I

I0001-WET DEPOSITION IN THE WESTERN REGION OF THAILAND

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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 μeq/L, respectively. Wet depositions of the important acid species: SO_4^{2-} and NO_3^- are 19.03 and 9.38 meq/m^2-year, respectively. The ratio of $NH_4^+ + Ca^{2+} + Mg^{2+}$ / nss-SO_4^{2-} + NO_3^- which indicates a neutralizing capacity, are in the range of 0.91-4.48. The ratio of NO_3^- / 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.

I0002-ACUTE TOXICITY AND EFFECT OF ENDOSULFAN ON GLUTATHIONE-S-TRANSFERASE ACTIVITY IN *Macrobrachium lanchesteri*

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Abstract: Endosulfan is an organochlorine pesticide often used in paddy fields by Thai farmers for snail eradication. The 96-h LC_{50} of riceland shrimp, *Macrobrachium lanchesteri* was 2.00 μg/L. Study on the glutathione-s-transferase activity (GST) in whole body of riceland shrimp showed that the activity of GST significantly increased after exposure to 0.35 0.7 and 1.4 μg/L endosulfan; and the activityies 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 μg/L endosulfan for 24 h. The results suggested that the GST level in Riceland shrimp can be used as indicator for organochlorine insecticide contamination.

I0003-STUDY OF FINE PARTICULATE MATTER IN PHITSANULOK HOMES

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Abstract Particulate Matter with an aerodynamic diameter less than 10 microns (PM10) was collected from six livings 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 μg/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.

I0004-TREATMENT OF WASTE COOLANT EMULSIONS BY COAGULATION AND FLOCCULATION

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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.

I0005-REMOVAL OF STABILIZED OIL IN WASTEWATER EMULSIONS BY INDUCED AIR FLOTATION

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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 μm 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.

I0006-REMOVAL OF HEAVY METALS FROM WASTEWATER BY ADSORPTION ON ACTIVATED CARBON

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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.

I0007-PRELIMINARY STUDY OF CONSERVATION IN A WORLD HERITAGE SITE: HUAI KHA KHAENG WILDLIFE SANCTUARY

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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.

I0008-Utilization of Distillery Slop for the Rice Production in Khon Kaen Province

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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 m^3 /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.

I0009-PREDICTING TIDE CHARACTERISTICS ON THE COASTLINE OF THE ANDAMAN SEA BY NON-HARMONIC METHOD

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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.

I0010-COMPUTATION OF D8 FLOW LINE AT RON PHIBUN AREA, NAKHONSITHAMMARAT PROVINCE

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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.

I0011-ELEVATION MODEL (DEM)

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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.

I0012-FLASH FLOODING PREDICTION BY RAIN EXPOSURE INDEX (REI) BASED ON GOES-9 SATELLITE DATA

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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.

I0013-REMOVAL OF CHROMIUM FROM CONTAMINATED SOIL BY SOIL WASHING METHOD

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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.

I0014-EFFECT OF OZONATION ON BACTERIA AND PHYTOPLANKTON IN THE WATER FROM SHRIMP POND

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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

I0015-A STUDY OF SORPTION OF HEAVY METALS USING *PADINA HAITIENSIS* THIVY

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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

I0016-DEGRADATION OF LEAD COMPLEX BY PHOTOOXIDATION IN THE PRESENCE OF HYDROGEN PEROXIDE

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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.

I0017-INVESTIGATION OF A VARIETY OF CLAY MINERALS FOR THE ADSORPTION OF ZEARALENONE

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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.

I0018-COMPOSTING BY LOCAL COMMUNITY IN COMMERCIAL SCALE USING AERATED STATIC PILE SYSTEM

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Abstract: In this research three full-scale piles were studied. Each pile consisted of 6 m^3 of shredded leaves and 3 m^3 of cow manure, and was piled on opened ground in prism-liked 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 m^3/sec for each pile. It took approximately 30 days to complete the composting and the suitable air flow rate was 0.155 m^3/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.

I0019-EFFECT OF HEAT TREATMENTS ON HECTORITE FOR THE ADSORPTION OF AFLATOXIN B_1

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Abstract: The objective of this research was to evaluate the effect of heat treatments on hectorite for the adsorption of aflatoxin B_1 (AfB_1). 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 AfB_1 adsorption (65.52 ± 0.92%). No significant difference in the increase in the adsorption of AfB_1 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 AfB_1 and heating hectorite at proper temperature could increase binding capacity.

I0020-STUDY OF TOXICITY SITUATION OF FRESHWATER RESERVOIRS BY DETERMINATION OF MICROCYSTIN IN BLUE-GREEN ALGAE USING HPLC

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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)

I0021-Cadmium Removal from Wastewater by Applying Natural Materials as Sorbents

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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 %).

I0032-THE MEASUREMENT OF CHEMICAL OXYGEN DEMAND (COD) WITH NO MERCURIC AND STANDARD PROCEDURES: A COMPARISON

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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±3.06% and 99.8±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.

I0033-DEVELOPMENT OF MINIATURIZED CHEMICAL OXYGEN DEMAND (COD)

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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±4.4% (100.9-109.7%) and 101.9±11.1% (89.0-108.3%) and standard closed reflux method were 104.3±2.8% (102.5-107.6%) and 100.3±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.

I0034-Effect of Chlorpyrifos on DNA damage in Haemocyte of Black Tiger Shrimp (*Penaeus monodon*)

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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 µg/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 µg/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

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Abstract One strain of *Arthrobacter* sp. was eventually selected as most appropriate for a bioaugmentation study due 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 [^{14}C]-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 *bed*C1 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

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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 SiO_2 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

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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 (0.1,0.2,0.4and 0.5 mg/L) by using phosphate test kit showed% recovery 96.4±0.84, 95.0±0.57, 111.2±0.14and95.3±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%and107 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±00 (0.1-2), 3.10 ±00 (1.8-6.4), 3.4±00 (2.9-4.7) and 2.03±00 (1.3-2.9) mg/L, respectively. Estimated phosphate from phosphate test kit were 0.72±00 (0.1-2.2), 1.31±00 (0.6-2.5), 2.2±00 (1.1-3.3) and 1.78±00 (1.1-2 5) mg/L, respectively. The correlation coefficient (r^2) 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

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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. Nowaday, 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

I0039-Analysis of Atmospheric Stability in Chiang Mai Province from Sounding and Calmet Model

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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.

I0040-Simulation of the favorable condition heavy rainfalls due to effect of the active south-west monsoon and Chanthu depression by MM5

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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.

I0041-Numerical simulation of the active low pressure area over Cambodia by MM5

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Abstract: The effect of the active low pressure area over Cambodia was analyzed by theMM5 during September 11-14, 2003. Surface moist air convergence was simulated overthe active low pressure area which was supported by the negative divergence of the moistair. The maximum predicted rainfall were 6.2-6.5 mm

I0042-Numerical weather simulation of the O2B cyclone in Thailand by WRF Model

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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 15o N latitude, the 94o E longitude with the wind speed at 50 km/hr on May 15, 2004 and later on at the 19o N latitude, the 92o 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.

I0043-Numerical simulation of active monsoon trough over northeastern Thailand by MM5

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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

I0044-Numerical Weather Simulation of the Chanthu depression track by WRF

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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.

I0045-Numerical simulation of the depression in the gulf of Thailand by WRF

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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.

I0046-Application of CALPUFF Model on Sulfur Dioxide Dispersion from Mae Moh Power Plant

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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.

I0047-REMOVAL OF CHROMIUM (III) AND CHROMIUM (VI) FROM AQUEOUS SOLUTION BY ALGAE *SPIRULINA* AND *CHLORELLA* SPECIES

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Abstract: Chromium (Cr) removal has been studied using three types of algae, namely *Spirulina sp., Chlorella vulgalis TISTR 8261* and *Chlorella vulgalis 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.

I0048-LEAD REMOVAL IN WASTE WATER BY HEAT TREATED COCKLE SHELL AND MUSSEL SHELL

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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

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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 soiless conditions, with different synthetic dye and synthetic wastewater concentrations (0, 10, 20 and 30 $mg \cdot L^{-1}$). 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 $mg \cdot L^{-1}$ 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

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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 ±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

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Abstract: The research about relationship of dam's water storage to be a guideline for dam's water management has been devided 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, Rajjaprabha 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.

I

I0052-Relationship of Rainfall between TMD's station and TRMM's Satellite Image Archive

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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.

I0053-Prediction of atmospheric polycyclic aromatic hydrocarbons using orange jasmine *Murraya paniculata* (L.) Jack leaves

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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 ($r^2 \geq 0.70$) 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 ($r^2 < 0.6$).

I0055-Preliminary study of elemental composition in tree leaves for using as biomonitor for air pollution

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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.

I0056-DETERMINATION OF FURAZORIDONE RESIDUE IN PORK SAMPLES IN MUNICIPAL AREA, AMPHUR MAUNG, UBON RATCHATHANI PROVINCE

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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. Furazoridone in pork samples were examined by spectrophotometric method. The result indicated that, furazoridone 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.

I0057-DEVELOPMENT OF WASTE MANAGEMENT DATABASE WITHIN KMUTT

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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. Nowaday, 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

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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

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ABSTRACT: Water samples were collected from 13 stations between Ban Dung (Udornthani province) and Ban Ta-sa- ard (Nongkai province) in Febuary, May, August and December. The collected samples were determined for the content of some anions, cations and heavy metalas 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 guality in Songkram viver was clearly shown during dry reason. 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 miximum content of 3,207.3 ppm NaCl in Ta-ma-now reservour 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 Febuary. 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.

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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://ep.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 publics mass media were done continuously. Morn 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

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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

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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 microfocal 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 mm^2 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

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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

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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

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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 rheologicly 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 pladmid 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

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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

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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

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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 Bridgeman Stocbarger 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 ACID

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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.

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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 Pressure

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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 seperately, 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

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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 8 h, corresponding to organic loading rates around 2 kg COD $m^{-3}d^{-1}$. 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.

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Abstract: The objective of this project is design 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 138 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 deposite 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.

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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 aluminium 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

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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 $W/m^2 \cdot °C$.

J0017-SPEED CONTROL SYSTEM OF DC MOTOR USING FUZZY LOGIC FOR A MACHANICAL ASSISTED MACHINE SYSTEM

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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

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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 ASSEMPLY SHORT-LONG WAVELENGTH UV-BOX FOR ORGANIC CHEMISTRY LABORATORY

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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 PLUSE WIDTH MODULATION

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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 gO_3/hr.

J0021-Speed Sensorless DC Motor Using Digital Signal Processing System

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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 tacho-meter.

J0022-Real time ECG Compression/Decompression System with Multirate Digital signal processing

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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

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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

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Abstract: The following article is introducing the design and construction of the emergency alarm for the patent 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

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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 HUSK

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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) TECHNIQUE

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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 $k-\varepsilon$ 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 $W/m^2 \cdot K$.

J0028-Modeling of Weather Data for Renewable Energy System Applications in southern Thailand

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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 NANOSPHERES

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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

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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 raruk A.DC.) with mixture of organic solvents to obtain the crude products. Then, crude saponinwas 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 sapnin: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

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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

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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

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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

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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

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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

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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.

K

K0001-The compact TEA N_2-laser

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Abstract: TEA N_2-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 MOLECULE

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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 ACCELERATION

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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.

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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

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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

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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

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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

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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

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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

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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 byThornton 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 devided 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

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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

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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 leaning 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

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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.

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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

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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

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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

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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

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Abtract: 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 x4mm 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

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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 Gabrial's College, Dusit District, Bangkok. The study was carried out during the second semester of the 2001 acadamic 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

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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.

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L0001-CHITOSAN USED AS A NATURAL DISINFECTANT UNDER PHYSIOLOGICAL CONDITIONS

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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

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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

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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

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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

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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 streneth 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

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Abstract: Metal working fluid (MWF) onto chitosan bead, carboxylated chitosan and cross-linked carboxylated chitosan with glutaladehyde (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

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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

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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

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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

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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 μm. SCTA was of an amorphous state and SCTH was of semi-crystalline form. FTIR and solid-state ^{13}C 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

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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*-DIACETYLCHITOBIOSE BY ENZYMATIC HYDROLYSIS OF CHITIN

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Abstract: This work presents an investigation for optimum conditions in a production of *N*-acetyl-Dglucosamine (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 oC, 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

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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

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Abstract: Chitosan was synthesized from shrimp shell with molecular mass of $1.4 \cdot 10^5$ 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±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

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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 1x1 cm^2 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

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Abstract: Severe hemorrhage is a leading cause of death from trauma. New methods of hemostasis have been developed to reduce hemorhagic 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)

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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

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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

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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±1.01%, using 3 repeated batches at 3 hour interval whereas the lowest degree of deacetylation was obtained at 110 °C, 81.29±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

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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 ml.mm.m^{-2}.day^{-1}.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

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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 deactylation was 90.1±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±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

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Abstract: Two methods were used to create charges on chitosan films. In the first method the amino group (-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 [-$N^+(CH_3)_3$] and sulfonate group [-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

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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 $6.7 \cdot 10^5 \sim 1.2 \cdot 10^6$ to $1.0 \cdot 10^5$ 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 carbonyldiimidazolide (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

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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

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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

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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 □m. 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 ± 0.44 □g/ml compared to 2.20 ± 0.37 □g/ml of standard curcumin and 2.60 ± 0.10 □g/ml of vitamin C.

L0031-Growth restraint activity of chitosan against a tomato leaf spot bacterium *Xanthomonas campestris* pv. *vesicatoria*

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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 deacetelation (DD) were tested for growth restraint activity against *X. campestris* pv. *vesicatoria*, a bacterial leaf spot of tomato. Similar effect was obtained with all deacetelated 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 chloramphenical, 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

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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 /mm^2, elongation at break 13.408 mm, water vapor permeability0 1564 x 10^{-3} g.mm /mm ^{2}hr .mm Hg .

L0033-STUDY THE ADSORPTION CAPACITY OF REACTIVE DYES USING ACTIVATED CARBON POWDER, CHITOSAN-ENCAPSULATED ACTIVATED CARBON AND CHITOSAN BEAD

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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.

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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 performed 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

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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 glycidyltrimethylammoiunm 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 ^{1}H-NMR, and FT-IR spectroscopic methods.

L0036-A Preliminary Study of Improvement Red Wine Making from Table Grapes by Using Chitosan

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Abstract: This research was a preliminary study of red grape wine improvement by using chitosan in wine precipitation, camparing 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 comparision 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

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Abstract: Chitosan, a natural, biodegradable, biocompetible 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

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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.6 0 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

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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 m^2 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

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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.

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