 7.25 and 10.00 mg g⁻¹, respectively.

I0037-AN EFFICIENCY EVALUATION OF PHOSPHATE TEST KIT THE DETERMINATION OF PHOSPHATE IN VARIOUS KINDS OF WASTEWATER

Sorasake Kulamai^{1*}, Suchada Chaisawadi¹, Darawan Thongbutre¹, and Waraporn Methawiriyasilp¹

¹Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: sorasake@pdti.kmutt.ac.th

Abstract: To choose the appropriated analytical method that simple, rapid, cost-effective, reliable and reduce amount of hazardous waste, the rapid phosphate estimation including phosphate test kit had been proposed. The efficiency of EPA accepted phosphate test kit was compared to phosphate standard method. Phosphate test kit used in this study are EPA accepted phosphate test kit (0-2.5 mg/l) that take only 5 minutes for phosphate measurement. The procedure was evaluated by analysis of standard phosphate and various kinds of wastewater. The results standard phosphate (0.1,0.2,0.4 and 0.5 mg/L) by using phosphate test kit showed% recovery 96.4±0.84, 95.0±0.57, 111.2±0.14 and 95.3±0.34, respectively. showed standard phosphate (1,2,5 and 8mg/L) by using standard method with % recovery 103.3±9.32%, 108.3±3.56%, 102.3±1.42% and 107.8±3.08%, respectively. The results showed phosphate from standard method in domestic wastewater, tuna caned wastewater, feed farm factories wastewater and starch factories wastewater were 0.91±0.00 (0.1-2), 3.10±0.00 (1.8-6.4), 3.4±0.00 (2.9-4.7) and 2.03±0.00 (1.3-2.9) mg/L, respectively. Estimated phosphate from phosphate test kit were 0.72±0.00 (0.1-2.2), 1.31±0.00 (0.6-2.5), 2.2±0.00 (1.1-3.3) and 1.78±0.00 (1.1-2.5) mg/L, respectively. The correlation coefficient (r²) of EPA accepted phosphate test kit and phosphate standard method which were compared in various kinds of wastewater was 0.8227. No significant difference between the two methods was found at the 99% confidence interval in all kinds of wastewater. The use of phosphate test kit as the rapid estimation in various kinds of wastewater in this study have been conclude.

I0038-ENVIRONMENTAL AND SAFETY MANAGEMENT IN UNIVERSIT: CASE STUDY KMUTT THAILAND

Solot Suwanyun^{1*}, Suchada Chaisawadi¹, Jarurat woranisaraku¹, Naraporn Hanwajanawong¹, Chalarmrij Wantawin¹, Sirinthornthep Taopreyoon¹, Nipawan Adisornvorawoot¹, Linda Pengsuwan and Nantaporn Nanta

Energy Environmental Safety and Health Office¹, King's Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: solot@pdti.kmutt.ac.th

Abstract: According to the environment impacts resulting from the activities on educational institutions and others, one of KMUTT policy is directed to Green University concept. The university activities on environment and safety have been

concerned, these include environmental and safety management for education and research. KMUTT is committed to the proper management of environment and safety provides an environmental and safety management service through the Energy, Environment, Safety and Health Office (EESH). Environmental management in KMUTT have been concerned on Chemical and Waste management. Chemical management system within KMUTT have been developed by using KMUTT Chemical database. To decrease the environmental pollution and minimize the risk of students, staffs and members of public. Laboratory waste management has been set up within KMUTT and aim to play an important role to maintain a safe and environmentally responsible within the university. Chemical and Laboratory waste management system within KMUTT has been established since 1999 according to research grant from the Thailand Research Fund of the master plan to establish a National Industry/University Cooperative Research Center (IUCRC). The system, procedures and manuals for the laboratory waste management and treatment were developed according to the Green University policy and standard practices. Waste minimization program has been set up and implemented in the pilot laboratory that successfully operated under the new developed system. Safety management have been developed according to standard practice with procedures and manuals on chemical safety, biosafety, electrical safety and equipment and machinery safety. Proper safety equipments and personal protective equipment (PPE) have been provided for students and staffs. Training and preparation on the developed procedures and systems have been given to majority of KMUTT staff. The system procedures and manuals for environmental and safety management have been developed and implemented for ten of pilot laboratories within the university. The systems evaluation show implementation require the cooperation and support of students, faculty and staff members. Nowadays, the environmental and safety management system have been implemented by 60% within KMUTT. And therefore, it is quite ready to expand the management system within KMUTT to cover all others in a near future. This paper describes the study and implementation experience on environmental and safety management in the university. As a results of this study, environmental and safety management within KMUTT can help to decrease the environmental impacts and maintain a sustainable management to all staffs and public.

10039-Analysis of Atmospheric Stability in Chiang Mai Province from Sounding and Calmet Model

Supanee Maichandee, Jiemjai Kreasuwan

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract: Analysis of atmospheric stability in Chiang Mai was conducted by both meteorological thermodynamic diagram analysis and Calmet modeling. Atmospheric stability was analyzed from the positive area and negative area of sounding data plotted on the thermodynamic charts. Stability classes of the atmosphere were classified from the output of the Calmet model with surface data, upper-air data, and geophysical data as the input data, according to Pasquill-Gifford-Turner (PGT) stability classes.

10040-Simulation of the favorable condition heavy rainfalls due to effect of the active south-west monsoon and Chanthu depression by MM5

Jiemjai Kreasuwan, Wonchai Promnopas, Orawan Wirunvedchayan, Sittidet Srinoi

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

e-mail address : aoy166@hotmail.com

Abstract: The weather conditions under the influence of the Chanthu depression and the active south-west monsoon in June, 2004 were investigated by the MM5. Favorable conditions for heavy rainfalls in Pitsanulok province and nearby areas were signified from the simulated convergence of the moist south-west monsoon and the Chanthu depression flow. Strong updrafts and the negative divergence of moist air over the affected areas were also indicated from the MM5 outputs. The predicted range of rainfalls in Pitsanulok province on June 14, 2004 were 8.0-12.0 cm/24 hrs.

10041-Numerical simulation of the active low pressure area over Cambodia by MM5

Wonchai Promnopas, Pimpaporn Patima, Jiemjai Kreasuwan

Department of Physics, Faculty of Science, Chiangmai University, Chiangmai 50200, Thailand

E-mail address: babq99@hotmail.com

Abstract: The effect of the active low pressure area over Cambodia was analyzed by the MM5 during September 11-14, 2003. Surface moist air convergence was simulated over the active low pressure area which was supported by the negative divergence of the moist air. The maximum predicted rainfall were 6.2-6.5 mm.

10042-Numerical weather simulation of the O2B cyclone in Thailand by WRF Model

Jiemjai Kreasuwan, Wonchai Promnopad, Pakpoom Ratjiranukool

Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

e-mail address: yoyo051@hotmail.com

Abstract: The investigation of the track of the O2B cyclone developed in the Andaman sea, the Indian ocean, which caused heavy rainfalls and severe floods in Tak province and nearby areas during May 15-21, 2004, was analyzed by the Weather Research and Forecasting model (WRF). Cyclonic flow and predicted rainfalls in the affected areas were simulated along the depression track. The simulated cyclonic flow was indicated in the Andaman sea at the 15° N latitude, the 94° E longitude with the wind speed at 50 km/hr on May 15, 2004 and later on at the 19° N latitude, the 92° E longitude with the wind speed at 54 km/hr on May 17, 2004. The maximum predicted rainfall on May 17, 2004 were 20-40 mm at Tak province.

10043-Numerical simulation of active monsoon trough over northeastern Thailand by MM5

Jiumjai Kreasuwan, Wonchai Promnopas, Kanitta Netsuwan
Department of Physics, Faculty of Science, Chiangmai University, Chiangmai 50200, Thailand.

Abstract: Monsoon trough is favorable condition for the development of big clouds and heavy rainfalls. Analysis of the weather in northeastern Thailand on September 11, 2003 by MM5 models indicated convergence of moist air, the updraft, heavy rainfall. Along the monsoon trough predicted maximum rainfall on September 11, 2003 were 60-62 mm./3 hrs

10044-Numerical Weather Simulation of the Chanthu depression track by WRF

Jiemjai Kreasuwan, Wonchai Promnopas, Sujittra Inthacha
Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand.
e-mail address: su_in9@yahoo.com

Abstract: The Analysis of the Chanthu depression track was performed by the Weather Research Forecasting (WRF) model. Simulated track indicated the cyclonic flow of the Chanthu typhoon, developed in the South China Sea moving north-westward during June 9-15, 2004. The vortex of the depression on June 11, 2004 was found at the latitude 10oN, the longitude 120oE with the wind speed of 65 km/hr and moved onwards to Thailand at the latitude 16oN, the longitude 103oE with the wind speed of 50 km/hr on June 14, 2004. Heavy rainfall due to the influence of the depression was also detected in Phitsanulok province and nearby areas where severe floods were reported.

10045-Numerical simulation of the depression in the gulf of Thailand by WRF

Jiemjai Kreasuwan, Wonchai Promnopas, Sittidet Srinoi, Chakrit Surain
Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
e-mail address: joey_1012003@hotmail.com

Abstract: This study simulated the cyclonic flow track in the gulf of Thailand, the wind vector convergence and the effects on the rainfall in southern during October 21-24, 2003 by WRF model. The model detected the active low pressure area in the gulf of Thailand that developed into a depression moving north- westward resulted in heavy rainfalls and flash floods in the low lands of Prachuap Khiri khan, Chumphon, Surat Thani, Nakho Si Thammarat and nearby provinces in southern Thailand.

10046-Application of CALPUFF Model on Sulfur Dioxide Dispersion from Mae Moh Power Plant

Sumit Jirungnimsakul, Jiemjai Kreasuwan
Department of Physics, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
e-mail: Fuse_j@hotmail.com

Abstract: This research uses the CALPUFF model, which consists of 3 sub - models; CALMET, CALPUFF and CALPOST to simulate the dispersion in Lagrangian form of exiting sulfur dioxide from the stack in Mae Moh Power Plant in Lampang as well as the wind speeds, wind directions and surface 2 SO concentrations. The study area covers 1600 square kilometre in the 18.1 - 18.5 o N latitudes and the 99.5 - 100.0 o E longitudes. Simulated 2 SO concentrations were 25.2 3 / g m μ and 6.4 3 / g m μ at the main station and the government center station respectively on Nov 11, 2002.

10047-REMOVAL OF CHROMIUM (III) AND CHROMIUM (VI) FROM AQUEOUS SOLUTION BY ALGAE *SPIRULINA* AND *CHLORELLA* SPECIES

Supranee Boora, Suchawadee Ardwichai, Lamfa Pootipan, Sumaree Parachaga, Jirasak Threeprom
Department of Chemistry, Faculty of Science, Mahasarakham University, Mahasarakham 44150, Thailand
E-mail: ple080@yahoo.com

Abstract: Chromium (Cr) removal has been studied using three types of algae, namely *Spirulina sp.*, *Chlorella vulgaris* TISTR 8261 and *Chlorella vulgaris* TISTR 8580. Cr(III) and Cr(VI) were simultaneously determined by using ion interaction chromatography with the detection at 200 nm. From the result, it was found that three types of algae offered satisfactory results for removal, but only *Spirulina sp.* was selected to further work. According to the developed *Spirulina sp.* system, Cr(III) was completely removed (100%) at pH 8.0 within 15 hours of contact time with the metal uptake value of 41.2 mg Cr/g biomass. Meanwhile, at pH 2.0, Cr(VI) removal was nearly completed (88%) within 5 days of contact time with the metal uptake value of 36.6.

10048-LEAD REMOVAL IN WASTE WATER BY HEAT TREATED COCKLE SHELL AND MUSSEL SHELL

Jinda Yuenyongchaiwat^a, Suneerat Pipatmanomai^a, Udornporn Khanthong^a, Sarawoot Jansuk^a, and Apichat Imyim^b
^a Department of Chemistry, Faculty of Science and Technology, Bansomdejchaopaya Rajabhat University, Bangkok 10600, Thailand; ^b Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand.
(*jinday@yahoo.com)

Abstract: The comparative studies on lead removal in synthetic wastewater have been investigated by using cockle shells and mussel shells as absorbents. Upon heating in a domestic cooking stove followed by rapid cooling, shells were broken into fine particles and the desired particle size of 0.125-0.250 mm can be obtained by screening. The structure and surface of absorbents were examined by using XRD and SEM, respectively. The XRD results showed that cockle shells were mainly composed of calcium hydroxide and calcium carbonate in form of calcite, while the major composition of mussel shells was

calcium carbonate in form of aragonite and calcite. Factors influencing adsorption in a batch process studied in this work included the contact time, the initial pH, the quantity of shells, and the Freundlich adsorption isotherm. The observed maximum absorption capacity of cockle shells was 0.5 mg (lead)/g (adsorbent) at 10 min and mussel shells was 5 mg/g at 5 min. The initial pH did not have a significance effect on the adsorption of lead. The adsorption constant in Freundlich isotherm was found to be 1.21×10^{-1} and 1.31×10^{-3} mg/g for cockle shells and mussel shells, respectively. The continuous process using a packed column was also studied. The results indicated that, under the conditions studied, both cockle shells and mussel shells could efficiently remove lead from the flowing solution. The effluent up to 15 and 45 times of the adsorbent bed volume could be treated by cockle shells and mussel shells, respectively, with the lead concentration in the effluent remaining lower than 0.2 mg/L, which is the standard for lead content in wastewater set by the Ministry of Industry. The results from batch and continuous processes similarly suggested that mussel shells had higher efficiency in lead removal than cockle shells.

I0049-THE POTENTIAL OF NARROW-LEAVED CATTAIL (*Typha angustifolia*) FOR DYE REMOVAL

Sumol Nilratnisakorn¹, Paitip Thiravetyan², Woranan Nakbanpote³

¹The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi

²Division of Biotechnology, School of Bioresource and Technology,

King Mongkut's University of Technology Thonburi (Bangkhuntien Campus)

³Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi

E-mail address: sumol_nil@yahoo.com¹, paitip.thi@kmutt.ac.th²,

woranan_n@pdti.kmutt.ac.th³

Abstract: Textile wastewater mainly contained chemicals and dyes. Reactive dyes in textile wastewater can be dissolved well in water and caused unattractive to the public. Phytoremediation is an alternative method for decolorization of textile wastewater, which is low cost and easy to operate. Narrow-leaved cattail (*Typha angustifolia*) is selected for wastewater treatment because its ability to absorb the large amount of nutrient and contaminated substances. In this study, narrow-leaved cattail was conducted under the soilless conditions, with different synthetic dye and synthetic wastewater concentrations (0, 10, 20 and 30 mg·L⁻¹). Comparison of Narrow-leaved cattail at initial pH of 5.8 and 8.8 was studied. The result showed that plant could remove dye well in the system pH with 5.6 - 6.4. The maximum dye removal was approximately 36 % in the treatment of wastewater containing 20 mg·L⁻¹ synthetic dye with initial pH 8.8. The further study will examine what chemical substances involved in dye removal and how dye can be uptake into the shoot. The defense mechanism of the plant will also be investigated.

I0050-Forecasting Peak Discharge at Chao Praya Dam (station C13) During September to November 2003 by using AIT River Network Model

Royol Chitradon, Narongsak Pimpunchat, Karnjana Saengprapai

National Science and Technology Development Agency

111 Thailand Science Park, Phahon Yothin Road, Klong Luang, Pathumthani 12120, Thailand

e-mail: karnjana@haii.or.th Tel. +66 (0)2-564-6900

Abstract: AIT River Network Model is the mathematical model in order to forecast the peak discharge and hydrograph forecasting at Chao Praya dam during September to November 2003, by utilizing 3 data requirements: daily rainfall from TMD during 1st July 2003 to 15th September 2003, daily discharge from Bhumibol and Sirikit dams during 1st July 2003 to 15th September 2003, and peak discharge at Chao Praya dam before 16th September 2003. Time base of hydrograph shows period of forecasting dates, which display the daily peak discharge (accuracy $\pm 5\%$ and ± 150 days) and 9 to 26 days forecast (accuracy ± 5 days). This model is limited by the conditions that the peak discharge at Chao Praya dam will be not greater than 2500 cms. and the forecasting date will start when the ratio of Q/Qp is greater than 0.4. The result of this model can be used as upstream boundary condition in mathematical model and flood warning.

I0051-Relationship of Dam's Water Storage to be a Guideline for Dam's Water Management

Royol Chitradon, Narongsak Pimpunchat, Jittiporn Chantarosiri

National Science and Technology Development Agency

111 Thailand Science Park, Phahon Yothin Road, Klong Luang, Pathumthani 12120, Thailand

e-mail: jittiporn@haii.or.th Tel. +66 (0)2-564-6900

Abstract: The research about relationship of dam's water storage to be a guideline for dam's water management has been divided into 2 parts: rainy (July - December) and dry (January - June) season. The model of this experiment was run on 8 dams around the country, which is, Banglang dam, Bhumibol dam, Kangkrachan dam, Rajaprabha dam, Sirikit dam, Srinagarind dam, and Ubolratana dam by using dam's data from Electricity Generating Authority of Thailand (EGAT) and monthly rainfall's data from Thai Meteorological Department (TMD). **In rainy season**, this research has the assumption that monthly rainfall in rainy season has affected to dam's water storage in rainy period. It was proved that monthly rainfall in rainy season has linked to dam's water storage in rainy period. **In dry season**, the research aimed to prove the assumption that dam's water level at the beginning of dry season has effected to dam's water storage in dry period. From the experiment, it was proved that dam's water level at the beginning of dry season has linked to dam's water storage in dry period. The result of this experiment could be used as a guideline for dam's water management in various conditions, by using water storage up dam and dam's water level.

10052-Relationship of Rainfall between TMD's station and TRMM's Satellite Image Archive

Royal Chitradon, Narongsak Pimpunchat, Usa Chachiyo, Somjate Khampumngson

National Electronics and Computer Technology Center,

111 Thailand Science Park, Klong Luang, Pathumthani 12120

e-mail address: usa.chachiyo@nectec.or.th telephone: +66 (0)2-564-6900

Abstract: TRMM (The Tropical Rainfall Measuring Mission) is a mission for record rainfall data in tropical regions from the satellite image archive. This research is aimed to compare daily rainfall data from TMD (Thai Meteorological Department) to the satellite image archive of TRMM in form of graph, from July 22, 2003 – January 20, 2004. The results from two of these sources are quite similar, hence, we could summarize that TRMM data can replace the missing data of TMD's rainfall stations.

10053-Prediction of atmospheric polycyclic aromatic hydrocarbons using orange jasmine *Murraya paniculata* (L.) Jack leaves

Benjalak Karnchanasest¹ and Arpapan Satayavibul²

¹Environmental Research Institute, Chulalongkorn University, Phaya Thai Road, Patumwan, Bangkok 10260, Thailand, benjalak.k@chula.ac.th ²Rajapat Suan Dusit University, Dusit Road, Bangkok, Thailand.

Abstract: This work was to study sorption of atmospheric PAH in orange jasmine leaves, *Murraya paniculata* (L.) Jack and their potential to predict atmospheric PAH were investigated. The partitioning experiments between the leaves and the water were conducted and calculated for the leaf/air partition coefficients. The air and leaves at the same 4 Bangkok roadsides were collected and analyzed for 16 PAH. The actual measured PAH concentrations were compared to atmospheric concentrations calculated from the leaf/air partition coefficients to evaluate the potential indicator. There were close relationships between calculated and measured PAH in the air as indicated by good correlation coefficient ($r^2 > 0.70$) particularly lower molecular weight (MW) PAH, which were ACY, ACE, FLU, PHE and ANT. This was due to lower MW PAH mostly present in gas phase, which played a major role in leaf sorption. Therefore, higher MW PAH existed mainly in particulate phase; exhibited lower correlation coefficient ($r^2 < 0.6$).

10055-Preliminary study of elemental composition in tree leaves for using as biomonitor for air pollution

Supamathree Bunprapob and Wanna Chueinta

Chemistry and Material Science Research Program, Office of Atoms for Peace, Bangkok 10900, Thailand

e-mail: supa_bunprapob@yahoo.com

Abstract: The use of plant tissue as biological monitor of air pollution had been of interest worldwide. The study on chemical composition of such biological monitor may provide important information on the levels and pathways of a variety of pollutants including heavy metals and trace toxic elements in atmosphere. The appropriate biomonitors are such as herbaceous plants, tree leaves, bryophytes and lichens, with their possible advantages and/or limitations. In this research, an investigation of element composition in leaves was performed. The technique of Instrumental Neutron Activation Analysis (INAA) was developed to determine heavy metals and trace elements in 8 species of tree leaves collected from 3 different locations. From the experiments, it was found that content of elements might vary depending on species and environment. Some specific elements are discussed and compared in this report.

10056-DETERMINATION OF FURAZORIDONE RESIDUE IN PORK SAMPLES IN MUNICIPAL AREA, AMPHUR MAUNG, UBON RATCHATHANI PROVINCE

Boonsong Taparuk¹, Kanjana Nhusin¹, Supit Pracharat¹ and Kanya Kerdsiri¹

¹Program of Chemistry, Faculty of Science, Ubon Ratchathani Rajabhat University, Ubon Ratchathani, 34000, Thailand

Abstracts : Furazolidone, an antibacterial drug in the nitrofurans group, often be mixed to stimulate growth and prevent infection in animals. These compounds are carcinogenic. In this study, pork samples were collected from local market in municipal area, Amphur Maung, Ubon Ratchathani province. Furazolidone in pork samples were examined by spectrophotometric method. The result indicated that, furazolidone in heart, meat and skin of pork samples were 4.36 ± 0.09 , 3.04 ± 0.07 and 2.24 ± 0.08 mg/kg respectively. The percentage recoveries of furazolidone in heart, meat and skin were 105.0, 89.1 and 95.4 respectively.

10057-DEVELOPMENT OF WASTE MANAGEMENT DATABASE WITHIN KMUTT

Suchada Chaisawadi¹, Theerasak Luechaphongthip¹, Nantaporn Nuntha¹, Penprapa Bualouy¹ and Solot Suwanyun¹

Energy Environmental Safety and Health Office¹, King's Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: suchada@pdti.kmutt.ac.th

Abstract: Waste management database within KMUTT has been developed according to the policy and standard practices. In this database, the laboratory wastes were separated into 23 difference categories for storage and treatment according to the activities within KMUTT. The developed database system has been designed by using SQL server for database operating system, Microsoft Window 2003 Server for Server operating system and ASP for webpage development. Pilot laboratory, Process and Environmental Analysis Center has been successfully operated under the new developed database system. The demonstration results indicate that the waste management database system established could be collected all data and analysed the amounts and categories of waste produced within the pilot laboratory. Training and preparation on the

developed procedures and system have been given to majority of laboratory staff on KMUTT. Nowadays, the waste management database system have been implemented by 50% of analytical laboratory within KMUTT. And therefore, it is quite ready to expand the system to cover all other laboratory operation within KMUTT in a near future.

I0058-Removal of Zinc (II) by silica gel produced from rice husk and modified with amino-thiol groups

Ratana Mahachai¹, Chaiwat Kongmanklang², Saksit Chanthai³, Chutima Kukusaude⁴, Tipawan Khummeng⁵ and Patana Teerapornchaisit⁶

^{1,2,4,5,6} Department of Chemistry, faculty of Science, Khon Kaen University 40002, ³ Suranaree University, Nakhonratseema

Abstract : Silica was extracted from rice husk (the content of silica to be 99.82 % w/w) and was prepared for silica gel. The silica gel was immobilized with amino-thiol groups and it was characterized by FT-IR spectrum and showed the additional peaks at wavenumber at 3303 and 2553 cm^{-1} which corresponded to -NH and -SH groups. The batch and column methods using this sorbent were demonstrated for removing Zn(II) from the Zinc electrolysis industrial wastewater which has concentration about 3300 ppm and the interference of Pb(II), Cd(II), Hg(II) and As (III) the total contents about 500 ppm. The results indicated that the removing in percent of Zn(II) on the batch and column methods were 70.24 ± 0.12 and 99.98 ± 0.40 respectively for 5 ml wastewater and 0.5 g sorbent dosage.

I0059-The Impacts of Natural Leaching and Production of Salt on the Water Quality of Mae Num Songkram

Chutima Kukusamude¹, Tipawan Khaemmeng², Supalax Srijaranai³, Ratana Mahachai⁴, and Patana Teerapornchaisit⁵

^{1,2,3,4,5} Department of Chemistry, faculty of Science, Khon Kaen University 40002

ABSTRACT: Water samples were collected from 13 stations between Ban Dung (Udonthani province) and Ban Ta-sa-ard (Nongkhai province) in February, May, August and December. The collected samples were determined for the content of some anions, cations and heavy metals including Cl^- , NO_3^- , SO_4^{2-} , PO_4^{3-} , Na, K, Mg, Ca, Pb, Cd, Mn and Hg. The result revealed that there was salt contamination from natural leaching at station 1 during early rain. The impact of salt production activity on water quality in Songkram river was clearly shown during dry season. Because salt production was allowed only from November to May each year. Two major sources of salt production areas that contributed to Songkram river salt contamination were supposed to be Ban Dung area which resulted in maximum content of 3,207.3 ppm NaCl in Ta-ma-now reservoir and Ban Ta-sa-ard where underground saline water was taken from the middle of the river and transported to boiling factories on the nearby river shore. The content of salt in Songkram river at this station was 974.1 ppm NaCl in February. The content of some heavy metals, in all samples were normal according to the standard of surface water quality of Thailand.

J0001-STRENGTHEN OF COUNTRY COMPETITIVENESS BY EXPLOIT PATENT INFORMATION.

Pramote Tammarate, Siriporn Stonsavapak, Pornwisa Boonyong, Kassamaporn Puntaburt, Ladda Kangwankietichai.
Institute of Food Research and Product Development, Kasetsart University, Bangkok, Thailand 10900
E-mail address: ifrpmt@yahoo.com, ifrpmt@hotmail.com

Abstract: Patent information disclosed technology for the production of all kind of industrial products. These database of industrial technology accumulated for more than 200 years. About 30 million documents from 71 countries able to search very rapidly from European patent office at <http://cp.espacenet.com>. Patented technology that not registered in Thailand or in any other country are public properties, every body could commercialize to make world progress. Good performance were found in trial use of patent download software such as Patent Hunter, IP-Discover, Patent Browser. Patent analysis software such as INAS, Matheo Patent found to be very useful for patent intelligent to find tread of competitor and technology trend and patent mapping to analysis white space of technology. The promotion of patent information and utilization of patent software through public mass media were done continuously. More than 2,000 persons participated in 48 training course on Patent search and patent software utilization. Recently, Competitiveness development office, Office of the National Economic and Social Development Board understand about an important of patent information for strengthen of country competitiveness going to exploit these patent information.

J0002-GROWING OF CsI(Tl) CRYSTAL FOR SCINTILLATION

Manit Jitpukdee*, Suvit Punnachaiya and Decho Thong-aram
Department of Nuclear Technology, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand.
E-mail address: finespiva.eng.chula.ac.th and jmanit@hotmail.com

Abstract: A CsI(Tl) scintillation crystal was grown under a simple developed process using the Bridgman-Stockbarger method. An economical vertical furnace was designed for crystal growing. The 99.9% purity CsI powder and 99.999% purity TlI powder were mixed and processed in closed system of crystal growth tube under pressurized Argon gas. In these studies, the parameters of 0.1 mol% TlI mixing concentration, 2 mm/h translation rate of crystal growth tube and 37.48 °C/cm of temperature gradient at the crystal growing zone were applied. It was found that the CsI growth crystal rod was clear and the non-uniform concentration of activated Tl in CsI growth crystal was in range of 0.0256 – 0.0806 mol%. The developed CsI(Tl) crystal was tested by coupling with the P-I-N photodiode and assembled as a scintillation detector for gamma spectrum analyzing. The tested results have shown the energy resolution of 15.48% at 662 keV for 10 mm diameter and 8 mm thickness of a crystal.

J0003-A THICKNESS CONTROLLING SYSTEM OF ELECTRICAL WIRE INSULATING MACHINE USING RADIATION TRANSMISSION TECHNIQUE

Passapong Paritamma, Suvit Punnachaiya and Decho Thong-aram
Department of Nuclear Technology, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand.
E-mail address: finespn@eng.chula.ac.th and aop527027@hotmail.com

Abstract: The microfocus x-ray transmission radiography was applied for developing a thickness controlling system of an electrical wire insulating machine associated with the image edge detection by Sobel method to determine an insulation sheath thickness and evaluate a conductor wire off-center. The evaluated results was employed to generate an error signal which was proportional to shifting magnitude and could be used to control an injection rate of the wire insulating machine. The developed system consisted mainly of a microfocus spot x-ray generating system and a real time fluoroscopic system. An x-ray image signal of x and y axes were sent to microcomputer for image processing and displaying. In operations test, the thickness of PVC insulated for electrical wire at cross-section area of 1, 1.5, 2.5 and 4 mm² were inspected comparing with the standard method. It was found that the inspected value were less than 120 µm error and the error signal from conducting wire center shifting resulted at 0-0.16 mm corresponding to 0 – 9.33 V could be generated.

J0004-RATE OF STYRENE-NR EMULSION COPOLYMERIZATION WITH HIGH RUBBER CONTENT IN VARIOUS REACTION CONDITIONS

Tarnee Nampitch¹ and Terdthai Vatanatham¹,
¹Department of Chemical Engineering, Faculty of Engineering, Kasetsart University, Bangkok, Thailand,
E-mail address: g4485021@ku.ac.th, and terdthai.v@ku.ac.th

Abstract: The emulsion copolymerization of NR and styrene monomer at high rubber content was done by mixing natural rubber latex, styrene, initiator, emulsifier, and water. The concentration of initiator, emulsifier, natural rubber, and temperature effected the rate of emulsion copolymerization. The initiator, emulsifier, styrene to rubber ratio, and temperature in polymerization recipe were increased from 0.8 to 1.4 parts, 4.5 to 6.5 parts, 2:3 to 1:1 per 100 parts of organic materials, and from 58 °C to 64 °C respectively. The rate of polymerization increased with these parameters. Moreover, the morphology of grafted polystyrene-

rubber consisted of NR core and polystyrene shell was observed by TEM study. The number of polystyrene and grafted polystyrene-rubber particles were obtained.

J0005-Layout Improvement by Using Roll Heuristic

Omurai Sangsawang and Sunarin Chanta

Department of Industrial Management, Faculty of Technology and Industrial Management, King Mongkut's Institute of Technology North Bangkok 1518 Pibulsongkram Rd., Bangsue, Bangkok 10800, Thailand

Email: oss@kmitnb.ac.th

Abstract: This research presents a new construction algorithm for computer – aided plant layout which combined the advantage of several construction algorithm together. The placement procedure for placing all departments into the layout which is placed in the 'Roll Pattern'. For the layout design in flow shop production system, this research generated a new layout for the television assembly plant. The layout is evaluated by the minimize distance – weighted adjacency – based objective and the maximize adjacency – based objective. From the result found that the layout generated from Roll Heuristic has the layout score near the both objectives more than the layout generated from CORELAP, and it used material handling distance less than the layout generated from CORELAP about 21.89 %

J0006-Power Characteristic of Conventional Impellers and The Ekato Intermig for Liquid Mixing

Saethawat Chamsartra

Department of Biology, Faculty of Science and BBERG Bangsae Biochemical Engineering Research Group, Burapha University, Chon Buri 20131, Thailand Tel.66 38 393522 E-mail: bchemeng@hotmail.com

Abstract: Power characteristic of two convention impellers (Pitched-blade and Bar) compared with a high efficient impellers (Ekato Intermig) all fitting with one, two, and three stages, was studied for turbulent fluid stirring in a reactor. Studying the power characteristic from the Power number, Po , in turbulent regime and the energy dissipation rate per unit mass or power input (ϵ_T) showed that turbulent Re ($Re > 20,000$) and ϵ_T at the same impeller speeds of the Pitched-blade and the Bar was ~5 times higher than those of the Ekato Intermig. In addition, testing these three impeller types were carried out by stirring a rheologically complex fluid, (the alkaline-cell lysate) which was very viscoelastic, to extract plasmid DNA. Results showed that all three impeller types gave no difference in plasmid yield and mixing time for both cell lysis and neutralisation steps. These can be concluded that the Intermig worked essentially well when compared with two convention impellers and it dissipated ~5 times less power.

J0007-BATCH SIMULATION OF CONTINUOUS COUNTERCURRENT RARE EARTH EXTRACTION

Jarunee Kraikaew¹, Wannee Srinuttrakul¹ and Kannika Kranlert²

¹Chemistry and Material Science Research Program, Office of Atoms for Peace, Bangkok, Thailand

²Transferred to Ministry of Energy, Bangkok, Thailand.

E-mail address: jarunee@center.oacp.go.th

Abstract: Liquid-liquid extraction is applied to separate and purify individual rare earths. Organic phase and aqueous phase flow continuously in countercurrent direction. Aqueous phase is rare earth nitrate solution and organic phase is 50% tributylphosphate in kerosene. Six-stage continuous countercurrent liquid-liquid extraction was simulated using separatory funnels by varying flow ratio of organic solvent per feed (S/F) to investigate optimum and high efficiency operating conditions. It was found that at S/F equaled to "2", 95.23% lanthanum in raffinate was upgraded from 51.55% lanthanum in feed solution.

J0008-NOVEL Fe-BASED CATALYSTS FOR FUEL SYNTHESIS

Pongpatt Tongmak and Kandis Sudsakorn

Department of Chemical Engineering, Faculty of Engineering, Kasetsart University, Bangkok Thailand 10900

E-mail address: kunpaan@yahoo.com, fengkdsk@ku.ac.th

Abstract: Fischer-Tropsch synthesis involves reactions between carbon monoxide and hydrogen to produce paraffins and olefins with linear and branched chains, which are used as automobile fuels. This research focuses on the production of gasoline and diesel fuels using Fe supported ZSM-5 catalysts and studies the improvement of catalysts using Cu and K promoters. Several catalyst compositions were prepared systematically and characterized using XRD, BET, and SEM. Their catalytic performances were investigated by measuring and comparing kinetic parameters such as reaction rate, CO conversion, product selectivity and yield. A catalyst sample was pretreated with 30 ml/min of H_2 at 500°C for 4 h prior to Fischer-Tropsch reaction, which was carried out using a tubular fixed bed reactor in the temperature range from 300 to 500°C under atmospheric condition in order to determine the efficient reaction conditions. A 30 ml/min flow of reactant mixture having H_2/CO equal to 2:3 was used to test Fe/ZSM-5 catalysts at different iron loadings i.e. 6, 8, and 30 wt%. Experiment results showed increase in CO conversion as temperature increased and gave maximum value at about 400°C. Loading of 18 wt% of Fe on ZSM-5 appeared to have highest CO conversion at this condition. The distribution of hydrocarbon products was analyzed for C_1 , C_2 , C_3 , and C_4 , in percentages as 8.75, 1.09, 0.44, and 0.11, respectively.

J0009-The Development of an Elevator for a Single-crystal Furnace

Kawin Chaumklang and Assoc. Prof. Jintana Laopaiboon

Department of Physics, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani 34190, Thailand.

Email: Kawin_phys@yahoo.com

Abstract: In a single-crystal growth of materials by moving a furnace along the growing area, an appropriate temperature of the growing area in a specific time is one of the main crucial factors on determining the quality of crystal growths by Bridgman Stockbarger Technique. To this end, the using of an efficient furnace elevator is required. The main aim of this paper is to develop the elevator having antifriction bearings and a motor controller to provide a suitable heat transfer along the growing area. The motor controller is controlled by PIC16F877 microcontroller in combination with an optical rotary encoder and a real time clock. The constructed elevator was designed to lift a weight 1-10 kg at the speed of 0.5 - 3.0 millimeters per hour. Note that the elevator height is 25 centimeters. Our experiments show that the elevator can be used in the single crystal growth of LiF with the operating speed 2.0 millimeters per hour for 10 hours in a constant manner.

J0010-PROCESS PARAMETERS AFFECTING THE KINETICS OF EUCALYPTUS KRAFT PULP DELIGNIFICATION WITH PEROXYACETIC ACIDPongsatorn Chaivichit¹, Panitnad Chandranupap¹ and Pravitra Chandranupap²¹Pulp and Paper Technology, Chemical Unit and Thermodynamics Research Group, Department of Chemical Engineering, Faculty of Engineering, King Mongkut's Institute of Technology North Bangkok, Thailand.²Department of Industrial Chemistry, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Thailand

Abstract: Kraft pulp delignification with peroxyacetic acid is known to be affected by chemical charge and temperature. In order to describe the kinetic equation, other variables that might affect pulp delignification, pH was found to be an important factor. The delignification rate increased with increasing pH to the value of 6. High delignification rate was obtained when the pulp was chelated with prior to the peroxyacetic acid stage. Therefore, delignification reaction rate depends on peroxyacid charge, temperature and pH. Lignin removal is described as a single reaction. The rate of this reaction increases with increasing temperature, pH and peroxyacetic acid concentrations. The reaction order with respect to lignin is high (4.52), probably because the single reaction is actually a combination of several parallel and consecutive reactions. The reaction order with respect to peroxyacetic acid and hydronium ion are 1.92 and -0.4, respectively. The activation energy of delignification is 88.8 kJ/mol.

J0011-Use of FEM to Predict the Leakage Behavior of a Exhaust Gasket Part II: Leakage Test under Thermal Cyclic Loading.Wisansart Satana¹, Karuna Tuchinda²¹Department of Tools and Materials Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, 10140. Email: wisansart@yahoo.com²Department of Tools and Materials Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, 10140. Email: ikarisut@kmutt.ac.th

Abstract: Leakage tests under high pressure and thermal cyclic loading are very important in the design and manufacturing of exhaust gaskets. The ability to simulate such tests using computational technique could lead to a huge reduction in time and cost consumption. In the first part of the current work, the finite element method (FEM) has been used as a tool to predict the behavior of a three-layer gasket during a leakage test under high pressure. The detail of this part of the work is described in Part I. In this paper, FEM has been applied to study the performance of the gasket similar to that studied in Part I but, instead, subjected to a leakage test under thermal loading. The main purpose of this work is to increase an understanding in the behavior of the gasket under thermal loading. It has been found that the thermal loading has a significant effect on the leakage behavior of the gasket. Moreover, the stress distributions developed in each layer of the gasket are different from those observed in the case where the gasket is subjected to high pressure

J0012-Use of FEM to Predict the Leakage Behavior of Exhaust Gaskets Part I: Leakage Test under High PressureWisansart Satana¹, Karuna Tuchinda²¹Department of Tools and Materials Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, 10140. Email: wisansart@yahoo.com²Department of Tools and Materials Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, 10140. Email: ikarisut@kmutt.ac.th

Abstract: A gasket is generally used to minimize fluid leakage in exhaust pipes. Under operating conditions, an exhaust gasket will expose to the clamping force and the high temperature and pressure generated during the combustion. Different types of tests are usually required to ensure the good efficiency of a gasket. A leakage test under high pressure is one of the main standard tests. During the design process, a huge number of trial and error tests are usually performed which consumes a great deal of both time and cost. In this work, the finite element method (FEM) has been employed to simulate a standard leakage test under high pressure of a three-layer metal gasket in order to minimize the number of trial and error tests. It has been found that a performance of the gasket predicted by FEM agrees well with that observed from the experiment. Moreover, by using the

technique of modelling each layer of the gasket separately, a better understanding of the behavior of each layer under tests could be obtained.

J0013-The development of scaled-up new three-phase separator in a UASB reactor

Rachbordin Wongnoi, Chantaraporn Phalakornkule

Department of Chemical Engineering, Faculty of Engineering, King Mongkut's Institute of Technology North, Bangkok

E-mail addresses: rachbordin@hotmail.com and cpk@kmitnb.ac.th

Abstract: The formation of microbial granules and reduction of granule losses at the outflow are important for optimal performances of Upflow Anaerobic Sludge Blanket systems (UASB). A new three phase separator in a lab scale UASB with working volume of 7.2 liter had been reported to help reduce particle losses with the effluent [1]. The objective of this study was to scale up the new three-phase separator and to evaluate its performance in a 30 liter UASB. A UASB with a conventional three-phase separator was also set-up and operated in parallel for performance comparison. Wastewater, with COD between 5,000-8,000 mg l⁻¹ and pH 5-6, was accommodated from a canned fruit factory. The initial seed for microbial granules with volatile suspending solid around 23.37 g l⁻¹ was from an anaerobic digester system. The UASB operation was started up under the atmospheric temperature with the hydraulic retention time at 88 h, corresponding to organic loading rates around 2 kg COD m⁻² d⁻¹. After 40 days of operation, both reactors showed good performances in treating wastewaters from a canned fruit production factory. In addition, based on the effluent VSS data, the UASB reactor with the new three-phase separator showed a the higher potential in retaining large-sized granules.

J0014-DESIGN AND CONSTRUCTION OF INDUSTRIAL SCALE VACUUM COATER.

Surasing Chaiyakun, Samphao Jonggitta, Nirun Wit-anun, Sakool Siryanalugsan and Chakapun Thawornthira

Vacuum Technology and Thin Films Research Laboratory (VTF), Department of Physics, Faculty of Science, Burapha University, Chon Buri 20131, Thailand.

e-mail address: chaikun@buu.ac.th

Abstract: The objective of this project is designing and construction of industrial scale vacuum coater for decorative industrial. The system consists of 7 major parts, namely, (1) a stainless steel vacuum chamber in octagon shape with 135 cm in diameter and 125 cm height, (2) vacuum pump system consists of diffusion pump, rotary pump and root pump, (3) a planar magnetron cathode, 22x67 cm, (4) a high voltage dc power supply was 3 phase 380 V, transforms to dc current, 20 kW, (5) cooling water system for cooling a cathode, a target and vacuum pump system, (6) the gas flow control system can adjust the rate of gas was mass flow controller and (7) system control unit for control all parts of vacuum coater. The ultimate pressure of this vacuum coater is 3.5x10⁻⁵ mbar. (in 30 min). This vacuum coater can deposit an aluminum thin films on a large glass (substrate), it give a very bright color of this metal and good films adhesion.

J0015-DESIGN AND CONSTRUCTION OF INDUSTRIAL SCALE PLANAR MAGNETRON SPUTTERING CATHODE.

Nirun Wit-anun, Surasing Chaiyakun, Samphao Jonggitta, Sakool Siryanalugsan and Chakapun Thawornthira

Vacuum Technology and Thin Films Research Laboratory (VTF), Department of Physics, Faculty of Science, Burapha University, Chon Buri 20131, Thailand

e-mail address: nirun@buu.ac.th

Abstract: The objective of this research is to design and construction of unbalanced magnetron cathode for used in industrial scale vacuum coater. In this research we constructed magnetron cathode from stainless steel in rectangle shape and separated electrode with Teflon, the size of this cathode was 22.0 x 67.0 cm long, for sputter target in rectangle shape with 15.0 x 60.0 x 4.6 cm. and using water for cooling the cathode. The magnetic field of this cathode was from the NdFeB permanent magnetic which attached to the back of cathode, which had asymmetry types, and high voltage DC power supply, 3 phase 380 V, 20 kW. This cathode can generated glow discharge with pressure about 2.0x10⁻² mbar, 300 voltage and 1 A. The cathode can deposited the metal thin films of aluminum and gold on the large flat glass substrates (80.0 x 80.0 cm) which give a very bright color of those metals and good films adhesion.

J0016-DETERMINATION OF CONVECTIVE HEAT TRANSFER COEFFICIENT OF GINGER DRYING UNDER NATURAL CONVECTION

Marina Mani^{1*}, Jatuporn Kaew-on² and Pompana Boonma³

^{1,2,3} Department of Physics, Faculty of Science, Thaksin University, Songkhla, 90000, Thailand

E-mail address: marina@tsu.ac.th

Abstract: This paper, an attempt has been made to evaluate the convective heat transfer coefficient operating in ginger drying in open sun drying conditions (natural convection). Values of the constant C and n were obtained by linear regression analysis from experimental data obtained for ginger. Based on the values of C and n , convective heat transfer coefficient for ginger drying was determined of 26.25 W/m² °C.

J0017-SPEED CONTROL SYSTEM OF DC MOTOR USING FUZZY LOGIC FOR A MACHANICAL ASSISTED MACHINE SYSTEM

Werapong Goedsin, Pattara Aiyarak, Boonlua Phongdara

Department of Physics, Faculty of science, Prince of Songkla University, Songkhla 90112, Thailand.

E-mail address: werapong_goedsin@yahoo.com

Abstract: In this work, we propose the speed control system using fuzzy logic controller for dc motor. The design of fuzzy logic controller for driving a dc motor is for constant speed control with fast response. The application of this work is to use in a mechanical assisted machine with more than two energy sources.

J0018-EFFECT OF TEMPERATURE ON ORDERING WITHIN SUBMONOLAYER FILMS GROWN THROUGH SLOW DEPOSITION OF PARTICLES

Panu Danwanichakul¹, Eduardo D. Glandt²

¹Department of Chemical Engineering, Faculty of Engineering, Thammasat University, Pathumthani 12120, Thailand

²Department of Chemical and Molecular Engineering, University of Pennsylvania, Philadelphia 19104-6393, USA

Abstract: Using Monte Carlo simulations, we have found that monolayer structures grown through sequential deposition of particles on a perfect solid surface shows increasing degrees of clustering as the temperature is lowered. In the low-temperature limit, a two-dimensional model system with a non-degenerate ground state would result in almost a perfect crystal. The opposite, high-temperature limit corresponds to the case of random sequential addition (RSA). In the present work we study the continuous evolution from disorder to order at intermediate states using a triangular well potential to represent particle short-ranged interactions. For each temperature, we investigate the bond order parameter as measures of the degree of crystallinity of the structures up to a reduced number density of 0.65, which is close to the jamming limit of RSA.

J0019-LOW COST AND SIMPLE ASSEMBLY SHORT-LONG WAVELENGTH UV-BOX FOR ORGANIC CHEMISTRY LABORATORY

Surapan Kanjanawong¹, Sukij Thongban¹ and Weerachai Phutdhawong²

¹ Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand

² Department of Chemistry, Faculty of Science, Maejo University, Sansai, Chiang Mai, 50290, Thailand; email address: weerachai@mju.ac.th

Abstract: The cheaply short (254 nm)-long (366 nm) wavelength UV box for organic chemistry laboratory without any exotic components and winding any transformers has been created. The manufacture UV box being from the domestic materials. The general lamp of UV and fluorescent 220 Volt, 10 Watts and 50 Hertz as the main components were connected in the wooden box (24 x 12 x 15). The commercial low pressure mercury UV lamp was used. The front of the box is clear wood so that the exhibit can be viewed and convenient for insert any TLC side. The top of wooden box contained glass window for observing the color point of mixed UV indicator TLC. The inside box was painted with dark color to make it more clear for the exhibit UV absorption.

J0020-OZONE GENERATING METHOD USING PULSE WIDTH MODULATION

Siseeroti Ketkaew

Department of Electrical Engineering, Faculty of Engineering, Mahanakorn University of Technology, Bangkok 10530, Thailand; e-mail address: siseeroti@hotmail.com

Abstract: This paper presents the design of the ozone generating procedure using Pulse Width Modulation (PWM) with high voltage high frequency inverter. With the working process of the increasing voltage half - bridge inverter, TL494 is in controlled of the switching. The half bridge inverter is designed to operate at 10 – 100 kHz frequency through a high frequency switching transformer at output voltage of 2.7 kVp. By adapting the highly nonuniform electric field to the stanless electrode design of the ozonizer, one-hour operating yields the maximum ozone generating capacity of 1.2 gO₃/hr.

J0021-Speed Sensorless DC Motor Using Digital Signal Processing System

Swit Kawikitwicha^{1*}, Phayung Desyoo¹, Suparee Navarattara¹, Kirkwut Rangseepanya² and Wiriya Kongratana²

¹Department of Industrial Physics & Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand;

²Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand;

E-mail address: swkp@kmitnb.ac.th, pdy@freemaid.com

Abstract: This paper proposes a new application of digital signal processing system estimate speed sensorless DC motor. In the design, the mathematical model of DC motor in discrete state-space form will be created[1, 2, 8]; the speed of DC motor which is considered as state variable and can be estimated by using digital signal processing system. In the experiment; TMS320C31 floating point digital signal processor is used for hardware implementation[3, 4]. The experimental results show the speed of DC

motor which is estimated by using digital signal processing system has good accuracy when compared with the results from tachometer.

J0022-Real time ECG Compression/Decompression System with Multirate Digital signal processing

Surapol Sriboonsong¹, Phayung Desyoo¹, Watcharapong Hinjit^{1*}, Nattapong phanthuna² and Fusak Cheevasuvit²

¹Department of Industrial Physics & Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand;

²Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand;

E-mail address: sss@kmitnb.ac.th, pdy@freemaid.com, wph@kmitnb.ac.th

Abstract: This research introduces the real-time ECG compression/decompression system using multirate digital signal processing implemented on TMS320C31 DSP board[2]. The designed ECG compress/decompress system is able to compress the ECG signals at ratio of 2 times, 4 times, and 8 times by decimation technique. The compressed signal is then recovered back by decompression and interpolation techniques. The consistency of this ECG compress/decompress system is showed by low PRDs (Percent Root Mean Square Differences)[4,5] compared between the decompressed signal and the original signal. The reliable of estimated signal of the ECG compression-decompression system make it suitable for the application in Telemedicine and home-based patient monitoring.

J0023-Harmonic Removal in ECG Signal Based on Digital Notch Filter

Surapol Sriboonsong^{1*}, Phayung Desyoo¹, Watcharapong Hinjit¹, Jirawat Ittisariyanon² and Somyot Junnaphithak²

¹Department of Industrial Physics & Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand.

²Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand;

E-mail address: sss@kmitnb.ac.th, pdy@freemaid.com, wph@kmitnb.ac.th

Abstract: The following article is introducing the harmonic removal of AC power line from ECG signals[4] by applying digital notch filter[1]. The main design of this notch filter is pole-zero positioning within the unit circle on the z-plane which the user can design the filters to meet the user's specifications such as center frequencies as well as the bandwidths. The design and simulation is done by using MATLAB while the actual implementation is done on TMS320C3x DSP board[2, 3]. The experiment results have shown that the multi-band digital band-stop filters function according to the specification with high accuracies while eliminating the noises from AC power line harmonic which contaminate ECG signals with efficiency.

J0024-Emergency Alarm for Patients

Phayung Desyoo^{1*}, Suraphol Sribunsong¹, Piyaporn Choopong¹, Jessarawut krucakham¹, Nanut Laipat¹ and Somyot Junnaphithak²

¹Department of Industrial Physics & Medical Instrumentation, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok 10800, Thailand;

²Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand;

E-mail address: pdy@freemaid.com

Abstract: The following article is introducing the design and construction of the emergency alarm for the patient to enhance the efficiency of the patient monitor with the highest safety. This emergency alarm for the patient is a portable alarm which patient can carry out and the alarm will ring out to wake the nurses up to rescue the patient after patient has pushed the button to remote micro controller during the emergencies. The main function for this alarm is the infrared transmitter and receiver controlled and decoded by MCS-51[1] micro controller to identify the source of signal from patient who needs the emergency care and the room where the machine alarmed. The results from the experiments have shown that this emergency alarm works with high accuracy.

J0025-MATHEMATICAL MODELING FOR VAPOR DIFFUSION IN 2-D STOCHASTIC PORE NETWORK

Supawan Tirawanichakul¹ and Yutthana Tirawanichakul²

¹Deptment of Chemical Engineering, Faculty of Engineer, Prince of Songkla University, Hatyai Campus, Songkhla, Thailand 90110.

²Plasma and Laser Technology Lab., Department of Physics, Faculty of Science, Prince of Songkla University, Hatyai Campus, Songkhla, Thailand 90110.

e-mail address: Tsupawan@eng.psu.ac.th, yutthana.t@psu.ac.th

Abstract: The objective of this study was to investigate preliminary study of pore network theory. The mathematical model of pore network was simulated using Numerical Explicit method. The simulation model based on principle of Kirchoff's current rule was applied for predicting of the drying kinetic of porous media. The evolution of moisture transfer of single cylindrical porous media was determined among drying time. A simple two dimensions (2-D) pore network also can be carried on by this simulation. Finally, the effective diffusivity of porous media with 2x2 nodes was determined and presented in this work. The simulation results indicated that the pore network model has a good agreement to predict the moisture ratio of each pore throat and effective diffusivity is relatively related to drying time.

J0026-STUDY OF MOISTURE ADSORPTION OF WHEAT BY RICE HUSKYutthana Tirawanichakul¹, Keiichi Inoue², Toru Hayashi³ and Somchart Soponronnarit⁴¹Plasma and Laser Technology Lab, Department of Physics, Faculty of Science, Prince of Songkla University, Hatyai Campus, Songkhla, Thailand 90110.²Laboratory of Agricultural Machinery, National Agricultural Research Center for Hokkaido Region(NARCH), Hokkaido, Japan³Food Science and Technology Division, Japan International Research Center for Agricultural Sciences (JIRCAS), Ohwashi, Tsukuba, Ibaraki, 305-8686 Japan⁴School of Energy and Materials, King Mongkut's University of Technology Thonburi, BKK, Thailand 10140

Abstract: The objective of this work is to investigate a grain moisture adsorption using rice husk. Advantage of this technique is low energy consumption and uses an agricultural residue as adsorbent. The mathematical modeling of rice husk drying was used for predicting evolution of moisture among the operating time. The simulated results show that the drying rate has highly relation to weight (or volume) ratio between rice husk and grain and initial moisture content. For the experiment, the fresh wheat and husk with initial moisture contents of 25.6% and 5.6% wet basis, respectively was dried by well-mixing rice husk/wheat ratio of 0.6:1.0 by volume. The results drying rate was relatively slow. However, the simulation was good agreement to the experimental results. Thus, the grain moisture adsorption by rice husk dryer is technically feasible.

J0027-THE STUDY OF NATURAL HEAT CONVECTION WITHIN THE BIOCLIMATIC ROOF BY USING THE COMPUTATIONAL FLUID DYNAMICS (CFD) TECHNIQUEJ. Waewsak^{1,*}, A. R. T. Golaka² and R. Sarachitti³¹Physics Department, Faculty of Science, Thaksin University, Songkhla, 90000, Thailand²Ph.D. Candidate, Energy Division, The Joint Graduate School of Energy and Environment (JGSEE) King Mongkut's University of Technology Thonburi, Bangkok, 10140, Thailand³Quantitative Science Department, Faculty of Arts and Sciences, Dhurakijpundit University, Bangkok, 10210, Thailand

E-mail address: jompob@tsu.ac.th

Abstract: This paper presents the study of natural heat convection within the bioclimatic roof (BCR) by means of the computational fluid dynamics (CFD) technique. Temperature and velocity contour as well as velocity vector in the air gap and the average convective heat transfer coefficient (h_c) of the BCR have been investigated in three dimensions based upon the standard $k - \epsilon$ turbulence model. Results showed that the average convective heat transfer coefficients of the upper and lower surface in the air gap of the BCR were in the range of $1.98-9.22 \text{ W/m}^2 \cdot \text{K}$.

J0028-Modeling of Weather Data for Renewable Energy System Applications in southern ThailandSuwit Phethuayluk^{1,*}, Pompana Boonma¹, Suppakorn Katathikamkul¹¹Renewable Energy System Research and Demonstration Unit,

Department of Physics, Faculty of Science, Thaksin University, Phatthalung, 93100, Thailand;

e-mail address: suwit@tsu.ac.th

Abstract: Monthly average daily data of climatic condition over the period 1971 – 2000 in southern Thailand was studied. Regression method was used to fit polynomial function to the monthly averages for nine parameters, namely atmosphere pressure, relative humidity, sunshine hours, solar radiation, dew point and ambient temperature, wind speed, evaporation and rainfall. The results, found that the relative equations with month of atmosphere pressure, solar radiation and sunshine hours were the best fits with the determination coefficient of better than 98%. But, the model for the evaporation is relatively low coefficient of determination, 86%. Thus the parameter functions have been enable to useful for renewable energy system application in this studied area.

J0029-STRUCTURAL MODIFICATION OF CHITOSAN FOR NANOSPHERESRangrong Yoksan¹ and Suwabun Chirachanchai²¹Division of Physico-Chemical Process technology, Faculty of Agro-Industry, Kasetsart University, Bangkok, Thailand.²The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

E-mail address: rangrong.y@ku.ac.th and csuwabun@chula.ac.th

Abstract: Chitosan nanosphere (*N*-phthaloylchitosan grafted mPEG) is accomplished by the dialysis against water of the mixture obtained from homogeneous reaction of hydrophobic *N*-phthaloylchitosan and hydrophilic mPEG-COOH. The obtained product is sphere with the size in nano-level varying from 85 to 400 nm depending on the chain length of hydrophilic part as observed from TEM technique. Alkylamines, which are applied as model drugs, can be incorporated into chitosan nanosphere as

confirmed from FT-IR, SEM, and TGA techniques. Chitosan nanosphere is expected to use as a carrier material for drug delivery system.

J0030-FLOTATION DEINKING OF PRINTED PAPER BY USING NATURAL SURFACTANT

Panitnad Chandranupap², Pravitra Chandranupap¹, Piyawat Pornoy¹ and Ruengluxmee Auewongyart¹

¹Department of Industrial Chemistry, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand 10800.

²Department of Chemical Engineering, Faculty of Engineering, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand 10800.

E-mail: pnn@kmitnb.ac.th, pvit@kmitnb.ac.th

Abstract: This work studied flotation deinking of printed paper by using natural surfactant. The experiment was divided into 3 steps. The first one was the extraction of dried soapberry fruits (*Sapindus rarak* A.DC.) with mixture of organic solvents to obtain the crude products. Then, crude saponin was tested with thin layer chromatography and Liebermann-Burchard reaction in order to specify saponin type. The second step was to do flotation deinking of printed paper by using surfactant of various mixture ratios between crude saponin and sodium lauryl sulphate (SLS). The total amount of chemical used was 0.5% by weight of oven dried pulp. The last one is the analysis of recycled pulps by brightness and dirt count. The results showed that mixture ratio of saponin:SLS = 40:60 gave the best result in brightness at 82.82%. 100% of crude saponin gave the lowest ability in deinking but the lowest lost weight.

J0031-Development of Integrated Silicon Pressure Sensor from Pressure Transducer

Royol Chitradon, Narongsak Pimpunchat, Ekarit Sriwalai

National Science and Technology Development Agency, 111 Thailand Science Park Paholyothin Rd., Klong 1, Klong Luang, Phatumthani 12120, Telephone : 0 2564 6900;

E-mail address : ekarit@han.or.th

Abstract: Model and development of integrated silicon pressure sensor are very such as Float-type Water Stage Recorder or Pressure Transducer. Thus, integrated silicon pressure sensor has been developed to be suitable to application in general condition with the lower price. Applying integrated silicon pressure sensor from Pressure Transducer, the device can measure water level from 0 to 5 meters with ± 1 inconsistent. We have tested the device at Samsen station (C.12), Royal Irrigation Department by collecting the data every 10 minutes since January 27, 2004 to February 12, 2004 (17 days). We have compared the collected data with the data from Float-type Water Stage Recorder of Royal Irrigation Department. The results were similar. The device is installed in small mobile telemetering which is developed in order to measure water level and precipitation and display the data through Internet network. It can also be used in order to trace water condition for water management in general and critical situation such as flood or drought.

J0032-FOURIER TRANSFORM INTERFEROMETRY: A SIMPLE METHOD OF THE WAVELENGTH MEASUREMENT

Pornsak Panjavirat*, Ratchapak Chitaree and Kwan Arayathanitkul

Department of Physics, Faculty of Science, Mahidol University, Rama VI Road, Bangkok 10400, Thailand.

Abstract: This paper presents a method of wavelength measurement. This method uses a Michelson interferometer in which one of the two mirrors is attached to a speaker. The vibration of the mirror depends on a signal that is sent to modulate the speaker. A condition for this method is to keep the amplitude of the vibrating mirror constant. The modulated mirror method, changing the optical path difference, gives rise to the output interference signal. We can calculate an unknown wavelength of a light source by comparing a number of fringes of the signal that is detected to those taken from reference light source (HeNe laser). Discrete Fourier Transform is used to determine the spectrum of the light source and, subsequently the unknown wavelength.

J0033-DEVELOPMENT OF MULTI-NATURAL DYES DYEING PROCESS ON COTTON YARN FOR VARIOUS SHADES OF GREEN FOR COTTAGE INDUSTRY

J. Pumchusak¹*, S. Komboonchoo¹, N. Chaiwong¹, N. Mahachaiwong², D. Buddhasukh³, A. Haewsungchareem¹

¹Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract: This research had developed the multi-natural dyes dyeing process in order to form various shades of green from blue and yellow dyes on cotton yarn for cottage industry. Blue dye was obtained from indigo, which was used in the range of 0.14-2.86 % owf. Yellow dyes were boil-extracted from jack-fruit heartwood, Tewdaeng leaves and Umbrella tree leaves. The ratios of yarn : water : plant were in the range of 1:10:0.1 to 1:10:2. The effect of the order of dyeing on dyed cotton was studied. The dyeing of yellow dye solutions were carried out at 70 °C for 1 hour by using copper mordant for jack-fruit heartwood and Tewdaeng leaves and aluminium mordant for Umbrella tree leaves. While indigo was dyed at room temperature. Various shades of green were obtained including the deep green, which could not gain from a single plant dyeing. Furthermore, in order to

achieve deep green with a good leveling, dyeing with blue dye once and yellow dyes twice was recommended. However, the wash and light fastness properties in case of dyeing yellow dye first, then dyed over with blue dye and finally with the yellow dye again was better than starting with blue dye and then dyed over twice with yellow dye.

J0034-Multi-Natural Dyes Dyeing on Cotton Yarn for Black Color

S. Komboonchoo^{1*}, J. Pumchusak¹, N. Chaiwong¹, N. Mahachaiwong², D. Buddhasukh³, A. Hhaewsungchareon¹

¹Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail address: sunsanee@aun@yahoo.com

Abstract: The research studied multi-dyes dyeing on cotton yarn for black color. Multi-dyes dyeing uses two or more natural dye materials. Natural dyes were obtained from umbrella tree leaves, indigo and Rokfah bark. An experimental study has been undertaken to obtain the optimum conditions for dyeing, method of mordanting, wash fastness and light fastness. It was found that shade of black color depends on the pairing of dyeing material selected, mordant types, dyeing method and dye succession. The black colors obtained were various shades. Moreover they were more wash fastness and light fastness.

J0035-MULTI-NATURAL DYES DYEING ON COTTON YARN FOR VARIOUS SHADES OF BROWN

N. Chaiwong^{1*}, J. Pumchusak¹, S. Komboonchoo¹, N. Mahachaiwong², D. Buddhasukh³, A. Haewsungchareon¹

¹Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Institute for Science and Technology Research and Development, Chiang Mai University, Chiang Mai 50200, Thailand

³Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract: In this research obtains various brown shades of natural dyes from Rokfah bark and Umbrella tree leaves. Second natural dye from Tewdaeng leaves, American cassia leaves, and Saabsuea leaves which give yellow to greenish yellow color, was applied. Dyeing experiments were performed using the suitable mordant and dyeing conditions. Co-dyeing and top-dyeing of two natural dyes were tested at various dye concentration ratios. It was concluded that second natural dye affected the shade of brown color and color fastness of dyed yarn. However the change depended on the couple of raw materials, dye concentration ratio and dyeing succession.

J0036-Effects of Some Salts and Tannic Acid on Dyeing of Cotton Yarn with Dye Extract from Heartwood of Jackfruit

Phansiri Moonsri^{*}, Anunsawake Haewsungchareon

Department of Industrial Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand,

E-mail address: phansiri.m@hotmail.com

Abstract: The effects of three different salts (sodium chloride, sodium sulfate and sodium carbonate) and tannic acid on dyeing of cotton yarn with dye extract obtained from heartwood of Jackfruit (*Artocarpus Integrifolia*) were studied. The investigated parameters were as followed: salt content in the range of 0-2% o.w.f. and salt addition timing. The cleaned cotton yarn was dyed for 1 hour at the constant temperature of 70°C. Dye exhaustion was followed by spectrophotometry. Dyed yarn was subjected to color measurement by using CIELAB system and tested for color fastness to washing. It was found that, under the conditions used, salt content and salt addition timing had no any effect on dye exhaustion, but dye exhaustion was slightly increased with increasing sodium sulfate content of the dye bath. Salts had some effects on hue and chroma of dyed yarn but showed no any effect on color fastness. However sodium carbonate seemed to give dyed yarn with less color fastness to washing in comparison with that obtained from dye bath without salt. Dye exhaustion increased with increasing tannic acid content but the acid addition timing had no effect on dye exhaustion. Tannic acid affected hue and chroma of dyed yarn and slightly decreased color fastness to washing of dyed yarn.

K0001-The compact TEA N₂-laserWarit Werapun¹, Paradorn Pakdeewanich² and Yutthana Tiravanichkul³¹Department of Science and Technology, Suratthani college, Suratthani Campus, Thailand*^{2,3}Department of Physics, Faculty of Science, Prince of Songkla University, Thailand

E-mail address: warit@ratree.psu.ac.th, pparador@ratree.psu.ac.th, tyutthan@hotmail.com

Abstract: TEA N₂-laser was built to demonstrate the principle of gas laser. The two parallel electrodes were made from stainless steel with length of 20 cm. It was placed on the rectangular aluminium bar. The capacitor plates were made from aluminium foil and mylar sheet which have capacitance of 11.54 and 5.17 nF. The A4-white paper, which was placed far from the laser channel around 30-100 cm, was used for demonstrating laser irradiance. The size beam was measured and recorded by digital camera Nikon coolpix 4300. The diameter of 6-20 mm was present and recorded. Then divergence of beam was 9.94 mrad when 13-14 kV_{dc} was supplied and the flow rate of nitrogen gas was 1 l/min.

K0002-SIMPLE ROTATIONAL SPECTRUM OF DIATOMIC MOLECULESurin Monchan

Department of chemistry, Faculty of Science, Chulalongkorn University, Bangkok,

E-mail address : surin@sc.chula.ac.th

Abstract: The computer program calculates and plots rotational spectrum for diatomic molecule. It interprets the spectrum by plotting vertical lines for the relative intensity of the absorption bands and the rotational transition involved in each band is given by the rotational quantum number. A simple knowledge of masses, bond length and temperature is required to predict the spectrum. The user easily can change the data of diatomic molecule and see how that change affects the spectrum.

K0004-INTRODUCTORY PHYSICS STUDENTS UNDERSTANDING TO ACCELERATIONChaiyapong Ruangsuan¹, Thidarat Sroyjak¹, Theerayut Charnnuwong¹, and Chernchoke Soankwan²¹Department of Physics, Khon Kaen University, Khon Kaen, Thailand,²Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand

E-mail address: chaiyapg@kku.ac.th

Abstract: This research was conducted to study the understanding and conception on force and motion of the first year students that learned the introductory physics course. The first year students of Khon Kaen University were asked to do Force and Motion Conceptual Evaluation (FMCE) at the first class meeting of introductory physics course. The results were shown that most of students had misconception on acceleration and force. One group of students was asked to join the Interactive Lecture Demonstration on motion topic. Their predictions on each situation were collected in the prediction-sheet. The studied situation was the ball-on-ramp that had constant acceleration. By document analysis method, it was found that the students had misunderstanding on the acceleration of the assigned situation.

K0005-Metrology and Physics of Instrumentation Research Unit, Department of Physics, Faculty of Science, Kasetsart University, Bangkok

อนันต์ ชีระบุณยะพจน, ปุชชก กิจอำนาจสุข, กนกพจน อารีกุล

E-mail: b4404449@ku.ac.th, puchong.k@ku.ac.th, Kanokpoj.A@ku.ac.th.

Abstract: This project is a part of The Research for Development of Basic Physics Laboratory System.* This study for an appropriate applying a computer network to practical physics education. From surveyed information the system is designed in 3 parts, experiment part, instructors service part and laboratory management part. Knowledge of Physics and Metrology blend with System Analysis result to relation database system, database management system and user interfaces. Objectives are support concept of student center, applicable to an interesting modern instrument. Not only keep an achievement skill of practical physics learning but also has benefit of good data management. Students can know their result after period end for improving their next experiments. It is more convenient to instructors and accommodating laboratory management according to education quality assurance.

K0006-COMPUTER ASSISTED INSTRUCTION (CAI) FOR INFRARED SPECTROSCOPY

Wasna Jaturonrusmee*, Kanitha pattharakitti and Rattanaporn Pichedrujirot

*Department of Chemistry, Faculty of Science, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand,

E-mail address: wasna.jat.@kmutt.ac.th

Abstract: A computer assisted instruction program for infrared spectroscopy was developed by using Authorware 5.0, Adobe ImageStyler 1.0 and Adobe Photoshop 7.0. The contents included the basic theory of infrared spectroscopy, the instrumentation of infrared spectroscopy, the interpretation of infrared spectra and tables of characteristics infrared absorptions regions of functional groups. The program was also provided examples, exercises, emphasized on infrared

spectra interpretation to determine functional groups of unknown compounds and solutions for self study. The software will improve the efficiency in learning and teaching this aspect of chemistry.

K0007-DEVELOPMENT OF A LEARNING MATERIAL IN BIOLOGY: A WANDERING THROUGH THE MUSCLE WORLD – WITH A DIFFERENCE

Karnyupha Jittivadhna, Jiraporn Thanpaew, Pintip Ruenwongsa, Pitakpong Kompudsa, and Bhinyo Paniipan*

Institute for Innovation and Development of Learning Process, Mahidol University, Bangkok, Thailand

E-mail address: g4638523@student.mahidol.ac.th and directit@mahidol.ac.th

Abstract: This set of learning materials, A Wandering Through The Muscle World, has been developed with the aim to make a better understanding of how striated muscle works and to lay down the basis for the study of non-muscle motility. It was designed for senior high school and undergraduate students consisting of two parts, computational multimedia and hand held illustrating model. The multimedia, developed to display in the Thai language, can be accessed by CD-ROM or internet. The content of the multimedia was designed to contain colorful illustrations and motion pictures in order to make enjoyable study and show relationships in many areas of muscle science including anatomy, physiology, biochemistry, physiology of exercise, kinesiology and meat science. The learning tasks in each chapter should help learners learn quickly and they should make meaningful connections to real-life situation. The problems provided in the final chapter were designed to allow learners think and be capable of self-assessment. The learning materials also demonstrate the arrangement of contractile proteins and their mechanism in muscle contraction which can be presented in 3-D illustration and in combination with the model of muscle sarcomere which can be pushed and pulled by hand to show its volume in relaxation and contraction state.

K0008-THE STUDY OF SATISFACTORY EVALUATION AND IMPROVEMENT OF INSTRUCTIONAL MODEL OF BIOLOGY LABORATORY IN THE TOPIC OF ANIMAL TISSUE FOR FIRST YEAR UNDERGRADUATED STUDENTS, MAHIDOL UNIVERSITY

Joonipot poomsripanon, Jongdee To-im, Duangduen Suwanjinda, Supaporn porntra, Somkiat Pornpisuthimas, Arun Chanchaichaowiwat

Institute for Innovation and Development of Learning Process, Mahidol University, Thailand

E-mail address: g4637346@student.mahidol.ac.th

Abstract: To evaluate the satisfaction and improvement of the biology laboratory in the topic of animal tissue for the first year undergraduated students at Mahidol University, the 500 registered students in the first semester of academic year 2003 were purposive sampled to be the sample group. The observation form and the satisfaction evaluation form were used for the data collection. The present study shows that the students had the discussion to solve problems, attempt to join the activities and participation in group activities in the highest level, but the originative thinking expression was the lowest level. Most instructors used the questioning, stimulating, and reinforcement in the medium level. The students' satisfaction was in the high level; in addition, the student had the useful suggestions such as some instructional media were not appropriated to the learning activities, the lecturers' assistants were not enough, the technical terms in the instructional process should be decreased, and the laboratory temperature was too high. Moreover, the researchers were also purposed the new improved model for the instruction in the future.

K0009-USING ROLE PLAY, MIND MAPPING AND SCIENCE QUIZ SHOW TO DEVELOP SCIENCE LEARNING MODEL: STUDENT CENTERED IN LARGE CLASS LEARNING

Sura Wuttiprom¹, Jongdee To-im¹, Karnyupha Jittivadhna¹, Chaiyapong Ruangsuwan¹, Ratchapak Chitaree², Narumon Emarat², Chernchok Soankwan², and Kwan Arayathanikul²

¹ Institute for Innovation and Development of Learning Processes, Mahidol University, Bangkok, Thailand

² Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand

E-mail address: g4637461@student.mahidol.ac.th, senem@mahidol.ac.th, directit@mahidol.ac.th

Abstract: This study presents the development in new science learning model called student centered in large class learning. The model contains three activities; role play, mind mapping and science quiz show. We applied this method with 287 first-year and fourth-year science students who receive fund from The Project for the Promotion of Science and Mathematic Talent Teacher (PSMT). These students come from 6 different universities in the north-east region of Thailand. The results show that PSMT students had positive attitude with this model. Moreover the students gave the useful suggestions such as, it could help students gain their knowledge better, provided more conceptual understanding, increased long term memory, increased students' participation during learning and could also be really applied to the small or medium size classroom. In addition, they offered other factors which have to be concerned; such as the limitation of time and curriculum contents.

K0010-THE DEVELOPMENT OF A MULTIMEDIA IN BIOLOGY: MUTATION

Karnyupha Jittivadhna, Duongdearn Suwanjinda, Jongdee To-im, Joonipot poomsripanon, Chularuk Kaveevivithchai, Supaporn porntra, Somkiat Phomphisuthimas, Sailom Gerprasert, Arun Chanchaichaovivat

Institute for Innovation and Development of Learning Process, Mahidol University, Thailand

E-mail address: enjti@mahidol.ac.th

Abstract: Mutation is the process that always occurs in the organisms. The study of mutation is one important topic in biology; however, mutation contains the complex process that is difficult to understand. Thus, the effective instructional media is able to support the mutation study's objectives. The researchers had developed the multimedia in the topic "mutation" to support the classroom study. In addition, the multimedia also presents on the internet website or CD - ROM, that students can access contents without the limitation of times and distance. The students can learn by themselves and self assessment. The multimedia is displayed in Thai version with the photos, diagrams, animation by the integration of biology, chemistry, and mathematics. The multimedia topics contain mutagens, mutation rate, mutation studies, DNA repair, the effect of mutation and application, the pretest-posttest questions for the students to assess themselves. This multimedia is the alternative to support the instruction in the mutation.

K0011-THE STUDY OF HIGH SCHOOL STUDENTS' MISCONCEPTIONS IN FORCE AND MOTION BY USING CONCEPTUAL STANDARDIZED TEST

Umpol Jairuk¹, Pattawan Narjaikaew^{1*}, Choksin Tanahoung¹, Chernchok Soankwan², Narumon Emarat² and Wunnee Kissanajakrawat²

¹Institute for Innovation and Development of Learning Processes, Mahidol University, Bangkok, Thailand; ²Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand

Abstract: This research is to study the use of Force and Motion Conceptual Evaluation (FMCE) test which is a research-based multiple choice assessment instrument. It was designed by Thornton and Sokoloff (1998). The test can be used to probe a conceptual understanding of students on Newtonian Mechanics. It consists of 43 questions, which are divided into five sets, i.e. The sled moving on ice, Cart on ramp, Coin Toss, Third Newton's Law and Graphical Evaluation. We have used the standardized test for the first year science students of mahidol university since 2001. In 2003, we applied this test to the high school students at Watsuti wararam school. It places more emphasis on students' understanding of graphical representation of velocity, acceleration and force and Third Newton's Law. The results from the pre-test and post-test indicate that there are only few students who understand correctly on force and motion, especially in Cart on Ramp. This set of questions are shown in figure 1.

K0012-MULTIMEDIA: INTEGRATION OF ELECTROCHEMISTRY

Saksri Supasorn, Nattinee Mophan, Kamtarat Wuttisela, Kulthida Nugultum, Wanchai Noi Wong, Sonthi Phonchaiya, Sanoe Chairum

Institute for Innovation and Development of Learning Process, Mahidol University, Thailand

E-mail address: g4637460@student.mahidol.ac.th

Abstract: The interconversion of electrical energy and chemical energy is called electrochemistry which is important to all living creatures. The explanation of the functions in living process and in some equipment is not simple because we have to combine our knowledge in chemistry, physics, biology, and mathematics together. Hence, Integration of Electrochemistry as multimedia had generated in website and CD-ROM for supporting the conventional classrooms. This multimedia, presented in Thai with multi-illustration, can be accessed by everyone with unlimited time and distance. The content includes the fundamental electrochemistry, redox in plant, redox in cell respiration, and electrochemical analysis by the integration of chemistry, physics, biology, and mathematics.

K0013-THE USE OF MULTIMEDIA FOR CHEMISTRY LABORATORY TEACHING IN HIGH SCHOOL

Sonthi Phonchaiya, Kulthida Nugultham, Kantarat Wuttisela, Saksri Supasorn, Wanchai Noi Wong and Sanoe Chairam

Institute for Innovation and Development of Learning Process, Mahidol University, Bangkok, Thailand; Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand.

E-mail address: g4637452@student.mahidol.ac.th

Abstract: It is well accepted that practical experiments in chemistry laboratory are essential to enhance knowledge in chemistry principles and concepts. Unfortunately, chemistry teaching in most of high schools in Thailand frequently avoid those practical experiments as a result of inadequate of equipments and chemicals. Moreover, practising the experiments is a time consuming process and it may lead to insufficient time for lecture in classroom. These problems cause high school students confronting with the lack of experiences in learning from laboratory. Consequently, multimedia in chemistry experiments, CD and website, is developed to provide an alternative method for chemistry laboratory teaching. The questionnaire from students reveal their interests and demand of this multimedia to fulfill their chemistry courses.

K0014-Tools for Deaf: Learning Thai-Thai Sign language

Srisavakon Dangsaart^{1*}, Thammanoon Ditcharoen¹, Supot Seebut¹

¹Institute for Innovation and Development of Learning Process, Mahidol University, Bangkok, Thailand

E-mail address: sri_dang@hotmail.com, namamin@hotmail.com, supotseebut@yahoo.com

Abstract: Deaf Thai people use the Thai sign language to communicate. The sign language and the spoken Thai language differ in syntax. For this reason deaf people have to learn Thai language in order to communicate with other people. Moreover, processing Thai Language is difficult for deaf. We developed an automatic system for deaf people that generate pictures and Thai sign language to improve literacy. The software is widespread and available for everybody. Deaf people use computer to repeat, to experiment and to focus on areas where they need to improve. They can progress at their own individual pace.

K0016-An Analysis of Local Agriculture Tools as Related to Science in The Upper Northern Part of Thailand.

Virapong Saeng-Xuto, Professor Mani Payormyong Consulator
Faculty of Education, Chiangmai University, Chiangmai, Thailand,
E-mail address: VISCIED@HOTMAIL.COM

Abstract: The research purpose is to study the local agriculture tools in the upper northern part of Thailand. The research studies agriculture tools in case of model, how to make, how to use and how useful it done. The other hand is an analysis of local agriculture tool related to Science and bring it into Local Curriculum, to make student realize in "Thai local wisdom" and they can mix it with global knowledge.

The result of this research, it can analyze the local agriculture tools in 4 groups.

- 1) Tool for prepare soil : a plow, a rake.
- 2) Tool for prepare water : a water wheel, a dam.
- 3) Tool for collected products : a sickle, a barn or a silo, a cart.
- 4) Tool for maintain products : potent bamboo flag and scare crow.

The most of science principle related to the local agriculture tools was Physic, Chemistry and Biological at the least.

K0017-LOGIC INTELLIGENT TUTORING SYSTEM FOR HIGH SCHOOL STUDENTS

Numtip Rattanawongchaiya¹, Sumalee Sonumteing², Kanlaya Naruedomkul²

¹ Institute for Innovation and Development of Learning Processes, Mahidol University, Bangkok, Thailand; ² Department of Mathematics, Faculty of Science, Mahidol University, Bangkok, Thailand.

E-mail address: {g4637458, g4637886}@student.mahidol.ac.th, scknr@mahidol.ac.th

Abstract: In this paper, we present Intelligent Tutoring System (ITS) in mathematics logic for high school student. The student can be Mathayom 1- 6 students and higher level for reviewing to be useful in the future. The purpose of this research is to support life-long learning and support the different learning style of the user. The system is responsible for preparing the presentation of the lesson that is corresponding to the student learning style and basic knowledge. First the system recognizes the characteristic, learning style and basic knowledge of the student from the data informed by student when registration to the system. Then select the most appropriate lesson plan to generate the presentation. The students who have different characteristic, learning style, and basic knowledge will learn with the different lesson.

K0018-Personalized Information Retrieval in Instructional Software System

Sumalee Sonamthiang, Numtip Rattanawongchaiya

Institute of Innovation and Development of Learning Process, Faculty of Science, Mahidol University

E-mail address: tew197@yahoo.com, numtip8002@hotmail.com

Abstract: To support student-centered learning, educational software system should be interactive individually with the learners. The Individualization was met by recognizing student individual characteristics and creating student model to tailor the learning activities, sequence of lessons, and evaluation. Personalized information retrieval (PIR) is added to extend individual interaction and facilitation the learners when they are learning. The PIR perform the Thai keywords by taking student model and history of student learning activities into account.

K0019-THE CORRECTION OF MISCONCEPTION IN SOUND WAVE IN A RESONANCE TUBE

Surachai Nopparatjamjornras*, Assawin Ranusawud, Chernchok Soankwan, Kwan Arayatanikul, Narumon Emarat, Ratchapak Chitarce

Department of Physics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand; e-mail address: sumuctu37@yahoo.com

Abstract: This work presents the study of misconception of sound wave in a resonance tube in the undergraduate students. We found that most of them visualized the vibrating air particles to be the vertical direction. By discussion, we discovered that this misconception caused by ways of teaching method using an image of node and antinode pattern as shown in the Figure1. Since this pattern is similar to a standing wave in a vibration string, the students think that this is a pictorial of wave in a resonance tube. Consequently, they think that this wave is a transverse wave but in fact the sound wave is a longitudinal wave. To correct this misconception of the students we invented an instrument to demonstrated the physical behavior of sound wave in a resonance tube that showed the movement of the colloid in the air as shown in the Figure2. When this instrument was used as part of Interactive Lecture Demonstrations (ILDs), it was found that the percentage of students who had this misconception decreased.

To confirm the effectiveness of this method, the students will reexamine the concept using the same worksheet in two weeks after the end of this semester.

K0021-A study of the effect of crystal geometry to the output power of a diode-pumped Nd:YAG laser

Assawin Ranusawud*, Chernchok Soankwan, Kwan Arayatanikul, Narumon Emarat, Ratchapak Chitaree, Surachai Nopparatjamjomras

Department of Physics, Faculty of Science, Mahidol University, Bangkok Thailand 10400

Abstract: During the development of Nd:YAG Laser using the Laser Diode to side pump the crystal rod at 20 watts it was found that the output laser power of 3 watts was not stable and tend to drop quickly. The system was redesigned by using a different shape of crystal. The new system used a slab shape of Nd:YAG crystal with the dimension of 6mm x 4mm x 30mm. The YAG slab was pumped at 20 watts by laser diode with pumping length 10mm. It was found that with this new design the output power of laser was smaller at 2 watts output but was much more stable.

K0022-A DEVELOPMENT OF COMPUTER – ASSISTED INSTRUCTION FOR PHYSICS LESSON ENTITLED PHOTOELECTRIC EFFECT FOR THE UPPER SECONDARY LEVEL

Unchada Phuapaiboon¹, Sawat Supboon², Manat Boonprakop², Chernchok Soankwan³, and Narumon Emarat³

¹Institute for Innovation and Development of Learning Processes, Mahidol University, Bangkok, Thailand

²Advisor Committee, Science Education, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand

³Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand

Abstract: The purpose of this research was to construct and develop a computer assisted instruction (CAI) for Physics lesson entitled Photoelectric Effect for the upper secondary level. The efficiency of the CAI was also examined. The experimental samples were 30 students of Matthayom Suksa V at Saint Gabriel's College, Dusit District, Bangkok. The study was carried out during the second semester of the 2001 academic year. The students were randomly selected by using Simple Random Sampling method. The Randomized Control Group Pretest-Posttest Design was used in the study. The statistical data, learning achievement scores, was analyzed by using t-test Dependent method. The results revealed that the computer assisted instruction entitled Photoelectric Effect was at the 85/85 of efficient criteria. Students' achievement after studying with CAI was significantly higher than before studying at .01 level.

K0024-The Study of Misconceptions in Kinematics, Force and Energy by Using Conceptual Standized Test

Decha Suppapittayaporn¹, Apisit Tongchai¹, Chernchok Soankwan² and Narumon Emarat²

¹Institute for Innovation and Development of Learning Processes, Mahidol University, Bangkok, Thailand; ²Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand

Abstract: This research is to study of a test to survey students' scientific conception emphasizing on kinematics, force and energy. This standard test can check or indicate students' basic conceptual understanding in physics deeply and correctly. It was developed by many physics education researcher groups. For example, Force Concept Inventory (FCI), Force and Motion Conceptual Evaluation (FMCE) and Mechanics Baseline Test (MBT). On this research, researcher took the test, FMCE, to test with first-year students at Mahidol University, academic semester 2004. According to pre-test and post-test focusing on velocity the enhancement of the correction students' understanding is about 10% increased.

L0001-CHITOSAN USED AS A NATURAL DISINFECTANT UNDER PHYSIOLOGICAL CONDITIONS

Katanchalee Mai-ngam, Pimpan Chumningan and Pannee Sribuathong
National Metal and Materials Technology Center, Pathumthani, Thailand
Tel: 0-2564-6500 Fax: 0-2564-6446
E-mail: katanev@mtcc.or.th and pannees@mtcc.or.th

Abstract: The antibacterial properties of chitosan were investigated in the media against *E. coli* to assess the potential for using chitosan as a natural disinfectant under various physiological conditions. Results show that, during a 24 h incubation, chitosan effectively inhibited the growth of *E. coli* culture in Muller Hilton culture media, phosphate buffered saline, platelet poor plasma and acidic urine, while the antibacterial properties of chitosan were suppressed in alkaline urine. Clinically relevant biomaterials including polyethylene and silicone were used as controls. Suppression of antibacterial activity was also seen by prewashing the chitosan film with ammonium hydroxide prior to incubation in all media. These results indicate that the effective cationic amine groups on chitosan may be shielded by ammonium hydroxide forming in alkaline urine. These studies results show that chitosan could potentially be used as a natural disinfectant in the biomedical field for applications not involving alkaline urine.

L0002-ENDOTHELIALIZATION ON CHITOSAN: EFFECT OF DEGREE OF DEACETYLATION, MOLECULAR WEIGHT AND SOLUTION CONCENTRATION

Nispa Sektapan and Katanchalee Mai-ngam
National Metal and Materials Technology Center, Pathumthani, Thailand
Tel: 0-2564-6500 Fax: 0-2564-6445
E-mail: nispam@mtcc.or.th and katanev@mtcc.or.th

Abstract: The objective of this study is to evaluate the effect of differences in physical and chemical properties of chitosan on endothelialization. Fibronectin coated wells (FN), polyethylene (PE) and tissue culture polystyrene (TCPS) were used as surface controls. All chitosan films were able to support human umbilical vein endothelial cell (HUVEC) adhesion and growth to some degree. Optically, the surface showed patches of confluent cells with the typical HUVEC cobblestone morphology similar to those on FN, and areas of no cell growth. Greater cell adhesion and growth were seen with increasing degree of deacetylation, molecular weight and concentration of chitosan. These results indicate that the chemical and physical properties of chitosan will influence EC adhesion and growth.

L0003-PHYSICAL PROPERTIES AND EFFECTIVENESS OF CHITOSAN IN MOUTHWASH PREPARATION

Supinya Thipvichai, Thawatchai Pacchamad and Somlak Kongmuang*
Department of Pharmaceutical Technology, Faculty of Pharmacy, Silpakorn University, Nakhonpathom, Thailand.
*Corresponding author e-mail address: somlak@su.ac.th

Abstract: The viscosity of mouthwash solutions containing chitosan (0.1, 0.3 and 0.5%) was higher than that of control (without chitosan). The higher amount of chitosan added, the higher viscosity of solution obtained. The taste of preparation containing chitosan was unpleasant. The physical properties of the solution did not change after one week. The solution containing chitosan did not show significant effect on retarding growth of bacteria and fungi comparing with the control. However, it shows significantly reducing the amount of microorganism from mouth cavity.

L0004-DEVELOPING CHITOSAN-BASED COMPOSITE WOUND DRESSING

Chureerat Prahsarn
National Metal and Materials Technology Center, 114 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani, Thailand, E-mail address: churcerp@metec.or.th

Abstract: Composite wound dressing was designed to consist of three layers: chitosan nonwoven, absorbent polymer, and protecting layers. The chitosan nonwovens were prepared via two techniques: wet laid and freeze-dry. Absorbent polymers were hydrogels of crosslinked polyvinyl alcohol (PVA) and crosslinked polyvinyl pyrrolidone (PVP), prepared by Gamma irradiation (at total dose 10, 20, 30, and 40 kGy) of polymer solutions. Results showed that chitosan nonwoven prepared from chitosan fibers by wet laid technique exhibited better water transport, both water vapor and liquid water, than that prepared by freeze-dry technique. It, however, showed disadvantage on surface roughness. Treatment with glycerol solution resulted in softer surface. For absorbent polymers, all hydrogels showed liquid absorbent capacity up to 20-30 times of their dry weights. Hydrogels of polyvinyl alcohol showed better characteristics for wound dressing application than those of polyvinyl pyrrolidone as they had better flexibility and resistance to high force without breaking. Hydrogel films showed variation in thickness and became curly after drying due to shrinkage, which made it difficult to form smooth thin hydrogel film for composite assembling. The wound dressing protocol achieved need further development in desired properties of each layer, assembling of wound dressing composite, and simple yet effective production line.

L0005-REMOVAL OF HEAVY METALS FROM WASTEWATER BY ADSORPTION ON VARIOUS FORMS OF CHITOSAN

Thipwimon KERD-IM¹, Sangobtip PONGSTABODEE,^{1,2*} Somsak DAMRONGLERD¹
¹Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok

²The National Research Center for Environmental and Hazardous Waste Management (NRC-EHWM), Faculty of Science, Chulalongkorn University, Bangkok, 10330, Thailand

E-mail address: annoynoy@hotmail.com, psangobh@se.chula.ac.th

Abstract: The purpose of this work was to investigate removal of Cu (II) and Cd (II) ion from wastewater by adsorption on various forms of chitosan such a flake, bead, modified bead, and cross-linked chitosan with glutaraldehyde (GLA). The crosslinked chitosan was also very stable and maintain their strength even in acidic and basic solution. The experimental results showed different pH optimum was found when using different forms of chitosan to adsorb Cu (II) and Cd (II) ion from wastewater. Isotherm adsorption was also considered in this work. In case of the same form of chitosan but different degree of deacetylation, performance of Cu (II) and Cd (II) ion removal from wastewater were closely. When keeping degree of deacetylation of chitosan, forms of chitosan had a significant effect on adsorption of Cu (II) and Cd (II) ion from wastewater.

L0006-REMOVAL OF EXHAUSTED METAL WORKING FLUID BY ADSORPTION ON CHITOSAN

Kowit Priyamongkalan¹, Sangobtip Pongstaboddee²

¹Department of Chemical Technique, Faculty of Science, Chulalongkorn University, Bangkok, Thailand.

²The National Research Center for Environmental and Hazardous Waste Management (NRC-EHWM)

Faculty of Science, Chulalongkorn University, Bangkok, Thailand.

E-mail address: kwt@kittinb.ac.th, psangobh@se.chula.ac.th

Abstract: Metal working fluid (MWF) onto chitosan bead, carboxylated chitosan and cross-linked carboxylated chitosan with glutaraldehyde (GLA) had been investigated. Chitosan beads were modified by chloroacetic acid and cross-link with GLA in order to obtain sorbents that were insoluble in aqueous acid and basic solution. Batch adsorption experiments were carried out as a function of pH and adding surfactant. The results showed that MWF adsorption obtained when no adding surfactant was lower than that obtained when adding cationic and nonionic surfactant. Adsorption capacity obtained when adding anionic surfactant was lowest. In cases of adding surfactant and no adding surfactant, the optimal pH is around 5.

L0008-Factors Influencing Pore Formation in Chitosan Temporary Scaffolds

Temsiri Wangtaveesab¹, Pawadee Methacanon², Varawut Lanepasuthadol^{1,3,4}

¹Petrochemistry and Polymer Science Program, Faculty of Science, Chulalongkorn University, Bangkok, Thailand 10330

²National Metal and Materials Technology Center, 434 Pabothum Rd., Klong 1, Klong Luang, Pathumthani, Thailand 12120

³Center for Chitin-Chitosan Biomaterials, Chulalongkorn University

⁴Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand 10330

E-mail address: varawut@chula.ac.th

Abstract: Porous scaffolds were fabricated from chitosan by lyophilization process. The effects of chitosan concentration (1, 2, and 3 wt%), type of chitosan (alpha and beta forms) and freezing temperature (-10 °C, -80 °C, and -196 °C) on pore size and morphology were studied by SEM. It was found that the freezing temperature was an important factor affecting on the pore morphology. Among the freezing temperature studied, -10 °C gave interconnecting round pore with 30-50 µm in size. The chitosan concentration and type of chitosan rarely influenced the pore size and morphology. The compressive modulus tended to be higher when chitosan concentration used to prepare the scaffold was increased.

L0009-CHITIN WHISKERS-CHITOSAN NANOCOMPOSITE FIBER

Chantiga Choochottiros¹, Suwabun Chirachanchai^{1,2}, Rangrong Yoksan³

¹The Petroleum and Petrochemical College Chulalongkorn University, Bangkok, Thailand

²Division of Physico-Chemical Process Technology, Faculty of Agro-Industry, Kasetsart University, Bangkok, Thailand

³Center for Chitin-Chitosan Biomaterials, Chulalongkorn University

*Corresponding author

E-mail address: chantiga@hotmail.com, esuwabun@chula.ac.th, and yyrangrong@yahoo.com

Abstract: Chitin is hydrolyzed to obtain chitin whiskers with the size of 200-500 nm as observed by Transmission Electron Microscope (TEM). The mixing of chitin whisker with chitosan salt is a novel approach to prepare chitin-chitosan nanocomposite. The present work shows a simple fiber fabrication which chitosan matrices are reinforced with chitin whisker at nanoscale. The fiber obtained was characterized by Fourier Transform Infrared Spectroscopy (FT-IR), Thermogravimetry Analysis (TGA), and X-ray Diffraction (XRD).

L0010-Amino acid as a salt forming agent of protein loaded chitosan nanoparticles

Mancee Luangtana-anan^{*}, Pranee Opanasopit, Tanasit Ngawhirunpat, Jurairat Nunthanid, Sontaya Limmattavapirat, Panida Asavapichayont, Pensee Nuengsigkapan

Faculty of Pharmacy, Silpakorn University, Nakorn Pathom 73000, Thailand

E-mail address: mancee@gmail.com, pharm.su.ac.th

Abstract: To investigate the potential of amino acid as a salt forming agent for chitosan nanoparticles. Chitosan salts were prepared by the application of amino acid as a salt forming agent. The chitosan solutions at 3 molecular weights (MW), i.e. 35, 100 and 800 kDa were dried by spray drying method. The nanoparticles obtained from chitosan salt in comparison to

chitosan base were produced based on ionotropic gelation process of tripolyphosphate (TPP) and chitosan. Bovine serum albumin (BSA) was applied as a model protein. The increasing MW and BSA concentration, in general, showed a larger size. Higher encapsulation efficiency (EE) and in vitro release were obtained for chitosan salts in comparison to chitosan base. The influence of molecular weight on the EE and release were observed for the chitosan salts, but not for the chitosan base. This study showed that the characteristics of chitosan nanoparticles loaded with a protein drug could be readily modulated by changing the salt form or the molecular weight of the chitosan carrier. Therefore, chitosan salt can be a potential carrier in drug delivery system of macromolecules and amino acid could be applied as a salt forming agent in the preparation of chitosan salt.

L0011-EVALUATION OF SPRAY-DRIED CHITOSAN SALTS AS NOVEL BINDERS FOR SUSTAINED RELEASE TABLETS

J. Nunthanid¹, M. Luangtana-anan¹, P. Sriamornsak¹, S. Limmatvapirat¹, P. Nuengsigkapan¹, S. Puttipipatkachorn²

¹Faculty of Pharmacy, Silpakorn University, Sanamchan Palace, Nakorn Pathom, 73000, Thailand, Tel. 66-34-255800, Fax. 66-34-255801, email: jurairat@email.su.ac.th

²Faculty of Pharmacy, Mahidol University, Sri-Ayudhya Rd., Rajadhevi, Bangkok, 10400, Thailand

Abstract: This research aims to evaluate the potential of spray-dried chitosan acetate (SCTA) and hydrochloride (SCTH) as novel tablet binders. Chitosan (MW 814 kDa, 88 %DD) obtained from source available in Thailand was dissolved in acetic acid and hydrochloric acid at molar ratio 1:2 and 1:0.8, respectively and was further spray-dried to obtain chitosan salts. Physicochemical and micromeritic properties of the salts were evaluated. The salts were spherical particles with rough surface. The particle size distribution mostly was under 75 μ m. SCTA was of an amorphous state and SCTH was of semi-crystalline form. FTIR and solid-state ¹³C NMR spectra exhibited the molecular structure of both salts as acetate and hydrochloride salts. Flowability of both salts was poor. However, flowability and strength of the granules and friability and hardness of the tablets using theophylline as a model drug and both salts as binders were closed to those using polyvinyl pyrrolidone, PVP K30. The approximate 100%-drug release within 24 h was obtained. It was concluded that the simple incorporation of spray-dried chitosan salts as tablet binders could give rise to controlled drug delivery systems exhibiting sustained release.

L0013-EFFECT OF ACIDIC MEDIUM ON SWELLING AND RELEASE BEHAVIOR OF CHITOSAN-REINFORCED CALCIUM PECTINATE GEL BEADS

Pornsak Sriamornsak¹, Kanokporn Burapapat¹, Nartaya Thirawong¹, Jurairat Nunthanid¹ and Satit Puttipipatkachorn²

¹Department of Pharmaceutical Technology, Faculty of Pharmacy, Silpakorn University, Nakhon Pathom 73000 Thailand

²Department of Manufacturing Pharmacy, Faculty of Pharmacy, Mahidol University, Bangkok 10400 Thailand

* E-mail address: pornsak@email.pharm.su.ac.th

Abstract: Chitosan-reinforced calcium pectinate (ChCP) gel beads were prepared by ionotropic gelation method. The swelling of ChCP gel beads and release behavior of indomethacin from the beads were investigated and compared to conventional calcium pectinate (CP) gel beads. The factors, such as molecular weight of chitosan, concentration of chitosan, and release medium, which can have a significant effect on the swelling and release behaviors from the beads, were discussed in this study. The mechanical test showed that the ChCP beads have slightly higher strength than that of CP beads. The swelling index of the ChCP beads in acidic medium was much lower than that in neutral medium. The release of indomethacin from ChCP beads under conditions mimicking intestinal transit were evaluated in simulated intestinal fluid (i.e., pH 7.4 Tris buffer). The effect of acid pretreatment on the drug release revealed that the drugs release faster. The less swelling in acidic medium and faster drug release of acid-pretreated ChCP beads may be due to the dissolution of chitosan from the beads in acidic medium. The results suggested that the acid, which essentially found in stomach, influenced the swelling and release behaviors of ChCP beads.

L0015-PREPARATION OF N-ACETYL-D-GLUCOSAMINE AND N,N-DIACETYLCHITOBIOSIDE BY ENZYMATIC HYDROLYSIS OF CHITIN

Thitima Maneekul¹, Krissana Aunirundronkul¹, Wasinee Prakobkij¹, Akamol Klaikherd¹, Ruth

Pichyangkura², Hunsu Punnayak², Mongkol Sukawattanasinit^{1*}

¹Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand;

²Department of Biochemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand;

e-mail address: smongkol@chula.ac.th

Abstract: This work presents an investigation for optimum conditions in a production of N-acetyl-D-glucosamine (GlcNAc) and N,N'-diacetylchitobiose ((GlcNAc)₂) from β -chitin using various sources of enzyme: chitinase from *Aspergillus fumigatus* fungus¹, *Serratia* sp. bacterium (Chi 60)², and serum of para rubber tree (*Hevea brasiliensis*)³. We found that chitinase from *A. fumigatus* produced GlcNAc and (GlcNAc)₂ in 82% total yield in 5 days at 45 °C, pH 3 with concentration of β -chitin = 20 mg/mL and enzyme concentration = 80 mU/mL. Chi 60 hydrolyzed chitin to give GlcNAc and (GlcNAc)₂ in 81% total yield in 6 days at 37 °C, pH 6, using 30 mg/mL of β -chitin and 150 mU/mL of enzyme. When the low concentration of enzyme, less than 30 mU/mL, was used, the (GlcNAc)₂/GlcNAc ratio as high as 93/7 was obtained in 6 days with 33% total yield of (GlcNAc)₂ and (GlcNAc). The serum of para rubber tree hydrolyzed β -chitin to give GlcNAc and (GlcNAc)₂ in 47% total yield in 8 days at 45 °C, pH 4 using 60 mg/mL of chitin and 13 mU/mL of enzyme, where the reaction produced both (GlcNAc)₂ and GlcNAc with the product mole ratio ((GlcNAc)₂/GlcNAc) approximately 2:1.

L0016-EFFECTS OF CHITOSAN DEACETYLATION AND ENVIRONMENTAL CONDITIONS ON FLOCCULATION OF METHANOGENIC BACTERIA

Chudapak Kaseamchochong¹, Pranee Lertsutthiwong¹, Chantaraporn Phalakornkule^{1*}

¹Department of Chemical Engineering, Faculty of Engineering, King Mongkut's Institute of Technology North, Bangkok,

²Center for Chitin-Chitosan Biomaterials, Metallurgy and Materials Science Research Institute, Chulalongkorn University, Bangkok, Thailand.

E-mail address: chudapak@hotmail.com, Pranee Lertsutthiwong: pranee.l@kmitn.ac.th and cpk@kmitn.ac.th

Abstract: Chitosan is one of the most effective granulation enhancements for UASB systems. In this study, the effects of chitosan characteristics and environmental conditions on the flocculation of Methanogenic bacteria were investigated. The study focused on the effects of degree of deacetylation (DD), concentration of chitosan, pH and ionic strength on the flocculation efficiency. The results showed that chitosan with either 70% or 85% DD improved the flocculation efficiency as compared to the control (without chitosan addition). Chitosan with 85% DD was more effective than that with 70% DD as the former required only 2 mg/g dry weight to obtain 90% flocculation at all studied pH. Restabilization or deflocculation was observed when chitosan was overdosed, but the reduction of deflocculation could be obtained by increasing the ionic strength of the medium.

L0018-PREPARATION AND CHARACTERIZATION OF CHITOSAN MEMBRANE ON WATER DESALINATION

Boonchoo Mahapon¹ and Khantong Soontarapa^{2*}

¹Inter-department of Environmental Science, ²Department of Chemical Technology, Center for Chitin-Chitosan Biomaterials, National Research Center for Environmental and Hazardous Waste Management, Chulalongkorn University, Bangkok 10330

Email: khantong@sc.chula.ac.th

Abstract: Chitosan was synthesized from shrimp shell with molecular mass of 1.4×10^5 Dalton. The membranes were prepared from chitosan solution of 1.5% by weight in 1% by weight acetic acid. Desalination properties of the chitosan membranes were investigated in plate and frame module using 4% by weight of NaCl solution. It was found that the highest salt rejection of $80.83 \pm 4\%$ was obtained from the membrane with evaporation time of 4 h. It was then used for desalination of real wastewater with salinity of 2-2.5%.

L0019-STUDY OF EFFECTS OF CARBOXYMETHYLCHITOSAN-BASED HYDROGELS ON HEALING OF DEEP PARTIAL THICKNESS WOUNDS IN GUINEA-PIGS

N. Sangjun¹, K. Pilakasiri², J. Muensoongneen³, B. Thavornvutikarn¹ and W. Janvikul^{1*}

¹Armed Forces Research Institute of Medical Sciences, Thailand

²Sinraj Hospital, Mahidol University, Thailand

³National Metal and Materials Technology Center, Thailand

*Presenting author, Phone: 02-564-6500, Fax: 02-564-6445, E-mail: wanidaj@mtec.or.th

Abstract: Carboxymethylchitosan (CM-chitosan)-based hydrogels (CM-chitosan and CM-chitosan/CM-cellulose blended hydrogels) were applied as wound dressings in this study. The effects of both dressings on the wound healing were comparatively evaluated with that of a commercial dressing, Cutinova hydro[®] (a control). Two mirror image areas of 1×1 cm² deep partial thickness incisions were made on the backs of guinea-pigs and separately dressed with CM-chitosan and Cutinova hydro[®]. Pairs of the treated animals were housed for given periods. When times reached, the wounds were inspected, and the remaining wound areas were photographed and measured by image analysis prior to the histological examination. A similar trial was conducted to comparatively study the effects of CM-chitosan and CM-chitosan/CM-cellulose blended dressings on the healing of similar wounds. The results revealed that, compared with the wounds dressed with Cutinova hydro[®], those covered with the CM-chitosan-based hydrogels showed no signs of infection and healed more efficiently. The blended dressing, however, seemed to slightly outdo the pure CM-chitosan dressing.

L0020-STUDY ON EFFECTS OF CHITIN, CHITOSAN, AND THEIR DERIVATIVES ON *IN VITRO* BLOOD COAGULATION

Paweena Uppanau¹, Wanida Janvikul¹, Boonlorn Thavornvutikarn¹ and Jirawat Krewraing¹

National Metal and Materials Technology Center, 114 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120, Thailand,

Tel: 0-2564-6500, Fax: 0-2564-6445, E-mail: wanidaj@mtec.or.th, paweenau@mtec.or.th

Abstract: Severe hemorrhage is a leading cause of death from trauma. New methods of hemostasis have been developed to reduce hemorrhagic mortality. The objective of this study was to study the effect of chitin, chitosan, and their derivatives on *in vitro* human blood coagulation. The derivatives used were water-soluble. The water solubility of the materials expectedly affected the blood coagulation process. Whole blood was mixed with each material, and the venous clotting time (VCT) was subsequently measured using a Lee and White method. The results showed that chitin, chitosan, and carboxymethylchitosan (CM-chitosan) significantly reduced VCT with respect to that of the pure whole blood ($p < 0.05$), while *N*-sulfated chitosan and *N*-(2-hydroxy)propyl-3-trimethylammonium chitosan chloride (HTACC) had no effects on VCT. In another blood coagulation testing method, platelet-poor plasma (PPP) was mixed with each material, and the recalcification time (RT) was

then determined using a hook method. Chitosan had no effect on RT. Chitin and CM-chitosan shortened RT significantly ($p < 0.05$), whereas *N*-sulfated chitosan and HTACC prolonged RT.

L0021-CREAMING OF SKIM NATURAL RUBBER LATEX USING *N*-(2-HYDROXY)PROPYL-3-TRIMETHYLAMMONIUM CHITOSAN CHLORIDE (HTACH)

Oraphin Chaikumpollert¹, Chaveewan Rakdee¹, Surapich Loykulnant¹, and Krisda Suchiva^{1,2}

¹National Metal and Materials Technology Center, 114 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120, Thailand

²Department of Chemistry, Faculty of Sciences, Mahidol University, Rama VI Rd., Rajdhevec, Bangkok 10400, Thailand
Phone 0-2564-6500, Fax 0-564-6446, E-mail: oraphe@mtcc.or.th

Abstract: Skim natural rubber (SNR) latex, containing 3-8% w/w of rubber with small particle size, is residual latex obtained as a byproduct of concentrating process of natural rubber (NR) latex by centrifugation. A problem of skim natural rubber latex is the difficulty to recover the residual rubber. The usual method to recover solid rubber from SNR latex is by coagulation with concentrated sulfuric acid. However, in acid coagulation, the acid content of the coagulated rubber reduces its quality and the remaining acid leads to generation of highly acidic effluent. In this article, as a method to recover residual rubber in the form of concentrated latex and reduce water pollution, we have focused on creaming using *N*-(2-hydroxy)propyl-3-trimethylammonium chitosan chloride (HTACH). Its simple synthetic method used chitosan, a biodegradable, non-toxic and renewable resource, as raw material as well as its cationic functional groups render HTACH a very interesting agent. In this study, HTACH was prepared from shrimp shell. Using the new creaming method, effects of HTACH concentration on creaming ability and creaming mechanism of skim rubber latex are investigated.

L0022-STUDY OF *IN VITRO* RELEASE AND SKIN PERMEATION OF CHITOSAN FILMS LOADED WITH METHIMAZOLE FOR TRANSDERMAL DELIVERY

Suchada Pinyaprasarth, Jurarat Nunthanid, Wanwilai Daronkaisorn, Sasithorn Sae-ico, Sameela Yuttawat, Sanchai Santithanes, Suwipa Tangsombutpaiboon, Pornsak Sriamornsak and Praneet Opanasopit

Department of Pharmaceutical Technology, Faculty of Pharmacy, Silpakorn University, Sanamechand Palace Campus, Nakorn-Pathom 73000, Thailand

E-mail address: suchada.j email.pharm.su.ac.th

Abstract: It is important to develop methimazole, antithyroid agent [1-2], for transdermal drug delivery system which is much convenient for patient compliance. Since methimazole is available only in an oral dosage form, the use in patients is limited, especially those who could not take the drug by oral route [3-4]. To investigate *in vitro* drug release and skin permeation which are important properties for development of transdermal delivery, methimazole was loaded into the films prepared from chitosan, a natural biopolymer, varying in molecular weight (MW). The drug was found existed in films as an amorphous state by using Differential Scanning Calorimetry (DSC). No drug-polymer interaction was found by using Fourier Transform Infrared (FTIR) spectroscopy. *In vitro* drug release study revealed that methimazole was released rapidly from low MW chitosan film. The increase in MW of chitosan resulted in slow release of drug; however, there was not significant different in permeation across new born pig skin.

L0023-CONTROL OF CHITOSAN DEACETYLATION DEGREE BY COMBINED EFFECTS OF DEACETYLATION TEMPERATURE, NUMBER OF REPEATED BATCH, AND TIME

Nuntiya Chieplaen¹, Yaowapha Waiprib^{2*}, Anan Tongta¹, and Pichan Sawangwong³

¹Environmental Science Graduate Program, Faculty of Science, Burapha University, Chonburi, Thailand.

²Department of Food Science, Faculty of Science, Burapha University, Chonburi, Thailand.

³School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

⁴Department of Aquatic Science, Faculty of Science, Burapha University, Chonburi, Thailand.

*Corresponding author. Email: yaowapha@buu.ac.th

Abstract: Control of chitosan deacetylation degree by combined effects of deacetylation temperature, number of repeated batch, and time was demonstrated. Firstly, a whole-dried shrimp shell was demineralized using 1 N hydrochloric acid at ambient temperature for 1 hour, and deproteinized using 2 N sodium hydroxide at 55°C for 1 hour consecutively to yield chitin. Chitin, were then ground and deacetylated with 50% w/w sodium hydroxide at different combinations of process conditions; that is, 110 °C, 120 °C, and 130 °C with the number of repeated batch of 1, 2, and 3, for 1 hour, 2 hours, and 3 hours to yield chitosan products. More extent of chitosan deacetylation degree achieved by combined higher deacetylation temperature, higher number of repeated batch, and the longer the time of reaction used for deacetylation process ($p \leq 0.05$). The highest degree of deacetylation was obtained at 130 °C, $95.04 \pm 1.01\%$, using 3 repeated batches at 3 hour interval whereas the lowest degree of deacetylation was obtained at 110 °C, $81.29 \pm 3.14\%$, using 1 repeated batch at 1 hour interval ($p \leq 0.05$).

L0024-Effect of Chitosan Coating on Storability of Coated Tangerine Orange

Chanikan Kantahan¹, Anan Tongta^{2*}, Jindarat Pimsamarn¹, Montira Nopharatana¹, and Yaowapha Waiprib⁴

¹Chemical Engineering Department, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

²School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

³Food Engineering Department, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

⁴Department of Food Science, Faculty of Science, Burapha University, Chonburi, Thailand.

*Corresponding author. Email: anan.ton@kmutt.ac.th

ABSTRACT: Films of seven commercially available chitosan samples were evaluated in order to investigate their oxygen and water permeability. Chitosan with the molecular weight (856,000) and degree of deacetylation (75.89%) showed highest oxygen permeability ($67.53 \text{ ml.mm.m}^{-2}.\text{day}^{-1}.\text{atm}^{-1}$) was chosen for coating the orange. 1%(w/v) chitosan solution was used for coating study of tangerine orange. Non-coated tangerine orange was served as a control. Samples of orange were stored at 28 °C, 75%RH for 15 days and at 5 °C, 95%RH for 49 days. Samples were taken at time intervals and analysis for fruit's internal atmosphere (oxygen and carbon dioxide gases), ethanol content, total soluble solid, total titrable acidity and ascorbic acid concentration. For coated oranges stored at 28 °C, 75%RH, ethanol content was increased throughout the storage period. Coated oranges lost their weight for about 11.58% and non-coated orange lost their weight for about 12.36%. For coated oranges stored at 5 °C, 95%RH, ethanol content was increased at lower rate than that stored at 28 °C, 75%RH. Coated oranges lost their weight for about 5.83% and non-coated orange lost their weight for about 6.75%.

L0025-CAPABILITY OF CHITOSAN FLAKES ON DECOLORIZATION OF DYE WASTEWATER

Benjawan Sutthachai¹ and Khantong Soontarapa^{2*}

¹Inter-department of Environmental Science, ²Department of Chemical Technology, Center for Chitin-Chitosan Biomaterials, National Research Center for Environmental and Hazardous Waste Management, Chulalongkorn University, Bangkok 10330

Email: khantong@sc.chula.ac.th

Abstract: This paper presented the capability of chitosan flakes on decolorization of acid and direct dye effluents from 2 case factories. The flakes of 710-850 micron were prepared from shrimp shells in laboratory under nitrogen atmosphere. Their degree of deacetylation was $90.1 \pm 4.5\%$. The optimum treatment conditions of both effluents by Jar test technique were same at pH 6 and dosing of 0.4 g. chitosan per 200 ml. effluent. The decreases in the maximum absorption of acid and direct dye effluents were 90.24 ± 0.36 and $98.87 \pm 0.23\%$, respectively. The adsorption isotherms of synthetic acid and direct dye waters could be fitted well with both Langmuir and Freundlich equations. The equilibrium sorption capacities of chitosan for acid and direct dyes by Langmuir equation were 13.40 and 25.51 mg/g, respectively.

L0026-Preparation of Surface-Charged Chitosan

Yaowamand Angkitpaiboon¹, Vipavee Hoven², Varawut Tangpasuthadol^{2*}

¹Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok.

²Organic Synthesis Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Bangkok, Thailand; Tel: 0-2218-7626(104)

e-mail address: varawut.t@chula.ac.th

Abstract: Two methods were used to create charges on chitosan films. In the first method the amino group ($-\text{NH}_2$) of chitosan was allowed to react with methyl iodide to form positively-charged quaternary ammonium salt. The second method was to create a negatively charged film by the reaction between the amino group and 5-formyl-2-furan sulfonic acid, which contain a negatively charged sulfonate group. Results from X-ray photoelectron spectroscopy (XPS) indicated iodide counter ion present in the positively charged films, while sulfur and sodium were found from the negatively charged film. The presence of quaternary ammonium [$-\text{N}^+(\text{CH}_3)_3$] and sulfonate group [$-\text{OSO}_2^-$] were confirmed by attenuated total reflectance IR (ATR-IR). The hydrophilicity of both modified films was higher than the non-modified film, as determined by air-water contact measurement. The value also increased when the reaction time and reagent amounts increased.

L0027-MOLECULAR WEIGHT REDUCTION OF CHITOSAN VIA γ -RAY IRRADIATION

Wanvimol pasanphan¹, Rangrong Yoksan² and Suwabun Chirachanchai^{1*}

¹The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

²Division of Physico-Chemical Process technology, Faculty of Agro-Industry, Kasetsart University, Bangkok, Thailand

³The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

*Corresponding author

E-mail address: p.wanvimol@hotmail.com, rrangrong@yahoo.com and esuwabun@chula.ac.th

Abstract: Chitosan is γ -ray irradiated with various doses up to 160 kGy in simple conditions with/without radical initiators. The molecular weight of chitosans decreases from $6.7 \times 10^5 \sim 1.2 \times 10^6$ to 1.0×10^5 Dalton with the primary structure retained under the γ -ray amount of 50 kGy for the conditions of chitosan solid flakes and chitosan dispersed in water. The similar level of molecular weight reduction can be achieved by only 20 kGy in the presence of radical initiator (H_2O_2). The reactivity of irradiated chitosan was enhanced 50-60% as observed from the coupling reaction with carbonyldiimidazole (CDI). In the case of chitosan in acetic acid solution, the structure of irradiated product is changed as determined from FT-IR, TGA, and XRD techniques.

L0028-EFFECTS OF DEGREE OF DEACETYLATION AND MOLECULAR WEIGHT OF CHITOSAN ON THE CONTROLLED DICLOFENAC SODIUM RELEASE

Krisana Siralerdmukul¹, Suwalee Chandrakrang², Werasak Udomkitchdech³, and Supot Hannongbua^{2*}

¹Metallurgy and Materials Sciences Research Institute, Chulalongkorn University, Bangkok 10330, Thailand

²Center for Chitin-chitosan Biomaterials, Metallurgy and Materials Sciences Research Institute, Chulalongkorn University, Bangkok 10330, Thailand

³Department of Materials Science, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

*E-mail address: krisana.s@chula.ac.th

Abstract: This study is to investigate the influence of degree of deacetylation (%DD) and molecular weight (MW) of chitosan on a release behavior of diclofenac sodium (DS) from the chitosan matrix. In addition, an effect of drug delivery vehicle design of chitosan beads with diameter in the range of 500-1000 μm , chitosan microparticles with mean sized diameter 37 μm . Beads of chitosan with %DD of 70 and 91 and the MW of 150,000, 400,000 and 600,000 Daltons were prepared. Bead size was not affected by %DD and MW. A phosphate buffer with pH 6.8 was chosen as a media for DS release study. This condition mimics small intestinal fluid found in human digestive system. The DS releasing rate increased slightly with the increase in DD and molecular weight of chitosan. Maximal release from the matrices beads and microparticles take place at approximately 75% and 85%, respectively.

L0029-STRUCTURAL MODIFICATION OF CHITOSAN FOR NANOSPHERES

Rangrong Yoksan¹ and Suwabun Chirachanchai²

¹Division of Physico-Chemical Process technology, Faculty of Agro-Industry, Kasetsart University, Bangkok, Thailand.

²The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

E-mail address: rangrong.y@ku.ac.th and csuwabun@chula.ac.th

Abstract: Chitosan nanosphere (*N*-phthaloylchitosan grafted mPEG) is accomplished by the dialysis against water of the mixture obtained from homogeneous reaction of hydrophobic *N*-phthaloylchitosan and hydrophilic mPEG-COOH. The obtained product is sphere with the size in nano-level varying from 85 to 400 nm depending on the chain length of hydrophilic part as observed from TEM technique. Alkylamines, which are applied as model drugs, can be incorporated into chitosan nanosphere as confirmed from FT-IR, SEM, and TGA techniques. Chitosan nanosphere is expected to use as a carrier material for drug delivery system.

L0030-ANTIOXIDANT ACTIVITY OF CURCUMIN RELEASED FROM CHITOSAN-ALGINATE MICROSPHERES

Kwunchit Oungbho¹, Satit Puttipipatkachorn², Supreedeer Sungkarak¹, Niwat Kaewpradap¹

¹Department of Pharmaceutical Technology, Faculty of Pharmaceutical Sciences, Prince of Songkla University, Hat-yai, Songkhla, 90112, Thailand.

²Department of Manufacturing Pharmacy, Faculty of Pharmacy, Mahidol University, Bangkok, 10400, Thailand.

¹Department of Pharmacognosy and Pharmaceutical Botany, Faculty of Pharmaceutical Sciences, Prince of Songkla University, Hat-yai, Songkhla, 90112, Thailand.

E-mail address: supreedeer.s@psu.ac.th

Abstract: Chitosan-alginate microspheres containing curcumin were prepared by complex coacervation/ emulsification technique. The mean particle size, d_{50} , of the microspheres was found between 11.35 – 15.67 μm . The SEM determination indicated the porous morphology of the microspheres. The release of curcumin from the microspheres was controlled over 48 hours. The antioxidant activity EC_{50} of curcumin microspheres was $2.00 \pm 0.44 \mu\text{g/ml}$ compared to $2.20 \pm 0.37 \mu\text{g/ml}$ of standard curcumin and $2.60 \pm 0.10 \mu\text{g/ml}$ of vitamin C.

L0031-Growth restraint activity of chitosan against a tomato leaf spot bacterium

Xanthomonas campestris pv. *vesicatoria*

Sopa Pisawongprakarn¹ and Porntip Wongkaew²

¹Graduate student, Department of Plant Pathology, Faculty of Agriculture, Khon Kaen University, Khon Kaen 40002, Tel & Fax: 043-343114

²Associate Professor, Department of Plant Pathology, Faculty of Agriculture, Khon Kaen University, Khon Kaen 40002, Tel & Fax: 043-343114, E-mail: porwon@kku.ac.th

Abstract: A leaf spot disease of tomato caused by *Xanthomonas campestris* pv. *vesicatoria* is one of the most serious problem of seed producing industry and export marketing at international level due to its seed transmission capability. A high cost of investment according to chemical control was obviously needed in spite of a high risk for environment safety. A natural compound such as chitosan is one of the most promising agent suggested for antibacterial substance in many cases. In this study, chitosan formulas ranged from 80, 85, 90 and 95% degree of deacetylation (DD) were tested for growth restraint activity against *X. campestris* pv. *vesicatoria*, a bacterial leaf spot of tomato. Similar effect was obtained with all deacetylated chitosan formulas from 2.5 up to 30.0 mg/ml concentration, that the growth inhibition zone size was increasing from 10.2 mm to 20.8 mm following an increasing of chitosan concentration. The size of inhibition zone by chitosan at 30.0 mg/ml was comparable to conventional antibiotics chloramphenicol, streptomycin, tetracycline and chemical cuprous oxide at regular therapeutic concentration, 3.0 mg/ml. While the treatment with other chemicals such as benlate, copper oxychloride, mancozeb and ridomyl yielded only minor growth restraint activity.

L0032-Physical and mechanical properties of chitosan film prepared with three organic acids

Suppajit Sukkunta¹, Patana Thavipoke¹, and Piyabutr Wanichpongpan²

¹Faculty of Environment and Resource Studies, Mahidol University, Salaya Nakhonpatom

²Department of Chemical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok

E-mail address: suppajit_s@yahoo.com, enptv@mahidol.ac.th and piyabutr.wan@kmutt.ac.th

Abstract: A preliminary study for a suitable method and base line data for a possibility of biodegradable cling film production from chitosan, which obtained from black tiger shrimp waste, was conducted. Effects of experimental conditions, as well as other factors on quality of chitosan film were evaluated. The results showed that in 1% lactic acid solution, the complete dissolution of chitosan could be observed. The chitosan film with suitable quality for further study on cling film production could be prepared from a 150 ml solution contained 1: 100 (w:v) chitosan. The physical properties of the produced chitosan film were: weight 1.5020 mg /piece, film thickness 0.0593 mm, tensile strength 60.5833 N /mm², elongation at break 13.408 mm, water vapor permeability 0.1564×10^{-3} g.mm /mm²hr .mm Hg .

L0033-STUDY THE ADSORPTION CAPACITY OF REACTIVE DYES USING ACTIVATED CARBON POWDER, CHITOSAN-ENCAPSULATED ACTIVATED CARBON AND CHITOSAN BEAD

Ananya Tribumrungsuk¹, Suwalee Chandkrachang², Thararat Supasiri¹, Panee Wathanaoran¹, Piyaporn Chaipongratana¹, Jaruporn Nhungam¹

¹Department of Chemistry, Faculty of Science, Srinakharinwirot University, Bangkok, Thailand,

²Center for Chitin-Chitosan Biomaterials, Chulalongkorn University,

E-mail address: ananya@swu.ac.th

Abstract: Water pollution caused by reactive dyes from textile factories is one of the problems that need to be solved. As activated carbon and chitosan have high adsorption efficiency, chitosan-encapsulated activated carbon (CEAC) will have more efficiency. The purpose of this work is to compare the adsorption of red and blue reaction dyes, by using activated carbon powder, CEAC, and chitosan bead. By spectrophotometry technique, it was found that CEAC has higher adsorption efficiency than activated carbon powder and chitosan bead. CEAC with 1 min coating time can adsorb red and blue dyes at 9100-8%, which is the highest efficiency obtained. The high efficiency is correlated with the photo from scanning electron microscope showing that the coated film of CEAC with the coating time 1-2 min is equally and not too thick or too thin.

L0034-Characterization and gene cloning of chitinolytic enzymes from *Bacillus* sp. PP8.

Santhana Nakapong¹, Supida Tubtimthep², and Rath Pichyangkura¹.

¹Department of Biochemistry, Faculty of Science, Chulalongkorn University, Payathai Rd., Bangkok 10330, Thailand

²Program in Biotechnology, Faculty of Science, Chulalongkorn University, Payathai Rd., Bangkok 10330, Thailand

Abstract: *Bacillus* sp. PP8 was isolated from PP Island, Krabi, Thailand. When *Bacillus* sp. PP8 was grown in liquid medium containing chitinous sources. Chitinase and chitosanase activity was detected. However, when it was grown in medium containing various types of chitosan only chitosanase activity was detected. The best inducer for chitinase and chitosanase activity was colloidal chitin and colloidal chitosan, respectively. GlcNAc can induce low level of chitinase production from PP8, however GlcN cannot induce either chitinase or chitosanase production. The optimum pH and temperature of the chitinase and chitosanase was pH 8.0 / 50°C and pH 7.0 / 50°C, respectively. GlcNAc and (GlcNAc)₂ are major products from colloidal chitin hydrolysis by PP8 chitinase. When crude enzyme from PP8 was analyzed by SDS-PAGE followed by activity staining, Five bands (145, 66, 55, 45 and less than 15 kDa in size) with chitinase activity and a single band of 47.5 kDa with chitosanase activity were observed. Chitinase encoding gene was cloned by shot gun cloning. Three colonies producing different clear zones on the selective agar designated, pST24, pST847 and pST1691 were selected. The highest chitinase activity, pST847 was chosen for further analysis. Nucleotide sequence revealed an open reading frame of 1797 bp encoding for 599 amino acids with signal peptide corresponding to 66.20 kDa. The chitinase gene expression was using pET19b and pTrcHis-2C. The chitinase activity was found in the culture medium and confirmed by SDS-PAGE followed by activity staining. The optimum pH, temperature, and products of colloidal chitin hydrolysis of the recombinant chitinase corresponded to the 66 kDa native chitinase from *Bacillus* sp. PP8. The enzyme did not degrade when kept in pH 5-8, at 4°C for 2 months.

L0035-SYNTHESIS AND ANTIMICROBIAL ACTIVITIES OF QUATERNARY AMMONIUM SALT OF *N*-ALKYLATED CHITOSANS

Warayuth Sajomsang^{1*}, Varawut Tangpasuthadol¹, Supawan Tantayanon¹, William H. Daly²

¹Functional Polymer and Petrochemistry Research Unit, Department of Chemistry, Faculty of Science, Chulalongkorn University, Phayathai Road, Pathumwan, Bangkok 10330, Thailand. sajomsang@hotmail.com

²Macromolecular Studies Group, Department of Chemistry, Louisiana State University, Baton Rouge, LA 70803, USA.

Abstract: The *N*-alkylated chitosan derivatives were prepared from the reactions between the amino groups of chitosan with aldehydes under acidic condition via imine intermediates which were simultaneously reduced by sodium cyanoborohydride. It was found that the degree of substitution was in the range of 0.04-0.75 depending on the equivalent amount of the aldehyde and reaction time. The quaternization was performed by using two methylating agents, i.e., methyl iodide and glycidyltrimethylammonium chloride (GTMAC) in basic and acidic conditions, respectively. The results showed that the alkyl substituents and the methylating agents affected the degree of quaternization and quaternary ammonium derivatives of chitosan showed antimicrobial activity. The structures of all chitosan derivatives were illustrated by ¹H-NMR, and FT-IR spectroscopic methods.

L0036-A Preliminary Study of Improvement Red Wine Making from Table Grapes by Using Chitosan

Wanichpongpan, P., Yompakdee, K., Puengprayoonpong, U. and Wichianchai, I.

Department of Chemical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, Tel. 0-2470-9220, E-mail: piyabutr.wan@kmutt.ac.th

Abstract: This research was a preliminary study of red grape wine improvement by using chitosan in wine precipitation, comparing to flocculants used at the present. Two parts of the experiment were investigated. In the first part was to study of the ability of chitosan solution in wine precipitation, the results were found that chitosan solution could be able to use as flocculant in wine precipitation process. In the second part was to study of the optimum dose of chitosan solution in wine precipitation, the results were found that the amount of sugar and pH in red wine weren't affected by any flocculants, e.g. pectinase, bentonite, chitosan solution 50, 100, 150, 200, 250, 300 and 350 ppm. For the amount of alcohol, was the most affected by bentonite, but there were no different between adding any doses of chitosan solution, pectinase and without adding flocculant. The comparison in red wine transparency was found that chitosan solution 200 ppm was the most effective. The result of tannin analysis was found that the amount of tannin was reduced effectively by pectinase, the secondary were chitosan solution 150 ppm.

L0037-A Study of Application of Chitosan as Meat Duck Growth Promoter

Piyabutr Wanichpongpan¹, Siripong Congchoo² and Kan Chantrapromma³

¹Department of Chemical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, Tel. 0-2470-9220, Fax. 0-2428-3534

E-mail: piyabutr.wan@kmutt.ac.th

²Triam Udomsuksa Southern School, Nakorn Sri Thammarat, Thailand

³Walailuk University, Nakorn Sri Thammarat, Thailand

Abstract: Chitosan, a natural, biodegradable, biocompatible and growth promoter biopolymer has many agricultural applications. In this research used the powder 50 mesh of shrimp chitosan with 70.6 %DD. It was found that the addition of chitosan 35 gram into 100 kg of the meat duck feed stock (350 ppm) had affected the maximum ADG of 60.54 g/head-day and the best FCR of 1.852 with the same size in the tested group as well as good healthy and beautiful feather. The different size of the meat duck was found in the control group with the lower ADG of 57.05 g/head-day and the less FCR of 2.141. The FCR and the ADG of the second experimental group used the chitosan addition of 25 g into 100 kg of the meat duck feed stock (250 ppm) had the value in between the maximum dose of chitosan addition group and control group. Even though, the initial weight was less than the other groups, it had a good result of the better FCR with the same size of meat duck as well as good healthy.

L0038-Copper Removal by Chitosan Porous Bead

Piyabutr Wanichpongpan¹, Raphat Petchniyom² and Niran Sappawinyoo¹

¹Department of Chemical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, Tel. 0-2470-9220, Fax. 0-2428-3534

E-mail: piyabutr.wan@kmutt.ac.th

²Mahapruttaram Girl's School, Bangruak, Bangkok 10500 Tel. 0-2236-5758 Fax. 0-2236-5740

E-mail: rapat_p@hotmail.com

Abstract: In this research was used chitosan with degree of deacetylation 96%, molecular weight 300,000 g/mol and mean powder size in range of 0.297–0.590 mm. Chitosan porous bead was developed from 4% chitosan solution in 2% acetic acid. The result was found that chitosan porous bead had higher efficiency of copper removal than chitosan powder. 60 g of chitosan porous bead had copper removal efficiency of 94% while 0.6 g chitosan powder had 67% of copper removal. Absorption isotherm of copper of chitosan porous bead and chitosan powder were not different. However, chitosan porous bead could adsorb copper better than chitosan powder at low concentration of copper solution while chitosan powder could be better at high concentration of copper solution.

L0039-A Study Mass Balance of Pacific White Shrimp (*Litopenaeus vannamei*) Growth

Piyabutr Wanichpongpan¹, Hathairat Jeerathawatchai² and Wiwat Ruenglerpanyakul¹

¹Department of Chemical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangkok, Thailand, Tel. 0-2470-9220, Fax. 0-2428-3534

E-mail: piyabutr.wan@kmutt.ac.th

²Department of Chemical Engineering, Faculty of Engineering, Kasetsart University

Abstract: This research studied mass balance of pacific white shrimp (*Litopenaeus vannamei*) by using 100 ppm concentration of 1% chitosan solution in 1% acetic acid coating-on the shrimp feed for every 3 days and 2 meals a day in field test using 3200 m² size of soil pond. Forty heads per time were sampled at the 40th, 80th and 115th cultivation date. Their total weight, meat weight, shell weight, waste weight, weight of hepatopancreatic were measured and the mass balance was calculated based on protein, calcium, lipid, fiber, chitin and ash content. Applying chitosan was found to positively affect the shrimp growth, frequency of molting, and chitin development process in all measured aspects. The chitosan feed additive dose at 100 ppm promoted the shell chitin had higher contents of 21.02% at the 115th day than the control set at 20.85%.

L0040-A Study of Protein Removal by Chitosan Porous Bead

Wanichpongpan, P., Ondee, T., Lertsupsuree, C., Pornprasart, R. and Sappawinyoo, N.
 Department of Chemical Engineering, Faculty of Engineering, King Mongkut's University of
 Technology Thonburi, Bangkok, Thailand, Tel. 0-2470-9220, Fax. 0-2428-3534
 E-mail: piyabutr.wan@kmutt.ac.th

Abstract: This research studied the comparison of protein removal efficiencies of chitosan porous bead between the poultry slaughtering wastewater and the standard solution of BSA at 706 mg/l and 5,000 mg/l respectively. It was found that chitosan porous bead had maximum protein removal efficiencies for the poultry slaughtering wastewater and the standard solution of BSA of 64.8% and 27.0%, and also had maximum protein adsorption rate for the poultry slaughtering wastewater and the standard solution of BSA of 800 and 1,048 gram of protein per gram of chitosan. It could well explain the adsorption characteristics by Langmuir's isotherm that protein was linearly favorable adsorbed by chitosan porous bead as monolayer, while the protein adsorption between the poultry slaughtering wastewater and the standard solution of BSA had value of Q (dosage adsorption protein using chitosan porous bead) at 57 and 250 and value of b (adsorption constant) at 3.22×10^{-3} and 1.77×10^{-4} respectively.

ดัชนีผู้วิจัยรับเชิญ

และดัชนีผู้วิจัย

**INVITED SPEAKER INDEX
AND
AUTHOR INDEX FOR**

Section A →	Mathematics, Computing and Information Technology (A-)
Section B. →	Biological Science (B-)
Section C. →	Chemistry (C-)
Section D. →	Physics (D-)
Section E. →	Materials Science (E-)
Section F. →	Agricultural & Food Science (F-)
Section G. →	Geology (G-)
Section H. →	Medical Science (H-)
Section I. →	Environmental Science & Technology (I-)
Section J. →	Engineering & Technology (J-)
Section K. →	Science Communication & Education (K-)
Section L. →	Chitin-Chitosan (L-)

ดัชนีผู้วิจัยรับเชิญ

และดัชนีผู้วิจัย

**INVITED SPEAKER INDEX
AND
AUTHOR INDEX FOR**

Section A →	Mathematics, Computing and Information Technology (A-)
Section B. →	Biological Science (B-)
Section C. →	Chemistry (C-)
Section D. →	Physics (D-)
Section E. →	Materials Science (E-)
Section F. →	Agricultural & Food Science (F-)
Section G. →	Geology (G-)
Section H. →	Medical Science (H-)
Section I. →	Environmental Science & Technology (I-)
Section J. →	Engineering & Technology (J-)
Section K. →	Science Communication & Education (K-)
Section L. →	Chitin-Chitosan (L-)

Section A - MATHEMATICS, COMPUTING AND INFORMATION TECHNOLOGY

B			
Boonyanuch Wathanyu	A0002	T	
C		Taweetham Limpanuparb	A0001
Chalothorn Liamwirat	A0018	Thammasak Thianniwet	A0011
Chanun Lewchalermvongs	A0021	Tipanun Thepsri	A0002
Chonvit Tholieng	A0008	Treechada Tawornmas	A0026
Chusak Sochara	A0005	U	
E		Ungsana Chundang	A0003
Erwin Mues	A0003	W	
J		Wacharapong Srisang	A0016
Jeerayut Chaijaruwanich	A0018	Warabhorn Preechaporn	A0017
K		Waraporn Viyanon	A0024
Kate Grudpan	A0018	Woranut Koetsinchai	A0015
Khwanjai Pasapan	A0025		
Kittisak Kerdprasop	A0011, A0012 A0013, A0014		
Komin Piromchom	A0005		
Krisanadej Jaroensutasinee	A0016, A0017 A0026, A0028		
L			
Laksamee Khomnotai	A0011		
M			
Michael A. Allen	A0019		
Mullica Jaroensutasinee	A0016		
N			
Naris Mingmora	A0012, A0013		
Narisa Chutinara	A0023		
Narong Lenghor	A0018		
Nathnarong Khajohnsaksumeth	A0020		
Natt Piyapramote	A0029		
Nawat Nantasen	A0006		
Nikolay Moshkin	A0010		
Nittaya Kerdprasop	A0011, A0012 A0013, A0014		
Nurupon Wongprachanukul	A0012, A0013		
O			
Oranit Panprasitwech	A0015		
Orawan Kaewkanjana	A0003		
P			
Panjit Musik	A0028		
Parichat Rattanasaring	A0011		
Pavadee Sompagdee	A0008		
Peiangpob Mounnumprang	A0010		
Pitsamai Hanmongkolpipat	A0002		
S			
Sakauwrat Jongpattanakorn	A0009		
Sarawut Poltue	A0005		
Sarun Phibanchon	A0019		
Sittichai Bussaman	A0005, A0006		
Somsak Orankitjaroen	A0020, A0021 A0025		
Sopak Chaichana	A0005		
Sunee Raksakietisak	A0022		

Section B – BIOLOGICAL SCIENCE

		A	
Achariya Sailasuta	B0010	Chortip Kantachote	B0048
Achariya Rangsiruji	B0018, B0019	Churee Pramatinai	B0076
Achra Thammathaworn	B0048	Chusri Talubmook	B0154, B0155
Albert J. Kettermann	B0044, B0075		D
Amara Naksathit	B0020	Damrong Santiarvorn	B0001
Amnat Rojanapaibul	B0051	Darawan Thongbute	B0138
Amornrat Promboon	B0045, B0046	Derek Bannajak	B0087
	B0063	Dolnapa Kaewpa	B0130
Anchalee Tassanakajon	B0030, B0031	Duangkamol Thong-a-ram	B0129
	B0082	Duangkamol Tangpong	B0144
Anchana Prathep	B0028	Duanpen Sandee	B0109
Anchana Thancharoen	B0021	Duriya Chantasingh	B0120
Ancharie Na-Chiangmai	B0098		E
Anoma Dongsansuk	B0107	Ek Sangvichien	B0115
Anudep Rangsipipat	B0076		G
Anuwat Wanthong	B0127, B0128	Gerd Katzenmeier	B0016
Apichai Bouchookarn	B0068, B0070		H
Apiradee Riennukool	B0034	Hataichanoke Niamsup	B0073
Aram Khumklang	B0074		I
Aranya Manosroi	B0013, B0041	Isarapong Pongsirikul	B0074
	B0042	Itsara Nuratsa	B0124, B014
Aranya Pimmongkol	B0132		J
Araya Jatisatienr	B0026	J. Promya	B0049
Aree Thattiyaphong	B0063	James R. Ketudat-Cairns	B0033
Arisra Rodmui	B0065	Jarupan Kobsuk	B0119
Artit Rukkasikorn	B0029	Jeeraphan Suksringarm	B0154
Arunrat Chaveerach	B0106	Jeeraphun Jaiinpon	B0108
		Jeeraporn Pekkoh	B0074
		Jiradej Manosroi	B0013, B00
			B0042
B		Jirarach Srijunngam	B0137
Banyong Khantawa	B0001	Jirasak Kongkiattikajorn	B0064, B00
Bavornlak Khamnamtong	B0082		B0066, B00
Benchamart Moolmuang	B0072, B0098	Jirundon Yuvaniyama	B0131
Benchaporn Buaban	B0121	Juthamart Piromjitpong	B0075
Benjamaporn Wonganu	B0058	Juthaporn Khampila	B0150
Boonhaing Promdonkoy	B0069, B0090		K
	B0091, B0092	Kanchana Bunnuang	B0105
Boonserm Withyachumnarnku	B0004	Kanchanee Tonak	B0009
Bundit Tengjaroenkul	B0061, B0062	Kanchit Thammasiri	B0006
Bungorn Thaewnon-ngiw	B0153	Kanjana Vongkuna	B0152
Busabun Chaisalee	B0034, B0092	Kanlaya Yoonan	B0064, B00
		Kanok Rattanakanokchai	B0064
C		Kanokon Riwlung	B0035
Chaivat Kittigul	B0063	Kanokphan Wongprasert	B0004
Chaiyasit Sittiwet	B0079	Kanokporn Saenphet	B0100
Chalermchai Wongwattana	B0139	Kanokporn Triwitayakorn	B0034, B00
Chalermpon Ongvarrasopone	B0094		B0098
Chanikul Chuttrakul	B0111	Kanokrat Namsinuan	B0125
Chanpen Chanchao	B0148, B0149	Kansri Boonpragob	B0113, B01
Chantima Keyanont	B0046		B0115
Charles Drewes	B0103	Kanya Santanachote	B0152
Chartchai Kritanai	B0068, B0090		
	B0069, B0070		
Chinuma Pinkate	B0052		

Kanyaratt Supaibulwatana	B0136		
Kanyawim Kirtikara	B0118, B0055		
	B0109, B0110		
	B0111, B0121		
Karuna Manoban	B0125		
Kasem Soyong	B0017		
Katewadee Boonyapakron	B0055		
Kawinnat Buaruang	B0115		
Kenji Mutsui	B0125		
Kestip Isarankura Na Ayudhya	B0147		
Khajeenat Photivetkul	B0125		
Khajornsak Tragoolpua	B0026		
Khanok Ratanakhanokchai	B0039, B0117		
Khesorn Nanthachit	B0001		
Khin Lay Kyu	B0039, B0117		
Khomsorn Lomthaisong	B0127, B0128		
Kienghathai Yeunyongsuwan	B0066		
Kingkaew Wattanasirmkit	B0137		
Kittapong Tang	B0118		
Kittisak Ajariyakajorn	B0078		
Komson Ruangrit	B0074		
Kosum Chansiri	B0125		
Kraijak Booncheun	B0004		
Krisanadej Jaroensutasinee	B0040, B0047		
	B0089, B0105		
Kristine Stubberud	B0157		
Krongkaew Supawat	B0063		
Kongsakda Noipanit1	B0117		
Kumpul Meesawad	B0105		
Kun Anantasomboon	B0004		
Kunya Sutjaritvongsanond	B0074		
Kusol Pootanakit	B0055, B0056		
	B0057, B0058		
	B0120		
		L	
La-aw Ampornpan	B0101, B0156		
	B0158		
Lertluk Ngernsiri	B0045		
Lily Eurwilaichitr	B0055, B0058		
	B0118, B0121		
	B0119, B0120		
		M	
Mana Kaomek	B0033		
Manit Kosittrakun	B0093		
Manit Pollar	B0089		
Manus Suwamin	B0141		
Marit Eriksen	B0156		
Masao Nakamura	B0122		
Matcha Porn-in	B0026		
Mayuva Areekijserree	B0003		
Miloslav Juricek	B0095, B0096		
Mongkol Pangpet	B0114		
Mongkon Audtho	B0090		
Mullica Jaroensutasinee	B0040, B0047		
	B0089, B0105		
		N	
Nakhon Norkeaw			B0015
Nalena Praphairaksit			B0103
Naowarat Cheeptham			B0108
Napat Puranamaneewiwat			B0073
Narit Sitasuwan			B0014
Narongsak Puanglarp			B0036, B00
Narumol Thongwai			B0026
Narumon Jeyashoke			B0039
Narumon Meesreruag			B0115
Narupat Hongdilokkul			B0136
Naruphat Paphattarapong			B0077
Nat Malainual			B0054
Naturang Homchantara			B0115
Nattha Wannissorn			B0140
Nattida Puenphasook			B0014
Nichanun Phochanukul			B0059
Nicharat Swasdipan			B0132
Nichaya Praditsup			B0020
Nipaporn Sankuntaw			B0024
Niramol Donghong			B0053
Nongnuch Gumlungpat			B0003
Nongnud Tangkrock-olan			B0002
Nonthawat Prachantasena			B0137
Nunthawun Uawonggul			B0106
Nuttira Gavinjan			B0146
		O	
Orawan Satayalai			B0010
		P	
P. Hongvityakorn			B0049
P. Rojvirat			B0135
Padermsak Jarayabhand			B0030, B0031
			B0032
Padungkwan Chitropas			B0062
Paisarn Sithigorngul			B0007, B0038
Paitoon Leksawasdi			B0029
Pakorn Winayanuwattikun			B0044
Panadda Boonserm			B0092
Panadda Larpkern			B0156
Panrithai Budthongsri			B0017
Paramita Phanwong			B0027
Parichat Phumkhachorn			B0024
Parin Chaivisuthangkura			B0007, B0038
			B0104
Patamaporn Tilarux			B0093
Patchara Nithirojpakdee			B0060
Patcharee Promdonkoy			B0091, B0092
Pathom Sawanpunyalert			B0063
Patompon Wongtrakoongate			B0126
Pattanop Kanokratana			B0120
Paul J. Groteb			B0027
Paveena Tapaneeyaworawong			B0085
Pawin Saihu			B0062
Penphun Naenna			B0079
Pensiri Sriburi			B0011

Pensri Pootrakool	B0103	Sakol Panyim	B0090, B0091
Permchai Itthisoponpisarn	B0095		B0092, B0094
Petcharat Werukamku	B0158		B0096, B0098
Phattara-orn Chongsatja	B0068	Salika Aritajat	B0100
Philip D. Round	B0020	Sa-ngium Promkutkaew	B0122
Phiromsak Phattanapaijitku	B0038, B0104	Sangvorn Kitthawee	B0021
Piamsak Menasveta	B0023, B0032	Sansook Boonseub	B0036
	B0036, B0037	Saowalak Pongpaichit	B0133
	B0051, B0082	Saowapa Sontichai	B0122, B0146
	B0086, B0099	Seewapong Chamratpan	B0151
Piboon Mongkolsuk	B0115	Shen Yuemao	B0116
Pilai Poonswad	B0020, B0021	Shigeyuki Tajima	B0073
Pinich Wangsomnuk	B0008	Shivcharn S. Dhillion	B0156, B0158
Pintip Pongpech	B0079		B0101
Piti Amparyup	B0031	Siam Popluechai	B0043
Piyada Theerakulpisut	B0107, B0129	Sirawut Klinbunga	B0030, B0031
Piyarat Chansiripornchai	B0076		B0032, B0037
Plaipol Dedvisitsakul	B0057		B0082
Pongsak Rattanachaikunsopon	B0024	Sirikanya Chungthanawong	B0086
Pongsarun Junshum	B0051, B0083	Siripen Trichaiyaporn	B0050, B0051
Pongsathorn Dhumtanom	B0013		B0052, B0053
Pongsopee Attasart	B0059		B0083
Pornpimol Rongnoparut	B0130	Siripong Tangprasertkit	B0045
Pornpimon Numsanguan	B0046	Sirirat Fa-aaroonsawat	B0043
Pragrom Prayoonrat	B0012	Sirirat Rengpipat	B0007
Prakart Sawangchotea	B0027	Siriwat Wongsiri	B0148, B0149
Pramote Triboun	B0150	Sittipon Intarapat	B0010
Pranadda Pimsee	B0142	Siwaporn Longyant	B0007, B0038
Pranee Pttanapitpaisal	B0124, B0145		B0104
Pranom Chantaranonthai	B0048, B0129	Soamrutai Boonsuepsakul	B0130
Prasert Meeratana	B0004	Solot Suwanyen	B0138
Priamsak Menasveta	B0030	Sombat Rukpratanporn	B0007, B0038
R			B0104
Ranu Yucharoen	B0026	Somdej Kanokmedhakul	B0017
Ratapol Sornprasert	B0009, B0035	Somdet Srichairatanakool	B0087, B0088
Ratikorn Chatchanayuenyong.	B0155	Somkiat Piyatiratitivorakul	B0023, B0086
Ratsamee Ketpadung	B0002	Sompong Thammasirak	B0106, B0127
Raveewan Siripokasupkul	B0076	Somporn Chunluchanon	B0051
Rawadee Thongbai	B0041	Somporn Bua-Kang	B0153
Renu Vejaratpimol	B0003	Somsak Sarangbin	B0141, B0142
Ruchanok Cheotacha	B0011	Songklod Sarapusit	B0130
Rumpalai Padoongsupalai	B0148	Soratan Ramangkoon	B0123
Rungjit Yoddee	B0023	Sorawit Powtongsook	B0085, B0099
Rungnapa Leelatanawit	B0030, B0032	Srisupaph Poonlaphdecha	B0037
Rutchadaporn Sriprang	B0118, B0119	Sriwan Wongwisansri	B0110
	B0121	Suchada Chaisawadi	B0138
Ruttikarn Mungmai	B0074	Suchada Saengwiman	B0096
S		Suda Saowakon	B0042
S. Traichaiyaporn	B0049	Suda Tunpiboonsak	B0134
S. Tungpradabkul	B0135	Sudaporn Tongsiri	B0074
Saisamorn Lumyong	B0108, B0116	Sujaree Khamparat	B0132
Sakaewan Ounjaijean	B0088	Sukanya Jesadanont	B0077, B0079
Sakda Daduang	B0017, B0106	Sukonthip Savatenalinton	B0153
Sakol Panyim	B0059, B0072	Suluk Vutteerapol	B0100
		Sumalee Tangpradubkul	B0126, B0134

Sumontip Bunnag	B0093, B0107 B0144	Unchulee Pongwiwatana	B0077
Sunan Pongsamart	B0076	Vanicha Vichai	B0109
Sunanta Pongsamart	B0077	Verapong Kiatsoonthon	B0097
Sunanta Ratanapo	B0045	Verawat Champreda	B0118, B0119
Sunanta Pongsamart	B0078, B0079	Verawat Champreda	B0121
Sunanta Ratanapo	B0046, B0063	Vichaya Gunbua	B0085
Sunee Kertbundit	B0095, B0096	Vimolmas Lipipun	B0077, B0078
Suntaree Preangkarn	B0074	Viriya Nitteranon	B0056
Supachai Boonnumma	B0138	Visut Baimai	B0021
Supajit Sraphet	B0072, B0098		
Supanee Liengpornpan	B0040	Wachiraporn Tipsuwan	B0087
Supaporn Thumrunthanakit	B0030	Wanchai Sonthichai	B0108
Suparporn Sutin	B0047	Wannipa Phianphak	B0007
Suporn Nuchadomrong	B0017	Wansuk Senanan	B0060
Surapon Piboonpocanun	B0054	Wanutsanun Tunyapanit	B0133
Surapong Pinitglang	B0117	Wanwarang Pathaichindachote	B0090
Suthasinee Somyong	B0094	Warannya Udomkam	B0155
Sutinee sinutok	B0028	Warayut Suranarakun	B0024
Sutipat Tanapongpipat	B0056, B0118 B0119, B0121	Warinee Palasarn	B0132
		Wasana Chausook	B0113
Suttatorn Suwanrat	B0146	Wasinee Wimonasuk	B0115
Suttikarn Sutti	B0099	Watchara Wongkerdsuk	B0004
Suwaree Sompong	B0138	Watcharee Khunkitti	B0062
Suwisa Pilalum	B0149	Weerachon Tepanant	B0069
		Weeradaj khonsantear	B0128
Tadahiko Kajiwara	B0125	Weerasak Saksirirat	B0107
Takashi Aoki	B0031	Weerawan Sithigorngul	B0007, B0038
Tanatchaporn Phaunfoong	B0078		B0104
Tanatchaporn Utairungsee	B0118	Wetchasart Polyiam	B0113
Tanussara Laochareonsuk	B0005	Wichian Magtoon	B0081, B0018
Tapawittra Pongpawe	B0019		B0123
Tarinee Arkaravichien	B0106	Wilawan Phromprom	B0154
Taweesak Khuantairong	B0050	Winanda Seangtong	B0022
Tawin Iempridee	B0016	Wipa Chungjatupornchai	B0043
Teerarat Chamchaiyaporn	B0139	Wiriya Khwancong	B0005
Thanawan Tejangkura	B0104	Wisut Nualchuen	B0159
Thararat Supasiri	B0141, B0142	Witayaporn Pornchuti	B0006
Thawat Donsakul	B0018, B0019	Witoon Khawsuk	B0022
Thawat Donsakul	B0081, B0123	Wiwit Samasanti	B0133
Theerawat Prasertanan	B0131	Wut Dumrongsak	B0039
Thitirat Ngaotepprutaram	B0054	Wuttipong Mahakhram.	B0150
Thongchai Taechowisan	B0116		
Tian Kanpuy	B0035	Yingmanee Tragoolpua	B0026
Tinnagorn Seeprasert	B0129	Yupin Taitobsakul	B0079
		Yuttana Munde	B0087
Udomphan Khansuwan	B0088	Yuwadee Peerapornpisal	B0074
Unchalee Kongbantad	B0155	Yuwadee Watanapokasin	B0141, B0142
Unchera Sookmark	B0006	Yuwapin Dandusitapun	B0065

Section C – CHEMISTRY

A

Acharawadee Chooyimpanit	C0071
Adrian E. Flood	C0205
Adrian Mulholland	C0169
Aimon Tongpenyai	C0209
Alakkhana Suwanvisut	C0158
Amarawan Intasiri	C0004, C0005
Amorn Chaivasat	C0084
Amorn Petsom	C0162, C0163
Ampan Promsiri	C0088
Anan Jean-Anong	C0199
Anan Tongraar	C0240
Anawat Ajavakom	C0247
Ankana Patomsakul	C0226
Anuch Hasakunpaisarn	C0246
Anucha Munchaidee	C0227
Anukorn Phuruengrat	C0018
Anuson Niyompan	C0157
Apakorn Yudee	C0254
Aphiwat Teerawutgulrag	C0066
Apichai Sivapraphagorn	C0015
Apichart Boonmalai	C0093
Apichart Suksamrarn	C0029, C0030
Apichart Suksamrarn	C0185, C0208
Apichat Chaicharnattee	C0215
Apichat Imyim	C0211
Apinya Chaivisuthangkura	C0115
Aranya Manosroi	C0152
Araya Jatisatienr	C0066
Arisa Jaiyu	C0139
Arjaree Suntichai	C0194
Aroon Jankum	C0016
Aroonsiri Shitangkoon	C0215
Aroonsri Priprem	C0023
Arusa Chaovanalikit	C0048
Arworn Donchai	C0213
Ashley T. Townsend	C0104
Atchara Buachuen	C0067
Athit Dathorn	C0112
Atitaya Samontha	C0205
Atitaya Siripinyanond	C0076
	C0074, C0075,
	C0077, C0078
	C0080
Attapol Pinsa	C0252
Attasak Rattanasumrit	C0243
Attera Worayingyong	C0035, C0109
Atthawan Benjamas	C0022
Auamphon Rattanasing	C0055
Aungkoon Bunya	C0099
Aurasorn Saraphanchotiwiththaya	C0143

B

Banchob Wanno	C0201, C0219
---------------	--------------

Bavornpon Jansang	C0220, C0221
Benjamaporn Promthong	C0130, C0202
Benjamas Chiangka	C0059, C0061
Boon-ek Yingyongnarongkul	C0140
	C0184, C0185
	C0215
Boonlorn Purachat	C0031
Boonsom Liawruangrath	C0094, C0095
Boonsong Kongkathip	C0246
Bruce. C. Gates	C0017
Buncha Pulpoka	C0138, C0144
	C0145
Bundet Boekfa	C0128
Bundit Siriket	C0244

C

Chaalev Pachthong	C0140
Chadaporn Supannanuyok	C0016
Chaiyuth Sae-kung	C0238
Chalerm Ruangviriyachai	C0038, C0048
Chalerm Jansom	C0013
Chalermrat Akarawitoo	C0211
Chalev Pachthong	C0139, C0142
Challa V. Kumar	C0152
Chananate Uthaisar	C0106
Chanida Palanuvej	C0163
Chanita Ponglimanont	C0001
Chantana Sae-Lim	C0195
Chantip Saeton	C0146
Chanwit Photicunapat	C0171
Chareonchai Jeamchanya	C0013
Charnwit Phacharapongsakul	C0147
Chatchai Ponchio	C0085
Chatchanok Karalai	C0001
Chatthai kawtong	C0145
Chaturong Boontanjai	C0186
Chaturong Suparpprom	C0231, C0232
Chatvadee Sastravaha	C0163
Chavalek Chayavadhanangkur	C0057
Chaveng Pakawatchai	C0007, C0008
	C0056, C0090
	C0091, C0092
Chawewan Jansakul	C0210
Chawlit Prasertsomboon	C0111
Cheeraporn Ananthanawat	C0230
Chetwana Rungwanitcha	C0162
Chinda Tambunchong	C0041, C0146
Chisanucha Satapolpan	C0013
Chomchai Suksai	C0055, C0056
Chompoonut Rungnim	C0234
Chompunuch Warakulwit	C0129
Chonlada Dechakiatkrai	C0025
Choosak Poonsawat	C0091

Chorchat Soonthornpalin	C0132	Jeerawan Promchan	C0073
Chote Jitrangsri	C0204	Jetsuda Areephong	C0223, C0224
Chuchaat Thammacharoen	C0198, C0199	Jianzhong Li	C0214
	C0200	Jinda Yuenyongchaiwat	C0107
Chulee Seriumnuay	C0006	Jintana Klamtet	C0051
Chumanan Tungchitpienchai	C0219	Jintana Pinwatananurak	C0006
Churairat Duangdeun	C0081	Jiradej Manosoi	C0066
Chutima Kukusamude	C0037	Jirasak Threeprom	C0177, C0178
Colin W. Gray	C0150		C0227
D		Jirayu Makchit	C0094
Dammrong Santiarwam	C0241	Jitraporn Vongsvivut	C0197
Darinee Sae-Tang	C0137	John Korth	C0104
David James Harding	C0217, C0218	Julaluk Phunnoi	C0237
Disyapong Jainuknan	C0056	Jumras Limtrakul	C0096, C0097
Duang Buddhasuk	C0066, C0139		C0122, C0123
Duangjai Nacapricha	C0058, C0059		C0126, C0127
	C0060, C0061		C0128, C0129
	C0062, C0063		C0130, C0131
Duangrat Thongkum	C0117		C0132, C0133
Dumrat Supyen	C0139		C0135, C0136
E			C0179, C0202
Ekkachai Ruangdam	C0173	Juntadej Kositcharoenkul	C0186
F		Juwadee Shiowatana	C0062, C0072
Frank W. Harris	C0248		C0073, C0075
Fuangfa Unob	C0115		C0076, C0077
Fumitaka Horii	C0233		C0079, C0080
G			C0150
Greg Dicinoski	C0067	K	
Griangkai Kungton	C0002	Kammal Kumar Pawa	C0013
Gudrun Stengle	C0198	Kamonthip Screenonchai	C0062
H		Kamonwan Anan	C0146
Hans Mosbæk	C0083	Kan Chantrapromma	C0001
Harinate Mungpayabal	C0253	Kanchana Watla-iad	C0044
Herman H.-Y. Sung	C0206	Kanda Panthong	C0014, C0064
Hideaki Otsuka	C0236	Kanidtha Hansongnern	C0010, C0011
Hironori Kaji	C0233		C0012, C0117
Horst Geckeis	C0049		C0118
Hussadee Detsen	C0121	Kanjana Rotpradit	C0222
I		Kannika Kranlert	C0057
Ian D. Williams	C0206	Kanyanat Kokkaew	C0041
Ian McKelvie	C0063	Kanyarat Kalpakorn	C0162
J		Karan Bobuatong	C0126
J.J. Brophy	C0070	Karnjana Tanapaiboon	C0154
Jakkapan Sirijaraensre	C0123	Kate Grudpan	C0042, C0044
Jamnong Kaewtubtim	C0013		C0045, C0046
Jane Chantarasupasen	C0054		C0047, C0049
Janya Buanuam	C0072		C0058, C0093
Jaroon Jakmunee	C0042, C0045		C0193, C0214
	C0046, C0047		C0256
	C0093, C0193	Kedthip Suppavanit	C0098
	C0214, C0256	Kenneth J. Haller	C0205, C0206
Jarun Lomratsiri	C0131	Ketsiri Kueseng	C0028
Jarunee Kraikaew	C0057	Khomson Thiansomjit	C0161
Jason Fernandez	C0197	Kirawit Supakornchailert	C0219
Jatuporn Wittayakun	C0017	Kittipong Chainok	C0206
Jaturong Phatchimkun	C0092	Kittiya Muaksang	C0010

Kornvalai Panpae	C0016	Nirun Sanoondee	C0160
Kowit Kittiwutthisakdi	C0028	Nisa Nauangchamnong	C0105
Krissada Ngarmtab	C0147	Nitiphong Jirathiwathanakul	C0103
Kritsana Jitmanee	C0043, C0256	Nitirat Chimnoi	C0030, C0208
Kritsana Sagarik	C0240		C0215
Kullaya Youngnoy	C0140	Nongnuch Muangsinsin	C0056
Kulwadee Pinwattana	C0051	Nongnuch Tantidanai	C0119
Kunlayanee Hansuthirakul	C0247	Nongnuj Muangsinsin	C0121, C0144
L		Noocharin Ratthanaporn	C0016
Ladda Meesuk	C0022	Nopporn Rueangsupapichart	C0223, C0224
Likhit Khawngam	C0188	Norita Mohamed	C0171
Lop Pathimapornlert	C0225	Nuanlaor Ratanawimarnwong	C0063
Luksamee Sahavisit	C0012	Nuanphun Chantarasin	C0121
M		Nuchanart Kitjavises	C0178
Maethinee Boonchupleing	C0086	Nuntana Aroonrerk	C0029
Malee Prajubsuk	C0157	Nutaporn Pimpha	C0248
Maliwan Amatatongchai	C0058	Nuttinee Supamathanon	C0053
Maliwan Sookseam	C0039	O	
Manat Pohmakotr	C0252	On-Uma Kheowan	C0106, C0149
Mangkorn Kitiphatmontree	C0086	Orapin Chienthavorn	C0033, C0034
Marisa Arunchaiya	C0099	Orapin Komutiban	C0208
Mark Bradley	C0184	Orapun Thawornsinsurakul	C0119
Mark Braiman	C0197	Oravan Sanguanruang	C0103
Mark Haworth	C0184	Orawan Sirichote	C0007
Mayuso Kuno	C0156, C0210	Orawan Tue-Ngeun	C0047
Michael Kiselev	C0176	Orawon Chailapakul	C0058, C0181
Miki Kanna	C0007	Ornuma Konghuirob	C0023
Mongkol Sukwattanasinitt	C0194, C0195	P	
	C0247	Pakakrong Thongdeeying	C0001
Monpichar Sirsa-art	C0162	Palangpol Kongsaree	C0056, C0194
Muriel Bouby	C0049		C0209
N		Panida Surawattanawong	C0096
Namfon Tongtavee	C0150	Panit Sherdshoophongse	C0171
Napaporn Sansila	C0188	Pannee Leeladee	C0056
Napaporn Youngvises	C0068, C0105	Panomwan Panseeta	C0030
	C0110	Panuwat Padungros	C0232
Nareerat Thongchai	C0108	Paramee Pengprecha	C0159, C0160
Narisara Suwannapoch	C0210	Parichat Damrongpong	C0100
Narong Pungwiwat	C0238	Parichutr Paungmanee	C0187
Narongdate Wattanavichian	C0161	Parinya Theramongkol	C0161
Narongsak Chaichit	C0121	Pataraporn Eutrarak	C0235
Narumol Vachirapatama	C0067	Patchanee Charoenying	C0024
Nathanon Amornthammarong	C0060	Patcharee Ngamviriyavong	C0231
Nathachai Aunchai	C0210	Patcharee Preedasuriyachai	C0250
Nathawut Choengchan	C0059, C0061	Patcharee Pripdeevech	C0088
Nattawan Kuppithayanant	C0175	Patcharin Chaisuwan	C0059, C0060
Nattawut Chaiyut	C0233		C0062
Nattawut Kaveevivitchai	C0027	Patcharin Moktip	C0158
Nattaya Poolkeaw	C0107	Pathumwadee Intharathep	C0240
Natthapong Jongrak	C0111	Patoomratana Tuchinda	C0252
Natthee Phattae	C0226	Patraporn Luksinkul	C0129
Nawona Boonnak	C0064	Pattana Sripalakit	C0143
Ngampong Kongkathip	C0246	Pattara Sawasdee	C0236
Nipaka Sukpirom	C0102	Patumtip Samuapark	C0158
Nipaporn Meepun	C0244	Paul B. Savage	C0026, C0027
Nirand Pongpun	C0207	Paul R. Haddad	C0067

Paweena Nookong	C0118	Preeyaporn Chaiyasat	C0084
Peerapol Nunrium	C0156	Prin Kerdsiri	C0142
Peerapong Nichamnarn	C0113	Prissana Junyuha	C0227
Penpan Khanrin	C0066	Puchong Wararattananuruk	C0009, C0153
Penporn Nermhom	C0143	Pulaporn Woasamneang	C0207
Perapat Anujaravat	C0060	Purnendu K. Dasgupta	C0214
Phadoong Boonsin	C0007	Puttirat Saraban	C0196
Phanee Rattanachaisit	C0006		R
Phanu Poonsawus	C0227	Rabiab Suwanpetch	C0009
Philippe A. Bopp	C0136	Rachada Haritakun	C0210
Phimphaka Klangsinrikul	C0217, C0218	Raewadee Srisakuldee	C0006
Piboon Pantu	C0122, C0127	Ramida Rattanakam	C0109
Pichit Sutta	C0113	Ratana Rungsirisakun	C0202
Pilawan Haouykawe	C0159	Rattanapon Meekabsom	C0178
Pimonporn Tiengtham	C0236	Rattikan Chantiwas	C0042, C0044
Pimthong Thongnopkun	C0200	Reweeworn Bunnium	C0181
Pinit Ratananukul	C0029, C0030	Riantong Seetongchairungrot	C0105
	C0208, C0210	Richard L. Deming	C0177
Pinyo Wongthong	C0133	Robert T. Blickenstaff	C0204
Pipat Chooto	C0171, C0173	Rodjana Burakham	C0046
	C0226	Ronald G. McLaren	C0150
Pipat Khongpracha	C0129, C0135	Ronald Grigg	C0246
Pipat Pichestapong	C0253	Roongroje Ratana-ohpas	C0071, C0244
Pitak Yoomee	C0002	Rungrot Cherdtrakulkiat	C0114, C0196
Piti Treesukol	C0135	Rungtiwa Chidthong	C0125
Pongtip Winotai	C0148, C0216		S
Ponlayuth Sooksamiti	C0142	Saengrawee Sutthiparinyanont	C0048
Poolsak Sahakitpichan	C0019	Saiphon Chanpaka	C0205
Poonsuk Poosimma	C0090	Saisunee Liawruangrath	C0094, C0095
Poramest Boonsri	C0015		C0068, C0110
Pornchan Sangkarn	C0086		C0116
Pornlada Daorattanachai	C0115	Saksit Chanthai	C0038, C0040
Pornmanee Khamloet	C0005		C0048
Pornpan Pungpo	C0157, C0158	Samran Prabpai	C0194, C0209
Pornpimol Muangthai	C0113	Sanong Ekgasit	C0197, C0198
Pornprapa Krasar	C0059, C0061		C0199, C0200
Pornthep Suksaranjit	C0087	Saowaluck Nganrungreung	C0044
Pornthip Boonsri	C0156	Saowanaporn Choksakulporn	C0228
Porntip Charoonniyomporn	C0250	Saowanee Kumpun	C0185, C0215
Porntipa Picha	C0041, C0104	Saowanee Rattanaphani	C0116
	C0146	Saowanit Saithong	C0008
Potjaman Poolmee	C0125, C0134	Saowapa Chotisuwan	C0017
	C0222	Saowapa Suphapon	C0114
Piyanete Sritharathikhun	C0043	Saowarux Fuangswasdi	C0026, C0027
Prachya Kongtawelert	C0042	Saravut Dejmanee	C0071, C0244
Prakai Sesto	C0227	Sarayut Yongprapat	C0069
Prancharee Teerathanakit	C0238	Seiney Kruanetr	C0116
Pranee Boonwat	C0024	Shoji Motomizu	C0043, C0256
Pranee Nandhasri	C0013	Sila Kittiwachana	C0193
Pranee Phukphatthanachai	C0080	Sirichai Lawanvisuth	C0249
Prapassum Chaisai	C0253	Sirinan Thupthimthed	C0151
Prapin Wilairat	C0058, C0059	Sirinapa Arenamnart	C0101
	C0061, C0062	Siripat Suteerapataranon	C0045, C0049
	C0063	Siripen Jarikasem	C0070, C0151
Prasit Purachat	C0032	Siriporn Jungsuttiwong	C0179
Pravit Sudkeaw	C0008	Sirirat Phaisansuthichol	C0018

Siritha Ausadasuk	C0035	Supawan Tantayanon	C0248
Soamwadee Chaianansutcharit	C0102	Supharart Sangsawong	C0074
Somchai Lapanantnoppakhun	C0046, C0193	Supichai Kantrasiri	C0149
	C0256	Supon Samran	C0015
Somjai Pengprecha	C0186	Supot Hannongbua	C0176
Somkiat Srijaranai	C0037	Suppadcharee Roddecha	C0097
Somporn Chantara	C0025, C0083	Surapol Natakankitkul	C0241
Somporn Prasertsongsakun	C0003	Surasak Pongpansook	C0057
Somsak Aramraeng	C0165	Surin Laosooksathit	C0108, C0238
Somsak Ruchirawat	C0019, C0114	Suriya Ounnunkad	C0216
	C0196, C0210	Surudee Treetepvijit	C0181
Somsak Saelim	C0021	Suwanna Vejabhikul	C0241
Somsak Sirichai	C0174	Suwassa Bamrungsap	C0129
Somying Leelasubcharoen	C0090, C0091	Suwat Pabchanda	C0122
Songtham Ruangchaithaweesuk	C0144	Svimon Aonlamoon	C0142
Sopon Purawatt	C0072		T
Sowaluk Aubpatham	C0153	Tadao Sakai	C0256
Soycom Kunchanawatta	C0029	Tadtanu Shanyib	C0242
Sripajak Kongsuk	C0176	Tanawat Kanjanaboonmalert	C0102
Stephen G. Pyne	C0104	Tanawat Prommanuwat	C0082
Subpachai Jayasvasti	C0256	Tanin Nanok	C0136
Suchaya B. Pongsai	C0036	Tanin Tangkuaram	C0120
Sudarat Saeseaw	C0075	Tapparath Lelasattarakul	C0110
Suekanya Jarupinthusopon	C0245	Tawatchai Keving	C0201
Sugunya Wongpornchai	C0087, C0088	Taweechai Amornsakchai	C0233
Sujitra Youngme	C0090, C0092	Teerakiat Kerdcharoen	C0176
Sukanda Jiansirisomboon	C0254	Teerasak Seibsa	C0161
Sukanya Wongpornchai	C0089	Teerayuth Liwporncharoenwong	C0207
Sukij Thongban	C0165	Tepparat Lelasattarakul	C0068
Sukon Phanichphant	C0002	Terence Cardwell	C0063
Sukunya Sukprem	C0016	Thanaporn Poonsukcharoen	C0033, C0034
Sumalee Ninlaphruk	C0253	Thanawan Boonyasakseri	C0113
Sumattana Worapanyanond	C0078	Thanh N. Truong	C0135, C0179
Sumpun Wongnawa	C0007, C0008	Thanit Praneenarat	C0138
Sumrit Mopoung	C0180	Thanwa Udom-piriyasak	C0238
Sunan Chainakul	C0041, C0146	Thanyada Rungrotmongkol	C0169
	C0207	Thanyarat Chuesaard	C0095
Sunanta Wangkarn	C0054, C0083	Thanyarat Techalertmanee	C0079
Suneerat Pipatmanomai	C0107	Thassanee Peerayuth	C0006
Sunit Suksamrarn	C0029, C0030	Thawatchai Tuntulani	C0026, C0027
	C0208, C0210		C0055, C0056
Suntree Rincome	C0050		C0144
Supa Hannongbua	C0124, C0125	Theerachart Leepasert	C0124
	C0134, C0137	Thitima Jiyavaranant	C0253
	C0156, C0169	Thitirat Mantim	C0062
	C0222	Thomas Fanghaenel	C0049
Supalax Srijaranai	C0037, C0039	Thumnoon Nhujak	C0162, C0163
	C0040	Tienthong Thongpanchang	C0223, C0224
Supaluk Prachayasittikul	C0114, C0196		C0250
Supana Techasakul	C0124	Tim Elliott	C0184
Supap Silapakamprirapap	C0107	Tinnagron Seesiadka	C0087, C0089
Supapan Srisukho	C0253	Tirayut Vilaivan	C0154, C0231
Supaporn Kradtap	C0042, C0093		C0229, C0230
	C0193		C0232
Supawadee Namuangruk	C0127	Tossapon Ruttanasit	C0188
Supawan Hattiya	C0160	Tritaporn Choosri	C0053

Tuanjai Yubolpas	C0004	Wichanee Meeto	C0125, C0134
U		Wichien Sang-aroon	C0255
Ubon Rerk-am	C0070, C0151	Wichitr Rattanaphani	C0116
Udom Jingit	C0173, C0226	Wijitar Duanchai	C0181
Udom Nusalo	C0108	Wilawan Mahabusarakam	C0171
Unchulee Suksangpanya	C0092	Wimonrat Trakarnpruk	C0100, C0101
Urai Tengjaroenkul	C0025, C0111	Winai Ouangpipath	C0110, C0225
Uraiwan Changsaluk	C0011	Winyu Chitsamphandhvej	C0147
Usa Onthong	C0157	Wipapan Pongcharaen	C0014
Usarat Kamtabtim	C0077	Wipaporn Phatvej	C0151
Uthaiwan Sonjarearn	C0161	Wiphada Hongthani	C0038
V		Wirat Phuwiwat	C0024
Vanida Chairgulprasert	C0003	Wiratda Wichaporn	C0003
Varawut Tangpasuthadol	C0154	Wolfgang Knoll	C0198
Vatcharin Rukachaisirikul	C0014, C0020	Woraluk Mansawat	C0229
	C0021	Worawan Bhanthumnavin	C0229
		Wutthisak Prachamon	C0157
		Y	
Veeramol Vailikhit	C0124	Yaowapha Jirakiattikul	C0067
Vichai Reutrakul	C0252	Yongsak Sritana-anant	C0228
Vinay Soukharath	C0041	Yongyuth Tundulawessa	C0112, C0187
Vinich Promarak	C0203		C0212
Virapong Prachayasittikul	C0114, C0196	Yot Kijchanalert	C0105
Virasak Chuamanochan	C0241	Yuppharat Pinkaew	C0091
Virasak Dungsrikaew	C0028	Yuttana Tantirungrojchai	C0096, C0097
Virat Sungkawisit	C0040		C0098
Vithaya Ruangpornvisuti	C0121, C0201		
	C0219, C0220		
	C0221, C0234		
	C0242, C0243		
	C0249, C0255		
Voranuch Srijesdsadaruk	C0039		
Vorawit Banphavichit	C0229, C0230		
W			
Wachiraphon Sinthavathavorn	C0162		
Wachirawan Pimrote	C0037		
Walailuk Poetpaiboon	C0173		
Walaya Sangchan	C0083		
Wandee Bunyarachata	C0038		
Wanee Srinuttrakul	C0057		
Wannilak Wannachai	C0040		
Wanpen Naklue	C0020		
Wanphen Boonruksa	C0212		
Wansiri Pitakkiattikul	C0225		
Wantida Srisongmeoung	C0159		
Waradool Chutrtong	C0112, C0187		
	C0188, C0212		
Warankana Suksom	C0158		
Waret Veerasai	C0085, C0119		
	C0120		
Warinthorn Chavasiri	C0235, C0236		
	C0237, C0245		
Wasana Chamnan	C0107		
Watsaka Siriangkawut	C0045		
Weerachai Phutdhawong	C0104, C0165		
Weeraphat Pon-un	C0148		
Weerasak Chomkitichai	C0180		
Werayut Srichaisiriwech	C0069		

Section D – PHYSICS

A		Damrongsak Maneepongswadi	D0002, D0004
Abiding Dasaesamoh	D0010	David Ruffolo	D0035, D0045
Adisak Punyanut	D0081	Duangmanee La-Orauttapong	D0051, D0094
Alejandro Sáiz	D0045	Dusit Ngamrungsroj	D0085
Amporn Poyai	D0027	E	
Anongnad Charoenruai	D0003	Eddy Simoen	D0027
Anurak Udomvech	D0048	Ekan Swatsitang	D0009
Anurak Prasatkhetragarn	D0066, D0070	Ekkachai Jantayod	D0013
Apaporn Thongphud	D0054	F	
Areefen Rassamesard	D0033	Fuenglada Veerasai	D0093
Areeratt Kornduangkaeo	D0081, D0079	G	
	D0082	Galayanee Doungchawee	D0029
Artorn Pokaipisit	D0021		
Arunee Intasorn	D0040, D0053	Gerald J. Diebold	D0023
Athikom Manoil	D0025	Glenn Mason	D0035
Auppatham Nakaruk	D0064	Gorge Siopsis	D0055
B		H	
B. Soodchomshom	D0089	Hathaitip Rojsuparat	D0074
Bancha Panacharoensawad	D0028, D0077	Hirokazu Hasegawa	D0079
Benjang Sangchuk	D0054	I	
Bernard Hennion	D0094	Itti Rittaporn	D0027
Boonsong Sutapun	D0029	J	
Buncha Silskulsuk	D0007	Jarupat Disrattakit	D0029
Burin Asavapibhop	D0043	Jatuporn Thongsri	D0008
C		Jean Toulouse	D0094
Cattleya Petchsingh	D0047	Jessada Chureemart	D0016
Chalermwat Wongwanitwattana	D0059	Jipawat Chamchang	D0079, D0081
Chanan Angsuthanasombat	D0058, D0088	Jirapa Sukhowattanakij	D0081
Chanruangrit Channok	D0035	Jirapat Ladawan	D0059
Chanwit Chityuttakan	D0015	Jiraporn Pongsopa	D0007
Charnwit Ruangchalermwong	D0042	John W. Bieber	D0045
Charoen Larppitakpong	D0082	K	
Chat Pholnak	D0076	K. Takashina	D0047
Chatchai Pawong	D0006	Kachain Dangudom	D0071
Chatchawal Sripakdee	D0005	Kageeporn Wongpreedee	D0051
Chitnarong Sirisathitkul	D0090	Kajornyod Yoodee	D0015, D0041
Chitra Kedkeaw	D0018		D0042
Chivalrat Masingboon	D0009	Kanokpoj Areekul	D0028, D0036
Chome Thongleurm	D0050		D0038, D0044
Chonticha Suwattanasophon	D0058, D0088		D0077
Chuleeporn Wongtawatnugool	D0066, D0067	Kasin Kasemsuwan	D0001
	D0068, D0069	Kittipong Tantisantisom	D0015
	D0070, D0071	Korsakul Punyavardhana	D0028
	D0072, D0073	Kriengsak Sriwichitkamol	D0032
	D0074, D0075	Krisanadej Jaroensutasinee	D0017
Cor Claeys	D0027	Krissada Kummabutr	D0030
D		Krongkaw Tapsila	D0032
D.Trikomoot	D0089	L	
		L. Liabchai	D0063

Laddawan Pdungsap	D0022	Pongtip Winotai	D0018
Ludda Trakulrum	D0065	Poramet Chunpang	D0005
Lukkana Ngamnasaew	D0084	Pornjuk Srepusharawoot	D0016
M		Pornpana Boonm	D0087
Manoch Hengwattana	D0040	Prathakon Srisongkam	D0032
Mayuree Kittidechachan	D0049	Preecha P. Yupapin	D0005
Mayuree Natenapit	D0008	Puchong Kijumnajsuk	D0036
Michael G. Kiselev	D0088	R	
Mihir Desai	D0035	R. J. Nicholas	D0047
Montri Aiempnanakit	D0041	Rachan Jaroen	D0001
N		Rakdiaw Maungma	D0068
N. J. Mason	D0047	Rattachat Mongkolnavin	D0085
Napat Sansuthikul	D0052	Ratthasart Amarit	D0029
Narong Boonyopakorn I	D0050	Rita Rooyackers	D0027
Narong Suwanmanee	D0078	Roger Pyle	D0045
Nason Phonphok	D0007	Rong Rujkorakarn	D0009
Ngamnit Gaewdan	D0091	Roongthum Sooksan	D0073
Ngamnit Gaewdang	D0064	S	
Nikorn Mangkorntong	D0060, D0061	S. Denchittacharoen	D0089
	D0062, D0076	S. Panyainkaew	D0063, D0089
Nipon Thangprasert	D0002, D0003	Sampart Cheedket	D0086
	D0004	Samran Lacharojana	D0066, D0067
Niyom Hongsith	D0061		D0068, D0069
Noparit Jinuntuya	D0037, D0038		D0070, D0071
	D0039, D0044		D0072, D0073
	D0052, D0077		D0074, D0075
Nuthapol Liengphibul	D0036	Santana Jeakjai	D0075
O		Sarinrat Wonglee	D0084
Oleksiy Svitelskiy	D0094	Sasiphan Khaweerat	D0083, D0084
Orawan Cherdchoo	D0049	Sathon Vijarnwannaluk	D0025
		Satoshi Koizumi	D0079
P		Serewat Saminpanya	D0093
P. harmanee	D0089	Sirasa Poomkeaw	D0029
Pairat Niumprasert	D0093	Siriluk Ruangrungrrote	D0040, D0053
Pairoj Jaidaew	D0032	Sirimas Pongjunla	D0036
Pairote Jaideaw	D0034	Sithichai Pinkanjanaroj	D0037
Pakorn Sittiketkorn	D0091	Sitthichai Pinkanjanarod	D0052
Panatcha Anusasananan	D0003, D0004	Sitthichai Kulsri	D0017
Patcha Chatraphorn	D0024, D0026	Sojiphong Chatraphorn	D0015, D0026
Patohn Roatjanapanitkit	D0062		D0041, D0042
Paul Evenson	D0045	Somchai Pongkasem	D0079, D0081
Pichet Limsuwan	D0021		D0082
Pikul Wanichapichart	D0046	Sompak Sutsue	D0038
Pinpan Visal-athaphand	D0054	Sompanee Petchpraprasert	D0082
Pirut Kumsing	D0085	Somporn Chongkum	D0080, D0081
Piti Panichayunon	D0026		D0083, D0084
Pitt Supaphol	D0054, D0079	Somporn Maneetoon	D0032, D0034
Piya parakoch	D0081	Somsak Dangtip	D0050
Piyachati wangmool	D0072	Somsorn Singkarat	D0050
Pongsri Mangkorntong	D0060, D0061	Songvudhi Chimchinda	D0086
	D0062, D0076	Soontorn Chanyawadee	D0024

Sorasak Danworaphong	D0023	Toemsak Srihirin	D0029, D0032
Sornchai Tanunchai	D0060, D0061		D0033, D0034
	D0076	Torranin Chairuangsi	D0061
Sripen Towta	D0060, D0076	Trakool Rummachat	D0003
		Tranee Kumlumlert	D0030
Sukrit Kirtsaeng	D0091	Treedej Kittiauchawal	D0019, D0020
Sumontha Songsom	D0053		
Sunanta Patrashakorn	D0006	Udom Tiparat	D0065
Sunun Taweeta	D0040	Udomsin Pinsook	D0016
Supab Choopun	D0060, D0061	Uraiwan Petlum1	D0002
	D0076		
Supakorn Pookerd	D0065	V. Dhusthachareon	D0063
Supaluk Meeim	D0011, D0012		
Supanee Limsuwan	D0018	Walter L. Craig	D0023
Supasarote Muensit	D0010	Wanchai Dharmavanij	D0080, D0083
Suphot Musiri	D0055	Waranont Anukool	D0062
Supiya Kulna	D0065	Warit Werapun	D0078
Suppalak Angkaew	D0049	Wattana Namchan	D0084
Supranee Lao-ubol	D0022	Wichian Ratanatongchai	D0054, D0080
Supreya Kumfu	D0019	Wichian Siriprom	D0039
Surachet Phadungdhitidhada	D0060	Wittaya Khruakham	D0069
Surapong Pimjun	D0083, D0084	Wutthikrai Busayaporn	D0043
Suthisa Leasen	D0036, D0037		
Suvijak Aticomkulchai	D0038	Yingyot Infahsaeng	D0034
Suwit Wongsila	D0060, D0062	Yodsoi Kanintronkul	D0001
	D0076	Yupeng Yan	D0086
		Yuttanan Pansong	D0090
		Yutthana Tirawanichakul	D0078
T			
Tadsanapan Lerdsuchatawanich	D0044		
Tanakorn Osotchan	D0032, D0033		
	D0034, D0048		
	D0050, D0088		
Tanapon Suklim	D0013 D0031		
Tanaporn Tansakul	D0051		
Tanattha Rattana	D0021		
Tanawat Wongluksanapan	D0046		
Tanut Jintakosol	D0020		
Tapanapong Tananchai	D0011, D0012		
Taveechai Taveechoenakool	D0058		
Teerakiat Kerdcharoen	D0001, D0032		
	D0048, D0058		
	D0088		
Teerasak Veerapasapong	D0006		
Teerasak Kamwanna	D0050		
Thidarat Khongthon	D0013, D0031		
Thiranee Khumlumlert	D0011, D0012		
	D0013, D0031		
Thitikorn Chanyatham	D0091		
Thitima Maturos	D0032		
Thitinai Gaewdang	D0064, D0091		
Titissak Kulkoulprakar	D0085		
Tiwakarn Phansanit	D0049		

Section E – MATERIALS SCIENCE

A			
A.M.Russell	E0061	Johannes Schwank	E0085
A.Udomporn	E0098	Jongrak Kluengsamrong	E0060
Adisorn Poopattanapong	E0068	Juthamas Jitcharoen	E0014
Alexander M. Jamieson	E0072	Jutharat Sirisukprasert	E0056
Amarawan Intasiri	E0067	K	
Ampika Apichibukol	E0096	K.A. Gschneidner, Jr.	E0061
Anida Petchkaew	E0003	K.Songsiri	E0037
Anocha Munpakdee	E0034	K.Wongpreedee	E0061
Anusara Srisroal	E0055	Kalyanee Sirisinha	E0028
Anuson Niyompan	E0073, E0074	Kamonpan Pengpat	E0017, E0031
	E0075		E0032, E0050
Anuvat Sirivat	E0072, E0085		E0052
Apichat Imyim	E0042	Kanchana Keowkamnerd	E0040
Apinon Nuntiya	E0021, E0022	Kasama Jarukumjorn	E0060
Araporn Tanrattanakul	E0003	Kasinee Hemvichian	E0078
Arnon Chaipanich	E0048, E0051	Kasinee Pathomwattanasak	E0018
	E0052	Kittichai Sopunna	E0091
Arrak Klinbumrung	E0099	Kittiphan Techakittiroj	E0004
Arunee Intasorn	E0024	Kittisak Kuntiyawichai	E0014
Athipong Ngamjarurojana	E0006, E0009	Krungsiam Piri	E0049
	E0015	Kulsinee Sintasanai	E0063
Athiya Kaengsilalai	E0082	L	
Attavit Pisit-anusorn	E0011	Ladawan Wannatong	E0085
Autchara Arunrattanapong	E0002	Laddawan Pdungsap	E0023
B		M	
Boonchoy Soontornworajit	E0085	Manit Sonsuk	E0078, E0086
Boonsong Sutapun	E0043	Mayuree Srinunthakul	E0065
Bunsit Wattanathai	E0092	Meechai Tapnurat	E0081
C		Metha Ratnakornpituk	E0084
Chakapun Thawornthira	E0059	Michael McNallan	E0091
Chalermwat Wongwanitwattana	E0080	Monrudee Phongaksorn	E0082
Chanchai Thongpin	E0041	N	
D		N. Sirikulrat	E0019
Darunee Bhongsuwan	E0008	Nanthaya Kengkhetkit	E0095
Daraporn Triampo	E0044	Nantida Niyompanich	E0067
Duangduen Atong	E0054	Narunchara Loikaew	E0049
Duangrudee Muakthong	E0092	Nattakarn Hongsrirphan	E0018, E0041
E		Nattapong Nithi-Uthai	E0004, E0013
Ekaphan Swatsitang	E0012	Nattaya Peardang	E0087
G		Nattida Siri Wong	E0049
Gobwute Rujjanagul	E0039, E0056	Neramitr Morakot	E0042
Goson Dumsim	E0055	Netima Sawangwan	E0030, E0038
H		Nikorn Mangkornmong	E0081
Heiko Hessenkemper	E0040	Nilubon Jampasud	E0041
J		Nimit Sriprang	E0002
Jakapong Kruamun	E0018	Nimit Lueprasert	E0055
Jantrawan phumchusak	E0095	Nirun Witit-anun	E0059
Jerapong Tontragoon	E0030, E0031	Nitat Jira-arun	E0020, E0045
	E0032, E0033	Nitinat Supakarn	E0060
	E0034, E0038	Nitipong Chotiwarirayon	E0041
Jiravadee Thaisongkram	E0088	Nititad Thirasart	E0094
Jitrawadee Phunkum	E0027	Nittaya Khamma	E0016
Joachim Kohn	E0068	Nongkran Chaiwong	E0021
		Noppavan Chanunpanich	E0071

Nuanphun Chantarasiri	E0016, E0057	Saisunee Nilmaung	E0090
	E0058	Sakool Siryanalugsan	E0059
Numphet Plueksa-anan	E0053	Santi Maensiri	E0083, E0090
O		Saovanee Kovuttikulrangsie	E0013
Onuma Doadara	E0026	Sauvarop Bualek-Limcharoen	E0043
On-uma Nimittrakoolchai	E0044	Sawarin Chamunglap	E0005
P		Sayant Saengsuwan	E0088
P. Dararutana	E0019	Sirichai Serksiri	E0074
P. Taowjamnong	E0019	Sirinya Chimdist	E0028
Pakinee Kittisuwannakul	E0042	Sitthichai Wirojnupatump	E0099
Panadda Niranatlumpong	E0029	Sitthisak Prasanphan	E0021, E0022
Panu Punnarak	E0097	Sitthisuntorn Supothina	E0070
Paradorn Ngamdee	E0084	Sittiphong Hanpimol	E0050
Pasaree Laokijcharoen	E0097	Sombat Thanawan	E0025, E0062
Pattamaporn Prapitpongwanich	E0017	Somchai Thongtem	E0091
Pattana Rakkwamsuk	E0055	Somkid Penshari	E0075
Patrawin Gasemjit	E0043	Somsak Boonjaeng	E0051
Paveena Laokul	E0083	Somsak Boonjang	E0052
Peera Pinetsiri	E0033	Sorachon Yoriya	E0070
Pearayost Somchinda	E0094	Suchada Pongpat	E0086
Phatcharin Thamasirianunt	E0025	Suchada Pongpatn	E0087
Phiriyatorn Suwanmala	E0078	Suchapa Netpradit	E0001
Pichanon Suwannathada	E0040	Suda Kiatkamjornwong	E0065
Pichit kajondecha	E0001	Sudsiri Hemsri	E0049
Pimsuda Heamtanon	E0062	Sukanda Jiansirisomboon	E0029, E0099
Pipat Pichestapong	E0096	Sukanya Petchsirivej	E0043
Pisith Singjai	E0017, E0099	Sukdipown Thiansem	E0011
Piyanoot Hiamtup	E0072	Sukhum Eitssayeam	E0050
Pongsri Mangkornrong	E0081	Sukon Phanichphant	E0040
Pongtip Winotai	E0023	Sukum Eitssayeam	E0031, E0032
Prachak Chantree	E0014	Supab Choopun	E0081
Prachya Malasri	E0056	Supanee Pathumarak	E0053
Prajuk Tamee	E0012	Suparerk Aukkaravittayapun	E0089
Pranee Chumsamrong	E0060	Supattra Visetpotjanakit	E0096
Pranee Phinyocheep	E0047, E0084	Supattra Wongsanmai	E0006, E0009
Prartana Kewsuwan	E0086, E0087		E0015
Prawpillin Koonsorn	E0018	Supawan Kasuriya	E0054
Putsadee Muhamud	E0092	Supawan Tantayanon	E0097
R		Supinya Prakanrat	E0047
Rakchart Traiphol	E0069	Supon Ananta	E0005, E0006
Ratirok Wanreakl	E0008		E0007, E0009
Rattikorn Yimnirun	E0005, E0006		E0011, E0015
	E0007, E0009	Surajit Tekasakul	E0008
	E0011, E0015	Surasing Chaiyakun	E0059
Rewadee Wongmaneeerung	E0007	Surawut Choungchod	E0041
Rojcarin Chantarachindawong	E0043	Suriya Polsin	E0073
Rungnapa Tipakontitikul	E0006, E0015	Suwimol Jatavattana	E0087
Rungsima Yeetsorn	E0071	Suwit Chaisupan	E0033
S		Suwit Wongsila	E0081
S. Ananta	E0098	T	
S. Jiansirisomboon	E0037	T. Huthayanon	E0077
S. Promsean	E0019	T. Tunkasiri	E0035, E0036
Sabaithip Tungkamani	E0082		E0037, E0077
Sahachai Kanarkard	E0014	Tanakon Osotchan	E0044
Sain Baowkaew	E0092		

Tawee Tunkasiri	E0030, E0031 E0032, E0034 E0038, E0039 E0050, E0051 E0052, E0056 E0026, E0027 E0057 E0059 E0048 E0039 E0032, E0050 E0089 E0023 E0063 E0004 E0010 E0024 E0079 E0091 E0043, E0044 E0029	Vipavee P. Hoven Vittaya Amornkitbamrung W W. Nhuapeng W. Thamjaree Wanna Bannarukkul Wanrudee Kaewmesri Wantana Sukkaew Warangkana Kanjina Waret Veerasail Wassana Supmark Watcharaporn Keankeo Weachsuwan Porban Wilirat Cheewasectham Wimonlak Sutapun Wimonrat Trakarnpruk Wipawee Na Ranong Wittaya Ngeon-tae Wiwat Nuansing Worapong Thiemsorn Worawan Bhanthumnavin Wutthisak Prachamon Y Yasuhiko Iwasaki Yongsak Sritana-anant Yupaporn Ruksakulpiwat	E0065, E0068 E0083 E0035, E0036 E0077 E0035, E0036 E0077 E0093 E0020, E0045 E0080 E0046 E0089 E0010 E0024 E0080 E0013 E0060 E0046 E0058 E0042 E0090 E0040 E0093, E0094 E0073 E0065 E0093, E0094 E0060
Taweechai Amornsakchai			
Thammasinee Jainim			
Thanee Bupphakorn			
Thanongsak Nochaiya			
Theerachai Bongkarn			
Theeraphong Thongkum			
Theerayootth Theapsiri			
Thipvan Muangon			
Thirawan Nipithalul			
Thitipat Srinual			
Thongchai Panmatarith			
Thunyakorn Chuaytukpuan			
Tithinun Puatrakul			
Titipun Thongtem			
Toemsak Sriksirin			
Tongchai Choesjai			
U			
Uraiwan Intatha	E0031, E0032 E0050		
Uthaiwan Injarean	E0096		
Uthaiwan Paka	E0088		
V			
Varawut Tangpasuthadol	E0067, E0097		

Section F- AGRICULTURAL & FOOD SCIENCE

A				
Akkasit Jongjareonrak	F0029	Prasert Prasertkithwattana	F0026	
Anuttara Pokharatsiri	F0018, F0019	Pratoomporn Yingthongchai	F0023	
B		Prawit Kongjan	F0004	
Bongkoch Noppon	F0031	R		
Boongueua Vajarasathira	F0018, F0019		Romanee Sa-nguandeekul	F0028
C		S		
Cameron Faustman	F0014	Saisamorn Lumyong	F0006	
Cattarin Theerawitaya	F0024	Saisunee Liawruangrath	F0026	
Chalernpol Kirdmanee	F0024	Santad Sriyota	F0030	
Chongrak Kaewprasit	F0027	Saranya Sribariwut	F0010	
D		Saroat Rawdkuen	F0013	
Darawan Thongbutre	F0021, F0022	Sasitorn Khamlhek	F0007	
Duangjai Noiwan	F0002	Sompoch Gomolmanee	F0002	
F		Sompop Boontim	F0006	
Friedrich Bauer	F0011	Sootawat Benjakul	F0011, F0012	
G			F0013, F0014	
Griangsak Chairote	F0007		F0029	
I		Sorasak Kulamai	F0021, F0022	
Itsara Khantikaew	F0017	Srinoi Chumkum	F0031	
J		Suchada Chaisawadi	F0021, F0022	
Jatuporn Phaopongthai	F0017	Suchapa Netpradit	F0001	
Jindawan Siruntawineti	F0018, F0019	Sumate Tantratian	F0028	
Jirapa Setjintanin	F0028	Sutatip Bhamarapravati	F0020	
K		Suwaree Sompong	F0021, F0022	
Kanyaratt Supaibulwatana	F0024	T		
Kwanjai Kanokmedhakul	F0017		Tanatorm Tongsumrith	F0001
M			Teraboon Pojanagaroon	F0026
Manat Chaijan	F0014	Tyre C. Lanier	F0013	
Morakot Tontichareon	F0024	U		
Munehiko Tanaka	F0029		Uraporn Sardsud	F0005
N		V		
Nipapan Kumngen	F0027	Vicha Sardsud	F0005	
Nitaya Boomtim	F0006	Vichitr Rattanaphani	F0026	
Noknoy Chitchuankij	F0018, F0019	W		
Nutakamol Triboon	F0002		Wae-asae Waehamad	F0008
Nutchalee Khawnol	F0004	Waraporn Methawiriyasilp	F0022	
O		Warin Pimpa	F0009, F0010	
Orathai Lalee	F0008	Win Chaeychomsri	F0018, F0019	
Orawan Julavittayanukul	F0012	Winai Oungpipat	F0030	
P		Wittayachai Lertittikul	F0011	
Pairote Klinpituksa	F0004	Wonnop Visessanguan	F0012, F0013	
Panpim Vonkhorporn	F0016		F0014, F0029	
Panuwat Suppakul	F0003	Woraluck Kaewyou	F0020	
Parinya Chantrasri	F0005	Y		
Pasuree Littilert	F0009		Yawadee Srimake	F0016
Pathanapong Thisong	F0031	Yosapong Temsiripong	F0018, F0019	
Pattharavot Ruangrak	F0008			
Phongyut Juntong	F0001			
Pornrat Sirikhum	F0023			
Pramjit Boonsaay	F0031			
Prapisri Borisoodtikoon	F0030			

Section G - Geology

B		C	
Benjavun Ratanasthien	G0001, G0003	Chairoj Pintukanon	H0009
Boontrarika Srithai	G0001	Chalermpon Thongpoon	H0003, H0004 H0006, H0007
C		D	
Chaiwat Lersviriyantakul	G0002	Charnsak Juengmankong	H0043
Chavalit Vidthayanon	G0003	Chidchanok Khamlert	H0010
M		Chiroj Soorapanth	H0041
Marut Saelim	G0005	Chittin Chindaduangratn	H0037, H0038
P		Chonlayut Raweewan	H0003
Pantip Wongtui	G0001	Chotika Suyarnsestakorn	H0042
Pattara Aiyarak	G0002	E	
R		Dollada Srisai	H0046
Rattanaphorn Hanta	G0003	Duangporn Winijkul	H0004
S		Duncan R. Smith	H0015
Sarunya Promkotra	G0004, G0005	G	
Sayan Charerntham	G0001	Ekarin Saifah	H0016
Suntree Rincome	G0004	H	
T		G.Rujijanakool	H0045
Thitirat Insalee	G0005	Greetha Mounghong	H0032
W		J	
Warawutti Lohawijarn	G0002	Haruki Yamada	H0016
Withaya Kandharosa	G0001	Hiroaki Kiyohara	H0016
Wutti Uttamo	G0001	K	
Y		J.Tuntrakoon	H0045
Yutaka Kunimatsu	G0003	Jantana Yahuaifai	H0047
		Jiradej Manosroi	H0012, H0013 H0014, H0019 H0020, H0021 H0036

Section H- MEDICAL SCIENCE

A		K	
Adisak Wongkajornsilp	H0023	Jiraporn Ungwitayatorn	H0035
Alan Townshend	H0006	John Korth	H0005
Anake Kijjoa	H0021	L	
Apichat Suwas	H0032	Lalana Kongkaneremittra	H0009
Aranya Manosroi	H0012, H0013 H0014, H0019 H0020, H0021 H0036	Lukkana Suksanpaisan	H0015
Aroonsri Priprem	H0010	M	
Atchara Panyosak	H0019	Mahmood Amiry-Moghaddam	H0044
Aurasorn Saraphanchotiwitthaya	H0022	Maneerat Ekkapongpisit	H0015
B		Maria Goretti Apriyani	H0013, H0014
Boonsom Liawruangrath	H0003, H0004 H0005, H0006 H0007	Mathurose Ponglikitmongkol	H0033
Boonyong Punantapong	H0041		
Budsapapat Natwong	H0025, H0027 H0028, H0029 H0030		
Bungorn Sripanidkulchai	H0010		

Maturot Boonchareon	H0034		H0007
Michael J. Fagan	H0041	Sa-nga Usa	H0040
Mullica Jaroensutasinee	H0011, H0017	Sangtien Youthao	H0011
	H0018	Siriphatr Chamutpong	H0033
N		Siriwan Wongkoon	H0017
Naiphinich Kotchabhakdi	H0037, H0038	Somchai Thongtem	H0041
	H0044, H0046	Somphong Sahaphong	H0001
Narisa Kamkaen	H0009	Sompote Im-erb	H0026
Narumon Sirintarawech	H0031	Somsak Tharata	H0012
Nicharat Swasdipan	H0043	Sonthaya Bunluechokechai	H0025, H0026
Nijsiri Ruangrunsi	H0016		H0027, H0028
Nikom Mangkorntong	H0039, H0040		H0029, H0030
Niwat Kangwanrangsan	H0001	Stephen G. Pyne	H0005
Nongluksna Sriubolmas	H0016	Subin Arnon	H0036
Nopphanant Lathulee	H0043	Suda Riengrojpitak	H0001
Nuanchan Jutapakdeegul	H0034	Sudaluck Chantaratchda	H0032
O		Supab Choopun	H0039, H0040
Ole Petter Ottersen	H0044	Suppawan Promprou	H0018
P		Surapol Natakankikul	H0004
Padungkwan Chitropas	H0010	Suratsawadee Piyaviriyagul	H0047
Panpen Kruathai	H0036	Suresh V. Ambudkar	H0002
Pansiri Phansuwan-Pujito	H0034	Suwipa Pattarameteewong	H0009
Patcharakorn Rattanapumee	H0031	Suwit Wongsila	H0039, H0040
Patcharin Nuansrithong	H0031	T	
Pattana Sripalakit	H0022	Thamarat Bunsoong	H0039
Pisit Jainonthee	H0012	Theera Leeudomwong	H0025, H0027
Piyachon Ketsuwan	H0039		H0028, H0029
Piyaporn Srisom	H0007		H0030
Piyarat Govitrapong	H0034	Theeraphan Machan	H0003, H0004
Pongpun Siripong	H0047		H0005, H0007
Pongsri Mangkorntong	H0039, H0040	U	
Pornngarm Limtrakul	H0002	Udom Rungruangsr	H0036
Pramote Mahakunakorn	H0010	V	
Pranorm Khaomek	H0016	Vanicha Vichai	H0042
Prasert Sobhon	H0001	W	
Prasit Watanapa	H0023	Wanida Chearwae	H0002
Prasong Tosaranon	H0025, H0027	Wanee Jiraungkoorskul	H0001
	H0028, H0029	Wattana B. Watanapa	H0023
	H0030	Weerasak Samee	H0035
Prattana Samasilp	H0023	Weerasak Ussawawongaraya	H0025, H0027
Putthiporn Chouplywech	H0033		H0028, H0029
R			H0030
Rittichai Chanpai	H0047	Wichian Sittiprapaporn	H0037, H0038
Rolf G. Werner	H0020	Wimonrat Poowaravutpanitch	H0044
Rujida Wilairat	H0021	Wisnu Thongchai	H0004
Rungpiyada Tipyasang	H0046	Y	
S		Yongyut Rojanasakul	H0019
S.Chaisupun	H0045	Yupa Phonphok	H0032
S.Noimane	H0045	Yutana Pongpiriyadacha	H0031
S.Sophonhummarak	H0045		
Saisunee Liawruangrath	H0005, H0006		

Section I- ENVIRONMENTAL SCIENCE & TECHNOLOGY

A		Komkrich Pimpukdee	I0017
Akaradet Mingmuang	I0015	Komkrich Pimpukdee	I0019
Amonrat Sawat	I0021	Kongsak Pattarith	I0036
Apichat Imyim	I0048	Krisanadej Jaroensutasinee	I0009, I0010
Arpapan Satayavibul	I0053		I0011, I0012
B		Kumthorn Thirakhupt	I0034
Benjalak Karnchanasest	I0053	L	
Benjamas Paibulkichakul	I0014		I0047
Boonsong Taparuk	I0056	Lamfa Pootipan	I0038
C		Linda Pengsuwan	
Chaichart Dhamgrongartama	I0007	M	
Chairote Yaiprasert	I0011		I0002
Chaiwat Kongmanklang	I0058	Maleeya Kruatrachue	I0001
Chakrit Surain	I0045	Mallika Panyakapo	I0010
Chalarmrij Wantawin	I0038	Mullica Jaroensutasinee	
Chalee Paibulkichakul	I0014	N	
Chanawat Nitatwichit	I0018		I0038, I0057
Chanon Koonnon	I0007	Nantaporn Nanta	I0038
Chartchai Chaitragul	I0007	Naraporn Hanwajanawong	I0050, I0051
Chuchart Thiengtham	I0007	Narongsak Pimpunchat	I0052
Chuleekorn Chooklin	I0005	Narongsak Puanglarp	I0034
Chutima Kukusamude	I0059, I0058	Nipawan Adisornvorawoot	I0038
D		O	
Darawan Thongbutre	I0037		I0021
Dirakrit Buavait	I0001	Ongsa pongpitakduamlong	I0040
Duangkamon Jiraroj	I0016	Orawan Wirunvedchayan	I0010
Duangmanee Machimawong	I0021	Ornanong Boonklong	
F		P	
Fuangfa Unob	I0016		I0049
J		Paitip Thiravetyan	I0003
Jarurat woranisaraku	I0038	Pajaree Thongsanit	I0004
Jatuporn Bavornkraisri	I0007	Pakawan Kamonchaivanich	I0042
Jeremy R. Mason	I0035	Pakpoom Ratjiranukool	I0021
Jiemjai Kreasuwan	I0040, I0039	Panittha rithiprad	I0013
	I0042, I0045	Passakorn Srijew	I0058, I0059
	I0046, I0044	Patana Teerapornchaisit	I0057
	I0041, I0043	Penprapa Bualouy	I0003
Jinda Yuenyongchaiwat	I0048	Phattharaphol Imkrajang	I0013
Jirapon Luamduppang	I0021	Phornsuang Markmanee	I0034
Jirasak Threeprom	I0047	Piamsak Menasveta	I0041
Jittiporn Chantarojsiri	I0051	Pimpaporn Patima	I0013
John Middleton	I0007	Pimpimol Kongjinda	I0013
K		Pitsamai Chairatu-tai	I0021
Kanatawan Aungsakul	I0009	Piyawan saimanophan	I0035
Kanitta Netsuwan	I0043	Poonsuk Pothiruckit-Prachyanusorn	I0001
Kanjana Nhusin	I0056	Pongsri Paopuree	I0002
Kannika Rukkid	I0006	Praneet Damrongphol	I0021
Kanya Kerdsiri	I0056	Prawit Nuengmatcha	
Karnjana Saengprapai	I0050	R	
			I0058, I0059
		Ratana Mahachai	I0050, I0051
		Royol Chitradon	I0052

Surapan Kanjanawong	J0019
Suraphol Sribunsong	J0024, J0022
	J0023
Surasing Chaiyakun	J0014, J0015
Suvit Punnachaiya	J0002, J0003
Suwit Kawikitwicha	J0021
Suwit Phethuayluk	J0028

T

Tarinee Nampitch	J0004
Terdthai Vatanatham	J0004
Toru Hayashi	J0026

W

Wannee Srinuttrakul	J0007
Watcharapong Hinjit	J0022, J0023
Weerachai Phutdhawong	J0019
Werapong Goedsin	J0017
Wiriya Kongratana	J0021
Wisansart Satana	J0011, J0012

Y

Yutthana Tirawanichakul	J0025, J0026
-------------------------	--------------

Section K- SCIENCE COMMUNICATION & EDUCATION

A		R	
Anun Teeraburanapong	K0005	Ratchapak Chitaree	K0009, K0019
Apisit Tongchai	K0024		K0021
Arun Chanchaichaovivat	K0010, K0008	Rattanaporn Pichedrujirot	K0006
Assawin Ranusawud	K0019, K0021	S	
B		Sailom Gerdprasert	K0010
Bhinyo Panijpan	K0007	Saksri Supasorn	K0012, K0013
C		Sanoe Chairam	K0013, K0012
Chaiyapong Ruangsuan	K0009, K0004	Sawat Supboon	K0022
Chernchok Soankwan	K0022, K0009	Somkiat Phornphisuthimas	K0010, K0008
	K0011, K0019	Sonthi Phonchaiya	K0012, K0013
	K0021, K0024	Srisavakon Dangsaart	K0014
	K0004	Sumalee Sonamthiang	K0018, K0017
Choksin Tanahoung	K0011	Supaporn porntra	K0008, K0010
Chularuk Kaveevivithchai	K0010	Supot Seebut	K0014
D		Sura Wuttirom	K0009
Decha Suppapittayaporn	K0024	Surachai Nopparatjamjomras	K0019, K0021
Duangduen Suwanjinda	K0008, K0010	Surin Monchan	K0002
J		T	
Jiraporn Thanpaew	K0007	Thammanoon Ditcharoen	K0014
Jongdee To-im	K0008, K0009	Theerayut Charnnuwong	K0004
	K0010	Thidarat Sroyjak	K0004
Joompot poomsripanon	K0008, K0010	U	
K		Umpol Jairuk	K0011
Kanitha pattharakitti	K0006	Unchada Phuapaiboon	K0022
Kanlaya Naruedomkul	K0017	V	
Kanokpoj Areekul	K0005	Virapong Saeng-Xuto	K0016
Kantarut Wuttisela	K0013	W	
Kanyupha Jittivadhna	K0009	Wanchai Noi Wong	K0012, K0013
Karnarat Wuttisela	K0012	Warit Werapun	K0001
Karnyupha Jittivadhna	K0007, K0010	Wasna Jaturonrusmee	K0006
Kulthida Nugultham	K0013, K0012	Wunnee Kissanajakrawat	K0011
Kwan Arayatanikul	K0019, K0021	Y	
	K0009	Yutthana Tiravanichkul	K0001
M			
Manat Boonprakop	K0022		
Mani Payormyong	K0016		
N			
Narumon Emarat	K0022, K0009		
	K0011, K0019		
	K0021, K0024		
Nattinee Mophan	K0012		
Numtip Rattanawongchaiya	K0017, K0018		
P			
Paradorn Pakdeevanich	K0001		
Pattawan Narjaikaew	K0011		
Pintip Ruenwongsa	K0007		
Pitakpong Kompudsa	K0007		
Puchong Kijajumnajasuk	K0005		

Section L – CHITIN – CHITOSAN

A		Nispa Seetapan	L0002
Akamol Klaikherd	L0015	Niwat Kaewpradap	L0030
Anan Tongta	L0023, L0024	Nuntiya Chieplaem	L0023
Ananya Tribumrungsuk	L0033	O	
B		Ondee, T	L0040
B. Thavornnyutikarn	L0019	Oraphin Chaikumpollert	L0021
Benjawan Sutthachai	L0025	P	
Boonchoo Mahapon	L0018	P. Nuengsigkapien	L0011
Boonlom Thavornnyutikarn	L0020	P. Sriamornsak	L0011
C		Panee Wathanaoran	L0033
Chanikan Kantahan	L0024	Panida Asavapichayont	L0010
Chantaraporn Phalakornkule	L0016	Panee Sribuathong	L0001
Chantiga Choochottiros	L0009	Patana Thavipoke	L0032
Chaveewan Rakdee	L0021	Pawadee Methacanon	L0008
Chudapak Kaseamchochoung	L0016	Paweena Uppanan	L0020
Chureerat Prahsarn	L0004	Pensee Nuengsigkapien	L0010
H		Pichan Sawangwong	L0023
Hathairat Jeerathawatchai	L0039	Pimpan Chumningan	L0001
Hunsa Punnapayak	L0015	Piyabutr Wanichpongpan	L0032, L0037 L0038, L0039
J		Piyaporn Chaipongratana	L0033
J. Muensoongnoen	L0019	Pomprasart, R	L0040
J. Nunthanid	L0011	Pornsak Sriamornsak	L0013, L0022
Jaruporn Nhungam	L0033	Pornpip Wongkaew	L0031
Jindarat Pimsamarn	L0024	Pranee Lertsutthiwong	L0016
Jirawat Krewraing	L0020	Praneet Opanasopit	L0010, L0022
Jurairat Nunthanid	L0010, L0013 L0022	Puengprayoonpong, U	L0036
K		R	
K. Pilakasiri	L0019	Rangrong Yoksan	L0009, L0027 L0029
Kan Chantrapomma	L0037	Raphat Petchniyom	L0038
Kanokporn Burapapat	L0013	Rath Pichyangkura	L0034, L0015
Katanchalee Mai-ngam	L0001, L0002	S	
Khantong Soontarapa	L0018, L0025	S. Limmatvapirat	L0011
Kowit Piyamongkala	L0006	Sameela Yuttawat	L0022
Krisana Siralermukul	L0028	Sanchai Santithanes	L0022
Krisda Suchiva	L0021	Sangobtip Pongstabodee	L0006, L0005
Krissana Auynirundronkul	L0015	Santhana Nakapong	L0034
Kwunchit Oungbho	L0030	Sappawinyoo, N	L0040
L		Sasithorn Sae-iao	L0022
Lertsupsuree, C	L0040	Satit Puttipipatkachorn	L0013, L0030
M		Siripong Congchoo	L0037
M. Luangtana-anan	L0011, L0010	Somlak Kongmuang	L0003
Mongkol Sukawattanasinit	L0015	Somsak Damronglerd	L0005
Montira Nopharatana	L0024	Sontaya Limmattavapirat	L0010
N		Sopa Pisawongprakarn	L0031
N. Sangjun	L0019	Suchada Piriayprasarth	L0022
Nartaya Thirawong	L0013	Supawan Tantayanon	L0035
Niran Sappawinyoo	L0038	Supida Tubtimthep	L0034

Supinya Thipvichai	L0003
Supot Hannongbua	L0028
Suppajit Sukkunta	L0032
Supreedee Sungkarak	L0030
Surapich Loykulnant	L0021
Suwabun Chirachanchai	L0027, L0029 L0009
Suwalee Chandrakrang	L0028, L0033
Suwipa Tangsombutpaiboon	L0022
T	
Tanasait Ngawhirunpat	L0010
Temsiri Wangtaveesab	L0008
Thararat Supasiri	L0033
Thawatchai Paechamad	L0003
Thipwimon Kerd-im	L0005
Thitima Maneekul	L0015
V	
Varawut Tangpasuthadol	L0035, L0026 L0008
Vipavee Hoven	L0026
W	
W. Janvikul	L0019
Wanichpongpan, P	L0036, L0040
Wanida Janvikul	L0020
Wanvimol pasanphan	L0027
Wanwilai Daronkaisorn	L0022
Warayuth Sajomsang	L0035
Wasinee Prakobkij	L0015
Werasak Udomkichdecha	L0028
Wichianchai, I	L0036
William H.Daly	L0035
Wiwat Ruenglertpanyakul	L0039
Y	
Yaowamand Angkitpaiboon	L0026
Yaowapha Waiprib	L0023
Yaowapha Waiprib	L0024
Yompakdee, K	L0036

รายชื่อบริษัท และหน่วยงานที่เข้าร่วมแสดงงาน วทท.30

1. BOSS SCIENTIFIC ASSOCIATE LTD., PART.
2. DCT INTER GROUP CO., LTD
3. eDAQ LAB THAI SCI
4. GAME & TOYS
5. HANNA INSTRUMENTS (THAILAND) LIMITED
6. IT S (THAILAND) CO., LTD.
7. PERFECT VISION MULTIMEDIA CO., LTD.
8. RENOWN TECHNICAL CO., LTD
9. SE-ED BOOK CENTER
10. TECHNOLOGY SUPPLY CO., LTD.
11. TOYS 4 U
12. UNION SENSE TECHNOLOGIES LIMITED
13. WISHER TOY
14. บริษัท กราฟิก อินฟอร์เมชัน จำกัด
15. บริษัท กรีน บรรายณ์ จำกัด
16. หจก. กาญจนดิษฐ์
17. บริษัท กิบบไทย จำกัด
18. ร้าน คอลเซ็ป คอลเลคชั่น แอนด์ ทอยส์
19. บริษัท คิวอีเอส (ไทยแลนด์) จำกัด
20. บริษัท เคโมไซเอนซ์ (ประเทศไทย) จำกัด
21. บริษัท โคแอกซ์ กรุ๊ป คอร์ปอเรชั่น จำกัด
22. บริษัท จรรย์เอสไอซีเอส จำกัด
23. บริษัท เจ็บเซ่น แอนด์ เจิสเซ่น มาร์เก็ตติ้ง (ที) จำกัด
24. บริษัท ชายนเทค จำกัด
25. บริษัท ซี.อี.อินสทรูเมนต์ (ประเทศไทย) จำกัด
26. บริษัท เซ็นทรัล เทคดิง จำกัด
27. บริษัท โซเบอร์ดี เทคโนโลยี จำกัด
28. บริษัท โซมิส อินสทรูเมนต์ จำกัด
29. บริษัท โซแอนติฟิค ปรโมชัน จำกัด
30. บริษัท ฌ บ้านวรรณกรรม กรุป จำกัด
31. บริษัท ดีไซน์ ออลเทอร์เนทีฟ จำกัด
32. บริษัท ดีทแฮล์ม จำกัด
33. บริษัท ทิมทอยส์ จำกัด
34. บริษัท ที.เอส.อี เทคโนโลยี จำกัด
35. บริษัท เทคโนโลยี สโตร์ จำกัด
36. บริษัท ไทยซอฟต์แวร์ เอ็นเตอร์ไพรส์ จำกัด
37. บริษัท ไทยยูนิ จำกัด
38. บริษัท ธเนศพัฒนา จำกัด
39. บริษัท นานมีบุ๊คส์ จำกัด
40. บรูเกอร์ ไบโอสปีน เอเชีย
41. บริษัท บางกอก ไฮเล็ป จำกัด
42. บริษัท บี.เค.เทค แอสโซซิเอท จำกัด
43. บริษัท เบคไทย กรุงเทพมหานครเคมิกัล จำกัด
44. บริษัท แบง เทคดิง 1992 จำกัด
45. บริษัท ไปโอแอคทีฟ จำกัด
46. บริษัท พรพลอะนาไลติคอล จำกัด
47. บริษัท พัฒนาคุณภาพวิชาการ (พว.) จำกัด
48. บริษัท พานาโพลีเทค จำกัด
49. บริษัท พาราไซแอนติฟิค จำกัด
50. พิพิธภัณฑภาพมุกกว้าง กรุงเทพมหานคร
51. บริษัท เพอร์กินเอลเมอร์ จำกัด
52. บริษัท เพาเวอร์ สตาร์ คอมมิวนิเคท เซ็นเตอร์ จำกัด
53. บริษัท มอนโดเทค (ประเทศไทย) จำกัด
54. บริษัท เมเจอร์ โซแอนติฟิค โปรดักส์ จำกัด
55. บริษัท เมทโรทิม สยาม จำกัด
56. บริษัท เมทเลอร์ - โทเลโด (ประเทศไทย) จำกัด
57. บริษัท ไมเนอร์ คอร์ปอเรชั่น จำกัด (มหาชน)
58. หจก. ยูพี มาร์เก็ตติ้ง เยเนอรัล ซัพพลาย
59. บริษัท ลิแกนด์ โซแอนติฟิค จำกัด
60. บริษัท โลกอส มาร์เก็ตติ้ง จำกัด
61. บริษัท วิวัฒน์สัน จำกัด
62. บริษัท วี เอส เค คอนซัมเมท จำกัด
63. บริษัท เวลซอร์ส จำกัด
64. บริษัท เวลด์โก้ จำกัด
65. บริษัท เวลด์ไวด์ เทคไทย จำกัด
66. บริษัท ไวท์กรุป จำกัด (มหาชน)
67. บริษัท สกอลลาร์ วิดีโอ จำกัด
68. หจก. สติตุคุณ
69. บริษัท สยามทามิยะ จำกัด
70. บริษัท สยามฟิวเจอร์ เอ็นเตอร์ไพรส์ จำกัด
71. หจก. สยามแมป เซ็นเตอร์
72. บริษัท สำนักพิมพ์ปาเจรา จำกัด
73. บริษัท สิทธิพรแอสโซซิเอต จำกัด
74. บริษัท อนาคติก เยน่า (ประเทศไทย) จำกัด
75. บริษัท ออฟฟิเชียล อีควิปเมนต์ แมนูแฟคเจอร์ จำกัด
76. บริษัท อาร์เคมีก้า อินเตอร์เนชันแนล จำกัด
77. บริษัท อิตัลมาร์ (ประเทศไทย) จำกัด
78. บริษัท อิมแพคท์ เอ็นเตอร์ไพรส์ จำกัด
79. บริษัท เอจิลেন্ট เทคโนโลยีส์ (ประเทศไทย) จำกัด
80. หจก. เอ็น วาย อาร์
81. บริษัท เอ็ม เอ็ดดูเคชัน จำกัด
82. บริษัท เอ็ม ไอ เอส ซอฟต์แวร์ จำกัด
83. หสม. เอส พี กลาส แอนด์ เคมีคอล
84. บริษัท เอส.เค.เพาเวอร์เอเบิล จำกัด
85. บริษัท แอ็ดวานซ์ มีเดีย ซัพพลายส์ จำกัด
86. บริษัท แอนนาไลต์ดีเคิลเลปไซน์ จำกัด
87. บริษัท ไอ แลป ฟลูอิด คอนโทรล จำกัด
88. บริษัท ฮอลส์วูด อินเตอร์เนชันแนล จำกัด

ขอขอบคุณหน่วยงานที่สนับสนุนการจัดงาน วทท.30 Acknowledgement for the Sponsors of STT 2004



สำนักงานส่งเสริมการวิจัย (สกว)



มูลนิธิส่งเสริมวิทยาศาสตร์และเทคโนโลยี
ในพระบรมราชูปถัมภ์



บริษัท แรนด์ มาร์เก็ตติ้ง แอนด์ แมเนจเม้นท์ จำกัด
123/292 หมู่ 5 ถนนสายใหม่ แขวงสายใหม่ เขตสายใหม่ กรุงเทพฯ 10220
โทรศัพท์ 0-2996-4461 โทรสาร 0-2996-4460
Rand Marketing & Management Co., Ltd.
123/292 Moo 5 Saimai Rd. Soi 29 Saimai District, Bangkok 10220
Tel 0-2996-4461-4 Fax 0-2996-4460
Website: www.randmarketing.net
E mail: sales@randmarketing.net, rand_marketing@yahoo.com

