

Abstract: Chlorpyrifos, an organophosphorus insecticide commonly used as active ingredient in agricultural and urban pest control products, was reported to contain harmful effect on the health status of many aquatic invertebrates. Black Tiger Shrimp (*Peneus monodon*), an important commercial species culturing extensively in agricultural areas, can be at risk by the chronic effect of this insecticide. To detect the exposure and early effect of sub-lethal concentration of chlorpyrifos to *P. monodon*, the molecular responses of the exposed shrimps were determined using mRNA DD-PCR. The experiment was conducted by exposing the shrimps with chlorpyrifos at the concentration of 0, 1, and, 10 µg/l. Then, RNA extraction and cDNA reverse transcription from the treated shrimps were carried out. DD-PCR was performed using 90 primer combinations (30 arbitrary primers and 3 oligo dT₁₂-N primers). A total of 36 differential displayed transcripts (24 up-regulated and 12 down-regulated) were obtained. Results from BLASTx analysis revealed that, of 13 transcripts, 5 transcripts were matched with genes reported in other animals which included phosphoglucosyltransferase (1 transcript), nitrogen regulatory protein (1 transcript) and ubiquitin-like 7 (3 transcripts) while 8 transcripts were no match to any reported genes. The differential expression of these candidate genes following chlorpyrifos exposure indicates the possible use of these genes as biomarker of exposure to organophosphorus pesticide in *P. monodon*.

I_10027 THEORETICAL STUDY OF ADSORPTION OF NITROSAMINE COMPOUNDS BY ZEOLITES

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Abstract: The study of adsorption of nitrosamine compounds by zeolites was performed by computational chemistry. The nitrosamine compounds consisting of nitrosamine (NA) and their derivatives such as N-methyl-N-nitrosamine (NMA), N-ethyl-N-nitrosamine (NEA), N,N-dimethyl-N-nitrosamine (NDMA), N-ethyl-N-methyl-N-nitrosamine (NEMA) and N,N-diethyl-N-nitrosamine (NDEA) were adsorbed on H-ZSM-5. The geometrical structures of nitrosamine compounds and H-ZSM-5 have been obtained by geometry optimization using DFT/B3LYP/6-31G(d) and ONIOM(B3LYP/6-31G(d):AM1) level of theory. From the calculation, the structure of nitrosamine compounds which adsorbed on H-ZSM-5 was conducted by O-H bond at the adsorption site. The adsorption energy was increased by increasing the steric effect of the substituted groups. The thermodynamics properties show the adsorption processes to be exothermic, spontaneous and higher order.

I_10029 PREPARATION AND CHARACTERIZATION OF ACTIVATED CARBON FROM *DENDROCALAMUS ASPER BACKER* AND *DENDROCALAMUS LATIFLORUS*

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Abstract: The objective of this work has conducted a research on the production of activated carbons from *Dendrocalamus Asper Backer* (DAB) and *Dendrocalamus Latiflorus* (DL) by chemical activation method. Activating parameters were carbonized temperature, breeds of bamboo (DAB and DL), ages of bamboos, activation reagents (H₃PO₄ and KOH), concentrations of activation reagents and activation times. The characterizations of activated carbon were studied by iodine number and scanning electron microscope (SEM). The 2-years DAB's activated carbon, obtained from the 85% H₃PO₄ activation for 4 hours, has the highest iodine number (615.84 mg/g).

I_10030 PREPARATION OF ACTIVATED CARBONS FROM *BAMBUSA ARUNDINACEA (RETZ) WILD* AND *GIGANTOCHLOA VERTICILLATA* BY PHOSPHORIC ACID AND POTASSIUM HYDROXIDE ACTIVATION FOR ADSORPTION OF IODINE

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Abstract: Activated carbons from *Bambusa arundinacea (Retz) Wild* (BAW) and *Gigantochloa verticillata* (GV) were prepared through chemical processes using phosphoric acid and potassium hydroxide. Characteristics of activated carbons were studied by iodine number and scanning electron microscopy (SEM). Efficiency for activating BAW's charcoal with potassium hydroxide was higher than in case of phosphoric acid and the age of bamboos has an effect on the iodine number. Activation time and concentration of chemical reagents have minor effects on activated carbon's activities. Scanning electron micrographs showed that the external surface characteristics of the bamboos charcoal between before and after activation were not significant difference. In addition, the iodine number of one-year GV's activated carbon activated by 20% potassium hydroxide for 8 hours, commercial activated carbon and three-year BAW's activated carbon activated by 80% potassium hydroxide for 4 hours was 1,202.4, 708.08 and 199.31 mg/g, respectively.

I_10031 ENVIRONMENTAL EFFECTS OF NANOPARTICLES: GENOTOXIC EFFECTS OF TITANIUM DIOXIDE ON INDUCTION OF MICRONUCLEUSE FORMATION IN THE SNAKE HEAD FISH CELL LINE

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Abstract: With the rising of nanomaterials or nanoparticles (NP) in commercial, to date few studies have investigated the toxicological and environmental effects of NP. Exposure to nanoparticle substances can be an important risk factor for human health. Mutagenicity tests represent a good method for genotoxic effect evaluation of environmental pollutants. Several studies have shown that fish micronuclei(MN) tests are sensitive enough to detect genotoxic agents in industrial water. In this work, we have measured MN and monitored nuclear abnormalities in the snake fish cells, with the aim to contribute to the comparative investigation of effects of TiO₂ nanoparticles(TiO₂-NP) and TiO₂ microparticles(TiO₂-MP). The differential sensitivity of fish cells to TiO₂-MP and TiO₂-NP was evaluated by exposing individuals of both species to different doses 1, 5, 10 and 50 for TiO₂-MP and 0.1, 0.5, 1, 5 and 10 for TiO₂-NP. The treatments are monitored over the period of 24, 48 and 72hr. We concluded that TiO₂-NP is more toxic to nuclear material, as it induced higher numbers of micronuclei. The data on increasing of genotoxicity in fish cells indicates a hazard of NP to environments and humans. The doses and the exposure period are important parameters. However, further studies with TiO₂ must be carried out using such as different dose and/or exposure period if we are to reach a better understanding.

I_10032 Antibacterial effects of TiO₂ nanoparticles combine with UVA on *Leptospira interrogans* serovar Canicola

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Abstract: TiO₂ nanoparticles (TiO₂-NP) combine with Ultraviolet-A (UVA) radiation were recently reported as the photocatalytic disinfection process. Our study is to investigate the antimicrobial effects of TiO₂-NP on *L. interrogans* serovar Canicola represented as pathogenic leptospires that cause leptospirosis. The bacteria were cultured and treated by TiO₂-NP, UVA radiation at variable time duration of 2, 6 and 24 hr with and without TiO₂-NP at 50 µg/~10⁸cells/ml. The results show that samples with higher dose UVA (112.3 W-sec/cm²) both with and without TiO₂-NP have higher antimicrobial effects resulting in the decrease in the growth and viability of bacteria when compared with those without UVA exposure. By immunoblotting method, Leptospiral antigen components about 21 and 48 kDa disappear when compared with non-exposed control. Only TiO₂ treatment alone does not significantly give any difference from the control (no treatment) samples. From our preliminary works, it may be concluded that the UVA play a major role on antimicrobial effects while the TiO₂-NP affect bacteria only when photocatalysis is occurred. Further studies with TiO₂-NP must be carried out using such as different doses and/or exposure periods if we want to reach a better understanding.

I_10033 Recycle of Screen Printing Ink for Ceramic

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Abstract: The purposes of recycle of ceramic ink in screen printing are to study the process of screen ink recycle and to determine the effect of temperature and duration of pigments burning to the recycle ink qualities. The useable blue ink was dried by evaporation of solvent and burned at 300 °C 325 °C 350 °C 375 °C and 400 °C for 5 and 30 minutes. The burned pigment was observed, grinded and screen passing through 120 T mesh. Medium oil was then mixed with pigments for quality testing such as particle size, ink viscosity. Recycle ink was printed on transfer paper and transferred on ceramic using 760 °C. The ink film was measured of color (CIE L*a*b*) with spectrophotometer.

The results show that pigments was black burned when increasing temperature viscosity was around 11 poise and fineness of pigment particle after grinding was 7 microns which can be adjusted to be suitable for printing. After printing, L*a*b* color value on transfer paper was changed. With increasing burning temperature and duration, blue color was changed to green color and darker. However, color on ceramic was similarly blue. In addition, temperature 325 °C and duration 5 minutes was a suitable status for pigments burning, in order to mixed with medium for application for screen printing ink ceramic by using transfer paper.

I_10034 QUANTITATIVES OF PHENOLIC COMPOUNDS IN TREATED PULP AND PAPER MILL WASTEWATER AFTER ADSORPTION BY ACTIVATED CARBON.

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Abstract: The water effluent after treatment with activated sludge of pulp and paper factory still has brown color because

of dissolution of lignin molecule. Lignin molecule contain the main component call phenolic compounds. These compounds are hard to degrade by biological treatment, so they make the color in the water effluent. This research study the adsorption of activated carbon made from rubber wood in reducing color, COD and the content of phenolic compounds. The experiment use the concentration of activated carbon in wastewater equal 0.02, 0.05, 0.10 and 0.20 % (W/V). The result show that the optimum condition is at 24 hour of adsorption time and 0.20 % of concentration. This condition can adsorb 80.6680% of color, 76.4583% of COD. GC-MS and GC are use to identify and quantitative the amount of phenolic compound before and after adsorption. The information from GC-MS and GC can explain the relationship between color adsorption and COD adsorption with each type of phenolic compounds in the molecular level.

I_10035 Activated carbon from sawdust char by physical activation and chemical activation

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Abstract: The research studied about the production of activated carbon from agriculture waste. Sawdust char was used as the precursor for activation preparation. Activated carbon was prepared by physical and chemical activation. This process used CO₂ and KOH for activation. The result of this study found that the chemical activation was better than physical activation because KOH used in this process could go into the sawdust, so it developed the pores and help efficiency in adsorption. Activated carbon was activation by KOH, the BET surface area and micropore volume increased by temperature and impregnation ratio. Activated carbon was activated by KOH at impregnation ratio of KOH: sawdust (4:1) at 800 °C for 1 hour gave the respectively BET surface area and micropore volume equal at 1168.10 m²/g and 0.5200 cm³/g when compared with sawdust char before activation process value was 169.57 m²/g and 0.1733 cm³/g

I_10036 UTILISATION OF LATEX SERUM FOR THE PRODUCTION OF CHLORELLA

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Abstract: The comparison of growth and biomass of *Chlorella* were carried out in 10 L flask using latex serum from latex processing factory effluent as fertilizer. Different ratios of latex serum between 1, 2, 3, 4, and 5 per cent by volume with 1.04 × 10⁶ cell/ml. initial cell density of *Chlorella* were applied to the experiment. Results showed that *Chlorella* reached to the maximum density within 5 days, and the final cell densities of the microalgae among treatments were 17.3 ± 1.30 × 10⁶, 5.0 ± 2.56 × 10⁶, 0.83 ± 0.36 × 10⁶, 0.00 ± 0.00 × 10⁶, and 0.63 ± 0.63 × 10⁶ cell/ml respectively. Biomass and growth rate of *Chlorella* when apply 1 percent of latex serum found to be significantly greater in all treatment (p<0.05). This result was further applied to mass cultivation of *Chlorella* at 1,000 L comparing with a group using chemical fertilizer. Growth rate and biomass of a batch used latex serum were still significantly higher than another (p<0.05), and the cultivation periods also delayed when using latex serum.

I_10037 ELECTROCOAGULATION OF PALM OIL MILL'S EFFLUENT IN THE PRODUCTION OF NATURAL RUBBER ANTIOXIDANT

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Abstract: A new approach in the management of palm oil mill's effluent (POME) with an emphasis on giving added value to wastes was demonstrated in this study. Electrocoagulation (EC), an electrochemical technique used in water purification technology was employed to remove dissolved organic substances from the POME at the same time utilized the recovered substance as antioxidant for natural rubber. The presence of phenolic groups, a characteristic functional group of most antioxidants, was confirmed by the formation of black precipitate upon mixing POME with FeCl₃. Removal of these phenolic compounds was done by electrocoagulating (2.0 A, 4.6-8.1 V) a liter of POME using aluminum as electrodes for 6 hours. The process afforded a clear solution (pH=7.86) and a coagulum. Recovery of the phenolic compounds from the coagulum was done by dissolution with 7% HCl followed by solvent extraction with butanol. The dried residue from the butanol extract was further extracted with hexane using a Soxhlet to remove oils and waxes. The overall process afforded a yield of 17.1g/L POME. The antioxidant property of the isolate was confirmed by the decolorization of DPPH on the TLC plate using a spray method. The isolate was incorporated into a rubber mixture and its effects on the physico-mechanical properties of the rubber were evaluated and compared with the commercial antioxidant.

I_10038 INFLUENCE OF HUMIC ACIDS ON SOLUBILISATION OF HEAVY METALS FROM CEMENT-BASED STABILISED CONTAMINATED SOIL

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Abstract: Humic acids (5% w/w) was added to heavy metals contaminated soil containing Cd, Cu, Cr, Ni, Pb, and Zn. The stabilization/solidification by Portland cement was done for humic acid added soil (S-HS) and original contaminated soil (S-OS). The solubilisation of the metals from both concretes was investigated at different pH of leachant ranging from 1-12. Regarding the dissolution of the metals in leachates from both materials, the results showed that the dissolution was mainly controlled by the pH at equilibrium. Leaching behaviors of the same metal from both materials were different. Cadmium, copper, nickel, and zinc were better dissolved from S-OS than S-HS. In acidic medium, chromium and lead had the similar leaching behavior as other metals, but in basic region their release from S-HS was greater than that from S-OS. Humic acids can reduce the dissolution of the metals.

I_10039 VERMICOMPOSTING OF SYNTHETIC ORGANIC WASTE BY *Perionyx excavatus*

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Abstract: This research was to study the vermicomposting of organic waste by using *P. excavatus*. The experiment was divided into 3 parts, 1) study of effect of bulking agent in vermicomposting, 2) study of optimum ratio of organic waste/worm in vermicomposting, 3) study of optimum depth of organic waste for vermicomposting. The organic waste was added once at beginning of the experiment. The vermicomposting was maintained moisture contents at least 50%. The experiments period were 28 days. The result of the vermicomposting showed that worms were able to digest waste materials and volatile solids more rapidly than the composting. The result of the effect of worm quantity can be suggested that 200 grams of earthworm was able to digest rapidly the most of organic waste and volatile solids. The result of organic waste depth found that the suitable depth was 1 cm. The digestion rate was decreased with increasing the depth of organic waste.

I_10040 THE ENVIRONMENTAL FACTORS AFFECTING HYDROGEN PRODUCTION FROM CASSAVA STARCH MANUFACTURING WASTEWATER BY CO-CULTURE OF ANAEROBIC SLUDGE AND

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Abstract: Bio-hydrogen production by fermentation is very promising method based on the low free energy and ability to consume organic substrate from wastewater. This research was conducted to investigate the effect of initial pH, light conditions, stirring condition, reducing agents, nitrogen and phosphorus levels on hydrogen production from cassava starch manufacturing wastewater by co-culture of anaerobic sludge and *Rhodospirillum rubrum*. Initial pH was effected on both hydrogen yield and specific hydrogen production. The illumination did not strongly affect on both of hydrogen yield and specific hydrogen production due to the beneficial effects of the light-dark cycle on nitrogenase. The mechanical stirring condition was enhanced the production of hydrogen. Both of *Enterobacter aerogenes* and L-cysteine was an effective to remove oxygen and generate anaerobic condition in the system. At nitrogen concentration rang 0.1-0.2 M showed the ability for capitalize on hydrogen production in the shorter lag time. An optimum rang of phosphorus level for hydrogen production from cassava manufacturing wastewater by co-culture of anaerobic sludge and *R. rubrum* was rang 0.02-0.04 M.

I_10041 Treatment of COD from offset printing wastewater by agricultural wastes

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Abstract: The research was to study the efficiency of COD reduction from offset printing by agricultural wastes from corncob char, bagasse bottom ash and sawdust bottom ash. These adsorbents were compare with commercial activated carbon can reduce initial COD from 1,277 mg/l to 687 mg/l, 909 mg/l, 689 mg/l and 650 mg/l, respectively. The adsorption properties of carbon products studied was COD adsorption capacity. From the results were 10.11, 7.43, 15.72 and 26.59 mg/g, respectively. The sawdust bottom ash was the highest adsorption capacity. Consequently, the efficiency of sawdust bottom ash increased by activation sawdust bottom ash with potassium hydroxide at impregnate ratio(1:1), 800 °C for 1 hour. The BET surface area increased from 189.57 m²/g to 850 m²/g could enhance COD reduction in wastewater.

I_10042 NITRATE REMOVAL EFFICIENCY AND BACTERIAL DIVERSITY IN THE TUBULAR DENITRIFICATION REACTOR FOR THE INDOOR AQUACULTURE POND

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Abstract: Nitrate accumulated in an indoor shrimp pond containing 7,500 L of seawater was treated by denitrification process using the tubular denitrification reactor (TDNR). The prototype reactor was made of 48 m length PVC pipe with 2.5 cm in diameter and packed with plastic substrate (bioballs) for bacterial attachment. Methanol was supplied as a carbon source for denitrifying bacteria in the reactor. It was found that TDNR could reduce nitrate concentration from 33 mg-N/L to 9 mg-N/L in 55 days. The maximum nitrate removal rate was 4006.8 mg NO₃-N/day. Investigation of bacteria in TDNR using Gram's staining showed that the dominant bacteria were rod-shape and gram-negative. With PCR-DGGE analysis, DNA sequence of 16S rDNA suggested that three of dominant bacteria in TDNR were uncultured bacteria.

I_10043 Potential of Organic Residues from Concentrated Latex, Fish Processing and Palm Oil Industries in the Preparation of Planting Materials for Garden Grass

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Abstract: Main nutrients, total nitrogen, total phosphorus and total potassium in organic residues or sludge in three different types of industries i.e. concentrated latex, fish processing and palm oil industries were investigated. The total nitrogen, total phosphorus and total potassium content in concentrated latex sludge were found at 1.02-2.53, 22.15-48.19 and 0.39-0.60, while those of fish processing factory sludge were found at 4.57, 2.57-3.20 and 0.03-0.22 and those of palm decanter were found at 1.52, 0.26-0.74 and 0.35-0.52 %wt. by dry wt., respectively. Planting materials were prepared from mixing three types of those organic residues at different ratios and tested for their efficiency in garden grass, Nuan noi (in Thai) or *Agrostis matrella* L., growing in order to replace using of ploughing soil. It was found that mixing of organic residues; concentrated latex sludge, fish processing sludge and palm oil factory decanter at 20:20:20 % wt. by wet wt. together with palm fiber and waste office paper at 20% each, could be used as planting material for growing garden grass with survival rate at more than 50% which better than control ploughing soil. The nutrients; total nitrogen, total phosphorus and total potassium content in that mixture were at 0.5, 1.7 and 1.1 %wt. by dry wt.

I_10044 CUTTING FLUID WASTEWATER ADSORPTION BY MODIFIED CHITOSAN BEADS

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Abstract: Adsorption of cutting fluid wastewater was investigated in this work. Chitosan and chemical modified chitosan consist of benzoyl chitosan and quateramminated chitosan beads were chosen as adsorbents. Batch adsorption experiments were carried out as a function of type of adsorbents. The adsorption capacity of cutting fluid wastewater on benzoyl chitosan, chitosan and quateramminated chitosan were 62, 55 and 50 mg/g, respectively. The protonation of amine groups in chitosan, interaction between chitosan through hydrophobic chain was play a role in cutting fluid wastewater adsorption onto chitosan. While benzoyl chitosan and quateramminated chitosan based on binding affinity and electrostatic interaction. Fourier transform infrared spectroscopy and heat of combustion from bomb calorimeter confirmed that cutting fluid wastewater could adsorbed onto all adsorbents.

I_10045 Degradation of heavy oil in seawater by mixed bacterial cultures

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Abstract: Heavy oil is a dense and viscous crude oil with high concentration of PAHs, asphaltenes, and resins. This study used mixed bacterial cultures consisting of *Sphingomonas* sp. AN17a and *Thalassospira* sp. MA18 for degradation of heavy oil. These bacteria were isolated from oil contaminated seawater collected in Japan and found that they can effectively degrade phenanthrene, a type of PAHs. Changes in oil components and number of bacteria populations during treatment were determined by TLC-FID and direct count techniques, respectively. Around 30% of total oil (initial 0.5% W/V) was degraded in seawater containing mixed bacteria and nutrients after 12 days. The amounts of saturates, aromatics, and resins fractions in this treatment were significantly lower than in seawater without mixed bacteria. Meanwhile, the mixed cultures could utilize only small fractions of heavy oil since bacterial number was slightly increased. The results suggested that more nutrients should be applied along with the mixed bacterial cultures for clean-up oil contaminated seawater.

I_10046 Water Quality Management from Seafood Restaurant within Bangkhuntien Chaythaley District

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Abstract: Water quality monitoring seems essential to evaluate the pollution and to control the water quality. Surface water is the one that needs to control the water quality and evaluate the organic pollution. The qualitative indicator that uses for evaluate organic pollution is chemical oxygen demand (COD). To develop the simple, rapid and sufficiently precise method to use as the organic pollution indicator, many studied focused on absorbance measurement at 254 nm by using Ultraviolet Spectrophotometer. To choose the appropriated method as the organic pollution indicator, the correlation between COD and absorbance measurement at 254 nm (OD_{254}) had been studied on 107 surface water and 50 organic wastewater samples. In this study, the results showed COD of surface water and organic wastewater range 14 – 159 mg/L and 22 – 220 mg/L, when absorbance measurement at 254 nm (OD_{254}) range 0.14 – 0.99 and 0.13 – 1.40, respectively. The correlation coefficient (r^2) of the two methods were 0.83 and 0.92. When using the turbidity compensation by subtracting with OD_{546} , the correlation coefficient (r^2) showed 0.84 and 0.94. Using Ultraviolet Spectrophotometer at OD_{254} as the organic pollution indicators for surface water quality and organic wastewater monitoring have been concluded. To use the Ultraviolet Spectrophotometer at OD_{254} in the water quality monitoring for industrial pollution and wastewater treatment plant have been suggested for further studied.

L10048 The applications of natural zeolites for cadmium removal from sample water:

Models on laboratory scale

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Abstract: Five natural zeolites found in the regions of Songkhla and Surathani provinces, Clinoptilolite, Mordenite, Willhensonite, Offretite and Ferrierite, have been applied to remove cadmium ions from sample water, on the basis of experimental models on laboratory scale. Clinoptilolite was used for preliminary study of the adsorption parameters. An hour adsorption time and 40 g/L of the ratio of zeolite per water sample are optimum adsorption parameters with an average cadmium removal efficiency of 91.68 %. The optimum adsorption conditions were then used for other four natural zeolites. The results show that the effective removal sequence can be listed as Offretite \approx Clinoptilolite > Willhensonite > Mordenite > Ferrierite. Clinoptilolite, Offretite and Willhensonite are successfully used to reduce significantly cadmium from sample water with removal efficiency ranging from 87-92%, respectively. Accordingly, the natural zeolites are recommendable adsorbents for highly cadmium removal of industrial wastewater with low cost of wastewater treatments and environmentally friendly chemical processes.

L10051 EVALUATING THE ENVIRONMENTAL QUALITY OF SALT DISTRIBUTION ON THE LOCAL SALT INDUSTRY

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Abstract: Saline water and soils were used to evaluate the environmental quality of salt distributions on the local salt industry in the Northeast, Thailand. The studied areas were covering Nong Khai, Udon Thani, Sakon Nakhon, Mahasarakham and Nakhon Ratchasima province. Chemical parameters, such as EC (electrical conductivity), TDS (total dissolved solid), pH and salinity surroundings the local salt industries of the evaporated salt and solar salt process were studied. The tests were done on site. According to waste brines and bitterns discarding to the local reservoirs, salt production sometimes affects the land contaminated with salinity. The EC of surface water in the creek, which located closed to the local salt productivity process was greater than 15,000 μ S/cm. The TDS was more than 1,000 mg/L. The pH and salinity in the same areas presented in the range of 6.5-8.5 and 10-85 g/L, respectively. Some studied areas in Udon Thani and Nakhon Ratchasima which had a good care of the waste leakage to the surroundings can maintain their production and no infectivity of the salinity.

L10052 REMOVAL OF LEAD FROM WATER BY USING NATURAL ZEOLITES

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Abstract: The removal of lead ion from diluted solutions by sorption on natural zeolites has been studied at laboratory scale. Four natural zeolites, mordenite, willhensonite, offretite and ferrierite, found in the regions of Songkhla and Surathani provinces were used. The results show that an hour adsorption time and 50 g/L as the ratio of zeolite usage per water sample volume are the optimum adsorption parameters at the initial solution concentrations of 0.6 ppm. 100% lead removal efficiency can be achieved in the adsorption systems of mordenite, offretite, and willhensonite. With regard to ferrierite, the removal efficiency is 86.8 %. Based on the preliminary study, it can be seen that the natural zeolites are effectively used for removing lead ion from

water. These findings are beneficial information for practical applications in industrial wastewater treatment with high efficiency and relatively low cost materials.

I_10053 ADSORPTION OF COPPER ION ON NATURAL ZEOLITES

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Abstract: Adsorption of copper ion from sample water has been investigated at laboratory scale by using natural zeolites. Natural zeolites as adsorbents used in this study are mordenite, willhensonite, offretite and ferrierite, found in the regions of Songkhla and Surathani provinces. The optimal adsorption conditions were firstly examined. The results reveal that the optimum adsorption parameters at the initial copper concentrations of 2.5 ppm are an hour adsorption time and the ratio of zeolite usage per water sample volume with 50 g/L. The adsorption efficiency are 100%, 99.70%, 92.81% and 60.15% from the adsorption systems of mordenite, willhensonite, offretite and ferrierite, respectively. On the basis of the present study, it proves that the natural zeolites can significantly reduce copper from sample water on laboratory scale. Therefore, the obtained results can suggest that the use of the natural zeolites as an effective adsorbent with relatively low costs for copper treatment from industrial wastewater.

I_10054 ADSORPTION CHARACTERISTICS OF AFLATOXIN B1 ON COMMERCIAL BENTONITES

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Abstract: The isothermal adsorption of aflatoxin B1 from aqueous solutions on some commercial bentonites at 25 °C have been investigated. The mixtures of 0.25 %w/v were shaken at 200 rpm for 24 hr. The concentrations of aflatoxin B1 solutions used were from 0.50 to 8.00 ppm. Adsorbed amounts of aflatoxin B1 were obtained from the determination of aflatoxin B1 concentration left in the solutions by UV-VIS spectrophotometry. Adsorption behavior of aflatoxin B1 could not applicable to Langmuir model and that mean non-monolayer adsorption approached. The experimental data could be better fit to modified Freundlich isothermal adsorption equation. For studied bentonites, adsorption isotherm plots were S-shaped that could be explained for multiple-site adsorption behaviors. The adsorption capacities were in a range of 1.61×10^{-3} – 4.52×10^{-3} mol/kg and the distribution constants were in a range of 2.52×10^5 – 3.60×10^5 .

J1_J0002 VOLTAGE SAG DETECTION METHOD IN POWER DISTRIBUTION SYSTEMS FOR POWER QUALITY ISSUE

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Abstract: Nowadays, voltage disturbances have occurred in power system because of nonlinear loads, unsymmetrical load and faults. Therefore the detection technique is necessary and useful for improving the power system method. This paper presents the detection techniques of voltage sag that occurred in power system for improving the power quality. There are four types of detection method, namely rms, FFT, peak sequence analysis, dq detection method, and then these methods are compared.

J1_J0003 DESIGN AND PERFORMANCE ANALYSIS OF A PILOT-SCALE VACUUM FRYER

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Abstract: The objective of this work was to design and construct a pilot scale vacuum fryer operating as a batch for 2 kg pineapple chips. The main components of the equipment are 1) frying vessel, 2) preheated oil tank, 3) vacuum pump, 4) condenser, 5) immersion electric heater, 6) oil centrifugal system, and 7) transfer oil pump. The design was based on an energy balance in order to maintain the frying oil temperature at $80 \pm 5^\circ\text{C}$ during the course of frying. The frying vessel was made of 4 mm thickness 304L stainless steel. A cylindrical shape elliptical head was designed to withstand the external pressure. The sizes of the vessel were 40 cm in diameter and 72 cm in height. The external jacket was filled with hot oil, which was heated by an immersion heater rated at 4.5 kW. The sample holder was equipped with a motor to get rid of excess oil by means of centrifugation. The preheated oil tank had a diameter of 30 cm with 68 cm in height. A rotary vane vacuum pump was used to reduce the pressure in the frying vessel to 60 mmHg. Shell & Tube heat exchanger was designed to condense vapor coming from the frying vessel. The performance test was carried out using frozen pineapple chips, which had an initial temperature of -20°C . It was found that the machine worked satisfactorily with the final product moisture content of 4.91 ± 0.28 percent (d.b.) and oil content of 17.04 ± 2.80 percent (w.b.) at 50 minutes frying time. In addition, the maximum temperature fluctuation was found to be in the range of $\pm 10^\circ\text{C}$. The efficiency of the condenser in terms of trapped water was 97 percent.

J1_J0004 A STUDY OF COMPRESSIVE STRENGTH OF CONCRETE USING QUARRY DUST AS FINE AGGREGATE AND MIXING WITH ADMIXTURE TYPE E

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J1

Abstract: This research is related to study the compressive strength of concrete using quarry dust as fine aggregate instead of sand. Ratio of cement: sand: rock is 1: 2: 4 (by weight) and at water-cement ratio (w/c) of 0.45. The admixture type E is added for increasing the compressive strength. Without using the admixture, it is found that the compressive strengths are 275, 260, 241 and 234 ksc for using quarry dust at 70%, 90%, 100% (sieve analysis) and 100% (not sieve analysis) respectively. When the admixture is added, the results of compressive strengths are 292, 287, 276 and 258 for 70%, 90%, 100% (sieve analysis) and 100% (not sieve analysis) of quarry dust respectively. Comparing the compressive strength at 28 days between concrete mixing with quarry dust and sand, the maximum compressive strength is 407 ksc for concrete mixing with 70% of quarry dust while the normal concrete has value of 348 ksc. From this research, the quarry dust could be used to replace sand in general concrete structures.

J1_J0005 USING RICE HUSK ASH FOR DEVELOPING STRENGTH OF ADOBE

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Abstract: This study aims to investigate the compressive strength and the bending strength (or Modulus of rupture) of the adobe brick mixing with rice husk ash. The rice husk ash is added by following contents: 0, 3, 6, 9, 12 and 15 by the total weight of the clay. In addition, the ratio of rice husk is 1: 0.5 by volume of the clay and the water ratio is 1: 1 by weight of the clay. In testing process, the adobe bricks are cast in sizing of $10 \times 15 \times 30$ cm and dried for 48 hours. After that, put the adobe bricks into the sun-dried environment for 14 days and 28 days. By the testing results at 28 days, the edge wise compressive strengths are 1.10, 1.15, 1.17, 1.34, 1.37 and 1.44 ksc, the flat wise compressive strengths are 0.96, 1.04, 1.02, 1.04, 1.09

and 1.08 ksc, the edge wise moduli of rupture are 0.76, 0.80, 0.73, 0.81, 0.74 and 0.85 ksc, the flat wise moduli of rupture are 0.81, 0.85, 0.90, 0.85, 0.90 and 0.89 ksc respectively. This research indicates that rice husk ash could be mixed in to adobe bricks for increasing the strengths.

J1_J0008 Effect of Screw Rotating Speed on the Properties of Poly lactic acid(PLA)/Organoclay Nanocomposites Prepared by a Twin Screw Extruder

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Abstract: This study analyzes the effect of different screw rotating speeds on the properties of nanocomposites prepared by melt compounding PLA with an organoclay in a co-rotating twin-screw extruder. Polyamide 12 was used as an additive. Two different screw rotating speeds, 65 rpm and 150 rpm, were used in this study. According to the tensile strength data, the Young's modulus and tensile strengths of the PLA/clay nanocomposites showed improvement at a screw rotating speed of 150 rpm. The d-spacing of PLA/PA12/Clay nanocomposites was independent of adding PA12. The size of the clay aggregates in the PLA/PA12/Clay nanocomposites is smaller than that of PLA/Clay. On the whole, the higher screw rotating speed (150 rpm) resulted in materials with better performance than the lower screw rotating speed (65 rpm) in a twin-screw extruder and the addition of PA12 showed the most improvement in the tensile strength and thermal stabilities.

J1_J0009 A GUIDELINE ON THE OPERATION OF AN ABSORPTION CHILLER WITH A CHILLED WATER STORAGE TANK

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Abstract: This objective of this research was to find a guideline on the operation of an absorption chiller (AC) with a chilled water storage system in the view of engineering and economics. The studied factory usually used continuously the energy for chilling in the form of chilled water and the thermal energy in the form of a vapor throughout a week. The operation time of the AC was divided into 3 periods: Monday to Friday, Saturday and Sunday in which energy was consumed differently. We compared the operations in 3 scenarios: A, B and C. It was discovered that AC running at mean load (Scenario C) was the optimum. Its payback period, internal rate of return and net present value were 4.89 years, 45.21% and 178.59 M Baht respectively.

J1_J0010 A LOW-POWER HIGH VOLTAGE 2 kV_{dc} DC SWITCHING POWER SUPPLY FOR OZONE TUBE

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Abstract: This paper presents a low-power high frequency high voltage DC switching power supply for ozone tube. The high voltage generating circuit is based on a flyback converter. The converter was designed to operate at 40 kHz switching frequency through a high frequency flyback transformer, a rectifier and filter circuits. The circuit is capable of producing up to 2 kV_{dc}. By adapting the highly nonuniform electric field to the electrode design of the ozone generator, one-hour operating yields the maximum ozone generating capacity of 30 mgO₃/hr.

J1_J0011 Lanthanum Separation by Batch Simulation of Continuous Countercurrent Liquid-Liquid Extraction

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Abstract: Lanthanum (La) was separated from rare earth nitrate solution in dilute nitric acid by the mixture (1.2 M TBP-0.3 M D2EHPA)/kerosene compared with 50%(1.8 M)TBP/kerosene. The separation was accomplished by batch simulation of 6-stage and 8-stage continuous countercurrent liquid-liquid extraction and the flow ratio of the solvent per feed solution (S/F) equaled to two. It was found that when the mixture of TBP and D2EHPA was applied as the extractant, the concentrations and the percentages of La in raffinate from stage-6 and stage-8 were high. Furthermore, %yield of La in raffinate was higher than %yield obtained when 50%TBP/kerosene was extractant. From 8-stage continuous countercurrent liquid-liquid extraction simulation, the purity of La output in raffinate is as high as 97.2% with %yield of 80.2%.

J1_J0013 A Preliminary Study of Preparing Biodegradable Film from Starch

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Abstract: In this research the optimum conditions to prepare films from corn and tapioca starch were determined. It was found that the suitable condition for obtaining gelatinized starch solutions was at temperature around 80-85°C and they were then dried at 100°C for 24 hours. Films from both corn and tapioca starch appeared homogeneous and suitable for utilization. To study the effect of glycerol used as a plasticizer on the properties of the film, starch was mixed with different amount of glycerol to obtain different mass ratio of starch to glycerol of 6:4, 7:3 and 8:2, respectively. As a result, for both types of starch, when increasing the amount of glycerol, both tensile strength and water absorbability of the film were decreased while film flexibility and water vapor permeability were increased. When comparing at the same glycerol content, it was found that the film allowing higher flux of water vapor and higher elongation percentage was from corn starch, whereas the film showing higher water absorption capacity and flexibility is from tapioca film showing higher water absorption capacity is from tapioca.

J1_J0014 ANALYSIS OF 2D FRACTURE MECHANICS PROBLEMS BY FINITE ELEMENT METHOD AND PHOTOELASTICITY TECHNIQUE

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Abstract: Finite element method and photoelasticity technique are presented to predict stress and stress intensity factor for fracture mechanics problems. This paper first describes 2D fracture mechanics theory. Finite element formulations and Q8 element. The computational procedure and its boundary conditions are then represented. Photoelasticity theory and its procedure are described. The validated examples of both techniques are single edge crack plate tension problem and double edge crack plate tension problem. The solutions show the efficiency of finite element method and have a good agreement with the photoelasticity results.

J1_J0019 TRANSMISSION EXPANSION PLANNING WITH ECONOMIC DISPATCH CONSTRAINT

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Abstract: This paper presents a scenario analysis method for transmission expansion planning taking into account an economic dispatch constraint. The method involves postulating practical network topologies which are required in two optimization problems: economic dispatch and transmission investment. The methodology was tested with a 5-bus system. The study results show that a transmission connection scheme can be appropriately identified while satisfying the economic dispatch constraint.

J1_J0022 A STUDY OF COMPRESSIVE STRENGTH OF MORTAR MIXING FLYASH AND USING QUARRY DUST TO REPLACE SAND

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Abstract: This research studies the compressive strength of mortar for the case of without fly ash and 50% of fly ash replacing in cement. The fixed ratios, binding agent to fine aggregate and water to binding agent, are 1: 2.75 and 0.52 by weight respectively. The ratios of quarry dust that uses instead of sand are 0%, 10%, 20% and 30% respectively. Mold of size 5x5x5 cm is used. Cure the mortars in the water. Test the samples when curing at age of 7, 14, 21 and 28 days under ASTM standard. From the results, it is found that the compressive strength increases as age of mortar increases. When using 50% of fly ash, the compressive strength is very low. However the adding of quarry dust results in increasing of compressive strength for the both cases. The best ratio of quarry dust to fine aggregate is 30: 70. This research shows that there is a possibility in well using of quarry dust in concrete work.

J1_J0023 ELECTRICAL PROPERTY CHARACTERIZATION OF ELECTROLYTE MATERIALS IN SOLID OXIDE FUEL CELLS BY AC - IMPEDANCE SPECTROSCOPY

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Abstract: Yttria - Stabilized Zirconia (YSZ) is an important solid electrolyte used in Solid Oxide Fuel Cells (SOFC) due to its good electrical (0.1 siemens/cm at 1000°C) and mechanical properties. The electrical property of YSZ was measured using AC-Impedance Spectroscopy, in the temperature range of 275 – 600°C and over the frequency range of 0.05 – 10⁷

Hz. From the impedance spectra, the bulk and grain boundary resistances of YSZ pellets were significantly influenced by the containing impurities and the sintering conditions. The impurities in the starting powder were analyzed using X-Ray Fluorescence Technique (XRF), while the microstructure was investigated using Scanning Electrons Microscope (SEM). The correlation between the electrical conductivity and sintering temperature from various electrolyte materials was developed. As a result, the AC-Impedance Spectroscopy technique in combination with microstructural investigation can be used to study the electrical property of YSZ effectively.

J1_J0024 SEAL LEAKAGE TEST STATION FOR SEALING MATERIAL IN SOLID OXIDE FUEL CELL

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บทคัดย่อ: ปัจจุบันประเทศไทย ทั่วโลกประสบปัญหาด้านราคาน้ำมันเชื้อเพลิงที่เพิ่มสูงขึ้น ซึ่งราคาน้ำมันดิบเพิ่มสูงขึ้นเฉลี่ยฐาน 70 ดอลลาร์ต่อบาร์เรล และมีแนวโน้มเพิ่มสูงถึง 80 ดอลลาร์ต่อบาร์เรล (กรุงเทพฯ 2 พ.ค. 49) ส่งผลกระทบต่อการเจริญเติบโตทางเศรษฐกิจของประเทศโดยตรง เนื่องจากปัญหาทางการเมืองของประเทศผู้ผลิตน้ำมันในตะวันออกกลาง และน้ำมันซึ่งได้จากธรรมชาติกำลังจะหมดลง จึงได้มีการคิดค้นด้านเทคโนโลยีด้านพลังงานทดแทน คือ เซลล์เชื้อเพลิงแบบออกไซด์ของแข็ง ก่อเกิดกระแสไฟฟ้าโดยการเกิดปฏิกิริยาไฟฟ้าเคมีของแก๊สไฮโดรเจนและออกซิเจน เซลล์เชื้อเพลิงแบ่งเป็น 2 แบบ คือ แบบท่อและแบบแผ่น โดยแบบแผ่นมีประสิทธิภาพสูงกว่าแบบท่อ แต่มีปัญหาในการใช้งาน คือ เซลล์เชื้อเพลิงแบบแผ่นต้องใช้วัสดุป้องกันแก๊สรั่ว เพื่อป้องกันการผสมกันของแก๊สไฮโดรเจนกับแก๊สออกซิเจนที่อุณหภูมิสูง ในการพัฒนาวัสดุป้องกันแก๊สรั่วจึงได้สร้างอุปกรณ์ทดสอบการรั่ว เพื่อใช้ทดสอบอัตราการรั่วของวัสดุป้องกันแก๊สรั่ว โดยอ้างตามมาตรฐาน ASTM F 37 - 89 ซึ่งยังไม่มีการขายสำเร็จรูปในท้องตลาด อุปกรณ์ทดสอบการรั่วแบ่งเป็น 2 ส่วนคือ หน้าแปลนทดสอบการรั่วและระบบทดสอบการรั่ว หน้าแปลนทดสอบการรั่วใช้ท่อเหล็กกล้าไร้สนิมเกรด 316 เชื่อมติดกับหน้าแปลนเหล็กกล้าไร้สนิมเกรด ZMG ระบบทดสอบการรั่วในส่วนที่เป็นท่อนำแก๊สใช้ท่อเหล็กกล้าไร้สนิมเกรด 316 และใช้สายยางแก๊สพีวีซีต่อเชื่อมมอเตอร์เข้ากับท่อนำแก๊สเหล็กกล้าไร้สนิมเกรด 316 พบว่าอัตราการรั่วของระบบมีค่าน้อยประมาณ $3.76 \times 10^{-5} \text{ cm}^3 / \text{min cm}$

J1_J0025 NUCLEAR PULSE WAVE SHAPING WITH DSP DEVICE

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Abstract: Nuclear pulse wave shaper using Digital Signal Processing (DSP) device was developed, in order to obtain a low noise nuclear pulse signal. Referring to the model 2011 Canberra spectroscopy amplifier, the transfer function of its analog filter was analysed. Two techniques of the digital signal processor were designed according to the analysed transfer functions. The first; TMS320C31 DSP starter kit was used; and the second; PCI-1712 data acquisition card with MATLAB programming were performed and combined with the developed program for displaying the signal waveform. The research results showed that the first technique with a DSP starter kit alone could not be correctly shaped pulse waveform due to the limitation of its performance. While the second technique could be shaped the pulse waveform in range of 1 μs to 4 μs continuously shaping time and the unipolar shaped pulse characteristics were similarly with the reference system. The count rate capability of over 10 kcps could be achieved.

J1_J0028 EXPERIMENTAL ON CONCRETE COLUMNS CONFINED WITH STEEL JACKETS SUBJECTED TO CONCENTRIC AXIAL COMPRESSION.

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Abstract: This paper presents the experimental results on the concrete columns and the concrete columns confined with steel jackets under concentric axial compression in order to study the compressive behaviors, modes of failure, and effects of the confinement. Twenty seven specimens were tested in this study. The square columns have the cross section of 150 x 150 mm and the length of 750 mm. The steel jackets have the dimensions of 150 x 150 mm with 3.2 and 4.5 mm thickness. From the tests, it was found that the confined columns with both thicknesses of the steel jackets had similar behaviors. At the beginning, the columns had linear behavior up to 80-90 % of their ultimate strength. After that, the axial shortening and lateral expansion of the columns were increased rapidly. The confined jackets were inflated until the failure of the columns. At the ultimate strength, the confined columns with steel jackets had the loads higher than those of the concrete columns in the range of 42 to 218 %. In addition, it was found that the confinement increased the ductility of the columns.

J1_J0003 STRESS ANALYSIS OF CONTACT PROBLEMS BY USING ADAPTIVE MESHES.

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Abstract: This paper presents stress analysis of contact problems by finite element method and adaptive meshes. Firstly, solid

mechanics theory and finite element formulations for contact problem are described. Then, adaptive remeshing technique is presented. The developed program is validated by two problems, contact between two cylinders problem and contact between rigid square and elastic foundation problem. The finite element solutions have a good agreement with the exact solution of both problems.

J1_J0034 Region of $\pm 0.5\%$ tolerance in Helmholtz coils for magnetic calibration

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Abstract: Standard Magnetic Generator is the most necessary for magnetic calibration process. Many Instruments and sensors used in military, aviation, medication and various sorts of industry demand regular calibration however the number of metrology laboratories providing this service is still inadequate. Consequently, development of standard magnetic generators will affect many relevance organizations. In this research, Helmholtz coils, a selected type of magnetic standard source, is mathematically simulated to find a region of $\pm 0.5\%$ tolerance of average magnetic field at the centre of coils or the region of $\pm 0.5\%$ uncertainty of calibration. Information from this modeling will be the design parameters of real Helmholtz used as reference data for mathematical modeling for calibration and traceability.

J1_J0035 REMOVAL OF CARBOXYLIC GROUPS IN OIL PRODUCT FROM PYROLYSIS PROCESS OF *JATROPHA CURCAS* OIL

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Abstract: *Jatropha curcas* oil comprises mainly fatty acid molecules. When these molecules are pyrolyzed at high temperature, they will break down into a large number of carboxylic groups resided in the pyrolyzed oil product. When applying the pyrolyzed oil to the engine, it may deteriorate the combustion process and causes the corrosion of the engine. The objective of this work was to study the possibility of removal the carboxylic contents during the pyrolysis process, hence removal of carboxylic acids of end oil product. The pyrolysis of *Jatropha* oil was carried out at high temperature under vacuum. The pyrolyzed oil products obtained from the pyrolysis with and without Calcium Oxide were analyzed using GC/MS. The results showed can be removal in the carboxylic contents of the pyrolyzed oil product with a catalyst when compared to the pyrolyzed oil product without a catalyst. The pH paper test was also conducted and in good agreement with the results obtained from GC/MS.

J1_J0037 NUMERICAL INVESTIGATION OF CONFINED IMPINGING JET FLOW WITH REYNOLDS STRESS MODEL

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Abstract: In this research, the applications of the $k-\epsilon$ turbulent model and Reynolds stress model (RSM) for prediction of impinging jet flow characteristic are described. The results of predicted axial and radial velocity profiles are compared with the experimental data. The computations indicated that the results predicted by both turbulence models are in good agreement with the experiments but the RSM performs better agreement in comparison with the experimental data. Moreover, effects of grid independent on prediction are also reported.

J2

J2_J0001 EVALUATION OF CONVECTIVE HEAT TRANSFER COEFFICIENT OF GREEN PEPPER DRYING UNDER NATURAL CONVECTION

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Abstract: In this paper, an experiment has been made to evaluate the convective heat transfer coefficient obtained by green pepper open sun drying (natural convection). Values of the constants, C and n were obtained by a linear regression analysis from experimental data determined. Based on the values of C and n convective heat transfer coefficient of green pepper drying was $6.28 \text{ W/m}^2 \text{ } ^\circ\text{C}$.

The experimental conditions are $Pr = 0.7$ and $1.3 \times 10^2 < Gr < 4.43 \times 10^2$

J2_J0007 SIMULATION OF HEAT TRANSFER OF LIQUID FOOD IN A BELL SHAPE CONTAINER.

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Abstract: Transient temperature and velocity profiles of jelly liquid contained in a bell shape container were simulated during pasteurization process in order to study the movement of the slowest heating zone (SHZ). Navier-Stokes equations for a Newtonian fluid with varying density and viscosity as well as the energy equation were numerically solved using a commercial Computational Fluid Dynamics (CFD) package, FLUENT®. Natural convection showed a strong effect on the liquid flow patterns and the movement of the slowest heating zone. During heating for 1500 seconds the SHZ moved from the core of the container to the bottom and eventually stayed at a region, which is about 5-20 percent of the container height from the bottom and about 10-60 percent from the central line. The simulated temperatures at various locations were validated with the experimental data. The simulated results showed a good agreement with the observed data with an error of less than 1 percent.

J2_J0012 MATERIAL PROPERTIES IMPROVEMENT OF LANNA UMBRELLA PRODUCTS.

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Abstract: Nowadays, Lanna umbrella is increasingly developed by Bor Sang Group to obtain several designs and to expand the manufacture to an industrial scale. Owing to the unique characteristics and the beauty of the lanna umbrellas, several countries imported them in a rather large scale. However, the life-time of the beautiful umbrellas are limited by quality of the materials. All materials can be destroyed by mold fungus but bamboo can also be destroyed by insects. The general properties of the materials (Sa paper, raw cloth and artificial silk) for covering the umbrella structure don't readily reach good standard qualities in cases of waterproof, heat retardation and UV protection. Improvements of the quality of all materials are investigated to obtain the long-life Lanna Umbrella for general purposes. Attempts at investigation to improve the general properties of bamboos, Sa paper, raw cloths and artificial silk in terms of anti mold fungus, insect protection, waterproof, heat retardation and UV protection were made by treatment with chemical solutions and surface coating materials to achieve the more efficient Lanna Umbrella for general purposes. With respect to bamboo bars and pieces, it was found that the most suitable sample treatment conditions that provide the best anti mold fungal activity were soaking the bamboo bars in 1% vinegar or 1% detergent solution for 6 hours and soaking the bamboo pieces in 2% copper sulphate solution for 6 hours. When bamboo bars and pieces were soaked in a mixture consisting of shell-dite (1:60) and ROCIMA243 (1:120) the best anti insect activity of the treated bamboos was obtained. It was found that the raw cloths treated with 3% solution of wood charcoal ash extract for 6 hours provided the best anti mold fungal activity. With respect to the preservation of artificial silks by treating with the chemical solutions in the same manner as with raw cloths, it was found that they exhibited the very strong anti mold and fungal activity probably owing to the artificial silks provide insufficient nutrients for mold and fungi to grow. The materials for covering umbrellas were treated with various chemicals and surface coating materials to find out the most suitable substances to improve the properties of the materials in terms of waterproof, heat retardation and UV protection. Evaluation by Multiple Attribute Decision Making, the most suitable coating material for Sa papers and raw cloths was tin oxide gel followed by urethane (3:1) whereas that for artificial silk was 1% PMMA.

J2_J0015 A FABRICATED PZT ACOUSTIC EMISSION SENSOR FOR PIPELINE LEAKAGE MONITORING.

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Abstract: A fabricated acoustic emission (AE) sensor using lead zirconate titanate (PZT) and its application for pipeline leakage monitoring are presented. The experiment on pipeline test leak between the different pressure conditions and the sizes of cavity show that the fabricated PZT-AE sensor has a potential and can be detected the leakages in pipeline. Therefore, the proposed PZT-AE sensor offers an alternative for Non-destructive testing (NDT) particularly pipeline leakage monitoring applications.

J2_J0020 Modification of Pore Size of SBA-15 Mesoporous Silica Produced from Rice Husk Ash

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Abstract: The pore diameter of SBA-15 mesoporous silica synthesized from rice husk ash has been modified by using swelling

agents such as 1,3,5-trimethylbenzene (TMB), 2,3,4-trimethylpentane (TMP), tetrahexylammonium bromide (THB) and N,N-dimethyldecylamine (DMD). The hydrolysis-condensation temperature of 35°C and hydrothermal treatment temperature of 110°C are the optimum synthesis temperatures. The effects of swelling agents were investigated for expanding the SBA-15 pore diameter. The swelling effect can be arranged in order as follows: TMB > TMP > THB > DMD. Maximum pore diameter of SBA-15 is approximately 31 nm when TMB was used as the swelling agent.

J2_J0021 THE POWER GENERATION BY BIOMASS GAS ENGINE FOR APPLICATION IN PRODUCTION PROCESS OF SMALL-SCALE COMMUNITY INDUSTRY

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Abstract: The aim of this research is to study the biomass gas engine system for power generation which is applied in the production process of small-scale community industry. Results showed that the system should be composed of Imbert-type gasifier of 1 m³ with screw pressed for fuel feeding, cyclone, ash hopper, wet scrubber, volatile matter bank, gas cooling system, gas filter, gas engine of 1,425 cc and generator of 10 KWe. The used gasifier in this research is fixed bed downdraft and steam is used as an agent for gasification process of sawdust of rubber wood from wood processing industry in Phatthalung province.

J2_J0026 Development of physics experiment set controlled by microcontroller for data detection and calculation

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Abstract: Measurement in many of physics laboratory sets can not be done accurately due to human being's error and his or her physical constraint. Time or period measurement is one of those problems. Detecting data by experimenter's eye and his finger to start and stop timer watch is not good practical approach especially for case that the time value is small. Microcontroller based circuit with appropriate sensors module matched with that experimental set have been developed for measuring time period automatically. This automation system has not been only designed for this purpose but also for other mean of measurements. By changing the proper sensors and software written for specified requirement will make this system be a general purpose data collecting system. Pendulum motion experiment was selected for testing its workability. To enhance this system's functions, data can be transferred to database in microcomputer for later calculation. Graphical report can be shown on monitor or printed on paper too.

J2_J0027 Electroforming Technique

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J2

Abstract: Electroforming Technique is the forming of objects in 3 dimensions by using metal coating or plating technique on non-conductive materials such as wax work-piece. The work-piece is then heated to melt the wax from the original 3 dimensional metal-plated workpiece. The advantage of this technique is that the work obtained is more finely-detailed than that of the casting or molding, securing all the details of the original work. In addition, the work will be lighter in weight, saving many times the metal content required in the molding technique. With the principle required, the researching team has therefore conducted the study on the impact of electric current, plating time, the size of the work-piece, and the proper condition of electroforming technique, by using electric current in the range of 0.1-0.4A with the plating duration of 60-180 minutes and the sizes of the workpieces of 1.72 cm, 6.99 cm and 15.48 cm respectively. According to the study, it is found that the proper condition of electric current is 0.2A providing shiny and smooth surface with good cohesion in the workpiece. The longer the workpiece is subject to the plating; the higher the degrees of thickness, shininess, and smoothness are. When the electric current is increased, the thickness is increased along the edge than in the inner area of the workpiece; however, electric current exceeding 0.4A, contrary to the earlier outcome, results in matt, irregular and even burnt surface. The purpose of the study of this technology is to apply the knowledge gained to handicrafts and jewelry products in Thailand.

J2_J0029 THERMAL PERFORMANCE OF A SMALL SCALE SOLAR PHYSIC NUT DRYER

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Abstract: The purpose of this research is to investigate the thermal performance of a small scale solar physics nut dryer which is described in terms of drying air temperature, drying rate and drying time. Initial and final moisture contents were also investigated based upon the AOAC standard. It was found that the initial and moisture contents of the physic nut were about 32.06%db. and 5%db. respectively. Under typical ambient condition of Phattalung province, the drying air temperature was about 55 °C when the solar radiation intensity was about 700 W/m². Furthermore, the drying time was about 9 hr.

J2_J0031 Effect of Glossy and Matte Coating for Plain Paper on Inkjet Print Quality

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Abstract: The objectives of this study are 1) to produce glossy and matte coating materials for inkjet paper, 2) to study paper surface properties after coating, and 3) to compare the inkjet print qualities among plain paper, coated paper and commercial ink jet paper. Acrylic resin as a binder was mixed with polyvinyl alcohol for glossy coating, and mixed with fume silica for matte coating. Each 100-gram plain paper was coated using a bar coater with a film thickness of 4 µm and printed with an ink jet printer. The results showed that print qualities of coated paper were significantly better than that of plain paper. The glossy coated paper showed better coating adhesion, more sharpness, less color shift, and better ink rub resistance than did the matte coated paper. However, the matte coated paper indicated faster ink drying, more color saturation, more light fastness and higher print contrast. Compared with commercial inkjet paper, the matte coated paper had higher color saturation and less color shift, but longer ink drying time.

J2_J0032 PERFORMANCE STUDY OF SOLAR FORCED CONVECTION PADDY- DRYER

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Abstract: The research is aimed to study the performance of forced convection solar dryer for paddy drying in Phatthalung province. The results indicated that the system is continuous hot air flow rate. Paddy, Chai-nat 1, was successfully dried in developed system. The average hot air temperatures were 35 °C. Drying time was 8 hour for paddy drying from moisture content of 25 % d.b. to 5 % d.b. The efficiency of the whole unit obtained was 49 %. This drying technology is suitable for small-scale process of dried paddy in the southern area of Thailand.

J2_J0036 THERMAL PERFORMANCE A SOLAR ASSISTED ELECTRICAL CHILLI DRYER.

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Abstract: This research studies on thermal performance of hybrid dryer for chilli dryer. By a usage for a force-convection solar and an electrical dryer. It demonstrates that it is one of drying technologies suitable for drying chilli of small-scale process in southern areas. Four cases were investigated, namely, hybrid dryer as air recycling and no air recycling, solar dryer as air recycling and no air recycling, respectively. Experiments were set up in order to study of temperature, initial and final moisture contents, drying rate, and specific energy for chilli drying, at a fixed drying air temperature of 50 °C. The results also revealed that the optimized drying rate in the first case. Drying time was 9 hours for reducing the moisture content from 109.42 %db. to 31.98 %db. The solar radiation intensity was found to be 500 W/m². Finally, the specific energy was 679 MJ/kgH₂O_{evap}.

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K1_K0023 POPULARIZATION OF SCIENTIFIC DISCOURSE: COMMUNICATING HEALTH SCIENCE IN THAILAND

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Abstract: This paper explores an issue of science popularization in Thailand, gauging the effectiveness of texts and to find the guidelines that would enhance it. Sixty five articles on health science have been collected for analysis. Four major problematic textual features have been revealed: reiteration of known facts, oversimplification, excessive details with high degree of complexity and excessive usage of technical terminologies.

K2_K0001 Development of an Instructional Set for a Laboratory in Biology Course for First-Year Thai Science Student Teachers

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Abstract: The objectives of this case study research are (1) to study the instructor's regular practice and beliefs in teaching and learning in a Laboratory in Biology Course and investigate first year Thai science student teachers' biological concepts, the nature of science concepts, science process skills and attitudes towards biology after they have participated in the course, (2) to create the guiding principles to develop an instructional set based on a learner-centered approach for the Laboratory in Biology Course from the findings of the first objective of the study, the National Education Act, 1999, and a review of documents and related research reports, and (3) to develop an instructional set for the Laboratory in Biology Course for Thai science student teachers based on the guiding principles generated from the second objective. The research study was conducted from June 2003 to October 2005.

The findings revealed that the regular practice in the Laboratory in Biology Course was teacher-centered and emphasized the promotion of biological concepts. The participant instructor believed that science student teachers must have correct concepts before doing laboratory activities. After the science student teachers participated in the course, their biology concepts were mostly in form of partial understanding and alternative conceptions were found in every topic. The science student teachers' nature of science concepts were mostly appropriate. Most science student teachers had better skills in interpreting data and drawing a conclusion than identifying problems, formulating hypotheses, identifying variables and designing an experiment. Their attitudes towards biology were mainly found to be positive. From these findings, a consideration of the National Education Act, 1999 and a review of documents and related research reports, ten guiding principles for the development of an instructional set for the Laboratory in Biology Course based on a learner-centered approach were generated. The instructional set was comprised of an instructor manual, a student activity book and a student thinking book.

K2_K0002 TECHNICAL TEACHER SKILLS AND KNOWLEDGE DEVELOPMENT MODEL.

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K1

Abstract: The objective of this research is developing the technical teacher skills and knowledge model. The research procedure is divided into 2 stages : The first stage is to studying the technical teacher skills and knowledge model through 114 population who are executives and instructors of Industrial Education Faculty from 4 institutes includes King Mongkut's University of Technology Thonburi, King Mongkut's Institute of Technology Ladkrabang, King Mongkut's Institute of Technology North Bangkok, and Rajamangala University of Technology. The subject is purposively from executives and instructors who have over 5 years experience in this field. Research instrument is a questionnaire concerning opinions toward the model. The research result is the new model. The second stage is prepared for model development and evaluation by developing model based upon the research result from the first stage. The model is afterward evaluated by 13 experts. Evaluation instrument is questions concerning the model. The research finding points out that the experts are consensus with the model in the first stage. The research result reveals the technical teacher skills and knowledge model consisting of self-management skills and knowledge, cooperative skills and knowledge, and technical skills and knowledge.

K2_K0004 AN APPLICATION OF THE LOCAL SCIENTIFIC WISDOM TO DEVELOP THE LEARNING RESOURCE ABOUT ELEPHANTS AT SURIN ELEPHANTS VILLAGE

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Abstract: The objectives of this research were:

1. to choose the knowledge resource by brainstorming and extract the knowledge, the local wisdom, and the local scientific lesson on Surin elephants from the findings of the 2004 research,
2. to apply them to the learning sets of Surin elephants, and
3. to experiment by using the learning sets in the knowledge resource, and to develop the sustainable knowledge resource in Surin elephants village continuously.

The participants were a researcher team and students from Surindra Rajabhat University, teachers and students from three secondary schools and seven primary schools near by, and the inhabitants of Surin Elephants Village. The methods employed were brainstorming, in-depth interview, focus group discussion, workshops, experiment and research with the aim to try out the learning sets on the knowledge resource. It was found that:

1. Ajeing Buddhist temple was the suitable place for the knowledge resource and the laboratory for natural science.
2. The results of the knowledge extracts conformed with the local scientific lessons on Surin elephants from the findings of the 2004 research, in four units.
3. The application of this knowledge from the findings of the 2004 research, was varied in accordance with the form of learning process in each unit was the suitable for place in Ajeing Buddhist temple etc., tale, game and sheet of knowledge.
4. The learning sets were divided into twelve topics in the primary schools, and ten in the secondary schools.
5. In the higher education level, two research papers and two experiments were completed.
6. The results from using the learning sets showed that both teachers and students had better knowledge about Surin elephants. They achieved scientific skills. They realized the important of the knowledge resource in the temple. They were well aware of Surin elephants conservation. The teachers and the students were satisfied with these learning sets most.

K2_K0005 IMPROVING THE STUDENTS' SKILLS IN DRAWING THE FISCHER PROJECTION FORMULAS OF TWO-CHIRAL MOLECULES BY ILLUSTRATING THE 3D ANIMATION MOVIE OF THE FORMULA CONVERSION.

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Abstract: In the Stereochemistry experiment in Organic chemistry laboratory 2, the 3D animation movie was used to assist the illustration of the conversion of the wedge formula of two-chiral molecule into the Fischer projection formula. The students' learning skills in drawing the Fischer projection formulas from the corresponding wedged formulas were comparatively measured. The results of the measurements showed that the 3D animation movie helped 71.43 percent of the students to draw the Fischer projection rightly.

K2_K0006 Computer tools for science communication and education

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Abstract: This poster presentation is intended to help science educators learn about the instructional use of computer tools to promote problem-based science teaching and learning. The presentation will focus on the utilization of following computer tools in science and technical education and research: "semantic tools" to represent knowledge, "modeling tools" to find and test relationship in complex system and to make predictions about mathematical, physical, biological, and environmental system, and "argumentation tools" to observe, model, and promote explanatory coherence of reasoning.

K2_K0009 Development of Molecular Models from Atoms in Molecules Theory

โกวิท กิตติวุฒิกิตต์ พรรณศิริ คำโอ ณัฐพร สุวรรณพจน์ และ รัชณี รวมเดช

สำนักวิชาวิทยาศาสตร์ มหาวิทยาลัยวลัยลักษณ์ 222 ตำบลไทยบุรี อ.ท่าศาลา จ.นครศรีธรรมราช 80160

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Abstract: Molecular models based on Atoms in Molecules Theory were constructed in both X3D and real models for functional group demonstration. The molecular surface was iso-electron density at 0.01 au. and the surfaces that divided the molecule into functional groups were inter-atomic surfaced calculated by MORPHY. The real models were created from computer models by a rapid prototyping machine. These models will be employed as teaching and learning media about molecules in fundamental science curriculum by Institute for the Promotion of Teaching Science and Technology (IPST).

K2_K0010 Research and Development of Science Learning Unit on Biodiversity in Nong Han, Kumpawapi, Udon Thani for secondary and university levels

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Abstract: The objectives of this participatory action research were: to study community context, life styles and local wisdom concerning biodiversity in the Nong Han wetland, to construct new knowledge of local science on diversity and to develop the learning unit on diversity for secondary and university levels, and to extend this results of the study to other educational institutes. The duration of time was during November 2003-September 2004. Results of the study are as follow: community context, life styles and local wisdom showed that most local people were rice farmers, fishermen and agriculturalists. Most of them conserved local arts and culture as Candle Festival etc. Local science on biodiversity in this area was: biodiversity of birds were 107 species within 55 species of local birds, 52 species of migratory birds, water plants were 50 species, Fish were 44 species, phytoplankton were 90 species, zooplanktons were 37 species, and benthos and periphyton were 39 species. From this study, Learning units on biodiversity for secondary and university levels were constructed and they comprise: (1) Learning kits on biodiversity in the Nong Han wetland: water plants, fish and birds, (2) Instruction Manual on surveying natural habitats for secondary students on biodiversity of birds in the Nong Han wetland, Kumpawapi, (3) Instructional Material of birds, (4) Laboratory Directions for students on biodiversity of phytoplankton, zooplankton, water plants, fish, benthos and periphyton. The results of this study can be distributed to other 10 educational institutes in the Northeast of Thailand in terms of expanding the idea of studying local wisdom which brings about the fruitfulness of local community.

K2_K0011 ILLUSTRATING THE DIMENSIONS OF THE BONDING MOLECULAR ORBITALS OF ETHANE, ETHENE, AND ETHYNE BY USING THE 3D ANIMATION MOVIES.

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Abstract: In teaching Organic chemistry 1, the instructor developed the three 3D animation movies to illustrate the virtual models of the bonding molecular orbitals of the carbon-carbon bonds in the molecules of ethane, ethene, and ethyne. The created movies illustrated the dimensions around the bonding molecular orbitals. These computer assisted instruction (CAI) media could excite the students in class well.

K2_K0012 Development of Web-Based Instruction for a Hardware Computer course

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Abstract: The research aimed to develop a Web - Based Instruction (WBI) for the computer hardware lesson, which was a part of the subject *Information Technology* at Chiangrai Rajabhat University. Tools used for developing the system were Macromedia Dream Weaver MX as web editor for both HTML and PHP tags and commands and MySQL for data based management and PHP language. This program was divided into two sections: learner control and instructor control. In the first section, registered students were able to study the course content and play the millionaire game for earning the test scores. Lecturer could create his online subject material directly to the system and was able to check the test scores of individual student in the latter section. There were 200 undergraduate students participated in this system. The evaluation result revealed that the system has worked properly and met all the required functions.

K2

K2_K0013 DEVELOPMENT OF ENVIRONMENTAL EDUCATION LEARNING MODEL TO ENHANCE KNOWLEDGE ATTITUDE AND BEHAVIOR ON WATER RESOURCES OF LOWER SECONDARY SCHOOL STUDENTS IN SAMUTSONGKRAM PROVINCE

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Abstract: This study is a research and development which aims to develop environmental education learning model to enhance students' knowledge, attitude and behavior on water resources. In this learning model, the content is integrated to environmental problems in the community, student - centered, and using inquiry based approach. The study's goals are to study and develop learning model to provide capacity building in environmental science for students, educators and communities, as well as to construct and strengthen educators' network in science and environmental education for life long learning. In addition this model will enhance knowledge, attitudes and behaviors about water resources of middle school

students who will be the key person for sustainable development in environmental education.

Five schools are involved in this study. Teachers in each school developed their own curricula for teaching their students with supports from the researcher team who acted as facilitators. Researchers act like mentors for supporting before, during and after learning model development. Small group discussions, school visits, trainings, seminars, workshops, demonstrations, and instructional materials supports were activities that provided for teachers who involved in this study. Five different learning models were developed according to teachers' plan. After implementation of their learning model on environmental education, t-test analysis was performed. Independent t - test was used for evaluate students' knowledge, attitude and behavior on water resources between students who participated and did not participate. The results show statistical significant difference on knowledge, attitude and behavior between students who participated in this study and control students ($P=0.001$). Students who participated had higher performance than students who did not participate. Thus, paired t - test was used for testing students' knowledge, attitude and behavior on water resources before and after attending teaching and learning by using developed learning models. The results show that after learning models implementations students had statistical significant higher overall knowledge, attitude and behavior than before ($P=0.001$).

K2_K0014 DEMONSTRATION APPARATUS OF ATOMIC FORCE MICROSCOPE FOR NANOSCIENCE STUDY

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Abstract: We have designed and invented the demonstration apparatus of Atomic Force Microscope (AFM), aiming to introduce high-school students into the nanoscopic-level forces. Our objective is to create something which can persuade them to have interest in the field of nanotechnology. This AFM demo kit is constructed from simple materials, available at street shops. The principle of the demonstration apparatus is not complicated and it is quite easy for K12 students to understand. However, the main basic principle of the real AFM is still preserved in this AFM instruction kit. From the experiment, the image of surface is rather different from real substance. The height of substance will appear sharply. Image filter as a tool in MATLAB is employed to modify the image of the surface. So, the image of surface after using the filter is in agreement with real substance within 1 cm resolution.

K2_K0015 Development and Implementation of A Program for Primary Teacher Professional Development on Instruction of Nature of Science

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Abstract: This research is a study of development and implementation of a professional development program on lower primary school teachers' understanding and instructing of the Nature of Science (NOS). Case study and action research were employed as research method in the development and implementation of the program. This program was constructed based on prior understanding and instructing of NOS of four participant teachers found from case studies. It was found that before participants attended the program, they had mixed traditional and contemporary views of science, held partial understanding of science processes and process skills, and struggled in integrating and teaching conceptions of NOS explicitly in science classes. These primary data guided the program designing and development cooperating with consideration of Thai science standards documents, the effective teacher development model and approaches based on the social constructivist perspective, the explicit instructional approach for NOS, and content framework derived from NOS conceptual scheme and general agreed characteristics for NOS instruction. After the program has been audited and improved based on suggestions of experts in science education, it was implemented by researcher with the same participants who participated in the case studies. Action research method was used to find out program's effectiveness. From the implementation of the program, it was found both advantages and disadvantages which provided insight for the improvement of the program.

K2_K0016 COMPUTER ASSISTED INSTRUCTION (CAI) FOR MASS SPECTROMETRY

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Abstract: A computer assisted instruction program for mass spectrometry was developed by using Authorware 5.0, Adobe ImageStyler 1.0 and Adobe Photoshop 7.0. The contents included the basic theory, the instrumentation and the interpretation of mass spectra. The program was also provided examples, and exercises, with emphasis on mass spectra interpretation to determine the structure of unknown compounds and solutions for self study. The software improved the efficiency in learning and teaching this aspect of chemistry.

K2_K0017 REINFORCEMENT FOR THAI STUDENTS TO UNDERSTAND CONCEPTS IN PROTEIN PURIFICATION BY A VIRTUAL CLASS PROGRAMME TRANSLATED INTO THAI

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Abstract: Purification of protein from a complex mixture is an important step in biochemistry. A JavaScript simulation programme has been written by Andrew G. Booth in English to reinforce the concepts involved in protein purification for the second-year students in the University of Leeds, UK. This programme was not developed for self-learning; therefore, students need to have at least the concepts of protein purification before hand. In 2005, the newly written programme using Python was translated into various languages including the Thai one. The translation from the original into Thai, however, is constrained by differences between the characteristics of two languages such as structure and semantics. The first generation of Thai version was aimed to teach undergraduates, the same as that in the UK. However, most undergraduate students in Thailand learn only a few theories and carry out no experiment on protein purification. Therefore, a mixed population of postgraduates and undergraduates was taught with English-Thai programme. This bilingual programme could help Thai students to better learn the concepts of protein purification as determined by an overall favourable feedback towards this programme with a mean of 3.94. In the students' opinions, this programme can also help them to plan the protein purification experiments and future research. The Thai version has thus been used to be a concept guide in protein purification and has been taught at both undergraduate and postgraduate levels.

K2_K0018 The Conceptual Understanding of Light Refraction of Thai High School Students

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Abstract: This research shows the results of an investigation in conceptual understanding of light refraction of high school students in Bangkok. This is done by using the conceptual test which comprises of a series of open-ended questions. The results from the investigation show that the tendency of students misunderstandings in light reflection are the same for each high schools. Moreover, some of them can not apply the refraction principle for light phenomena. The results of this research are useful for the improvement of an appropriate teaching method. They can be used as a guide to design the apparatus and the learning process of refraction of light.

K2_K0019 The Use of Interactive Lecture Demonstrations in Force and Motion to Teach High School-level Physics in Thailand

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Abstract: This paper presents the results of an experiment using the microcomputer-based interactive lecture demonstrations (ILDs) to teach force and motion for 133 high-school students in Bangkok in the second semester of academic year 2004. To evaluate the effectiveness of the ILDs, the Force and Motion Conceptual Evaluation (FMCE), which was translated into Thai language, was administered to the students at the beginning and the end of the ILDs. The results indicated that, after using the ILDs, there was a 0.26 normalized gain in student's performance, while, by using lecture, there was 0.12 normalized gain in student's performance. In particular, there were very high gains in the topic of acceleration and Newton's third law. The study suggests that the ILDs can help high-school students develop conceptual understanding of force and motion.

K2_K0020 Investigation of students' Misconception in Direct Current

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Abstract: In this research, we will present the results of the study of misconception of direct current by using the Electric Circuits Concept Evaluation (ECCE) with the first year students of Rajamankala University of Technology Bangkok. The ECCE standardized test, developed by Ron Thornton and David Sokoloff at Oregon University was used to test students' understanding in the concept of direct current. The translated version of the ECCE was used with Thai first year civil engineering students at Rajamankala University of Technology Bangkok.

The standardized test was used before and after the traditional teaching on the topic of direct current. The results show that many students have misconception in fundamental topics such as brightness of bulbs in parallel circuit, potential difference across the bulb in series circuit, and current through bulbs in complex circuit.

The analyzed results from the test show poor student performance. This indicates the need for new teaching method in the topic of currents to make student gain better understanding in the topics of the direct current.



K2_K0021 INTEGRATING HANDS-ON YEAST BIOCONTROL OF PLANT DISEASES IN BIOLOGY COURSE OF GRAD 11 CLASS

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Abstract: The knowledge of yeast biocontrol of anthracnose disease in chili fruits has been used to create a hands-on learning model for biology course in the topic of organism interrelationship of Grade 11 class. This aimed to enhance conceptual understanding, critical thinking ability and to evaluate the attitude of students toward hands-on biocontrol. Multiple choice test with reason explanation was used to assess the conceptual understanding and the ability to think critically of students was evaluated by holistic critical thinking scoring rubric constructed by Facione (1994). The results from t-test analysis indicated that the treated group (32 students) studying hands-on yeast biocontrol had higher conceptual understanding and critical thinking ability than the control group (31 students) taught by lecture only with significant differences at $P < 0.05$. Moreover, students of the treated group showed positive attitudes toward the learning model with most agreement in the case of hands-on biocontrol help them practice their scientific skill.

K2_K0024 SCORM 1.2 CONFORMANCE CONTENT: VELOCITY AND ACCELERATION

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ABSTRACT: The objectives of this study were (1) to develop SCORM 1.2 conformance e-learning content in physics on the topic of velocity and acceleration based on 85/85 efficiency criteria, (2) to compare the students' achievement prior to and after learning this e-learning content, (3) to determine the students' opinion on this E-Learning. The first group of sample consisted of 70 students of Burapha University, Chanthaburi campus (selected by simple random sampling) and the second group consisted of 50 high school students from Chanthaburi and Trad provinces (selected from students who have computer at home). Both groups were students in the second semester of the 2005 academic year. The instruments were the SCORM 1.2 Conformance e-learning content on the topic of velocity and acceleration, an achievement test, and a questionnaire on students' opinion toward the e-learning content. Statistics for data analysis includes E1/E2, mean, standard deviation, and T-test. The results showed that (1) the efficiency of the e-learning was at 85/85, (2) students' achievement after learning was increased significantly at the 0.05 level, and (3) this e-learning content is more interesting than the traditional method and it encourages learners to develop and improve their learning outcomes

K2_K0025 COMMUNITY EMPOWERMENT FROM THE COMPETENCY BASED STUDENT-CENTERED LEARNING MODEL

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Abstract: A competency based of student-centered learning module for community empowerment was developed within the course of the Clinical Microbiology and Immunology, Department of Clinical Microbiology, Faculty of Medical Technology, Mahidol University. The main objective of the module was to gain learning skills and competency development of the Medical Technology (MT) student to transfer general microbiology knowledge for the purpose of community health promotion.

Learning based was set up into 3 platforms in the community of Klongmai, Sampran District, Nakhonprathom province. These included (i) Infectious disease knowledge for the community by the poster type; (ii) Microbes in daily life and food production involvement; and (iii) Demonstration of microscopic microbial examination and hand washing practice. All together, 50 residents of the Klongmai community, and 80 MT students were as the target group of this model. By after action, interview and questionnaire responding, 68.57% the MT student aware of the significant role playing of Medical Technologist for community health promotion. Among this, 55.71% gained their confidence to play part as a leader for empowerment team which was five fold increasing as compared to the pre-action survey. Meanwhile, a two fold increasing, 58.57% of MT student demonstrated their competence as an efficient team-worker.

K2_K0026 COLLECTION OF GEOLOGICAL SAMPLES FOR THE ROCK GARDEN MUSEUM

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Abstract: The Geological Museum of Geotechnology Department has been established since 2001. The purpose of this museum is to display and use as teaching and learning media for students and school teachers in the vicinity. The

small specimens are displayed in the museum, whereas the large ones are exhibited outside as the rock garden. The specimens were collected from various geological field trips and field works. These geological collections were identified and classified into 8 categories including volcanic rocks (1), mainly collected from Buriram; intrusion rocks (2) and metamorphic rocks (3), taken from Loei and Petchaboon; sedimentary rocks (4), collected from the Khorat Plateau in the Northeastern region; meteorites and tektites (5), basically found on gravel beds; fossils (6); gems, collected from (7) and economic minerals (8). The Museum and rock garden can serve as the education resources for earth science education.

K2_K0027 STUDENTS' UNDERSTANDING ON OPEN-ENDED QUESTIONS IN SOUND WAVE

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Abstract: This research presents students' performance on a series of open-ended questions in sound wave. The sample of this study is a group of 44 Matthayom six students who had learned sound wave. The questions in the test are a series of open-ended questions related to the principles of sound wave. The results show that many students have misconceptions on the principles of sound wave. The most common misconception is students' explanation on the relationship of speed, frequency and wavelength. They believe that the speed of sound depends on the frequency of vibration of the medium and also wavelength. Moreover, the results show that students use wave diagrams to describe the displacement of the medium causing them to believe that sound wave is a transverse wave.

K2_K0028 Teaching and Learning using Conceptual Change Perspectives to Promote Grade 10 Students' Understanding and Problem-Solving Skills of Stoichiometry

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Abstract: Stoichiometry is one of the most important topics in chemistry. The literature suggests that many students have difficulty in understanding and applying the stoichiometry concepts. In this work we identified Thai student conceptions for stoichiometry using a purpose designed questionnaire - the *Stoichiometry Concept Questionnaire*, and then we report the development of a series of stoichiometry learning units (SLUs) which seek to enhance students' understanding of, and problem-solving skills in, stoichiometry. Conceptual change theory was used as the theoretical based for the development of the units, in which we drew upon a situation analysis of students' understanding and problem-solving skills, along with observation of teaching and learning when designing the SLUs. The units were implemented by three volunteer teachers in three Grade 10 science classrooms from three different schools. The results of the evaluation suggest that the units offer an alternative for the teaching stoichiometry and helping students develop their understanding, and enhancing their problem-solving skills, of stoichiometry.

K2_K0029 SIMPLE DEMONSTRATION APPARATUS AND HANDS-ON ACTIVITY FOR CONSTRUCTING CONCEPTS OF SCANNING PROBE MICROSCOPES.

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Abstract: The simple demonstration apparatus were constructed and hands-on activity was set to improve in the concept of scanning probe microscope. The first activity, "attach me please", aims to demonstrate the moving atom by scanning tunneling microscopy (STM) with actual scaling. The cylinder with diameter of 50 cm was used to represent the tip with solenoid wired around soft iron at the tip edge. Sphere iron ball with diameter of 1 mm was employed as an atom and was shaking up and down as analog for thermal vibration. The second activity, "where is the surface?", aims to demonstrate the principle of STM by using model conducting surface covered by carbon powder. The ohmmeter connected to the metal bar and model surface was implemented to indicate the current through the carbon powder at constant height. The third one, "touch me with love", is a hands-on activity to help understanding on atomic force microscope (AFM). The participants drag the plastic and aluminum ruler with sharp bottom at the end through the various rough surfaces. Forty teachers from various fields participated and evaluated the activities. From the evaluation study, it was found that the demonstration apparatus and hands-on activity can enhance the understanding in the concept of scanning probe microscope at high level.

K2_K0030 Investigation of Student Understanding Force and Motion Using Concentration Analysis

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Abstract: The objectives of this study have two folds — 1) investigating students' basic understanding of force and motion and

2) employing the model analysis in evaluating multiple-choice test. The main instrument in studying conceptual understanding of mechanics is Force and Motion Conceptual Evaluation (FMCE). The FMCE test was administered to 746 engineering freshmen taking an introductory physics with calculus at Chiang Mai University. The first algorithm of model analysis, called the concentration analysis was used in evaluating student responses. The concentration factor for each question was obtained and plotted versus score on each question. Then each question was categorized according to the 3-level scheme in order to interpret overall student understanding. The results from the concentration analysis indicated that most students come into the physics classroom with a weak understanding about force and have misconceptions about force and momentum.

M_M0001 Characteristics and physical stability of nanoparticles entrapped with mineral water from various sources in Thailand

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Abstract: In this study, we investigated the characteristics and stability of nanoparticles entrapped with mineral water from various hot spring locations in Thailand comparing with distilled water (control). Sources of mineral water were selected which On-Luay (Sankamphaeng district), Pong Kum (Doi Saket district) and Ranong Province, that contained high content of metals (such as Mg^{2+} , Ca^{2+} , and Na^+), which are useful for skin. Thirty six formulations of niosomes entrapped with mineral water were prepared by chloroform film method. The nanoparticles were composed of Tween 20, 60, 61, 80 and Span 20, 40, 60, 80 and 85 with cholesterol in the ratio of 1:1. The total concentration of the non-ionic surfactants and cholesterol was adjusted to 20 mM. The Particle size observed under the optical microscope was small unilamellar vesicle with the diameter range of 50-550 nm., which were the smaller than control (2.47-5.23 μm) ($n=12$) significantly ($P=0.05$). The order of the particle sizes of Span 40<60<80<20< Tween 61<60<80<20 at 85.21 \pm 15.57, 93.66 \pm 18.86, 99.15 \pm 16.67, 170.02 \pm 38.03, 176.25 \pm 11.56, 186.67 \pm 90.89, 200.16 \pm 132.19 and 486.32 \pm 54.92 nm, respectively. Span 85 can not prepare niosomes because no film was obtained. Stability of niosomal formulations at condition 4°C, RT and 45°C was observed at initial 1, 2 and 3 months indicated that. Span 20, 40 and 80 showed the best stability because of less sedimentation and layer separation as well as the unchange particle size observed under the optical microscope and Zeta Potential/Particle Sizer Nanoparticles entrapping with mineral water from Sankamphaeng gave the most stable with the less sedimentation and small particle size than other mineral water resources. Percentages of entrapment were investigated by separating niosome from unentrapped mineral water by Sephadex column and the Na^+ contents which was used as a marker was determined by atomic absorption. Percent entrapment of Na^+ were 84.95 \pm 14.32, 76.43 \pm 20.98 and 61.01 \pm 12.35% for Span 40, 60, and 20 respectively. Percent entrapment was decreased with times.

M_M0002 CHARACTERISTICS OF NANOPARTICLES ENTRAPPED WITH BIOACTIVE COMPOUNDS EXTRACTED FROM WASTES OF RICE BRAN OIL INDUSTRIES IN THAILAND

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Abstract: The objective of this study was to extract the bioactive compounds from wastes of rice bran oil industries in Thailand and entrap in nanoparticles (liposomes and niosomes) to be used as cosmetic raw materials, in order to increase the value of agricultural products and for the substitution of the import cosmetic raw materials. The selected 7 rice bran and rice bran oil samples from 2 factories were acid distilled rice bran oil (AT, AK), crude rice bran oil (CT, CK), refined rice bran oil (RK), defatted rice bran (DBT, DBK) and one sample of rice bran from Chiang Mai market was RBM. The 8 samples were extracted by 80% methanol with alkaline hydrolysis. The ferulic acid contents were analyzed by HPLC. The three rice bran samples (DBT, DBK and RBM) were extracted for phytic acid by dissolving in 2.4% hydrochloric acid. The phytic acid contents were determined by spectrophotometry according to AOAC standard method. The ferulic acid contents were found in AT, CT, AK, CK and RK and RBM samples at 4.01, 0.72, 3.52, 0.52, 1.47 and 1.79 g/100 g respectively, but not found in DBT and DBK samples. Amounts of phytic acid were found in DBT, DBK and RBM samples at 41.23, 64.39, 248.62 $\mu g/g$ respectively. AT and RBM samples were selected to extract for ferulic acid and phytic acid respectively. The extracts at 5% was entrapped in liposomes and niosomes by chloroform film method with sonication. Three formulations of DPPC/CHOL, Tween61/CHOL and Span60/CHOL at 1:1 molar ratio were selected. Physical characteristics of pH, particle sizes and sedimentation were investigated. Tween61/CHOL at 1:1 molar ratio entrapped with the ferulic acid and phytic acid extracts showed the best physical stability with the particle sizes of 95.6 \pm 23.8 nm and 92.1 \pm 22.3 nm, respectively. This formulation will be used for further development of topical formulation.

M_M0003 PHYSIOLOGICAL AND PSYCHOLOGICAL EFFECTS OF ESSENTIAL OIL IN AROMATHERAPY MASSAGE

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Abstract: The aim of the study was to investigate the physiological and psychological effects of sweet orange oil (*Citrus sinensis*, Rutaceae) in healthy subjects after transdermal absorption. Thirty nine healthy volunteers participated in the experiments. Four physiological parameters, i.e. blood pressure, breathing rate, pulse rate, skin temperature were recorded. Psychological responses were assessed were assessed in terms of alertness, attentiveness, calmness, mood, relaxation, and vigor. Sweet orange oil caused significant decreases of breathing rate and pulse rate which indicate a decrease of autonomic arousal. At the emotional level, subjects in the sweet orange oil group rated themselves more cheerful and more

vigorous than subjects in the control group. This finding points towards an increase of psychological arousal.

M_M0004 FORMULATION OF CREAM BASE READILY FOR MIXING WITH VEGETABLE AND FRUIT EXTRACTS

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Abstract: Concentrated cream base readily for mixing with vegetable and fruit extracts was prepared using isopropyl isostearate as an oil phase, polyacrylate 13/polyisobutene/polysorbate 20 as an emulsifier, methyl paraben/propyl paraben as a preservative and distilled water as a water phase at a ratio of 15:3.5:1:40. An average viscosity and pH of the obtained concentrated cream base was $37,866.67 \pm 11,477.08$ cps and 6.87 ± 0.26 , respectively. The concentrated cream base exhibited glossy look and milky white color. It was stable after 6 cycles of temperature cycling test. The concentrated cream base was readily to be mixed with vegetable or fruit extracts at a ratio of 3:2.

M_M0005 DEVELOPMENT OF A SKIN CARE PRODUCT FROM BAN-DUNG SALT MUD, UDONTANI

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ABSTRACT: A skin care product from Ban-dung Salt Mud, Udonthani, was developed by collecting and processing the mud into dry powder. Chemical and microbiological tests of the product suggested that it passed the quality control in cosmetics in terms of heavy metals and microbes and contained certain levels of 7 essential minerals. Forty females, met the inclusion criteria, volunteered in the skin moisture and pH testing upon using the product with a double-blinded comparison to a commercial product. The average moisture and pH of the skin, measured 15 mins after application significantly increased with all age groups ($p < 0.01$). All of the volunteers (100%) reported cooling sensation. Ban-dung Salt Mud could be potentially further developed as a source of raw materials of mud pack products for skin moisturizing and pH adjustment.

M_M0007 Protection of α -Lipoic acid and dihydrolipoic acid against intracellular mitochondrial reactive oxygen species

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Abstract: Oxidative modification alters the function of proteins and plays an important role in the decline of cellular function during aging process. The mitochondria may be the primary cellular source and target of endogenous reactive oxygen species (ROS) as they are produced as a normal byproduct of the electron transport system. α -Lipoic acid (α -LA), naturally occurring compound, is present in all parts of the body as part of several multienzyme complexes involved in energy formation. It is reduced to dihydrolipoic acid (DHLA) in the pyruvate dehydrogenase complex. In this investigation, α -LA was extracted from Thai spinach (*Spinacia oleracea*) and characterized using LC-MS. DHLA was synthesized by reducing α -LA and characterized using ESI-MS. Intracellular free radical production was determined by using dichlorofluorescein (DCF) and dihydroethidium bromide (DHE), cell-permeable oxidation-sensitive probes. For quantitative analysis of ROS and $O_2^{\cdot -}$ formation, flow cytometry analysis was performed. The levels of $O_2^{\cdot -}$ and ROS in NHDF cells were significantly reduced in the systems treated with α -LA and DHLA. Interestingly, both α -LA and DHLA blocked mitochondrial ROS generation. Moreover, they also increased growth rate of normal dermal human skin fibroblast (NHDF). Therefore, α -LA and DHLA might be useful in products containing anti-free radical and stimulate cell renewal.

M_M0008 RAT SKIN TRANSDERMAL ABSORPTION OF AZELAIC ACID-CYCLODEXTRIN COMPLEXES

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Abstract: This study aimed to investigate the transdermal absorption of an aqueous solution of azelaic acid (AA) complexed with hydroxypropyl- β -cyclodextrin (HP β CD). Equimolar of AA and HP β CD complexes were prepared by physical mixture (PM), coevaporation (COE) and freeze-drying (FD). The complexes were characterized by infrared spectroscopy (IR), differential scanning calorimetry (DSC) and X-ray diffractometry (XRD). The AA contents were assayed by a HPLC. Transdermal absorption studies of AA, PM, COE and FD products across the full-thickness abdominal skin (the male Wistar rats) were conducted, using vertical Franz diffusion cells at $32 \pm 1^\circ\text{C}$. The donor compartment was filled with 2 ml of samples (10mM). An amount of 12 ml of pH 7.4 phosphate buffer saline (PBS) was put in the receiver chamber. After 4, 6, 8 and 12 h, the cells were withdrawn. The amount of AA in the stratum corneum (SC) was collected by stripping the skin, using 3M Scotch Magic™ tape. For AA in the viable epidermis and the dermis (VED), the whole skin was cut into small pieces, and AA was

extracted from the skin using methanol. Samples in methanol were derivatized and analyzed for AA by HPLC. From IR, DSC and XRD investigation, PM and COE methods gave partial inclusion complexes, whereas FD formed complete complexation. The fluxes ($\mu\text{g cm}^{-2} \text{ h}^{-1}$, $n=3$) in SC, VED and receiver chamber were at 30.60 ± 4.78 , 28.27 ± 6.16 and $6.03 \pm 2.31 \mu\text{g cm}^{-2} \text{ h}^{-1}$ which were more than the uncomplexed which gave 22.06 ± 3.24 , 26.51 ± 3.20 and $0.38 \pm 0.03 \mu\text{g cm}^{-2} \text{ h}^{-1}$ respectively. This present study has suggested that AA complexed with HP β CD by the FD process gave not only the complete inclusion, but also improved the aqueous solubility of AA thereby increasing the permeation through skin. FD method might be the most proper process for the preparation of the complex in the development of AA for topical products.

M

N1-N0004 GROUNDWATER RECHARGE ASSESSMENT OF RIVER BASIN IN THAILAND

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Abstract: The total area of Thailand is about 513,115 km². Topographically, the country can be classified into 25 river basins (Royal Irrigation Department) and the country rocks comprised of Precambrian – Quaternary rocks (Department of Mineral Resources, 2001). These rock formations can be hydrogeologically classified into 9 units, as follows: Recent alluvial deposits, Younger terrace deposits, Older terrace deposits, Colluvial deposits, Limestone/Carbonate unit, Sedimentary rock unit, Metasedimentary and Metamorphic rock unit, Volcanic rock unit and Granitic unit. Recharge into each river basin will depend on rainfall, permeability of rock and influence of slope. Using average rainfall data during eighteen year period (1987-2004), designated infiltration factor and slope factor, it is found that the average recharge range from 0 - 570 mm/yr, or 0 - 12 percent of local annual rainfall. The calculated recharge is useful for future water management of each river basin.

N1-N0006 TROPOSPHERE ATMOSPHERIC OBSERVATION BY MIE SCATTERING LIDAR AT SRISAMRONG, SUKHOTHAI PROVINCE

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Abstract: In 1995–2004, Mie scattering lidar system was installed and developed at Srisamrong, Sukhothai province under the observatory for atmospheric radiation research founded by Thai and Japanese scientists. With the raw data collected in 2003–2004, the tropospheric atmosphere of this urban region was studied. In this work, the variation of vertical profiles of range corrected signals for distinct 2 months of December (winter) 2003 and March (summer) 2004 were performed. Further studies of related local parameters supporting this work have still been required for precise and reliable characterization of aerosol studies in our environmental atmospheres. Additionally, in the future we wish to utilize this tool for climatological research in Thailand.

N1-N0007 THE VERTICAL DISTRIBUTION OF OZONE OVER SONGKHLA, THAILAND.

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Abstract: The vertical distribution of ozone is a significant requirement in monitoring the atmospheric ozone layer. It can be measured by Ozone Sonde, ground-based Dobson or Brewer spectrophotometer and satellite-based instruments. In order to provide a data set of ozone profile over Songkhla the Umkehr measurements taken by the Brewer spectrophotometer No. 120 authorized by the Meteorological Department during 2001–2003 and TOMKEHR software developed by the World Ozone Data Center in 1992 were used in this study.

The ozone profile calculated using TOMKEHR software expressed good agreement with those from SAGE II satellite and Malaysia Ozone Sonde measurements as for a latitudinal dependence. The vertical distribution of ozone over Songkhla was found that the height of maximum density is 26–28 km above the earth surface and its annual average concentration is approximately 4.70×10^{12} molecules/cm³ in 2001, 4.90×10^{12} molecules/cm³ in 2002 and 4.70×10^{12} molecules/cm³ in 2003 respectively. There is no significant change in long term as a meaning of ozone depletion in tropical regions during these years, except that high value of the ozone at near surface has showed its role as a pollutant in urban site.

N1-N0008 Time variation of aerosol in Bangkok

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Abstract: From the time variation of aerosol in Bangkok using AERONET data at Chulalongkorn site during 2003–2004 found that AOT were mostly high in summer and winter, low in rainy season. The comparison between the AOT and daytime average air temperature found that while AOT were greater than 0.4, the air temperature was greater than 33 °C in summer and decreased than 0.2 °C in winter. For rainy season, AOT were lower when rainfall was greater than 10 mm. In addition, the variation of AOT shown as a cycle mostly every 4–7 days and corresponding with the variation of air temperature. The Angstrom exponent values showed the fine mode particles with loading dominant in summer and winter, the volume size distribution showed on two modals with a fine mode more dominant than other. For the analysis of AOT and back-trajectory, revealed that there were the aerosols from China to Thailand.

N1

N1_N0010 DAYTIME ESTIMATION OF THE HEAT BUDGET FROM ROUTINE METEOROLOGICAL DATA AT NON-IRRIGATED PADDY FIELD IN SUKHOHAI, THAILAND

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Abstract: This paper is presented to find out the empirical model for hourly estimation of the surface heat budget from routine meteorological data during daytime in Thailand. The model is designed for paddy field, but it contains parameters which take account of the surface properties in general. The required input meteorological data are no more than the air temperature and relative humidity at screen height, single wind speed and total cloud cover. The output of the model is in terms of incoming solar radiation, net radiation, latent heat flux and sensible heat flux. For one year of observations at non-irrigated paddy field in Sukhothai, Thailand, we obtained satisfying results between observations and estimates. It appears that the root mean square error are $\sigma = 105.7 \text{ W/m}^2$ for incoming solar radiation, $\sigma = 68.1 \text{ W/m}^2$ for net radiation, $\sigma = 83.0 \text{ W/m}^2$ for latent heat flux and 36.1 W/m^2 for sensible heat flux.

N1_N0011 The Observatory for Atmospheric Research at Phimai

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Abstract: The distribution of radiative energy mechanism is complicated in the Asian monsoon region with the monsoon circulation caused by the ocean-land contrast at the continental scale. There are numerical simulations, for example, indicating that upper and lower level clouds play the important but different roles in the energy flow on a continental scale. The effect of global warming due to greenhouse gas increasing is especially large and sensitive budget structure over land areas. Therefore, to understand the climate formation of this region, it is important to study the effect of clouds, water vapor and surface conditions on the radiative budget of this region. The high accuracy and temporal continuous instruments are need for radiative fluxes measurement and related ancillary quantities for this study. So, the Observatory for Atmospheric Radiation Research was constructed in the corporation between Thai and Japanese scientists under GAME-T project. The Observatory was located at Sri Samrong, Sukhothai, Thailand about 700 km., north of Bangkok. The Observatory contained some of equipments that can divide into 4 groups as below;

1. Water vapor observation group composed of Global Positioning System and Microwave radiometer or Water vapor radiometer.
2. Atmospheric radiation and surface meteorological component group composed of Upward and down looking Pyranometers and Pyrgeometers, Pyrheliometer, and automatic thermometer, barometer and anemometer.
3. Aerosol observation group, there are Sky and i-Sky radiometer and Lidar.
4. Wind Profiler to observe air parcel movement by Doppler Radio Detection And Ranging or Doppler RADAR technique.

All of the instruments control by PC and working automatically. After the observation, data stored in the PC, download to computer server and transferred to the server at Chulalongkorn University. Because the observatory at Sri Samrong was too narrow for extensive field of research activities therefore, it was decided to move to Chaleamprakit Royal Rain-making Research Center, Phi Mai, Nakhon Ratchasima in January 2005. The Observatory was renamed as "The Observatory for Atmospheric Research".

N1_N0012 AEROSOL OPTICAL DEPTH OBTAINED BY MULTI-FILTER RADIOMETER (MFR-7)

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Abstract: Multi-filter Radiometer (MFR-7) has been installed at the Observatory for atmospheric radiation research at Sri Samrong, Sukhothai (17°09N, 99°51E) by the cooperation of Frontier Research Center for Global Change (FRCGC), Japan since 2002. This instrument is design to measure global, diffuse and direct solar irradiance. For this study, we apply direct irradiance data of 3 wavelengths (415, 500 and 985 nm.) from MFR-7, during January 2003 to investigate aerosol optical depth (AOD) by Beer-Lambert-Bouguer law ($I = I_0 e^{-\tau}$). AOD was 0.68 – 0.31 at 500 nm at Sri Samrong site. Trajectory analysis has shown that higher AOD aerosol come from the west site of Sri Samrong observatory from mid to late of January. AOD was increase from early to late of January 2003.

N2-N0001 CERTAIN CHARACTERISTICS OF DICKITE FROM SARABURI, THAILAND

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Abstract: The characteristics of dickite samples from the deposit at Khao Cha-Om, Tambon Cha-Om, Amphoe Kaeng Khoi, Saraburi Province, Thailand were investigated. The techniques used include SEM, TEM, WD-XRF, XRD, FTIR and Raman microprobe. The samples show their cryptocrystalline habit exhibiting pseudo-hexagonal plates stacking together like books, variation in chemical composition as well as some varieties coexist with quartz.

N2_N0002 PALEOECOLOGICAL ANALYSIS OF MOLLUSCAN ASSEMBLAGES FROM BANGKOK CLAY IN SAMUT PRAKAN

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Abstract: Holocene deposit, Bangkok Clay in Bangkok central plain are well observed in the sandpit of Samut Prakan. Block sampling and NaTPb treatment of sample blocks had been carried out for the Paleocological analysis of fossil molluscan assemblages. It reveals that only one cycle of transgression and regression is recognized in Bangkok Clay. The transgression is characterized by *Veremolpa* - *Moerella* Assemblage and the regression is characterized by *Cryptonatica* - *Paphia* Assemblages. The beginning of the transgression is also characterized by the brackish water molluscan assemblage.

N2_N0013 Uranium Contents Analysis in Soils at Pattani and Narathiwat Provinces with the Gamma Spectrometer

พระพรหม หิมสุทธี และ พวงทิพย์ แก้วพันทิพย์

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Abstract: The Uranium contents in soil samples in Pattani and Narathiwat provinces were investigated. The global positioning system device was used to identify the location of the collected samples. All the collected samples were heated at 120°C for 20 hours before sieving by using 18 mesh sieve. Each soil sample of 100 gram with the particle size less than 1 mm was kept in a sealed plastic container for one month to reach the secular equilibrium. The gamma ray spectrometer was used to analyze the equivalent uranium content at the 1.76 MeV photopeak that emitted from Bi-214.

The result showed that the average uranium content in 46 locations of Pattani province at the 0 - 5 cm and 5 - 10 cm depth were 4.09 ± 0.19 ppm and 5.11 ± 0.20 ppm, respectively. For the Narathiwat province with 54 locations of collected sample sites, the analyzed uranium contents at the 0 - 5 cm and 5 - 10 cm depth were 4.53 ± 0.20 ppm and 5.42 ± 0.21 ppm, respectively. The uranium content contour was performed to identify some areas that may be harmful to human.

N2_N0014 EVALUATION OF THE TSUNAMI DISASTERS ON 26TH DECEMBER 2004 ALONG THE SHORELINE RANONG TO KHA LAC - LAMRU

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Abstract: The tsunami disasters along the shoreline from Ranong to Khao-Lak Lamru have been investigated totally. 5 times for 1 month in 2005. Principles for the Tsunami disasters observed and established in Japan are applicable to those in Thailand. In Thailand, the first wave was pulling waves. So many foreigners tried to go far out at sea. An after that, when the second pushing wave attacked the beach, nobody came back to the beach and died. Sumatra - Andaman earthquake is belonged to the APlate boundary type. So, on account of periodicity of the earthquake, next Tsunami is predictable. Cycles of the Tsunami are expected 60 to 63 years. It is also important to study historical Tsunami disasters.

N4_N0005 A Survey of *Ruditapes variegatus* (Sowerby, 1852) at Kho Kham Yai, Sichang District, Chonburi Province

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Abstract: The distribution and population variation of Venus Clam *Ruditapes variegatus* (Fam. Veneridae) were studied at Kho Kham Yai, Sichang district, Chonburi province during May 2005 to April 2006. *R. variegatus* is normally found inhabiting in medium (0.25 - 0.50 mm) and coarse sand (0.50 - 1.00 mm). The highest and lowest population densities were found in June and November, respectively. The recruitment of the small clams (5-10 mm in shell length) took place from May to July and September. This study also reveal a relationship between percentage of organic content and density of *R. variegatus* ($r = -0.291$, $p < 0.05$).

N4

01_O0002 ATOMISTIC SIMULATION OF THE STRUCTURE OF AMORPHOUS POLYSTYRENE

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Abstract: A static, atomistically detailed model of dense, glassy polystyrene was simulated using molecular mechanics/molecular dynamic hybrid method. Initial chain conformations which were generated using a Monte Carlo technique including periodic boundary conditions, were relaxed by potential energy minimization. Detailed analysis of the minimized structure indicated that intermolecular packing effects create a large variety of chain conformations different from the purely intramolecular ground states. The distribution of the torsion angles of the minimized structures did not show the expected behavior of the model compounds (dimer) indicating the intermolecular interaction dominate the local preferences. The systems are amorphous, exhibiting random coil behavior. The predict Hildebrand solubility parameter and Neutron/X-Ray structure factor are in reasonable agreement with the experimental values

01_O0003 MOLECULAR DYNAMICS SIMULATION OF POLYETHYLENE OXIDE: POTASSIUM IODIDE ELECTROLYTES

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Abstract: Molecular dynamics simulations of pure tetraglyme, a model for amorphous PEO, and tetraglyme:potassium iodide (KI) complexes with an ether oxygen:K⁺ ratio of 10:1 were performed at 400 K. Structural analyses were done to investigate PEO conformations, I⁻ and oxygens coordination by K⁺. The mean-square radius of gyration shows that PEO chains become more compacted upon complexation with salt. Dihedral angle population density distributions for PEO chains show that the *trans* conformation is favored for C-O bonds while the more compact *gauche* conformation is favored for C-C bonds. Both bonds prefer less *trans* conformation enforced by coordination of adjacent oxygens to K⁺. Diffusion coefficient for both K⁺ and I⁻ were estimated from the mean square displacement. K⁺ was found to diffuse slightly slower than I⁻ in PEO.

01_O0006 THE STRUCTURE OF IRON-STARCH.

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Abstract: Iron is an essential element for metabolic processes in human body, such as oxygen carrier, DNA synthesis and electron transport. A human body needs iron approximately 10-20 mg per day. The persistent abnormality in iron balance leads to either iron deficiency anemia or hemosiderosis. The medication of iron deficiency disease normally uses iron complexes, oral iron-supplement or intravenous iron-supplement i.e. iron-polysaccharide, iron-dextran, iron-sucrose and ferrous gluconate. Even though, iron saccharide has been used for medication for more than 50 years, the structure of iron saccharide has not yet been clearly understood. In this work, the study on the structure of iron-starch samples were carried out. X-ray powder diffractograms showed that the as-prepared iron-starch samples were in amorphous phases. FT-IR spectra of iron-starch samples displayed the same band as one of iron-oxides. Indicating that the core structure of the iron-starch samples was similar to iron-oxide. X-ray absorption spectroscopy (XAS) results showed that the only oxidation state iron(III) was found. Shifted of absorption edge at different energies with various types of starches, indicated different interactions of iron with starch.

01_O0011 ANGLE-RESOLVED PHOTOEMISSION STUDY OF ENERGY-BAND STRUCTURE ON NICKEL (111)

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Abstract: This report provides new information on the bulk-energy-band structure of metallic Ni(111) using angle-resolved photoemission spectroscopy. On the basis of free-electron final-state model, we revealed bulk energy-band dispersions. The obtained bulk energy-band dispersions show a fair agreement with energy-band calculations using local density approximation (LDA) and beyond LDA. These analyses suggest the dynamical screening effect brought about by off-site as well as on-site electrons should be concerned to explain the appearance of satellite structures as well as the energy-band dispersions obtained here.

01_O0018 AN INVESTIGATION OF CLEAN P-TYPE GALLIUM NITRIDE (0001) SURFACES USING SYNCHROTRON RADIATION FROM SIAM PHOTON SOURCE

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Abstract: p-GaN (0001) surfaces were treated with HCl, annealed at 550 °C for 10 minutes and nitrogen-sputtered for 15 minutes. Auger electron spectroscopy (AES), synchrotron photoemission spectroscopy (PES) and low energy electron diffraction (LEED) were used to study surface cleanliness, electronic properties and surface structure of the p-GaN (0001) surfaces, respectively. Results obtained showed that treating the surface with HCl will leave chlorine and carbon on the surface. These contaminants were removed after annealing at 550 °C for 10 minutes but oxygen was found instead. Oxygen was removed by nitrogen-sputtering for 15 minutes. Clean surface was found to have (1x1) surface but did not improve the electronic structure as expected.

O1_00019 OXIDATION STATE INVESTIGATION OF SULFUR IN NATURAL AND SYNTHESIS GLOVE BY X-RAY ABSORPTION SPECTROSCOPY (XAS)

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Abstract: Rubber and products made from rubber are the first and foremost exported goods in Thailand. Several techniques have been used to improve the quality of rubber product but none can provide details about the chemical structure mainly the sulfur-crosslinks and oxidation states of sulfur within the rubber. Since sulfur is introduced during vulcanization process, understanding the local environment of sulfur atoms can lead to a better understanding about the elasticity of rubber product. X-ray absorption spectroscopy (XAS) is one of the powerful technique of synchrotron light application. It is the only technique to identify the chemical properties within the rubber products. XAS measurements were carried out using synchrotron radiation source at the Siam Photon Laboratory. This preliminary work, we was successful enough for distinguishing oxidation states of sulfur atom between natural and synthesis rubbers in vulcanization process.

O1_00021 TRANSGENIC THALASSEMIA HEMOGLOBIN E FROM HUMANIZED MOUSE: X-RAY CRYSTALLOGRAPHIC AND FUNCTIONAL INVESTIGATION

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Abstract: Hemoglobin E (HbE), the most common β -thalassemic disease in Southeast Asia, is caused by a substitution of Glu by Lys at codon 26 of the β -globin gene. Clinically they are very heterogeneous in severity. Individuals homozygous HbE exhibit mild thalassemia, while the combination of HbE with a β -thalassemia mutation exhibit highly variable severity. A novel C57BL/6 Transgenic murine model of HbE were generated by S. Fucharoen's group with knock out mice that had deletions of the β -globin genes in order to create mice expressing chimeric hemoglobin ($\mu\beta_2$: $\mu\beta_2^E$). Evidently, human β^E -transgene can be expressed and functioned *in vivo*. The structural investigation of transgenic hemoglobin would eventually reveal the involved mechanism in atomic level leading to better understanding of thalassemic mouse model before the development for testing antisense therapy and some antioxidant drugs instead of testing in human.

O1_00022 CRYSTAL STRUCTURE AND DIELECTRIC PROPERTIES OF A-SITE DOPED $(\text{Bi}_{1-x}\text{Y}_x)(\text{MnNb})\text{O}_7$ ($\text{M} = \text{Fe}^{3+}$, In^{3+}) BI-PYROCHLORES

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Abstract: In this work, we investigate the local structure and associated dielectric properties of a family of Bi-based pyrochlore phases, namely $\text{Bi}_2(\text{MnNb})\text{O}_7$ ($\text{M} = \text{Fe}^{3+}$ and In^{3+}) with a 1:1 M:Nb ratio on the pyrochlore B sites. At 1 MHz and room temperature, the dielectric constant of $\text{Bi}_2(\text{FeNb})\text{O}_7$ (BFN) was found to be 100 while its dielectric loss was 0.007. For $\text{Bi}_2(\text{InNb})\text{O}_7$ (BIN), under the same conditions, the corresponding dielectric constant was 133 and the dielectric loss 0.002, respectively. These results suggest this family of Bi-pyrochlore phases have potential for application as dielectric materials as well as expanding the options available to adjust the physical properties of current Bi-containing pyrochlore phases. A

composite $\text{Bi}_2\text{Fe}_{0.5}\text{In}_{0.5}\text{NbO}_7$ (BFIN) intermediate was also synthesized to optimize associated dielectric properties.

O2_00001 *In vitro* permeation study of an extract of *Phyllanthus amarus* using shed scale of *Ophiophagus Hannah* as a barrier

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Abstract: *In vitro* permeation study of *Phyllanthus amarus* extract using shed snake scale as a barrier membrane, side-by-side diffusion cells with a controlled temperature at 32°C and UV spectrophotometric analysis at a λ_{max} of 277 nm. After 4 h, permeants were observed in the receptor. Qualitative analysis by TLC showed several band colors under UV light at 254 and 366 nm. HPTLC of the permeants at 4 h gave 2 out of 8 peaks at R_f values of 0.42 and 0.72 with an extent of permeation of 2.4 and 0.25%, respectively. It is concluded that the extract of *P. amarus* could permeate the barrier and each component permeated differently.

O2_00004 The effect of medicinal plant extracts on cytoplasmic membrane of multidrug resistant bacteria by flow cytometry

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Abstract: The *Dracaena loureiri* Gapnep., *Myristica fragrans* Houtt. and *Mansonia gagei* Drumm. were investigated for their abilities to enhance bacterial permeability by flow cytometry. This experiment exhibited enhancement of herb extracts to disrupt the cytoplasmic membrane of living bacterial cells. The membrane-impermeant nucleic acid stain of ethidium bromide of *Acinetobacter baumannii* and *Staphylococcus aureus* were tested by FACScan flow cytometry. The varied concentration of herb extracts were tested their ability to enhance permeability of multidrug resistant bacteria. The results indicated that herb extracts could promote intracellular accumulation of ethidium bromide in both strains of multidrug resistant bacteria. In the treatment of crude extracts to *Acinetobacter baumannii* the lowest concentration of *D. loureiri* Gapnep., *M. fragrans* Houtt. and *M. gagei* Drumm. that showed the brighter signal and uniformly fluorescent were 0.1, 0.05 and 5 mg/ml, respectively. Also, the treatment with 0.1 mg/ml of *D. loureiri* Gapnep or *M. fragrans* Houtt. enhanced bacterial permeability of ethidium bromide into cell membrane of MRSA.

O2_00005 THAI MEDICINAL PLANT EXTRACTS POSSESSING ANTI-BACTERIAL ACTIVITY AGAINST CATFISH PATHOGENS, *AEROMONAS SOBRIA*

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Abstract: This research was to study the effect of Thai medicinal plant extracts against bacterial pathogens of catfish, *Aeromonas sobria*. Eighty-two samples both extracted in water and 75% ethanol derived from 41 species of Thai medicinal plants were tested by agar well diffusion assay. The water-extracted samples of pomegranate (*Punica granatum*), rose apple (*Eugenia javanica*), and Ma-kum-kai (*Drypetes rexbughii*) exhibited the highest antibacterial activities, order. Their minimal inhibitory concentration (MIC) values were 6.25, 12.50, and 12.50 mg/ml, respectively. The minimal bactericidal concentration (MBC) values of all three extracts were at 12.50 mg/ml. The MBC/MIC values of these plant extracts indicated that they were bactericidal (≤ 4). The primary analyses of their active chemicals were carried out by TLC-bioautographic and TLC-chemical assays. The antibacterial components of *P. granatum* extract separated on TLC plate were classified in phenolic/flavonoid and steroid groups. Active components of *E. javanica* extract were tested positively to steroids and proanthocyanidins, while steroids were the active components of *D. rexbughii* extract.

O2_00007 FORMULATION OF ANTIFUNGAL CREAM FROM *Impatiens balsamina* Linn.

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Abstract: The purpose of this study was to prepare an antifungal cream from *Impatiens balsamina* Linn (lb). The dried leaves were macerated in methanol and the extract was reextracted with chloroform. The final extract was tested by agar diffusion method for its antifungal activity against *Trichophyton rubrum* and *Trichophyton mentagrophytes* and the optimum concentration to be used in lb cream which was found to be 20%. Three formulations of 20% lb creams were then prepared using the selected bases and tested for antifungal activity against the 2 organisms mentioned in comparison with the 2% ketoconazole cream available in the market. It was found that the three lb creams possessed higher antifungal activity than the proprietary preparation. The results suggested the potential of lb cream to be further developed into an effective antifungal cream.

O2_00008 The effects of crude extracted *Kaemferia parviflora* on human cholangiocarcinoma cells proliferation, metastasis and apoptosis

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Abstract: This study was aimed to investigate the anti-proliferation, anti-metastatic and apoptotic effects of the crude extracts from *K. parviflora* on human cholangiocarcinoma cell line. Firstly, cytotoxic effect and 50% inhibitory concentration (IC_{50}) were evaluated and determined by MTT assay. Then, the appropriated doses were selected for further investigation on anti-metastasis and induction of apoptosis, by transwell invasion and DAPI staining assays, respectively. The results shown that the cell viability of HuCCA-1 cells exposed to ethanol and hexane extracts were decreased in a dose-dependent manner and the 50% inhibitory concentrations (IC_{50}) values were 29.97 and 36.81 μ g/ml, respectively. The selected low cytotoxic dose of each extracts slightly reduced HuCCA-1 invasion and the selected high cytotoxic dose induced nuclear fragmentation in the cells. Further study on mechanisms of metastasis inhibition and cell death induction by *K. parviflora* are underway.

O2_00009 Antimicrobial property of the essential oil and crude extract from Patchouli leaves

(*Pogostemon cablin*)

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Abstract: Concentration (MIC) of patchouli oil and crude patchouli extracts Agar diffusion method with 2 strains of *Propionibacterium acnes* and *Staphylococcus epidermidis*. It was found that the efficient inhibitory concentration for the previous 2 strains of patchouli oil in acne facial foam compared with Trichosan in the level of studying at 0.5% and 1.0%, respectively. The result showed that the MIC of patchouli oil and crude patchouli extracts that could inhibit the 2 strains was 64 mg/ml. The result also demonstrated that Trichosan with concentrations of 0.5% and 1.0% significantly showed better inhibition than acne facial foam containing patchouli oil. However, the concentration of patchouli oil at 0.5% and 1% in acne facial foam showed the efficiency to inhibit the microbial acne growth of 2 strains, *P. acnes* and *S. epidermidis*, followed by the standard. In addition, both concentrations of patchouli

O2_00010 Determination of lipophilicity values of flavonoids using butanol-water system and calculation methods

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Abstract: This study aims to determine the lipophilicity of a series of flavonoids that the carbon atoms at different positions in ring A, B and C was substituted by hydroxyl, methoxyl group or hydrogen atom, by using butanol-buffered system and the concentration of flavonoid was analyzed with reverse phase HPLC. The pH of buffered solution was varied from 2 to 12. The ratio of flavonoid concentration in butanol to aqueous phase, the so-called partition (P) and log P represents the lipophilicity values. Among compounds studied, catechin is the simplest in chemical structure and its log P values experimentally determined was equal to 0.38 ± 0.04 . Experimental data suggested that the conjugation characteristics and hydroxyl substitution pattern were the most important determinants of log P of flavonoids. The log P values with respect to the chemical structure of compounds were analyzed and the numerical log P differences resulting from the various substitutions of as H, hydroxyl and methoxyl groups at various carbon positions of flavonoid nucleus was obtained. The log P values of flavonoids can be estimated from the expression: $\text{Log } P = \text{Log } P_{(\text{catechin})} + \Delta \text{Log } P_{(\text{ring A})} + \Delta \text{Log } P_{(\text{ring B})} + \Delta \text{Log } P_{(\text{ring C})}$. There is very good relation (Slope = 1.084 and $R^2 = 1$) between the calculated log P and experimental log P values in butanol/buffer systems. Using the log P expression can correctly predict the log P values of the flavonoids studied and other flavonoids in octanol/buffer.

O2_00012 LACK OF GENOTOXIC ACTIVITY OF CURCUMA COMOSA EXTRACT ON MICRONUCLEUS FORMATION OF MOUSE BONE MARROW CELLS

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Abstract: *Curcuma comosa* Roxb. commonly known as Waan chak mod look, is widely used as in indigenous medicine in all regions of Thailand. In spite of its long use, there have been only few studies of its toxicity. Therefore, the present study aims to investigate the genotoxicity of *C. comosa* by using micronucleus assay in polychromatic erythrocyte (PCE) of mouse bone marrow. Male mice orally received the hexane extract of *C. comosa* at a dose of 250, 500 or 1000 mg/kgBW. At 24 and 48 hour after treatment, the animals were sacrificed and number of micronucleus were determined. Hexane extract at all doses had no effect on the micronucleus formation in the mice bone marrow cells at any time point when compared to the control ($p < 0.05$).

In conclusion, hexane extract of *C. comosa* is lack of genotoxic effect as assumed by micronucleus test in PCE of

mouse bone marrow. However, at the very high dose, the extract did have cytotoxic effects on the cells.

O2_00013 ACETYLCHOLINESTERASE INHIBITORS FROM *Feroniella lucida*

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Abstract: Nine furanocoumarins were isolated from the stems of *Feroniella lucida*. Three compounds are novel structures having an oxolane, oxane and oxepane moiety. The overall structures and configuration were determined by spectral method.¹ All compounds were tested for Acetylcholinesterase; five of which were active against the enzyme.

O2_00014 ANTIOXIDANT XANTHONES FROM *Cratoxylum cochinchinense* (Lour.) Blume

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Abstract: Two new xanthones named cratoxylumxanthone A (1) and cratoxylumxanthone B (2) together with six known compounds: dulcisxanthone B (3), 2-geranyl-1,3,7-trihydroxy-4-(3-methylbut-2-enyl)xanthone (4), α -mangostin (5), β -mangostin (6), cochinchinone A (7) and garcinoneA (8) were isolated from *Cratoxylum cochinchinense* stems. The structure of new compounds were characterized by 1D and 2D NMR techniques. The isolated compounds showed free radical scavenging against DPPH and lipid peroxidation inhibition.

O2_00015 ANTIRADICAL ACTIVITY OF VOLATILE OIL AND EXTRACT FROM THAI ZINGIBERACEOUS PLANTS.

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Abstract: The objective of this research was to study antiradical activity of extract and volatile oil from 5 kinds of Zingiberaceae plants: *Alpinia galanga* (L.) Willd., *Curcuma longa* Linn., *C. mangga* Val. & Zipp., *Zingiber montanum* (Koen.) Thellade, *Z. ottensii* Valetton. The extract was obtained by continuous extraction using 95% ethanol as solvent. The residue was extracted by reflux technique with water to obtain water extract. Volatile oil of these plants was prepared by hydrodistillation. For testing of antiradical activities, ABTS (2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid) assay was used and compared with the activity of known antioxidant, Trolox (milligram of Trolox per gram of sample). Results indicated that the antiradical activity obtained from alcoholic extract of *C. longa*, volatile oil and water extract from *Z. montanum* showed highest activities of 187.543, 56.469, and 32.058 mg/g in each group respectively.

O2_00016 VERIFICATION OF THAI TRADITIONAL MEDICINE BY CHEMINFORMATICS

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Abstract: In this study, a part of Thai traditional medicine was verified using a novel cheminformatics method. It was carried out by virtual screening on the structural database of Thai medicinal plants for anti-neuraminidase compounds. The screening procedure was a combined method of molecular docking and the scoring functions. After the candidates structures were obtained, traditional formulations were analyzed to see if the plants having these candidates were included in the formula. The results showed that few traditional formulations contain most of the potential herbs. This implied that there was a correlation between the Thai traditional knowledge and the results using cheminformatics.

O2_00017 Investigation on Antimicrobial Activity of *Eclipta prostrata* Linn.

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Abstract: *Eclipta prostrata* Linn., a medicinal plant of family Compositae, has been used as antidiarrhoeal, laxative, anti-venom and local anesthetic actions. The crude hexane extract was separated using repeated silica gel column afforded eight fractions (G1-G8) and stigmasterol together with a mixture of stigmasterol and β -sitosterol. The fractions were evaluated for antimicrobial activity using agar dilution method against 28 strains of microorganisms. The results showed that all the tested fractions (G1-G8) inhibited many microorganisms at concentration 64-256 μ g/mL. Particularly, fractions G5 and G6 completely inhibited the growth of *C. diphtheriae* NCTC 10356 at 64 μ g/mL.

O2_O0020 HYDNOCARPUS ILICIFOLIA EXTRACTS FOR INHIBITION OF FUSARIUM OXYSPORUM AND XANTHOMONAS CAMPESTRIS

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Abstract: This research has the aim to extract active crudes from *Hydnocarpus ilicifolia* – the medicinal plant found in tremendous quantities on Nam-Sub hill, Kasetsart University at Si Racha campus – for inhibition of 2 categories of plant pathogenic organisms - *Fusarium oxysporum* - causing of Fusarium wilt and *Xanthomonas campestris* - causing of citrus canker. *Hydnocarpus ilicifolia* leaves were extracted with hexane, dichloromethane and ethanol by comparison of 2 methods - soxhlet extraction and ambient temperature extraction. Then the extracts were tested with *Fusarium oxysporum* and *Xanthomonas campestris* by disc diffusion. The results indicated that soxhlet dichloromethane and ethanol extracts showed greater activity on *Fusarium oxysporum* than hexane extracts. Furthermore, soxhlet ethanol extract produced more efficient to inhibit *Xanthomonas campestris* than hexane and dichloromethane extracts. Whereas the ambient temperature ethanol extract produced more efficient to inhibit both of the organisms than their corresponding hexane and dichloromethane extracts. In addition, on the whole, the ambient temperature extracts showed greater activity than the soxhlet extracts.

O2_O0023 FLUORESCENCE RESONANCE ENERGY TRANSFER STUDY OF QUERCETIN AND QUERCETRIN INTERACTION WITH BOVINE SERUM ALBUMIN IN PHYSIOLOGICAL SOLUTION: DETERMINATION OF BINDING CONSTRAINTS AND BINDING SITES

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Abstract: We sought to use bovine serum albumin (BSA) as a protein fluorescence probe system, coupling excited-state intermolecular Förster energy transfer and intramolecular proton transfer (PT). BSA contains tryptophan residues, which transfers its excitation energy to quercetin or quercetrin, an acceptor exhibiting excited-state intramolecular PT. We demonstrate such a coupling in BSA-quercetin and -quercetrin complexes, excited via the single intrinsic tryptophan. Analysis of spectroscopic data leads to the conclusion that two binding sites are involved in the bovine serum albumin-quercetin and quercetrin interaction. In physiological buffer pH 7.3 at 37°C, the molecules bound to the higher affinity binding site and to the lower affinity site, has the association constant of k_1 equal to $2.36 \times 10^5 \text{ M}^{-1}$ and $1.27 \times 10^5 \text{ M}^{-1}$ and k_2 equal to $4.2 \times 10^6 \text{ M}^{-1}$ and $3.22 \times 10^6 \text{ M}^{-1}$ for quercetin and quercetrin, respectively. These microscopic binding constants did not change when the reactions were performed in the same conditions at pH 4 but the complexes were dramatically decreased. This signified that the electrostatic interaction plays a major role in stabilizing complex.

O2_O0024 Screening of Thai Medicinal Plants for Antimalarial Activity

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Abstract: *Andrographis paniculata*, *Streblus asper*, *Abutilon indicum*, and *Heliotropium curassavicum* were selected for the study based on their ethnomedicinal values. Their crude extracts were screened for in vitro antimalarial activity against the chloroquine-resistant (K1) strains of *Plasmodium falciparum*. The crude extract of *A. paniculata* showed the most effective than other extracts. Four andrographolides (1-4) and flavonoid (5) isolated from the EtOAc crude extract of *A. paniculata* were also evaluated for their in vitro antimalarial activity. Andrographolide (1) and flavonoid (5) exhibited significant inhibition of *P. falciparum* growth with IC_{50} value of 5.96 and 2.03 $\mu\text{g/mL}$, respectively. Furthermore, in vivo antimalarial activity against *P. berghei* on ICR mice of andrographolide (1) were evaluated using Peters' 4-day test and it showed 30% parasitemia suppression at a dose of 50 mg/kg/day and 43 % at a dose of 100 mg/kg/day by intraperitoneal (ip) administration without any significant toxicity.

O2_O0025 IN VIVO IMMUNOMODULATING ACTIVITY OF WOOD EXTRACTS FROM CLAUSENA EXCAVATA BURM. F.

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Abstract: Immunomodulating effects in Balb/C mice of aqueous extract (CEHW) and the Thai folklore preparation (CEHF) of *Clausena excavata* Burm. f. were investigated. Haemagglutinating antibody (HA) titers at day 0, 7, 14, 21, 28 and 35 from the serum of animals fed or injected intraperitoneally with the extracts for 5 days were compared and evaluated for humoral mediated immunity (HMI). Footpad swelling test was used to determine delayed type hypersensitivity for cell mediated immunity (CMI). CEHW and CEHF injected intraperitoneally and administered orally exhibited the same maximum antibody

production of 1/800. Both extracts given orally reached the maximum antibody titer at day 7, which was 2 weeks faster than by intraperitoneal administration. However, antibody titers from CEHW injected intraperitoneally diminished without retaining whereas the CEHF retained for 1 week. Moreover, CEHW gave CMI response more than the CEHF. This study suggested the potential in vivo immunomodulating activities of extracts from *Clausena excavata* supporting our previous *in vitro* studies.

O2_O0026 Purification of polyphenols of Siamois® red wine and study of their efficacy of antiproliferative and apoptosis-inducing activity against erythromyogenous leukemic and small cell lung carcinoma cell lines

วิภา สุธาบุญ, สมาน เดชสุภา, ไพฑูรย์ เรืองพัฒน์พงศ์, มนตรี ตั้งใจ, วินิจ ช้อยประเสริฐ, วรวรรณ ปราบมณี, สมพงษ์ ศรีบุรี, สุชาติ โกกัณฐ์ และ สำริ มั่นเขตต์กรณ์*

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Abstract: The chemical analysis and separation of polyphenols of Siamois® red wine and their potential inhibition of leukemic and small lung carcinoma cell growth were studied. The Siamois® red wine powder was composed of flavonoids, phenolic acids and proanthocyanidin and the total polyphenolic contents is 45% of dried weight powder. Quercetin (IC_{50} : K562 = $10 \pm 0.8 \mu M$ and GLC4 = $22 \pm 1.6 \mu M$), quercetin glycoside (IC_{50} : K562 = $6 \pm 1 \mu M$ and GLC4 = $8 \pm 1 \mu M$) and kaempferol (IC_{50} : K562 = $13.2 \pm 0.8 \mu M$ and GLC4 = $20.6 \pm 1.6 \mu M$) were majority found. These molecules exhibited two fold of antiproliferative activity against MDR cells compared with their corresponding parental cells. The mixture of mamo wood extract and Siamois® red wine show higher antiproliferative activity than Siamois® red wine alone. In addition, Siamois® red wine powder induces apoptosis in all cell lines and flavonoids were proposed as their active molecules by which mediate action at mitochondria of cells.

O2_O0027 FREEZE-DRIED WHITE KWAO KUA (PUERARIA MIRIFICA) POWDER PROCESSING

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Abstract: White Kwao Kua (*Pueraria Mirifica*), one of the Thai medicinal herb, has been recognized for Thai folk medicine centuries for its remarkable health-enhancing properties and although known for specific application. Some of the main components, miroestrol and deoxymiroestrol, extracted from Kwao Kua have been shown to have estrogen like effects. Because of the components in Kwao Kua has substantial health benefits, its extracts are made by concentrating active ingredients from the rhizomes and used as ingredients in cosmetic and pharmaceutical industry. The White Kwao Kua powder which contains the high contents of active ingredients and the same properties of the fresh White Kwao Kua is in a great demand for stability with high quality. The freeze dried White Kwao Kua powder processing has been developed and implemented at the Production Services, Industrial Park, KMUTT. The preliminary results show one hundred kilograms of White Kwao Kua produced 9.6 kilograms of dried White Kwao Kua by using hot air oven. These dried products produced 1.48 kilograms of freeze dried White Kwao Kua powder. The quality of freeze dried White Kwao Kua has been analysed in active ingredient to compare with the fresh one. The results showed actives ingredients in freeze dried White Kwao Kua powder had the same quality as the fresh White Kwao Kua. The stability of the freeze dried powder is now on the process of stability test. The waste utilization and clean production on freeze-dried White Kwao Kua powder has been proposed for further study to make it feasible in commercial production.

O2_O0028 APPLICATION OF MEDICINAL PLANT EXTRACTS FOR ANTI - PROPIONIBACTERIUM ACNES ACTIVITY.

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Abstract: *Propionibacterium acnes* is an anaerobic bacteria found around skins and hair follicle areas. It is the causative agent of acne vulgaris or pimples. In this study the effect of 68 of 95% ethanolic and water extracted medicinal plants were tested for inhibitory effect on *P.acnes* by paper disc agar diffusion method. The bacterium was grown on brain heart infusion agar at 37°C under anaerobic condition for 5 days, then the inhibition zones were determined. The 95% ethanolic extracted fresh medicinal plant which include *Pluchea indica*, *Butea superba* and *Azadirachta indica*, as well as dry *Azadirachta indica*, *Garcinia mangotana* and *Pouzolzia pentandra* were found to exhibit high inhibitory effect against *P. acnes* with inhibition zone of 2.2, 2.07, 1.77, 1.70, 1.77 and 1.67 cms., respectively. In general, fresh and ethanolic extracted medicinal plant had higher inhibitory effect against the bacterium than the dry or water extracted plant.

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รองกรรมการผู้จัดการใหญ่
บริษัท ปตท.สำรวจและผลิตก๊าซธรรมชาติ จำกัด
คุณพิสมัย จันทบุบผา
ผู้อำนวยการฝ่ายวิศวกรรม
คุณณัฏฐชัย บุญรัตน์
ประธานคณะกรรมการบริหาร
บริษัท มาลีสามพราน จำกัด (มหาชน)
ดร.มรกต ตันติเจริญ
ผู้อำนวยการศูนย์พันธุวิศวกรรม
และเทคโนโลยีชีวภาพแห่งชาติ

ประธานคณะกรรมการ

รศ.ดร.เนาววรรณ นพรัตนารักษ์

กรรมการ

คณบดีคณะวิทยาศาสตร์
มหาวิทยาลัยวลัยลักษณ์
รศ.ดร.ศุภวรรณ ตันยานนท์
รศ.ดร.สุรินทร์ เหล่าสุขสถิตย์
ศ.ดร.จำรัส ลิ้มตระกูล
คุณ มนธิตา สีตะธนี

เลขาธิการ

อาจารย์ทิพย์ นิลนพคุณ

2. คณะกรรมการฝ่ายวิชาการ

รศ.ดร.เนาววรรณ นพรัตนารักษ์
ประธานคณะกรรมการ
รศ.ดร.ธรรารัตน์ คุภศิริ
รองประธานกรรมการฝ่ายประสานวิชาการ
ผศ.ดร.สุณี รักษาเกียรติศักดิ์
รองประธานฝ่ายจัดการข้อมูล
อาจารย์ทิพย์ นิลนพคุณ
เลขานุการ
รศ.เพ็ญรัตน์ หงษ์วิทยากร
กรรมการและผู้ช่วยเลขานุการ

นางฤดีมล แสงธรรม

กรรมการและผู้ช่วยเลขานุการ

กรรมการสาขาวิชาการ

A. Math, Computing and IT

ประธานสาขา: ศ.ดร.ยงค์วิมล เลณบุรี
ประธานร่วม: ศ.ดร.ชิตชนก เหลือสินทรัพย์
กรรมการ
รศ.ดร.มนต์ทิพย์ เทียนสุวรรณ
Prof. Dr. Julian Paulter
รศ.ดร.พัชรา ไชยสุริยา
รศ.ดร.เบญจวรรณรส วิวัฒน์ปฐม
รศ.ดร.นรินทร์ อนันต์ชื่น
ศ.อานวย ชนนไทย
ศ.ดร.สมพงษ์ ธรรมพงษา
ศ.ดร.ยุพภรณ์ เข้มประสิทธิ์
รศ.ดร.กฤษณะ เนียมมณี
ดร.วิชาญ ลีวงศ์กุล
รศ.ดร.อัจฉรา หาญชูวงศ์
รศ.ดร.พีระพนธ์ โสฬสสถิตย์
รศ.ดร.วีระ จันทรงค์
รศ.ดร.ศาสตรา วงศ์นวนสุ

B. Biological Science

ประธานสาขา: ศ.ดร.ม.ร.ว. ชีษณุสร สวัสดิวัตน์

B1: Biology, B2: Microbiology, B3: Genetics

ประธานสาขา: ศ.ดร.สิริวัฒน์ วงษ์ศิริ
ประธานร่วม: ศ.ดร.ปรานอม จันทโรนัย

กรรมการ

ผศ.ดร.มาลินี ฉัตรมงคลกุล
ผศ.ดร.สุพัฒน์ เจริญพรวัฒนา
ผศ.ดร.ศุภจิตรา ชัชवाल
ผศ.ดร.พงศ์ธาริน ไส้ตระกูล
ดร.พงษ์ชัย หาญยุทธนากร
ดร.ชัชवाल ใจเชื้อสกุล
กรรมการและผู้ช่วยเลขานุการ: ผศ.ดร.จันทร์เพ็ญ จันทร์เจ้า

B4: Biotechnology, B5: Biochemistry

ประธานสาขา: ศ.ดร.ม.ร.ว. ชีษณุสร สวัสดิวัตน์

ประธานร่วม: รศ.ดร.ธาวรัตน์ ศุภศิริ

กรรมการ

รศ.ดร.รัชนิกร กัลล์ประวิทย์

รศ.ดร.พวงรัตน์ ยงวณิชย์

รศ.ดร.พรทิพย์ ชัยมณี

รศ.ดร.โสฬศ วงศ์คำ

รศ.ดร.สุนันทา รัตนโก

รศ.ดร.รมิดา วัฒนโกคาสิน

ดร.บุรชัย สมนยานนท์

ผศ.ดร.พัลลภ ปะพันธ์วัฒน์

ผศ.ดวงพร สุทธิพงษ์ชัย

ผศ.ดร.ชื่นจิตต์ บุญเกิด

ผศ.ดร.กันยารัตน์ สุโหบูลย์วัฒน์

ดร.สุจินต์ อังกราวีรุทธ์

รศ.ดร.เอมอร เบญจวงศ์กุลชัย

กรรมการและเลขานุการ: รศ.ดร.ฤดี สุราฤทธิ

C. Chemistry

ประธานสาขา: ศ.ดร.จำรัส ลิ้มตระกูล

C1: Analytical Chemistry

ประธานสาขา: รศ.ดร.ยุวดี เชี่ยววัฒนา

ประธานร่วม: ศ.ดร.เกตุ กรดพันธุ์

กรรมการ

รศ.ดร.เพริศพิชญ์ คุณาธารณา

รศ.ดร.ภาวดี สุทธิไวยกิจ

รศ.ดร.คณิต กฤษณังกูร

รศ.ดร.อรรรณ ชัยลภากุล

ผ.ศ.ดร.อรุณศิริ ชิตางกูร

รศ.ดร.สนอง เอกสิทธิ์

ผศ.ดร.ดวงใจ นาคะปริษา

ดร.วเรศ วีระสัย

ผศ.ดร.อหิตยา ศิริปัญญาพนนท์

ผศ.ดร.จรรยา จักรมณี

ดร.สมชาย ลาภอนันต์นพคุณ

รศ.ดร.ศุภลักษณ์ ศรีจรรย์

ผศ.ดร.รจนา บุระคำ

ผศ.ดร.อรพินท์ เจียรถาวร

ผศ.ดร.รัศมี ชัยสุขสันต์

อาจารย์วีณา เสี่ยงเพราะ

อาจารย์นรินทร์ พงษ์พันธ์

C2: Inorganic Chemistry

ประธานสาขา: รศ.ดร. รัชชัย ต้นทุลานี

ประธานร่วม: รศ.ดร. สุจิตรา ยังมี

กรรมการ

รศ.ดร. อรรรณ ชัยลภากุล

รศ.ดร. นวลพรรณ จันทศิริ

ผศ.ดร. อัญชลี สุกแสงปัญญา

ผศ.ดร. นงนุช เหมืองสิน

ผศ.ดร. เสาวรักษ์ เพ็ญสวัสดิ์

ผศ.ดร. บุญรัตน์ ธรรมพัฒน์กิจ

ดร. อธิชา ฉายสุวรรณ

ดร. วไลยา เอื้องไมตรีภิรมย์

ดร. โสมวดี ไชยอนันต์สุจิต

กรรมการและเลขานุการ: ดร.นิปกา สุขภิรมย์

C3: Organic Chemistry

ประธานสาขา: รศ.ดร.วิรัช วัลย์

ประธานร่วม: รศ.ดร.มงคล สุขวัฒนาสินธุ์,

ผศ.ดร.เทียนทอง ทองพันชั่ง

กรรมการ

รศ.ดร.บุญส่ง คงคาทิพย์

รศ.ดร.สมเดช กนกเมธากุล

รศ.ดร.สมยศ สุทธิไวยกิจ

รศ.ดร.ปัญญา พูลโกคา

ผศ.ดร.วรวรรณ พันธุมนาวัน

ผศ.ดร.วรินทร์ ชวศิริ

ดร.ชุตินา คูหากาญจน์

ดร. พูนศักดิ์ พลอยประดิษฐ์

ดร. พุฒินันท์ มีเผ่าพันธุ์

กรรมการและเลขานุการ: ดร.พัลลภ ค้านิชยงค์

C4: Physical Chemistry

ประธานสาขา: ศ.ดร.จำรัส ลิ้มตระกูล

ประธานร่วม: ผ.ศ.ดร.ยุทธนา ตันติรุ่งโรจน์ชัย

กรรมการ

รศ.ดร. สุภา หารหนองบัว

ผศ.ดร. พิบูลย์ พันธุ์

ดร.จักร แสงมา

ดร.ธานิน นานอก

ดร.เพ็ญศรี บุญสุวรรณศรีสง

ดร.จงกล จารุกัทราก

ดร.วเรศ วีระชัย

ดร.เอกสิทธิ์ สมสุข

ผศ.ประวิทย์ สุตแก้ว

ศ.ดร. กฤษณะ สาคริก

ผศ.ดร. ไฉนพร ด้านวิรุฑ์

ผศ.ดร. สุนันทา เอ่งระดมัย

กรรมการและเลขานุการ: ดร.อภิรักษ์ รุจิวัตร

C5: Medicinal Chemistry

ประธานสาขา: รศ.ดร.งามม่อง คงคาทิพย์

ประธานร่วม: รศ.ดร.พลังพล คงเสรี

กรรมการ

รศ.ดร.สุรินทร์ เหล่าสุขสถิตย์

รศ.ดร.ปทุมรัตน์ ตูจินดา

รศ.ดร.สุนิตย์ สุขสำราญ

รศ.ดร.วัชรินทร์ รุกชโชติวิกุล

กรรมการและเลขานุการ: รศ.ดร.ขวัญใจ กนกเมธากุล

D. Physic

ประธานสาขา: ศ.ดร.สุทัศน์ ยกส้าน

ประธานร่วม: ผศ.ดร.บุญโชติ เผ่าสวัสดิ์ยรรยง

ศ.ดร.วิรุฬห์ สายคณิต

ศ.ดร.สมชายทองเต็ม

รศ.ดร.พิเชษฐ์ ลิ้มสุวรรณ

รศ.ดร.บัญชา พนเจริญสวัสดิ์

รศ.ดร.รัศมีดารา หุ่นสวัสดิ์

รศ.ดร.วิทยา อมรกิจบำรุง

รศ.ดร.สุกิจ ลิ้มปิ๋มจันงค์

E. Materials Science

ประธานสาขา: ศ.ดร.ทวี ดันจศิริ

ประธานร่วม: รศ.ดร.วิรัชศักดิ์ อุดมกิจเดชา

กรรมการ

รศ.ดร.สุพล อนันดา

รศ.ดร.จิระพงษ์ ตันตระกูล

รศ.ดร.ทวีชัย อมรศักดิ์ชัย

Dr. Robert Molloy

ดร.วนิดา จันทรวิกุล

ดร.สมนึก ศิริสุนทร

ดร.ศิริพันธ์ุ เจียมศิริเลิศ

ผศ.ดร.รัตติกกร ยิ้มนิรัญ

F. Agricultural Science

ประธานสาขา: ศ.ดร.สายชล เกตุษา

ประธานร่วม: ผศ.สมโภชน์ น้อยจินดา

กรรมการ

ศ.ดร.สายัณห์ ทัดศรี

ศ.ดร.อุทัยรัตน์ ณ นคร

รศ.ดร.นิพนธ์ ทวีชัย

รศ.ดร.ประทีป ดาบทิพย์วรรณ

ผศ.ดร.กิตติ โพธิ์ปัทมะ

ผศ.ดร.ชัยภูมิ บัญชาศักดิ์

กรรมการและเลขานุการ: ผศ.ดร.ลพ ภาณุตานนท์

G. Food Science

ประธานสาขา: ศ.ดร.อรอนงค์ นัยวิกุล

ประธานร่วม: รศ.ดร.สายวรุฬห์ ชัยวานิชศิริ

กรรมการ

รศ.ดร.สุคนธ์ขึ้น ศรีงาม

รศ.ดร.สงวนศรี เจริญเจริญ

ดร.วราณี วารัญญานนท์

ผศ.ดร.ปาริฉัตร หงสประภาส

ผศ.ดร.สุเมธ ตันตระกูล

ผศ.ดร.อุบลรัตน์ สิริภัทรวรรณ

ดร.ธนจันทร์ มหาวนิช

กรรมการและเลขานุการ: ดร.วราภา คงเป็นสุข

H. Biomedical Science

ประธานสาขา: ศ. นพ. ยง ภู่วรวรรณ

ประธานร่วม: ศ. นพ.อภิวัฒน์ มุทิรางกูร,

รศ. บวรศิลป์ เขาวนขึ้น

กรรมการ

รศ.พญ.ณัฐริยา หิรัญกาญจน์

รศ.ดร.จินตนา จิระวาร

ผศ.ดร.เทวิน เทนคำเนาว์

รศ.ดร.คันสนีย์ ไชยโรจน์

ผศ.น.สพ.ดร.อลงกร อมรศิลป์

ทญ.อรนาฎ มาตังคสมบัติ

ดร.วันชัย อัครลาภสกุล

รศ.ดร.โสภิต วงศ์คำ

รศ.ดร.ปรัชญา คงทวีเลิศ

ดร.พรพธ สัมประเสริฐ

กรรมการและเลขานุการ: ผศ.ดร.ฉัตรศรี เดชะปัญญา

I. Environment Science

ประธานสาขา: รศ.ดร.สุเมธ ชวเดช

ประธานร่วม: ศ.ดร.วิจิตรา จงวิศาล

กรรมการ

รศ.ดร.วิศณุ มื้ออยู่

รศ.ดร.สันทัต ศิริอนันต์ไพบูลย์

กรรมการและเลขานุการ: ดร.จันทรา ทองคำภา

J. Engineering and Technology

ประธานสาขา: ศ.ดร.สมชาย วงศ์วิเศษ

ประธานร่วม: รศ.ดร.สุทธิชัย อัสสะบำรุงรัตน์

กรรมการ

ดร.สุรัช สนิทใจ

ดร.สนธิ์พีร์ เอ็มมณี

ดร.อนรรฆ ชันชะนวนะ

ผศ.ดร.เก็จวลี พงกษาพร

ผศ.ดร.จุใจ ปันประณต

กรรมการและเลขานุการ: ดร.จรัสศรี รุ่งรัตนอุบล

K. Science Communication and Education

ประธานสาขา: ผศ.ดร.ยุวดี นาคะผดุงรัตน์

ประธานร่วม: ศ.ดร.วรรณทิพา รอดแรงคำ

กรรมการ

รศ.ดร.ปิฎก โพนิชพันธ์

รศ.ดร.พนิตทิพย์ รื่นวงษา

ผศ.ดร.ปวิรินทร์ ชัยวิสุทธิทางกูร

ผศ.ดร.นฤมล ยุทธาคม

ดร.พงษ์ประพันธ์ พงษ์โสภณ

กรรมการและเลขานุการ: ดร.ขจรศักดิ์ บัวระพันธ์

L. Health and Sport Science

ประธานสาขา: รศ.ดร.สุพิตร สมานิติ

ประธานร่วม: ศ.นพ.ธีรวัฒน์ กุลทนันทน์

กรรมการ

รศ.นพ.ปัญญา ไหมมุก

ศ.ดร.สมบัติ กาญจกิจ

ดร.สิบลาย บุญวิโรต

ผศ.ดร.ราตรี เรืองไทย

รศ.ดร.สุปราณี ขวัญบุญจันทร์

รศ.ดร.ศิริรัตน์ หิรัญรัตน์

M. Beauty and Cosmetics Science

ประธานสาขา: ศ.ดร.มาลิน จุลศิริ

ประธานร่วม: รศ.ดร.อุบลทิพย์ นิมนานิตย์

กรรมการ

ดร.พรชัย โรจน์สีหศักดิ์

รศ.ยุวดี วงศ์กระจำ

รศ.ดร.อรุณศรี ปรีเปรม

รศ.ดร. เนติ วรรณุช

ผศ.ดร.ทัศนาศิ พัทธสัณธิ์พงษ์

ดร.วันดี รังสิวิจิตรประภา

อาจารย์ จิตร์ดี ลูประสงค์

ดร.เมธิน ผดุงกิจ

ผศ.ดร. ขวัญจิตร อึ้งโพธิ์

ผศ.นัฏฐา แก้วนพรัตน์

Yuishi Vayanabe

กรรมการและเลขานุการ:

ภก.พิพัฒน์ ตันติวัฒนาศิริกุล

N. Earth Science

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		B5_B0102, B5_B0103
		J1_J0035
		B4_B0009, H_H0008
		B5_B0024, C3_C0009
		H_H0007, H_H0009
		M_M0008, M_M0001
		M_M0002, C2_C0025
		B2_B0156

Arda Pakpitcharoen	B2_B0078	Bavornpon Jansang	C4_C0239
Aree Thongpukdee	B1_B0209, F_F0006	Benchapom Buaban	B4_B0173
	F_F0007, F_F0008	Benjamas Palbulkitchakul	I_J0020, F_F0002
	F_F0009, F_F0010		I_J0022
	F_F0011, F_F0015	Benjamas Thanomsab	B4_B0026, H_H0006
	F_F0017, F_F0018	Benoit Guylisse	C1_C0192
	F_F0019	Bhinyo Panlpan	K2_K0017, K2_K0029
Areefen Rassamesard	D_D0064	Bhuchonk Panichertumpi	C1_C0072
Areeporn Ontam	E_E0090	Bo Mattiasson	C1_C0192
Areerak Khamnoi	J1_J0023	Bo Albinsson	C4_C0168
Arisara Chaipurimat	E_E0072	Boonchai Seentrakoon	I_J0002
Arkachai Fungtammasan	B1_B0093	Boonchoat Paosawatanyong	D_D0071, D_D0072
Arkorn Kanjanaphachot	C1_C0135	Boon-Ek Yingyongnarongkul	C3_C0247, C3_C0248
Arconsiri Shitangkoon	C1_C0112, C1_C0115		C3_C0249, C3_C0250
Arconsri Piprem	O2_C0001, C1_C0118		C3_C0255
	C5_C0110	Boongeeu Vajarasathira	G_G0025, F_F0027
Arconsuk Chaiubon	K2_K0010	Boonhiang Promdonkoy	B5_B0196, B3_B0068
Arporn Busamongkol	C1_C0271		B4_B0067, B5_B0032
Arreerat Mattpha	E_E0037		B5_B0070, B5_B0077
Artasit Tangserisuksan	B4_B0142		B5_B0109, B5_B0111
Arun Buaklin	B1_B0048		B5_B0112
Arun Chanchaichavvat	K2_K0021	Boonhong Chongkid	F_F0036
Arunchai Tangcharoenbumnongsuk	C1_C0238	Boonlorn Purachat	C1_C0236
Aruneer Suratpipit	C1_C0184	Boonphol Meechaiyo	I_J0018
Aruneer Intasom	N1_N0006	Boonsan Prasertkulchai	B5_B0124
Aruneer Chaisingh	H_H0011, H_H0021	Boonsorn Withyachumnankul	H_H0010
Arunya Pimmongkon	E_E0110, E_E0112	Boonsom Liawruangrath	C5_C0045, C5_C0048
Asadhawut Hirarat	C3_C0040		H_H0012, C1_C0181
Atchana Wongchaisuwat	C1_C0217, C1_C0223		C5_C0149, C5_C0276
Atchara Sirimungkala	C4_C0160		C5_C0046
Atchara Panyosak	M_M0008	Boonsong Kongkathip	C5_C0080
Aticha Chaisuwan	C2_C0195, C2_C0207	Boonsong Sutapan	B4_B0169, D_D0046
	E_E0060, E_E0064		D_D0059
	E_E0072, E_E0074	Boonsong Kongkathip	C5_C0273, C5_C0274
Attinop Pongpanich	O2_C0004		C5_C0275
Attaya Samontha	C1_C0076	Boossarasin Thana	N1_N0007, N1_N0008
Attaya Sinpinyanond	C1_C0076, C1_C0123	Bootsaya Srianan	B4_B0096
	C1_C0176, C1_C0190	Bounleuam Sodahak	E_E0037
Attaya Meenongwa	C2_C0221	Bratee Chettanasena	E_E0056
Atom Nuntiyagul	A_A0009	Brendan J. Kennedy	O1_O0022
Attarod Pedram	N1_N0010	Brian M. Dressen	C1_C0186
Attera Worayingyong	C2_C0175	Bronwen Cowie	K2_K0001
Attihakorn Thongtha	E_E0101	Budsarakam Phangsee	E_E0007
Attahapon Elamudomkan	H_H0011	Buncha Pulpoka	C3_C0125, C3_C0193
Auradee Pankvong	C4_C0259	Buncha Silpasakulskul	N2_N0001
Aurasom Saraphanchotwitthaya	H_H0044, O2_C0025	Bundet Boekfa	C4_C0219
Aurathai Phongchiewboon	B1_B0092	Bundit Sinket	C1_C0019
Aussanee Pichakum	B4_B0053, B4_B0094	Bundit Tengjaroenkul	F_F0058, I_J0054
	B4_B0096, B4_B0098	Bunjong Dechapanichkul	J1_J0033
Awadh Owyimer Alsuhaimi	C1_C0050	Bussarin Ksapabutr	C2_C0041, C2_C0054
Azizon Kaesaman	E_E0040, E_E0051		C2_C0232
	B		C
B. Thana	N1_N0011, N1_N0012	C. Ketloy	H_H0015
	N1_N0012	C. Chancham	J2_J0032
Bancha Silskulsuk	D_D0011	CH. Iesro	D_D0065
Bancha Arthibenyakul	D_D0056	Chaderat Duangrat	C1_C0103
Banchob Wanno	C4_C0007	Chalrath Tangduangdee	J2_J0007
Bandit Nuansrichay	H_H0021	Chaiwat Ruksakulpiwat	E_E0019, E_E0042
Banjong Boonchorn	C4_C0258	Chaiyan Boonyuen	C1_C0010
Banpot Kakharn	J1_J0025	Chaiyaporn Rukrowm	B4_B0008
Banith Chatsawang	H_H0022	Chaiyapruk Katepetch	E_E0066
Barry M. Trost	C3_C0113	Chaiyavat Chaiyasut	H_H0032, C5_C0129
Bavornlak Khamnamtong	B3_B0062, B3_B0064		O2_C0015
	B3_B0086	Chak Sangma	C5_C0174, O2_C0016

Chakorn Chinvongamorn	C1_C0205	Chartchal Kittanai	B5_B0069, B5_B0077
Chalasai Chatyasorn	D_D0008		B5_B0106, B5_B0110
Chalee Paibullichakul	I_J0020, I_J0022		B5_B0111, B5_B0124
	F_F0002	Chartchalerm Isarankura-Na-Ayudhya	C3_C0167, H_H0035
Chalerm Wanarak	D_D0022		B4_B0154, B4_B0168
Chalerm Ruangvinyachai	C1_C0072, C1_C0117		B5_B0143, B5_B0145
	C1_C0118, C1_C0120		B5_B0147, C3_C0151
Chalermchai Kaewmaneechai	E_E0108		C3_C0163, K2_K0025
Chalermpol Suwanphakdee	B1_B0050	Charuwan Rakamnee	B1_B0116
Chalermpol Kirdmanee	B4_B0053, B4_B0094	Chat Pholnak	D_D0025, D_D0008
	B4_B0096, B4_B0098	Chatchai Veranitsagul	C2_C0041
Chalermpon Thongpoon	C5_C0045, C5_C0048	Chatchalida Boonpanaid	C1_C0172
	C5_C0046	Chatchana Thanbun	C3_C0252
Chalisa Louicharoen	B3_B0046	Chatchanok Karalai	C3_C0067, C3_C0111
Chalobol Wongsawad	B4_B0008, B1_B0011	Chatchawal Wongchoosuk	K2_K0014
	B1_B0013	Chatchawan Changtam	C3_C0249, C3_C0250
Chalobon Yooosook	C5_C0274	Chattira Chuaynukool	C1_C0130
Chaloemsin Pertermisin	H_H0029	Chatraphun Somton	C1_C0019
Chalongchai Teevasutomsakul	K2_K0024	Chatthapon Mungkundar	H_H0033
Chamnan Promjantuk	D_D0014	Chatuporn Sawatruksa	C1_C0227
Chan Inntam	C4_C0096, I_I0048	Chatyapha Pongchan-O	C2_C0104
Chanaiorn Danvirutai	C4_C0258, C2_C0218	Chaval Sriwong	C2_C0078
	C4_C0279	Chavalek Chayavadhanangkur	C1_C0031, J1_J0011
Chanan Angsuthanasornbat	B5_B0159	Chaveng Pakawatchai	C1_C0064, C2_C0147
Chanchai Thongpin	E_E0099		C2_C0218, C2_C0222
Chanchana Thanachayanon	E_E0102, O1_O0018		C2_C0224, C2_C0244
Chanida Palanuvej	H_H0004, H_H0017		C4_C0093
	H_H0016, H_H0020	Chawalit Hongprayoon	B4_B0184
	H_H0026	Chawanit Sittidilokratna	B2_B0006
Chanida Sangaewtrup	B1_B0004	Chaweewan Chawattana	D_D0066
Chanin Nantasenamat	B5_B0147, B5_B0145	Chaweewan Sapcharoankun	E_E0070
Chanin Tirawattanawanich	B5_B0177	Chaweewun Tawara	K2_K0010
Chanin Nantasenamat	C3_C0163, C3_C0167	Chernchok Soankwan	K2_K0018, K2_K0020
Chanita Ponglimanont	C3_C0067	Chetsada Gonsurin	B1_B0192
Channarong Poolperm	C2_C0128	Chidchanok Meechaisue	E_E0098
Channarong Choowong	C5_C0005	Chinac Thumarongthum	B4_B0030
Chanpen Karuwan	C1_C0203	Chinamas Jenkitjaroenchal	J1_J0035
Chanpeng Angchakan	D_D0060	Chinanal Wittayaprapakorn	E_E0059
Chanprapa Imjongjirak	B4_B0038, B5_B0039	Chinapong Kritayakornupong	C4_C0166, I_J0027
Chanuangrit Channok	D_D0004	Chintana Chitchamnong	O2_O0004
Chansawang Ngamphongsai	F_F0051	Chintana Tocharoentaphot	B5_B0133
Chantana Kankamol	B4_B0153, B4_B0160	Chirawat Kuenrat	D_D0034
Chantane Buranathai	H_H0021	Chisanucha Sattapongpun	H_H0003
Chanthana Susawaengsup	C1_C0173	Chitchol Palarak	B1_B0176
Chanthaporn Chinara	F_F0013	Chitnarong Sirisathikul	D_D0002
Chanthira Kaewthong	O2_O0007	Chittima Laohpongspaisan	C4_C0074
Chantragan Srisomsap	B5_B0121, B5_B0069	Chockpisit Thepsithar	B1_B0209, F_F0006
	B5_B0061, B5_B0107		F_F0007, F_F0008
	B5_B0122, B5_B0083		F_F0009, F_F0010
	B5_B0131		F_F0011, F_F0015
Chanugorn Tabtimsai	C4_C0279		F_F0017, F_F0018
Chanwit Chityuttakan	D_D0056, E_E0089		F_F0019
	E_E0095	Cholicha Sarasuk	C1_C0105
Chanya Chaicharoenpong	C3_C0038	Chom Sosawang	D_D0024
Chanyah Dabsah	K2_K0028	Chome Thongleum	D_D0015
Chaowalee Jaisuk	B3_B0135	Chompoonuch Puchmark	E_E0011, E_E0083
Chaowaneeporn Chepprasop	B5_B0018	Chompoonuth Porncharoennop	B5_B0097
Charida Pukahula	B2_B0156, B4_B0188	Chornyong Chaiubon	K2_K0010
Chamwat Samanchat	O1_O0021	Chonlada Lewis	E_E0050
Charles S. Henry	C1_C0186	Chonlade Komno	C3_C0009
Chamsak Sukkaew	E_E0003	Chonlatee Cheewasedtham	I_J0036
Charoen Chinwanitcharoen	E_E0104	Chonlayut Raweeewan	C5_C0046
Charoen Nakason	E_E0051	Chontita Rattanakul	A_A0008
Charoen Khamta	F_F0059	Choosak Poonsawat	E_E0019, E_E0045
Charoenchai Jaisawang	C3_C0254		E_E0042

Choosri Sribhen	B5_B0114	Dujreutai Pongkao Kashima	E_E0105
Chortip Kantachot	B1_B0019	Dumrong Lohataksanadech	I_I0004
Chowwanee Meewang	O2_O0009	Duriya Chantasingh	B4_B0187, B4_B0127
Chuaychusi Sripuman	K2_K0010	Duthathai Fujaroen	B2_B0054
Chuchaat Thammacharoen	C4_C0161, C4_C0162		E
Chumpunee Naksiri	F_F0054	Eakachai Pathomsunyaporn	B2_B0104
Chuntip Kumnuantip	E_E0018, E_E0020	Eakaphun Banhyeeekhun	B2_B0104
Chureerat Phokaew	H_H0041	Eakasit Sornsook	C2_C0222
Chutamat Phraphuchamnong	B1_B0158	Edward J. Wood	K2_K0017
Chutarat Saengkul	I_I0013	Ek Sangvichien	B1_B0189
Chutikom Nopparat	H_H0022	Ekachai Hoonhivathana	D_D0049
Chutima Sinlapavech	B5_B0025	Ekachai Chukeatirote	B1_B0017, B3_B0007
Chutima Matayatsuk	C1_C0146		B4_B0030, F_F0024
Chutima Thongkasam	C4_C0187	Ekaphan Swaisitang	E_E0048
Chutima Paksunchai	D_D0034	Ekasith Sornsook	C4_C0109, C4_C0257
Chutima Eamchotchawalit	E_E0056, E_E0058		O1_O0006, C2_C0100
	E_E0062		C2_C0126, C4_C0099
Chutima Hanjavanit	B1_B0029, B1_B0116	Ekawan Luepromchai	I_I0042, I_I0045
Chutima Kukusamude	C1_C0120	Ekgapon Chutchawatkulchai	E_E0052
Chutirat Assawatthap	B3_B0115	Eksuree Saksornchai	C1_C0158
	D	Enrico Traversa	C2_C0041
D. Martens	C1_C0213	Evelyne Bachre	B5_B0179
D. La-Orauttapong	D_D0055		F
Damras Wongsawang	A_A0009	Fanny L.-Y. Shek	C2_C0107
Damras Punnuan	D_D0037	Fred J. Sigworth	B5_B0159
Damrongsak Maneepongswadi	D_D0023, D_D0024	Fuanglada Veerasai	D_D0048
Darane Chokchaichamnankit	B5_B0122, B5_B0203		D_D0047
	B5_B0121, B5_B0083	Fumihito Nakajima	D_D0018, D_D0017
	B5_B0131	Fuyumi Kobayashi	C1_C0127
Darane Sridate	D_D0058		G
Darawan Thongbute	B2_B0172, B2_B0178	G.M. Greenway	C1_C0122
Dares Kaswket	D_D0018	Galayane Doungchawee	I_I0032
Daungamol Nuntasri	E_E0061, E_E0074	Gaysorn Chansiri	M_M0004, B2_B0076
Daungmanee Chuakheaw	O2_O0018	George Rowlands	D_D0029
Daungtawan Fongfunga	E_E0082	Gerd Katzenmeier	B3_B0163
David Harding	C2_C0145	Gerhard Buchbauer	M_M0003
	C4_C0164	Griangsak Chairote	B4_B0101
David Ruffolo	D_D0010, D_D0029		H
	D_D0026, D_D0027, D_D0028	Harald Rosner	C3_C0087
David J. Harding	C2_C0003	Harnate Mungpayaban	C1_C0225
David A. Simpson	B1_B0019	Harit Pitakjakpipop	I_I0031
David Stc. Black	C3_C0211	Harry Adams	C2_C0003
Dhanupat Pasutanun	O2_O0017	Haharoom Himsuhre	N2_N0013
Dhassida Sooksawat	C2_C0244	Hataichanok Naimsup	C4_C0082
Dhiravit Chantip	H_H0034	Hathawan Kraisuwan	F_F0043
Dhirayudh Yokubol	H_H0044	Heiko Leutbecher	C3_C0087
Direk Injan	H_H0008, H_H0009	Herbert Budzikewicz	C1_C0118
Donald M. Cropek	C1_C0186	Herman H.-Y. Sung	C2_C0107
Dondej Tungtrakarnpong	I_I0039	Hideaki Kaneko	A_A0005
Doungjai Thirathumthavorn	G_G0023	Hideki Nakajima	O1_O0011
Duang Buddhasukh	C3_C0008, C3_C0009	Hiroki Muramatsu	J1_J0008
Duangamol Nuntasri	E_E0072	Hirun Sawangkaew	K2_K0010
Duangjai Nacapricha	C1_C0131, C1_C0134	Hong-York Sinumnuaypol	D_D0052
	C1_C0142, C1_C0148	Hywel A. Davies	E_E0021
	C1_C0172, C1_C0203		I
	C1_C0230, C1_C0241	Ian D. Williams	C2_C0107, C2_C0210
	C1_C0233	Ikuo Hirono	B5_B0037
Duangkamol Maensiri	B4_B0087	Ining Meesa	I_I0019
Duangmanee La-Orauttapong	U_U0069	Inthira Sripichai	D_D0037
Duangporn Jamsai	O1_O0021	Irina Smimova	E_E0081
Duangratchaneekorn Muenmart	C3_C0014		
Duangruedee Wattanasirichaigoon	B5_B0059		
Duangta Tongsakul	C4_C0161		
Dudsadee Kittiyawat	B5_B0071		

Ins Klalber	C3_C0087, C3_C0089	Jirada Wajkamol	C3_C0013
Isara Rakham	I_I0052	Jiradej Manosroi	M_M0002, B4_B0009
Isra Teerawatsakul	J2_J0012		B5_B0024, C3_C0009
Issarang Nuchprayoon	B3_B0046		H_H0007, H_H0008
Itsara Intanai	B1_B0051		H_H0008, M_M0008
Itsara Khantikaew	K2_K0011, K2_K0005		M_M0001, O2_O0025
Ittipon Chaidacho	C1_C0231		G_G0031
	J	Jiranan Boonkong	E_E0071
J. Toulouse	D_D0055	Jirapan Dutchaneephet	M_M0007
J. Kaew-On	J2_J0021	Jirapan Moungjaroen	C5_C0276
J. Waewsak	J2_J0021, J2_J0029	Jiraporn Chuangbunyal	C1_C0051
	J2_J0032, J2_J0036	Jiraporn Homewong	G_G0035
J.A.N. Parnell	B1_B0118	Jirarat Tattiyakul	E_E0099
J.T.H. Pearce	E_E0102, E_E0079	Jirasak Kongkiattikajom	B5_B0020
Jaitsada Angsuwatcharakorn	C1_C0142	Jirasak Wong-Ekkabut	I_I0032
Jakaphan Rangsan	F_F0029	Jirawan Banditpuritat	C3_C0033
Jakaphun Jutsrigival	O2_O0015	Jirawan Siramanont	E_E0097
Jakob Magid	I_I0001	Jirayu Makchit	C5_C0149, C1_C0029
Jakrapan Meechai	D_D0010	Jirayu Sitanurak	C1_C0131
Jakrapong Kaewkhao	D_D0001	Jiro Nakayama	B5_B0130
Jakrawut Tansura	E_E0018	Jisuson Svasti	B5_B0203, B5_B0033
Jaksada Thumrongvut	J1_J0028		B5_B0059, B5_B0061
James R. Connor	H_H0010		B5_B0083, B5_B0097
James R. Ketudat-Cairns	B5_B0028, B5_B0059		B5_B0107, B5_B0131
	B5_B0061		B5_B0121, B5_B0122
Jamjun Pechsiri	B1_B0167		B5_B0146, O1_O0021
Janejira Pubua	B1_B0011	Jitlada Chumes	C2_C0124
Janjira Salubchua	B4_B0188	Jitladda Sakdapipanich	E_E0010
Janpen Intaraprasert	C2_C0102	Jitima Chaodamrongsakul	C4_C0035
Janpen Tangitjaroenkun	O2_O0020	John Korth	C6_C0048
Jantana Yahuefai	C5_C0273	John R. Holchuss	A_A0008
Jantrarak Tovarantonie	B1_B0017	John W. Bieber	D_D0026
Jantrawan Pumchusak	C4_C0150, E_E0096	Jompob Waewsak	D_D0007, J2_J0001
	E_E0100	Jonathan Bell	A_A0001
Jaran Phumnok	E_E0027	Jonathan M. Slater	H_H0012
Jaray Jaratjaroenphong	C3_C0113	Jongdee To-Im	K2_K0013
Janya Sakayaroj	C3_C0037, C3_C0055	Jongjit Jantra	C1_C0085, C1_C0089
Janya Boonjawat	E_E0075	Jongruk Samart	D_D0013
Janyavattanavijit, C	G_G0034	Jose H. Hodak	D_D0064, D_D0073
Jaroon Jakmunee	C1_C0180	Juergen Conrad	C3_C0089
Jarun Lomratsiri	C4_C0106	Jukrapun Nakjamsai	D_D0037
Jarunee Krakaew	J1_J0011	Jumras Umtrakul	C4_C0216, C4_C0228
Jaruntorn Boonyanuphap	F_F0056		C4_C0201, C4_C0215
Jarupat Osrattakit	D_D0045		C4_C0219, C4_C0239
Jaruwan Sirtapetawee	O1_O0019		C4_C0267
Jaruwan Buakheaw	F_F0002	Junichi Ishii	C1_C0127
Jaruwan Namnongsang	F_F0034	Junyaporn Oomong	B1_B0138
Jatupol Sangsuriyan	H_H0029	Jrgen Conrad	C3_C0087
Jatuporn Wittayakun	C2_C0209, C2_C0261	Juta Mookdasanit	F_F0035
Jatuporn Jaiboon	E_E0034	Jutamas Jitcharoen	B2_B0156, E_E0109
Jatuporn Wittayakun	C2_C0262, C2_C0124		E_E0110, E_E0112
Jeerapun Worapong	H_H0036	Juthatip Manissorn	B4_B0058
Jessadaporn Ruangmareng	O2_O0009	Jutinun Kraikrer	E_E0077
Jinda Khemprasit	C1_C0051, E_E0086	Juwadee Shiowatana	C1_C0076, C1_C0123
Jinda Songnintuck	E_E0060		C1_C0176, C1_C0190
Jindawan Sruntawneti	G_G0025, F_F0027		
Jing Liu	C1_C0192		
Jinming Gao	H_H0005	K. Ruxrungtham	H_H0015
Jintana Homkailat	B1_B0137	K. Yongvanitchit	H_H0016
Jintana Laopaiboon	D_D0001, E_E0024	K. Ariempanakit	D_D0043
	C2_C0102, C2_C0104	K. Kitta	G_G0019
	E_E0053	Kadsada Sala	C2_C0253
Jintana Sattayasai	B5_B0012	Kaew Udomsinchakorn	B4_B0204
Jintana Siripitayananon	H_H0030	Kajeenart Potivejkul	F_F0034
		Kajohnsak Vongshewarat	B1_B0162, B1_B0155

Kajornyod Yoodee	D_D0056, D_D0059 E_E0089, E_E0095	Kate Grudpan	C1_C0073, C1_C0180 C1_C0203
Kalaya Laohasongkram	G_G0006, G_G0007	Katesirin Phalaham	C1_C0011
Kallaya Dangtip	B5_B0106	Kavichat Katuengngan	E_E0043
Kallaya Pingmaung	C3_C0033	Kawin Leelawat	B5_B0133
Kamol Dasa	B1_B0194	Kawinnat Buanuang	B1_B0162, B1_B0155 B1_B0158, B1_B0161
Kamol Suwannakarn	H_H0011, H_H0027	Kedsann Pimraksa	C4_C0121
Kamolchat Charungchitree	E_E0075	Keerati Maneesai	D_D0003
Kamolporn Panyakard	C5_C0129	Keiko Kitamura	I_I0045
Kamoltip Boriboon	I_I0048	Ken Kurosaki	E_E0030
Kamolwan Wasintonwisutti	E_E0091	Kenji Sonomoto	B5_B0130
Kamonchai Trongvanichnam	C5_C0080	Kenji Abe	H_H0027
Kamonnuh Kasemchit	H_H0036	Kenji Sugibayashi	M_M0001
Kamonnut Singkhamanan	B5_B0109	Kenneth J.Haller	C2_C0107, C2_C0108 C2_C0210, C2_C0155 C2_C0253
Kamonthip Sereenonchai	C1_C0131, C1_C0241		D_D0016, D_D0017 D_D0018, D_D0019
Kamonwan Tangcharoenbumrungsui	C1_C0238	Kenjaro Onabe	H_H0041 C3_C0177
Kampanad Bhaktikul	K2_K0013	Keskanya Subbalekha	F_F0035
Kampanart Chayajanus	C3_C0220	Ketthip Anuwareephong	B5_B0121, B5_B0083 C2_C0024
Kampanart Huanbutta	M_M0004	Khaemaporn Boonbumrung	B5_B0148, B5_B0020
Kanarat Nalamang	E_E0059	Khajeelak Chablaem	I_I0017
Kanchana Sittikankaeaw	B4_B0049, B4_B0084	Khaniha Pudhom	G_G0008
Kanchana Kengkoom	B1_B0128	Khanok Rattanakhonchai	C4_C0265
Kanchit Thammassiri	B4_B0199	Khanitta Somtrakoon	D_D0067
Kanda Whangchai	B1_B0192, B4_B0008	Khasipoom Thaunkhong	C1_C0001
Kanda Saosong	C1_C0117	Khatcharin Siri Wong	B5_B0148
Kanidtha Hansongnem	C2_C0147, C2_C0165 C2_C0244	Kheamrutai Thamaphat	B5_B0012
Kanit Krisnangkura	B5_B0071	Khesom Nantachit	I_I0039
Kanit Asavaputanapun	C2_C0025	Khin Lay Kyu	G_G0013
Kanitha Snuksawad	C1_C0023	Khomkrit Arunhaipong	C1_C0023
Kanitha Katanyukunanon	K2_K0014	Khwanthipa Pandecha	C1_C0278
Kanitha Pattharakitti	K2_K0016	Khwinthi Chuaynukool	D_D0070, D_D0073
Kanitha Duangjit	I_I0053	Kiatpong Kamdee	H_H0010
Kanjana Pounto	C3_C0009	Kieatsuda Poothree	I_I0018
Kanjana Niraphai	F_F0024	Kiranant Ratanathamman	B4_B0105
Kanlaya Namsri	C2_C0102	Kitja Sawangjaroen	B1_B0034
Kanlaya Naruedomkul	A_A0009	Kitsana Aumjang	E_E0012
Kannika Sahakaro	E_E0051	Kittapong Tang	C2_C0210
Kannika Meemark	K2_K0004	Kitti Tanmuangpak	H_H0011
Kanoh Shigeyoshi	E_E0104	Kittichai Sopunna	C5_C0012
Kanokkarn Skulhee	C1_C0264	Kittipong Chanok	B2_B0003
Kanokneth Suksen	H_H0025	Kittipong Kongsomboon	C1_C0090
Kanok-On Phruksathamrungkun	H_H0007	Kittipong Longsa	B5_B0031
Kanokpan Thammawat	B4_B0152	Kittisak Chawawisit	C3_C0208
Kanokpoj Areskul	J1_J0034	Kittisak Boriboon	E_E0084
Kanokporn Boonsong	C1_C0186	Klaokwan Srisook	C1_C0172
Kanokporn Burapapadth	M_M0004	Klaus Mosbach	E_E0099
Kanokrat Singnui	C4_C0164	Klongthong Chakvattanatham	C5_C0273
Kanokvan Srakaeaw	B4_B0188	Koichi Oguma	G_G0017
Kanokwan Sawang	F_F0030	Komditi Wongtimnoi	C3_C0056
Kanokwan Puttisakunwong	G_G0021	Komkrit Hasitapan	O1_O0002
Kanokwan Rungsirivitoon	I_I0035	Kongkarn Kijroongrojana	B1_B0195
Kansri Boonpragob	B1_B0175, B1_B0164 B1_B0181, B1_B0182	Kongkiat Trisuwan	C2_C0004
Kanya Kerdin	C1_C0268	Kongvit Prasitnok	B2_B0113
Kanya Kawin	B3_B0023	Korakot Atjanasuppat	B5_B0071
Kanyarat Supabulwalana	B1_B0093	Korakot Navakhun	M_M0004
Kaoru Tada	E_E0104	Korapan Sawetsuwannakun	C4_C0201
Karan Bobuatong	C4_C0215	Kornkanok Anyusuk	B2_B0076, B2_B0078
Kasem Soyong	C3_C0214	Kornkam Kamprasert	K2_K0009
Kasidit Uechiewcharnkit	H_H0003	Kornvika Tangpong	K2_K0018
Kasinee Poolpipat	B5_B0056	Kosum Chansin	
Kasinee Hemvichian	E_E0031, E_E0039	Kowit Kittiwutthisakdi	
Kasuma Hinawahama	E_E0027	Kraetha Keawkhong	

Kriangkrai Wantong	E_F0089	M. Onur Ozbas	F_F0040
Kridsanee Muangkeaw	C1_C0260	Makoto Ogawa	E_E0090
Kriengsak Lirdprapamongkol	B5_B0083	Malee Srisodsuk	B2_B0190, B2_B0191
Krisada Piticha	C1_C0173		B4_B0184, O2_O0028
Krisana Pootakham	C1_C0103	Malee Klinkulorb	D_D0058
Krit Koyvanich	D_D0049	Malin Kvist	B4_B0168
Krit Pinthong	K2_K0004	Malinee Chutmongkonkul	B1_B0198
Kntsada Atimanon	C3_C0075	Malinee Wongnawa	C2_C0036
Kntsana Ruxwong	G_G0021	Maliwan Suebsadsena	C1_C0118
Krongkan Nasee	B4_B0095	Maliwan Amatatongchai	C1_C0230
Kongsakda Phakthanakanok	B5_B0148	Maliwan Kutako	I_I0042
Kulvadee Trongpanich	G_G0004, G_G0005	Matyn Chulasiri	C5_C0110
	G_G0012	Mana Kaomek	B5_B0028
Kumthom Thirakhuat	I_I0026	Mananya Mahdla	C1_C0134
Kunlanit Chuaychuesai	C1_C0070	Manat Jaimasit	E_E0103
Kunlaya Somboonwiwat	B5_B0179	Manee Tantirungkij	B2_B0081
Kuntida Duangsee	B4_B0074	Maneeut Prasertthawonsin	M_M0005
Kunwadee Rangsiwatananon	C4_C0187	Manit Sonsuk	E_E0031, E_E0039
Kusol Pootanakit	B3_B0075, B4_B0108		J1_J0011
	B4_B0127, B4_B0180	Manwika Boonkongkaew	C2_C0101
	B4_B0187	Marc Ellis	B4_B0186
Kwan Arayathanitkul	K2_K0019, K2_K0018	Manna Mani	D_D0007, J2_J0001
	K2_K0020	Mario Lutz	D_D0068
Kwanjai Kanokmedhakul	C3_C0212, C3_C0214	Marisa Anunchaiya	C1_C0217, C1_C0223
Kwanjira Kabdee	C1_C0225	Mark J. Embrechts	H_H0035
Kwanprasert Panchai	B1_B0029	Mameerat Sagamenjitt	C3_C0250
Kwiseon Kim	D_D0038	Martin Leitenberger	F_F0012
		Masaaki Sato	C2_C0054
	L	Masahiko Abe	M_M0002
Ladda Kanjanaseraneeepokin	C1_C0060	Matana Kacha	I_I0048
Ladda Wongpayapkul	C1_C0001	Matee Buaprom	C3_C0251
Ladda Wattanasiritham	G_G0027, G_G0004	Mathieu Lenoir	C1_C0192
Laddawan Pduangsap	C4_C0152	Matuross Malaisree	C4_C0027, C4_C0229
La-Ead Pengsopa	I_I0046	Md. Shafiquzzaman	E_E0076
Lakana Hlmakoun	H_H0045	Meghan M. Caulum	C1_C0186
	I_I0031, O2_O0012	Melissa B. Agustin	I_I0037
Lalida Vachangken	B4_B0030	Metta Charonpanich	J2_J0020
Lampa Yossornbat	C5_C0005	Michael Mcnellan	E_E0012
Leena Suntomsuk	C1_C0203	Michael J. Whitcombe	C3_C0208
Lei Ye	C3_C0208, B5_B0145	Michle Maurs	C3_C0163
	C3_C0167	Mike Bange	B4_B0186
Leif Blow	B4_B0168, B5_B0145	Mingkhwan Muangmanee	B2_B0089
	C3_C0167	Mongkhon Panyot	B3_B0075
Ukhit Khao-Ngam	C2_C0025	Mongkol Pangpet	B1_B0164, B1_B0175
Lily Eunwilaichitr	B4_B0105, B4_B0108	Mongkon Audtho	B3_B0068, B4_B0087
	B4_B0119, B4_B0127		B5_B0077
	B4_B0149, B4_B0170	Mongkon Rayanakorn	C1_C0173, C1_C0182
	B4_B0173, B4_B0180		C1_C0136
	B4_B0187	Monpichar Srisa-Ari	C1_C0272
Linda Thiraphattaraphun	E_E0035	Monrudee Ratlerdkam	B3_B0068, B4_B0067
Lucksagoon Ganranoo	C1_C0154	Monrudee Chaiyapo	B1_B0013, B1_B0011
Lukana Ngilwsara	B5_B0059, B5_B0061	Montakam Benjapalakorn	G_G0006
	B5_B0203, B5_B0107	Montakam Tansatit	H_H0042
	B5_B0121, O1_O0021	Montree Tungjai	O2_O0028
	B5_B0083	Monthana Sangkapan	E_E0035
Luksamee Sahavisit	C2_C0147	Monthatip Yunchalaad	G_G0005
Lumpoon Oxocon	E_E0024	Monthon Lertcanawanichakul	B2_B0003
Lursuang Mekasut	I_I0044	Monthon Ganmanee	N4_N0005
		Monthon Kanmanee	F_F0043
	M	Montip Lawsunyonta	E_E0020
M. Babusekam	H_H0001	Montra Montalong	B1_B0043
M. Hashizume	N1_N0011	Montra Priyapittaya	C1_C0057
M. Ilhan Cagircan	F_F0040	Montree Sawangphruk	C4_C0216
M. Mani	J2_J0021, J2_J0029	Montree Katemala	C1_C0031
	J2_J0032, J2_J0036	Montree Tungjai	O2_O0010

Montri Thongmoon	A_A0006	Nathaporn Promros	D_D0033
Montri Sanglarphachareonkit	B1_B0189	Nathawut Choengchan	C1_C0233
Montri Yasawong	B2_B0078	Natinee Lopattananont	E_E0040
Moragot Buddhakala	O1_O0011	Natticha Chiangkum	H_H0008
		Natkamol Peungsamran	E_E0085
	N	Natsurang Homchantara	B1_B0150, B1_B0165
N. Dejang	E_E0008		B1_B0161, B1_B0162
N. Nankongnab	J2_J0032, J2_J0036	Natta Tansila	B4_B0168, B5_B0147
Na Ayudhya	B4_B0154, B4_B0168	Nattachote Rugthaicharoencheep	J1_J0019
Nafena Praphairaksit	B1_B0138	Nattamon Koonsaang	C2_C0041, C2_C0054
Nampong Kongkathip	C5_C0060		C2_C0232
Nampong Piemyoo	J1_J0034	Nattapong Nujakong	C4_C0016
Nannapat Thesamran	F_F0007	Nattapong Kaensa	D_D0045
Nantana N. Ngemliang	D_D0042	Nattapong Niithi-U-Thai	E_E0092, E_E0041
Nantaporn Chookaew	K2_K0006		E_E0043
Nantaporn Nanta	C1_C0276	Nattaporn Anumansirikul	C3_C0191
Nantarat Puengpang	K2_K0001	Nattawut Rungjindamai	C3_C0037, C3_C0055
Nantarat Suebsanit	E_E0059	Nattaya Ngamrojanavanich	C2_C0024
Nantarit Chokethaworn	C1_C0135	Natthaphol Chomsaeng	E_E0079
Nantawan Kanawapee	B4_B0087	Natthapol Assavachartthongchai	C1_C0115
Nanthavan Ya-Anant	I_I0021	Nattida Suwanakitti	C2_C0024
Nanthawan Sangthong	C4_C0017	Nattida Ragkapao	C4_C0034
Nanthawat Wannarit	C2_C0222	Natwida Duangphui	B1_B0155
Nantiya Aggimarangsee	B1_B0200	Navarat Maneekaew	C5_C0143
Napanporn Vallapa	H_H0043	Nawaporn Ittichaimanon	I_I0024
Napaporn Youngvises	C1_C0049, C1_C0050	Nawarat Muanglen	B1_B0126
	C1_C0053	Nawarut Chunsuk	I_I0015
Napasawan Hatthakitpanichakul	C2_C0020	Netnapit Kaewchoay	K2_K0005
Napasorn Kusucharit	C5_C0080	Ngamnit Wongcharoen	D_D0005, D_D0033
Napattarapong Suvannachai	C3_C0033		D_D0039, D_D0041
Napharat Minsakorn	H_H0029	Ngampong Kongkathip	B5_B0177, C5_C0273
Narakorn Khunweeraphong	B3_B0136		C5_C0274, C5_C0275
Nararat Thongsnoon	C1_C0192	Nichaya Praditsup	N4_N0005
Narathip Pradidphol	C5_C0273	Nick Ceroone	A_A0009
Nareerat Moonjai	B4_B0168	Nijisri Ruangrungsi	B4_B0058, H_H0017
Narin Pisuthrattana	B4_B0171		H_H0020, H_H0004
Narin Sinkulrat	E_E0071		H_H0016, H_H0026
Narintip Chanakul	C1_C0120	Nikom Seangsuwan	C4_C0098
Naris Mingmora	A_A0002	Nikom Mangkornitong	D_D0035, D_D0040
Narison Kongruttanachok	H_H0039		D_D0051, D_D0036
Narit Sitasuwan	B1_B0015	Nikom Panrun	D_D0032
Narit Klompong	D_D0007	Nilubol Kitancharoen	O2_O0005, B1_B0116
Narit Sitasuwan	B1_B0082		B1_B0029
Narong Kotchabhakdi	C1_C0043	Nimit Kimpraphan	D_D0028
Narongchai Tongyoo	B3_B0023	Nipan Ratchapol Srathongjai	F_F0011
Narongsak Puanglarp	B1_B0063, B4_B0140	Nipaphat Charoenthai	C4_C0020, C4_C0015
	B4_B0142		C4_C0017, E_E0023
Narongsak Chaichit	C2_C0218, C2_C0222	Nipaporn Sansawit	G_G0020
	C2_C0224	Nipawan Adisornvorawoot	C1_C0276
Narongsak Yotmao	D_D0040	Nipawan Poramathikul	H_H0029
Narongsak Puanglarp	I_I0026	Niphone Thaveechai	F_F0049
Narongsak Srisom	K2_K0012	Nipon Tungtham	C1_C0023
Naruemon Setthaya	C4_C0121	Nipon Thangprasert	D_D0023, D_D0024
Naruemon Yutakorn	K2_K0028	Niran Vipungruon	H_H0020, H_H0017
Narumol Kerdsa	E_E0061		H_H0026, H_H0016
Narumol Vachirapatana	F_F0036	Nirand Pongpun	C1_C0234
Narumon Pattayagorn	C4_C0156	Nirawadee Shreesuvun	B2_B0104
Narumon Emarat	K2_K0018	Nisa Kunapongsin	E_E0035
Nason Phonphok	D_D0011	Nisanart Navapan-Traiphol	E_E0073, E_E0092
Nataporn Nanta	I_I0026	Nisarat Taweewan	E_E0004
Natchanon Amornthammarong	C1_C0172, C1_C0241	Nisaudah Radenahmad	H_H0010
Natchanon Leepipalpiroon	C1_C0057, C1_C0278	Nison Sattayasai	B5_B0012, F_F0001
	C1_C0006	Nitat Jira-Arun	E_E0014
Natechanok Thamnierdee	B3_B0086	Nitchatorn Sungsin	B1_B0198
Nathamol Chindapan	G_G0029	Nithima Khaorapapong	E_E0090

Nitima Wongwattananukul	H_H0032	Orapun Thawornsinsurakul	C1_C0235
Nitisak Sawasirakij	B5_B0056	Orasa Pattarapibolchai	C2_C0078
Nittaya Suklim	C1_C0206	Orasa Pancharoen	C6_C0005
Nittaya Laosat	B3_B0007	Orasa Patarapiboolchai	E_E0034
Nitus Tipsothaiyana	I_J0033, J2_J0031	Orasa Anan	I_J0052, I_J0053
Nivet Chirawichitchai	A_A0010	Orasa Patarapiboolchai	O1_C0019
Niwaichai Pompatcharasakul	I_J0016	Oratal Sukcharoen	C3_C0249, C3_C0250
Nobuhiro Nakadan	D_D0018		C3_C0255
Nonglek Saedow	B5_B0183	Oravan Sanguanruang	C2_C0226, E_E0060
Nongluck Houngkamhang	E_E0022, E_E0023	Orawan Khamman	E_E0067
Nongnuch Gumlungpat,	B1_B0193	Orawan Chountragoon	B2_B0081
Nonpiya Vongsavatsot	C1_C0059	Orawan Chachawankanphanich	F_F0049
Nooduan Muangsarn	B2_B0016	Orawon Chailapakul	C1_C0171, C1_C0199
Noojaree Prasitpan	C1_C0223, C5_C0273		C1_C0203, C1_C0205
Nootchanat Mairuae	B4_B0095		C1_C0230, C1_C0200
Nootchanat Kunlayanawisut	I_J0018		C1_C0202
Noparit Jinuntuya	J1_J0034	Orn-Anong Arquero	C1_C0197
Noppakao Ex-Un	I_J0011	Ornjira Anuksakunwong	C4_C0027
Noppol Leksawasdi	G_G0024	Ounsa Nontpala	I_J0046
Noppom Leeprechanon	J1_J0019		
Noppom Rujsamphan	D_D0071		P
Nuanchawee Wetprasit	H_H0038	P.Sutthavaiyakit	C1_C0213
Nuanlaor Ratanawimarnwong	C1_C0148	P.Rakkwamsuk	D_D0043
Nuanpan Piboonrinakra	C3_C0084	P. Santprasert	E_E0063
Nuanphan Chantarasiri	E_E0025	P. Singjai	E_E0063
Nuchanapom Kullabootdee	C2_C0100	P. Buaphet	J2_J0021, J2_J0036
Nuchanart Jongreklia	C1_C0181		J2_J0029, J2_J0032
Nuchanat Na-Ranong	E_E0097	P. Panichayunon	J2_J0021
Nucharin Luangsa-Ard	G_G0001	P.F. Rogl	D_D0065
Nuchjarin Kongchana	E_E0019	Pacawadee Tirawongsaraj	B4_B0108, B4_B0180
Nuchthana Poolthong	E_E0079	Pacharapom Phupaiboon	B2_B0081
Nungruethai Yoswathananon	C2_C0054	Pachaya Ngamlin	F_F0019
Nuntana Aroonrerk	C3_C0094, C3_C0247	Padermsak Jarayaphan	N4_N0005
Nuntawut Puttawong	C1_C0141	Padung Laeyadsinlapa	D_D0012
Nunthawan Nowwarote	B5_B0114	Pailin Phoopat	G_G0012
Nurak Gnsdanurak	C2_C0261, C2_C0262	Palrote Jaideaw	D_D0058
Nutchanun Sompao	E_E0107	Palrote Klinpituksa	O1_C0019
Nulsurang Homchantara	B1_B0158	Paisan Tooprakai	D_D0027
Nuttapon Apiratikul	C3_C0247	Paisan Boonchiam	J1_J0002
Nuttapon Laorodphan	E_E0103	Paisam Daungjak Na Ayutthaya	D_D0068
Nuttapong Thancharoen	I_J0051	Paisam Sithigomgul	B1_B0063, B4_B0066
Nuttaporn Promros	D_D0041	Partip Thiravetyan	I_J0035, I_J0041
Nuttawut Kaveevitichai	C2_C0042	Paitoon Leksawasdi	B1_B0088
Nuttha Thongchul	E_E0044, H_H0043	Pajarea Patanathabutr	E_E0004
Nutthita Chuankrerkkul	E_E0021	Pajaree Chooprayoon	H_H0030
Nuttima Kositcharoenkul	F_F0049	Pajaree Thongsanit	I_J0018, I_J0039
		Pajaree Thavorniti	E_E0078
	O	Pajongsuk Sutarut	B1_B0063
Oldroyd B.P.	B1_B0055	Pakawadee Sutthavaiyakit	C1_C0206
Oliver Hofmann	C1_C0230	Pakhwan Vanichnukroh	N1_N0007
Onanong Pringsulaka	F_F0034	Pakorn Sittiketkorn	D_D0005, D_D0041
Onanong Chamlek	D_D0062		D_D0033, D_D0039
Onanong Naivikul	G_G0002, G_G0016	Pakorn Varanusuakul	C1_C0202
Ongard Nirmpao	C3_C0084	Pakwipa Poonsawad	C1_C0189
Onjila Bouprasert	C3_C0062	Palangpon Kongsaree	C2_C0100, O1_C0021
Onjira Anuksakunwong	C4_C0229	Pan Tongraung	C2_C0026
Onuma Noppagorn	D_D0045	Panadda Boonserm	B5_B0070, B5_B0109
Opas Bunkoed	C1_C0061		B5_B0112
Orachat Apichatratanachai	B4_B0169	Panadda Phansamdaeng	E_E0086
Oranari Matangkasantombut	H_H0039	Panatcha Anusasananan	D_D0023, D_D0024
Oranat Suntornwat	C1_C0010	Panawan Moosophon	C3_C0214
Oranuch Nakchat	I_J0010	Panee Subprasert	C1_C0196
Oraphan Anurukvorakun	C1_C0203	Panich Kanchai	D_D0013
Orapin Komutiban	C5_C0194	Panichakorn Jaiyong	C4_C0257
Orapin Chienthavorn	C1_C0189, C1_C0196	Panida Un-Arn	C2_C0155

Panit Sherdshoopongse	C1_C0130	Patidta Sastranurak	C1_C0241
Panita Decha	C4_C0229, C4_C0188	Patiya Pasakon	C1_C0134
	C4_C0027	Patjarapom Wongvithoonayaporn	B5_B0209, B4_B0152
Panita Chinvetkivanich	D_D0056, E_E0095		B5_B0183
Panita Ngamchuachit	G_G0020	Patompong Chanani	E_E0048
Panitat Hasin	C2_C0232	Patoommam Upathum	C1_C0077
Pannee Pakkong	B4_B0040, C1_C0023	Patoomratana Tuchinda	C3_C0092
Panomwan Wangspa	B3_B0079	Patradanal Rotkasem	E_E0089
Panomwan Panseeta	C5_C0198	Patrick S. Callery	M_M0007
Panor Asvarujanon	B2_B0076	Pattana Sripalakit	H_H0044
Panote Thavarungkul	C1_C0085, C1_C0086	Pattanop Kanokratana	B4_B0127
	C1_C0088, C1_C0095	Pattarachai Lalitrojwong	A_A0007
	C1_C0059, C1_C0061	Pattarapol Chaisuntikutwat	C1_C0049
	C1_C0069, C1_C0071	Paul Evenson	D_D0026
	C1_C0192	Paul B. Savage	C2_C0042
Pantaree Katawee	B1_B0004	Paul S. Gross	B5_B0139
Panthip Rattanasinganchan	B5_B0133	Paveena Khansawai	E_E0019, E_E0045
Pantipa Subhasitanont	B5_B0107, B5_B0203	Paveena Tapaneeyaworawong	F_F0046
Pantipa Nuamkhuntod	B2_B0174	Pawanrat Mollat	C4_C0016
Pantipa Subhasitanont	B5_B0121	Paweena Wadbua	O2_C0005
Panu Danwanichakul	J1_J0013	Pawinee Piyachaturawat	H_H0024, H_H0025
Panupat Chaiworn	D_D0036	Pawinee Srisukvatananan	K2_K0015
Panutat Boonpramuk	D_D0022	Pawncan Sangkam	C1_C0148
Panuwat Punitinsee	B3_B0132	Pawnprapa Krasae	C1_C0241
Panuwat Suppakul	G_G0001	Pedram Attarod	N1_N0010
Panvika Pannopard	C4_C0201	Peerada Pakdeespin	C1_C0019
Paramaporn Chiewpattanakul	B4_B0026	Peeraporn Siriputtawon	D_D0041
Parawan Chuichay	C4_C0265	Peeravut Wongsawad	B1_B0192
Parawee Chaono	E_E0065	Penpan Khanrin	C3_C0009
Parayya Udomkusonsri	C5_C0080	Penporn Sujiwattananat	B5_B0033
Parichat Theanjumpol	C1_C0279	Penporn Neamhom	H_H0044
Parichat Nareeboon	C3_C0089	Pensak Jantrawut	M_M0001
Parichat Phumkhachorn	B2_B0002	Peter A. Graf	D_D0038
Parichat Khamsam	I_I0053	Peter F. Messer	E_E0021
Panchai Venalabhapatana	C1_C0199	Phanee Sawangareetrakul	B5_B0131, B5_B0203
Parin Chavisuthangkura	B4_B0066		B5_B0121
Parinda Manonut	C4_C0015	Phanee Pidetcha	K2_K0025
Pannda Penroj	G_G0018	Phanom Kadrun	D_D0049
Pannithom Temyarasilp	I_I0029	Phaopirat Khasaksaw	C3_C0013
Parinya Seelanan	C1_C0272	Pheravut Wongsawad	B4_B0166, B1_B0013
Parnupong Artsalee	I_J0016		B4_B0008
Parvapan Bhattarakosol	H_H0011	Phichet Limsuwan	D_D0042
Pat Wongpan	D_D0029	Phikon Ralphonson	E_E0045
Pataranan Chotsang	C3_C0094	Philip S. Crooke	A_A0008
Patcha Chatraphorn	D_D0006	Phimchanok Naktharut	B4_B0099
Patchanee Charoenying	C3_C0094	Phimpaka Harding,	C2_C0145
Patchara Subhadhirasakul	H_H0010		C2_C0003, C4_C0164
Patcharapen Sirwat	B5_B0203	Phinyatorn Suwanmala	E_E0031, E_E0039
Patcharaporn Boonyos	B5_B0112	Phrom Singhaphan	B2_B0078
Patcharaporn Wongsomboon	C1_C0181	Phisam Khawsak	B2_B0078
Patcharawalai Kinubol	B4_B0157	Phongsak Innok	C3_C0252
Patcharee Promdonkoy	B5_B0032, B5_B0111	Phoonthawee Saetear	C1_C0131
	B5_B0196	Phoungtip Kaewtubtim	N2_N0013
Patcharee Sunthomanch	C5_C0276	Phrapasri Louchem	C2_C0030
Patcharee Tungtrakul	G_G0027, G_G0003	Phunticha Phunpal	C3_C0254
	G_G0015, G_G0018	Piamsak Menasveta	I_I0042, B1_B0042
Patcharee Srichaen	C1_C0011		B1_B0048, B1_B0063
Patchareenart Sapanpakorn	C4_C0259	Piamsook Pongsawadsi	B3_B0062, B3_B0064
Patchareeyaporn Pan-Ya-Ari	B1_B0015	Piangjan Poyoi	B3_B0086, B4_B0049
Patcharin Jantawong	I_I0046, B2_B0178	Piboon Pantu	B4_B0084, B4_B0140
Patcharin Chaisuwan	C1_C0203		B4_B0142, F_F0046
Patcharin Nuansrithong	H_H0034		I_I0026
Pathom Jujun	C1_C0103		B4_B0045
Pathra Sakunasingh	F_F0015		B4_B0066
Pathumwadee Intharathep	C4_C0188		C4_C0216

Piboon Mongkolsuk	B1_B0150, B1_B0155 B1_B0158, B1_B0161 B1_B0162, B1_B0151	Ponchai Jaruratjamon	F_F0001
Piboon Mongchay	D_D0051	Pongchayont Sirikhajomnam	J1_J0013
Pichai Namprakai	J1_J0009	Pongjet Promvongse	J1_J0037
Pichai Lawruangrath	J2_J0012	Pongmanee Thongbai	B4_B0186
Pichayana Juamane	G_G0017	Pongpant Netsingha	O2_O0007
Pichayothai Mahatthanapiwat	A_A0004	Pongpun Siripong	C5_C0273, F_F0029
Pichet Limsuwan	D_D0014, E_E0055	Pongsak Rattanachakunsopon	B2_B0002
Pikul Kongkawl	E_E0032	Pongsak Dokpong	C2_C0107, C2_C0108
Pianee Vaitthanomsat	B2_B0006	Pongsak Noophan	I_J0011
Pimonthan Sereewattanachai	B1_B0041	Pongsakom Talpengtamrongkul	D_D0045
Pimpanitpa Kunthadong	H_H0031	Pongsakom Jantaratana	D_D0002
Pimporn Leelapornpisid	C5_C0132, H_H0032	Pongsathorn Dhuntanorn	B5_B0024
Pimpong Chitbunchong	G_G0018	Pongsiri Wintchai	O2_O0009
Pinich Wangsomnuk	B1_B0126, B1_B0137	Pongsri Mangkornong	D_D0035, D_D0040
Pinith Ratananukul	C5_C0143, C5_C0194 C5_C0198		D_D0051, D_D0036
Pinphet Choochongdij	I_I0010	Pongsuda Pongtanya	B4_B0152
Pinsuda Viravathana	E_E0016, I_I0011	Pongtanawat Khemthong	C2_C0209
Pinsupha Petiraksakul	E_E0069	Pongyut Junthong	I_J0033
Pintip Ruenwongsa	K2_K0013, K2_K0021	Poochawind Sanitt	B5_B0070
Pintip Jantaratap	C5_C0012	Poonlarp Cheepsunthorn	B4_B0095
Pipat Chooto	C1_C0084, C1_C0125 C1_C0130	Pornchai Maneeratpairoj	N2_N0001
Pipat Pichestapong	C1_C0225, J1_J0011	Pornpan Watchasanyakorn	C4_C0157
Pipat Khongpracha	C4_C0239	Pornpan Pungpo	C4_C0266, I_I0053
Pipop Arunjindawan	J1_J0035		C4_C0096, C4_C0259
Pisal Srigate	G_G0022	Pompapa Buaphet	I_J0052
Pisit Tangkijvanich	H_H0019, H_H0027	Pompat Sam-Ang	J2_J0001, D_D0025
Pisit Jantarasuwan	E_E0046, M_M0001	Pompat Sam-Ang	C5_C0275
Pisutti Dararutana	E_E0071	Pompem Khaiman	E_E0098
Pitak Youmee	C2_C0030	Pompimol Muangthai	C1_C0011
Pitak Loaratanakul	E_E0073	Pompimol Boonchai	C1_C0071
Pitchasak Chankusorn	D_D0053	Pompimol Srongkham	B4_B0119
Piti Treesukol	C4_C0267	Pornpimon Thiptara	B5_B0122
Piti Panichayunon	D_D0008, D_D0025	Pornpimon Kanjanavas	B2_B0078
Piti Amparyup	B4_B0038, B5_B0039 B5_B0139, B5_B0037 B5_B0208	Pornpun Phimol	C1_C0086, C1_C0095
Pitsanu Khoriboot	I_I0030	Pornrat Wattanakasiwich	K2_K0030
Pitt Supaphol	E_E0098	Pornsatit Sookchoo	C4_C0152
Pittaya Suamsiri	F_F0012	Pornsilri Kongjaeng	D_D0016
Piyachat Chaluar	G_G0023	Pornswan Wasant	B5_B0061
Piyada Suwandittakul	C1_C0202	Pornthep Sompompisut	B5_B0148, C4_C0074
Piyada Jittangprasert	C1_C0203, C1_C0142		C4_C0188, C4_C0027
Piyada Theerakulpisut	B4_B0087	Pornthip Liewtrakul	K2_K0006
Piyada Saenghirun	O2_O0028	Pornthip Pomsuriya	F_F0026
Piyanan Leekaew	B3_B0060	Pornthip Seema	O1_O0003
Piyane Chuychai	D_D0010, D_D0027	Pornthip Tantivong	K2_K0005
Piyanee Phatsanaphin	C1_C0263	Prabhop Dansethakul	K2_K0025
Piyancot Noiduang	G_G0030	Prachak Chantree	E_E0110, E_E0112
Piyannun Harnpicharnchai	B4_B0180, B4_B0108	Prachoom Khampit	J1_J0005, J1_J0022
Piyaporn Suanchan	E_E0040		J1_J0004
Piyaporn Srisom	H_H0012, C5_C0276	Prachumporn Kongsaree	B5_B0033, B5_B0097
Piyarat Itharat	B1_B0165		B5_B0146
Piyarat Bhamanee	D_D0087, J2_J0026	Prachya Kongtawelert	H_H0002
Piyarat Trakuljitsuth	E_E0054	Pradit Nutthanara	E_E0088
Piyarat Govitrapong	H_H0022	Pradudnate Katewong	C3_C0033
Piyat Moonson	C4_C0082	Prasawpilin Kangvansura	C2_C0175
Piyawan Boonmakso	B4_B0099	Pragrom Prayoonrat	B1_B0005
Piyawat Komolmit	H_H0019	Prakaywan Tachaprasertporn	E_E0025
Ploy Leungphairojana	E_E0004	Pramot Satasuvon	J2_J0026, D_D0067
Pluang Suwanmanee	B1_B0167	Pramote Pomsuriya	F_F0026
Polkil Sangvanich	B5_B0122	Pranee Nandhasri	H_H0003
		Pranida Kgpituck	H_H0024
		Pranom Chantaranothai	B1_B0019, B1_B0050
			B1_B0123, B1_B0125
			B4_B0087
		Pranom Dacheungkhoa	H_H0037
		Pranom Chumreang	I_I0004

Pranom Puchadapirom	O2_O0012	Rachanida Panjakha	H_H0030
Pranon Nanakorn	E_E0087	Rachanimuk Preechaphot	B4_B0084 ,B4_B0140
Prapaij Kaikaw	C1_C0242	Rachata Phokrachang	J2_J0007
Prapassorn Damrongkool	B3_B0007, B4_B0030	Rachsak Sakdanuphab	E_E0095
Prapassorn Chaisai	C1_C0225	Radchada Buntan	C2_C0079 ,C2_C0178
Prapat Cheuthai	J2_J0027	Raewat Laopai boon	D_D0001 , E_E0024
Prapimpan Supmuang	C4_C0159		C2_C0102 ,C2_C0104
Prapin Wilarat	C1_C0131, C1_C0142		E_E0053
	C1_C0148, C1_C0148	Raina Wanbayor	C4_C0026
	C1_C0203, C1_C0241	Rakchart Traiphon	C4_C0021 , C4_C0015
	C1_C0233		C4_C0016 ,C4_C0017
Prasat Phonmdaeng	O2_O0005		C4_C0020 ,E_E0022
Prasat Kittakoo	B1_B0195		E_E0023
Prasert Kengkan	D_D0052, D_D0057	Rakrudee Samthima	B5_B0072 ,B5_B0073
Prasert Pavasat	I_J0042	Ramida Watanapokasin	E_E0056 ,B5_B0056
Prasit Purachat	C1_C0138		C3_C0248
Prasit Tharavichitkul	C1_C0103	Ranee Suwanpruk	I_J0030
Prasit Burapanuangsang	C3_C0167	Rangson Katsutath	E_E0064
Prasong Kesseratikoon	I_J0019, D_D0020	Ranco Khamhorn	I_J0052
	D_D0021	Rasamee Chaisuksant	C1_C0010 ,C1_C0070
Prasong Tungprasit	K2_K0004		C2_C0079
Pratchya Namwong	E_E0103	Rasamee Supasri	G_G0015
Prathan Prachopchok	D_D0041, D_D0005	Ratadej Chanwirat	C1_C0206
	D_D0033, D_D0039	Ratana Sampantachit	B5_B0141
Pravit Asarvanonda	B4_B0157	Ratana Rujiravanit	E_E0033 , E_E0066
Praweena Maneerattananurong	B1_B0043	Ratana Banyerdpongchai	H_H0002
Pravit Nuengmatcha	C1_C0066	Ratanapom Chaiyapongpipat	I_J0041
Prayoon Songsirintitkul	O1_O0018, O1_O0011	Ratanasuda Wanunoyupalin	C2_C0036
Preecha Thiampanya	C3_C0125	Ratapol Somprasert	B1_B0001
Preecha Phuwapraisirisan	F_F0029, F_F0030	Ratapol Promnocy	D_D0057
	O2_O0013, O2_O0014	Ratapon Sukamsae	F_F0010
Preeda Sansri	F_F0009	Ratchada Teparak	E_E0017
Preeyanan Buasod	C1_C0070	Ratchadaporn Puntharod	C2_C0107 ,C2_C0108
Preeyanut Duanglaor	C3_C0193	Ratchapak Chitane	K2_K0018
Premruechai Supungul	B5_B0197	Rathanawan Magaraphan	E_E0066
Premsak Puangploy	C1_C0246	Ratrot Pareepart	C1_C0269
Preprame Pattanamahakul	G_G0019	Ratsami Lekphrom	C3_C0212
Prisnar Sirlacha	B2_B0006	Rattanabhorn Junthip	H_H0007
Proespichaya Kanatharana	C1_C0085, C1_C0088	Rattanan Tuangudomsap	C3_C0183
	C1_C0088, C1_C0095	Rattanaporn Pichedrujirot	K2_K0016
	C1_C0059, C1_C0061	Ratthasart Amarat	D_D0059
	C1_C0069, C1_C0071	Rattikam Khankua	E_E0080
	C1_C0192, C1_C0043	Rattikorn Yimnirun	E_E0067
Prompong Pienpinijtham	C4_C0170	Rattiya Chueysong	C1_C0064
Prutinan Changhin	C3_C0179	Rawat Jaisutti	D_D0062
Puchanee Lamulsuk	C3_C0248	Ray L. Withers	O1_O0022
Puchong Wararattananurak	C1_C0126, C1_C0130	Rayakorn Nokkaew	C3_C0032
Puey Ounjai	B5_B0159	Reinhold Carle	F_F0012
Punlop Kuntiyong	C3_C0075 ,C3_C0084	Renu Vejaratpimol	B1_B0193
Punlop Toghaw	A_A0005	Reshmi Sharma	C1_C0058
Punya Temcharoen	O2_O0012	Richard L. Deming	C4_C0082
Pumendu K. Dasgupta	C1_C0233	Rinrada Promsin	B4_B0153
Putcharin Chittiteeranon	B4_B0045	Ritthirong Sae-Lee	B4_B0067
Putsatee Pariyanonth	B1_B0198	Robert Molloy	E_E0028
Puttanuksa Varanusupakul	C1_C0227	Robert McKibbin	A_A0006
Puttinan Meepowpan	H_H0031 ,B1_B0195	Robert Azerad	C3_C0153
		Robert Molloy	H_H0030 ,H_H0031
	Q		E_E0059
Qingdi Zhou	O1_O0022	Rodjana Burakham	C1_C0073 ,C1_C0044
		Roger Pyle	D_D0026
	R	Roger F. Uglow	C1_C0053
R. Soner Silme	F_F0040	Romanee Sanguandeeikul	G_G0001, G_G0035
R.Koul	K2_K0005	Romchat Chutoprapat	M_M0002
Rachadaporn Benchawattananon	B1_B0027	Romran Chusie	C2_C0204 ,C4_C0028
Rachanee Rujivarodom	D_D0034	Ronald Beckett	C1_C0058

Roongroje Flatana-Chpas	C1_C0019 ,C1_C0169	Sakdiphon Thiansem	C1_C0081
Ruangsak Trakunphutthrak	A_A0007	Sakmontri Nachaiwiang	F_F0037
Ruangsn Watanesk	C1_C0081 ,C4_C0082	Sakol Panyim	B1_B0129 , B3_B0136
Ruben O. Donis	H_H0021		B5_B0032 , B6_B0077
Ruchanok Cheotacha	B4_B0160 ,B4_B0153		B5_B0130 , B5_B0196
Rudee Surarit	B5_B0083	Saksit Chanthai	C1_C0047 , C1_C0072
Rudeerat Suntako	E_E0073, E_E0092		C1_C0120 , C1_C0118
Rungaroon Pimparu	C1_C0182	Sakuntam Sanonpim	D_D0017 , D_D0016
Rungdaow Dumsri	D_D0008		D_D0018
Rungnapa Leelatanawit	B4_B0140	Salukit Thanee	I_I0034
Rungnapa Chotongdee	B5_B0020	Salin Chutinimitkul	H_H0021 , H_H0011
Rungnapa Leelatanawit	B4_B0084		H_H0019
Rungnapa Tipakontitkul	E_E0001 ,E_E0002	Samaisukh Sophasan	H_H0024 ,H_H0025
Rungnapha Suttisri	I_I0042	Samam Kaewyudth	K2_K0015
Rungrach Wangspa	B3_B0079	Samart Kongtaweelert	E_E0055
Rungrat Jitvaropas	B5_B0139	Samart Shianmon	J1_J0035
Rungroj Maofanon	D_D0068	Samlee Mankhetkorn	O2_O0010, O2_O0023
Rungrot Cherdtrakulkiat	K2_K0025 ,O2_O0017	Samorn Hirunpraditkoon	B4_B0169
Rutaiwan Tohtong	B5_B0133	Samran Prabpai	C2_C0100
Rutchadaporn Sriprang	B4_B0170 , B4_B0105	Samroeng Krachodnok	C2_C0107 ,C2_C0108
	B4_B0108 , B4_B0149	Sanan Subhadhirasakul	C3_C0111
	B4_B0173 , B4_B0180	Sanglar Polnok	H_H0044
Ruthairat Nimthong	C4_C0093	Sangobtip Pongstabodee	I_I0044
Ryuji Katayama	D_D0017 , D_D0018	Sa-Nguansak Thanapompoonpong	C1_C0279
	D_D0019 , H_H0015	Sanong Ekasat	E_E0052 , C1_C0238
			C4_C0156 , C4_C0157
	S		C4_C0159 , C4_C0161
S.Sutthivaiyakut	C1_C0213		C4_C0170 ,E_E0070
S.Phutwat	D_D0043	Santi Kaewmokul	C4_C0162
S.Dumrongrattana	D_D0043	Santi Tip-Pyang	C5_C0080
S.Wirojanupatump	E_E0008		F_F0029 ,F_F0030
S.Jiansirisomboon	E_E0008		O2_O0013 ,O2_O0014
S. Furui	G_G0019	Santiya Kerdphocha	C5_C0052
S. Nakapadungrat	N1_N0011	Sanya Meesim	B1_B0161
S. Phethuayluk	J2_J0029 , J2_J0036	Sanya Tedthong	C1_C0270
S Phetuayluk	J2_J0032	Saovane Kovuttikulrangsie	E_E0032 ,E_E0041
S Ravangvong	J2_J0029		E_E0043
S. Ravikumar	H_H0001	Saovaratjanee Jantawang	E_E0108
S. Wannarukwian	N1_N0012	Saowakon Wattanchant	G_G0013
Sa-Ad Treepongkaruna	B5_B0133	Saowanit Thongsai	C2_C0145
Sa-Ad Riyajan	E_E0010	Saowanit Chobun	B5_B0018
Sabine Mika	C3_C0087	Saowanit Sathong	C4_C0093
Seengrewee Sutthiparinyanont	C5_C0110	Saowapak Teerasong	C1_C0134
Saethawat Chamsart	I_I0003	Saowarux Fuangswasdi	C2_C0042
Sahattaya Rattanamongkonkul	A_A0008	Saranyu Khammuang	B5_B0073 ,B5_B0072
Saion Vinitnantharat	O1_O0006	Sarasate Eiamtanasete	B1_B0129
Seijai Chamsethikul	C1_C0206	Saravut Dejanee	C1_C0019 ,C1_C0169
Seipin Chaiyanan	B4_B0171	Saravut Tantivat	K2_K0004
Seisamom Lumlong	E_E0036 , E_E0037	Sarawadee Kosrisakul	C1_C0200
Seisunee Uawruangrath	C1_C0022 ,C1_C0139	Sarawut Pomsinichotkul	E_E0098
	C1_C0144 ,C5_C0045	Sarayut Radapong	O2_O0001
	C5_C0048 , C1_C0029	Sarinya Kitticharoenkan	G_G0030
	C1_C0077 , C1_C0090	Sarote Boonseng	C4_C0099
	C1_C0122 , C5_C0149	Sarra Rafrafi	C1_C0053
	H_H0012 , C5_C0278	Sarun Chittavanichprapa	C2_C0079
	C1_C0184, C5_C0046	Sarunya Promkotra	I_I0051
Seisuree Prateeptongkum	C3_C0092	Sarunyaporn Maksup	B4_B0098
Saiwanun Chaiwanichsiri	G_G0020 , G_G0006	Sarute Ummayotin	C2_C0054
Sakchal Sattienperakul	C1_C0090	Sasthon Petkon	B4_B0140
Sakda Yainoy	B4_B0154	Sasthom Muncharoen	C1_C0134
Sakda Daduang	B5_B0080	Sasuree Jarujit	F_F0001
Sakda Yainol	B5_B0145	Sathaporn Direkbusarakom	F_F0043
Sakda Jongkeawwattana	C1_C0136	Sathon Vjarnwannaluk	N1_N0007 , N1_N0008
Sakda Suknil	C1_C0236		D_D0017
Sakda Daduang	F_F0053	Satima Saranark	E_E0074

Satreerat K.Hodak	D_D0073 , D_D0070	Sinpor Jungsuttiwong	C4_C0266
	D_D0072	Siriporn Larpiattaworn	E_E0049 , E_E0016
Savitri Gadavanij	K1_K0023	Siriporn Chantaraj	H_H0038
Sawanya Janput	E_E0022 , E_E0023	Siriporn Boonpa	E_E0016
Sayan Prakobpetch	B3_B0064	Siriprapa Intaphan	A_A0003
Sayan Phokate	D_D0013	Sirirat Phalsansuthichol	C1_C0169
Seewapong Chamratpan	B1_B0057	Sirirat Fa-Aroonsawat	B3_B0115
	B1_B0208	Sirtan Jiamsinert	J1_J0024 , E_E0077
Seik Weng Ng	C2_C0253		E_E0078
Senee Kruanetr	C1_C0122	Siriwan Kaewdee	C4_C0039
Sergei Nazarenko	H_H0005	Sinwan Onjun	E_E0062
Seri Donnua	F_F0051	Sinwan Phattananudee	E_E0082 , E_E0084
Seriwat Saminpanya	N2_N0001	Sinwara Tosayanon	D_D0045
Serm Surapinit	O2_O0014	Sirwat Sansuk	C4_C0180
Shamaporn Niwasabutra	B1_B0021	Sirwit Buajarem	I_I0024
Shanop Shuangshoti	H_H0041	Siriwoot Sookkhee	B2_B0089
Shigetaka Wada	E_E0077	Sinya Thammachat	B5_B0110
Shinsuke Yamanaka	E_E0030	Siriyaporn Thaleongwuttiwong	C3_C0254
Sho Sakurai	B1_B0041	Sirorat Tungsatiporn	E_E0058
Shoji Motomizu	C1_C0233	Siseerot Ketkaew	J1_J0010
Shuichi Tanoue	J1_J0008	Sita Predanon	C3_C0040 , C3_C0056
Shuleewan Rajviroongit	C4_C0257 , C3_C0211	Sithichai Pinkanjanarod	J1_J0034
Shunichi Hayashi	E_E0104	Sithichai Anuphap-Udom	J2_J0015
Shunji Sugano	E_E0104	Sithidesch Sombund	O2_O0013
Siam Popluechai	B4_B0030 , B3_B0007	Sittichai Kulawong	C2_C0262
	C1_C0060	Sittichai Seangatih	J1_J0028
Sikthamondhol, C	G_G0034	Sittichai Wirajanupatump	E_E0005 , E_E0007
Sineenat Utto	C2_C0195	Sittikom Theerakawong	B4_B0171
Sineenat Siri	O2_O0005	Sittipong Ruktamatakul	A_A0001
Sirada Mapantha	H_H0044	Sittipong Amnuaypanich	E_E0019 , E_E0042
Siranul Lamseejan	F_F0059		E_E0045
Sirapat Pratontep	D_D0068 , D_D0062	Sittiporn Pamimen	B1_B0150
	E_E0076	Sittiruk Roytakul	B4_B0053 , B4_B0094
Siraporn Ripon	C1_C0279		B4_B0096 , B4_B0098
Siraprapa Thaitaworn	C2_C0226	Sittischok Soontonopas	K2_K0002
Sirasa Phoomkeaw	D_D0059	Sittiwat Lertsiri	H_H0036
Sirawut Klinbunga	B1_B0042 , B1_B0048	Sivapong Sungpredit	H_H0018
	B3_B0062 , B3_B0064	Siwadol Sateanpattanakul	A_A0004
	B3_B0086 , B4_B0047	Siwaporn Longyant	B1_B0063 , B4_B0066
	B4_B00496 , B4_B0084	Siwaporn Meejoo	E_E0054 , C4_C0065
	B4_B0140	Smartachai Santawanpas	B5_B0025
Sirichok Jungthawan	D_D0038	Smith Elamsa-Ard	J1_J0037
Sirichom Thungkao	I_I0003	Soanwadee Chaarnansujarit	E_E0064
Sirikan Nawapan	B4_B0040	Sojiphong Chatraphorn	D_D0028 , D_D0056
Sirikan Pasook	C3_C0062		E_E0089 , E_E0095
Sirikan Pemsarnut	C1_C0142	Solaya Suksa-Ard	B4_B0184
Sirikant Prasertlux	B1_B0042	Sombat Rukpratanporn	B4_B0066
Sirikwan Suntithunyaroj	C1_C0158	Sombat Kongwithaya	B4_B0101
Sirikwan Leehokseng	G_G0028	Somboon Subwongchareon	B5_B0133
Siriluck Attrapadung	H_H0006	Somboon Sahasittiwat	D_D0046 , D_D0059
Siriluk Ruangrungrrote	N1_N0006	Somchai Lapanantnoppakhun	C1_C0154
Siriluk Meesuwun	H_H0046	Somchai Boonpangrak	C3_C0208
Sirimanus Sangngam	B1_B0194	Somchai Issaravanich	H_H0026
Sirinart Lacharajanaphand	C1_C0270	Somchai Chumpolkutwong	O1_O0011 , O1_O0018
Sirinnya Suwansomboon	C1_C0234	Somchai Mananunsap	B3_B0135
Sirinuch Loiha	C2_C0262	Somchai Boonpangrak	C3_C0163
Sripastr Jayanta	C1_C0057	Somchai Thongtem	E_E0012
Sripat Suteerapataranon	C1_C0058 , C1_C0080	Somchai Issaravanich	H_H0016 , H_H0017
Sripat Pratontep	K2_K0029		H_H0020
Siriporn Keeratchamroen	B5_B0059	Somchai Awakeit	H_H0038
Siriporn Jungsuttiwong	C4_C0106	Somchai Lapanantnoppakhun	C1_C0180
Siriporn Larpiattaworn	E_E0065	Somdej Kanokmedhakul	C3_C0212 , C3_C0214
Siriporn Sittiprased	B4_B0038 , B5_B0039	Sornjai Peragulanuck	F_F0055
Siriporn Keeratchamroen	B5_B0061	Sornjai Siripoke	F_F0034
Siriporn Pongsomboon	B5_B0208	Sornjintana Taveepanich	C3_C0153

Somkane Piromrak	D_D0002	Steve Milroy	B4_B0186
Somkiat Kongkum	C3_C0255	Suchada Sukrong	B4_B0058
Somkiat Srijaranai	C1_C0051 , C4_C0160	Suchada Vearasilp	C1_C0279
Somkiat Boonnasa	J1_J0009	Suchada Chalsawadi	B2_B0172 , B2_B0178
Somkiat Phomphisutthimas	K2_K0017		C1_C0276 , I_I0025
Somkiat Piyatratitvorakul	F_F0051		I_I0046 , O2_O0027
Somphong Chatraphorn	D_D0056	Suchada Issaraporn	J2_J0020
Somphop Morada	C1_C0105	Suchapa Netpradit	J2_J0031
Sompoch Gomolmanee	F_F0013	Suched Samuhasaneetoo	G_G0023
Sompong Thammasinrak	B5_B0080	Suchin Udomsomporn	D_D0020 , D_D0021
Sompong Doolindachabaporn	F_F0007		I_I0019
Sompong Thammasinrak	F_F0053	Suchonma Udomertprecha	B5_B0208
Sompong Lawilas	M_M0004	Suchonwat Wongwilikhit	F_F0004
Sompop Rungsupa	I_I0014 , N4_N0005	Suda Saowakhon	B4_B0009
Somporn Chantara	I_I0015	Suda Kiatkamjornwong	E_E0075 , E_E0082
Somporn Prasertsongsun	I_I0043		E_E0084 , E_E0087
Somporn Sirisumrannukul	J1_J0019		E_E0097 , H_H0043
Somporn Triyasi	C2_C0025	Sudatag Kohengkul	B5_B0202
Somporn Chantara	C1_C0043	Sudaporn Tangkawant	C4_C0039
Somporn Manestoon	D_D0058	Sudarat Damrongwatanapoken	H_H0011 , H_H0021
Somrit Unai	K2_K0014	Sudarat Pookboonmee	E_E0044
Somruathai Kidsanguan	B5_B0069	Sudarat Suanjit	I_I0003
Somrudee Onto	B3_B0007	Sudarat Chaduthi	I_I0032
Somrudee Kaewkaw	A_A0003	Sudarut Watkuolham	C3_C0252
Somruthai Tunma	C4_C0150	Sudjit Sanguanruang	K2_K0028
Somsak Maneerattanakul	D_D0048	Suganya Soontaros	B4_B0045
Somsak Wongwan	O2_O0007	Sugunya Wongpormchai	C1_C0173 , C1_C0136
Somsak Ruchirawat	C3_C0151		C1_C0141
Somsak Pianwanit	C4_C0027	Sugunya Mongkol	D_D0031
Somsak Maneerattanakul	D_D0047	Sujint Anguravinit	F_F0059
Somsak Ruchirawat	O2_O0017	Sujitra Youngme	C4_C0258 , C2_C0218
Somying Leelasubcharoen	C2_C0224		C2_C0222
Somyote Suthivalayakit	C3_C0087 , C3_C0089	Sukanda Jansirisomboon	E_E0005 , E_E0006
	C3_C0091		E_E0007
Songchan Puthong	C3_C0038	Sukanya Petchsinvej	D_D0046
Songwut Suramitr	C4_C0266	Sukchai Sompompun	K2_K0004 , I_I0010
Songyos Pramjit	C3_C0018	Sukhontip Thaomola	C3_C0174
Soontarane Tongyai	B5_B0177	Sukhuma Puangmali	C1_C0243
Soonthorn Somsual	G_G0029	Sukit Limpijumnong	D_D0038
Soosuek Rooblem	E_E0001 , E_E0002	Sukitcha Puangthong	C1_C0234
Sopa Klinchan	B4_B0169	Sukjit Kungwankunakorn	C1_C0158
Sopa Simarugumpai	K2_K0004 , I_I0010	Sukaneste Tungasmita	D_D0018
Sophida Sukprasert	B5_B0080	Sukon Phanichphant	C1_C0022
Sophon Kasothip	B5_B0122	Suksaman Sangyoka	I_I0040
Sophon Phuangphenbut	C2_C0025	Suksan Chuboon	B1_B0011
Sorapat Samerkai	G_G0020	Sukthai Pongpatanasri	F_F0014
Sorapong Janhom	C4_C0028	Sumaree Boonma	C5_C0080
Sorapong Pavasupree	E_E0015 , E_E0017	Sumate Tantratan	G_G0035
Sorapong Janhom	C2_C0204	Sumitra Boonbumrung	F_F0035
Sorasak Danworaphong	D_D0012 , C4_C0164	Sumittra Jarosrojkul	E_E0103
Sorasake Kulamai	I_I0046	Sumittra Charojrochikul	J1_J0023 , J1_J0024
Sorawit Powtongsook	F_F0043 , F_F0046	Sumon Masuthon	B1_B0050
	F_F0051 , I_I0042	Sumontip Bunnag	B1_B0043 , B4_B0074
Sompranart Sathapornvajana	C3_C0114		B4_B0087
Sorrapob Potisook	I_I0016	Sumpars Khunsook	B2_B0002
Sorrayut Ratanapojnand	K2_K0013	Sumpun Wongnawa	C2_C0036 , C2_C0078
Souwalak Phongparchit	C3_C0037	Sunan Sung-Ong	K2_K0028 , K2_K0015
	C3_C0040 , C3_C0055	Sunanta Wangkam	C1_C0173 , C1_C0165
	C3_C0056		H_H0012 , C1_C0133
Srisomporn Preeprame	O2_O0001		C1_C0135 , C1_C0136
Srivikom Dit-Udom-Po	D_D0048		C1_C0182 , C3_C0251
	D_D0047	Sunanta Ratanapo	B5_B0114
Sriwipa Puyati	C4_C0017	Sunate Goosantae	B1_B0193
Stephen Elliott	B1_B0092	Sunchai Payungpom	H_H0021 , H_H0019
Stephen G Pyne	C5_C0048		H_H0033

Sunee Chansakaow	C5_C0129 , C5_C0132 H_H0032 , O2_O0015	Supphawut Benjakul	D_D0021
Sunee Kertbundit	B1_B0129	Supraewpan Lohafaksanadech	G_G0022
Sunida Tiamyuen	O2_O0008	Supraanee Muenpueng	G_G0033
Sunisa Plangsungnum	D_D0045	Supraanee Lao-Ubol	E_E0062
Sunisa Akkarasamiyo	C3_C0075	Supreya Trivittikasem,	D_D0034 , D_D0049
Sunisa Siripongvutikorn	G_G0013	Supuk Mahadthanapuk	B4_B0166
Sunit Suksumram	C5_C0143 , C5_C0194 C5_C0198	Surachai Artida	C2_C0261
Sunsanee Yoojun	B5_B0106	Surachai Limpakdee	C4_C0085
Sunsanee Phasook	B2_B0078	Surachai Kaewboonruang	B2_B0178, O2_O0027
Suntiparp Sriwattanaphaiboon	K2_K0010	Surachai Pornpakakul	O2_O0024
Supa Hannongbua	C4_C0259	Surachate Kshsangchote	D_D0048, D_D0047
Supab Chooopun	D_D0035 , D_D0040 D_D0051 , D_D0036	Surachet Burut-Archanai	B5_B0044 , B5_B0035 B5_B0036 , B5_B0102 B5_B0103
Supachai Ngamsinlapasathian	E_E0015	Surajet Jangrod	B4_B0171
Supagone Katalikamkul	D_D0008	Surang Nuchprayoon	H_H0018
Supagorn Rugmai	C4_C0035 , C1_C0002 O1_O0003	Surang Suthirawut	B2_B0006
Supakij Suttiruengwong	E_E0080 , E_E0081 J1_J0035	Surang Nuchprayoon	B3_B0120
Supakit Kowuditham	H_H0042	Surangrat Snsuratanon	H_H0011
Supakorn Boonyuen	C2_C0101 , I_J0024	Surapol Kongtim	O2_O0012
Supalax Srijarana	C1_C0047 , C1_C0051 C1_C0073 , C1_C0044	Surapol Natakankitkul	C1_C0181
Supaluk Prachayasitikul	C3_C0151 , O2_O0017	Surapong Pinitglang	B5_B0148
Supanee Umsuwan	E_E0055	Surapun Yimman	J1_J0025
Supannika Kittikitsak	F_F0017	Surasak Laloknam	B5_B0103
Supap Bunkird	H_H0030	Surasak Siripornadulsil	B2_B0016
Supapan Srisukkho	C1_C0225	Surasak Laloknam	B4_B0101 , B5_B0102
Supaporn Dawan	C1_C0086 , C1_C0095	Surasak Watanesk	C1_C0081
Supaporn Kantawong	B4_B0166	Surasak Laloknam	H_H0029
Supaporn Itsariyodom	B5_B0177	Surasak Watanesk	C4_C0082
Supaporn Pengping	C1_C0158	Surassawatee Jamikorn	C1_C0217
Supaporn Noppakundilokrat	E_E0087	Surat Sedpho	D_D0035
Supaporn Suttitum	G_G0021	Surawat Jariyawat	H_H0024 , H_H0025
Suparat Reungmaneeapitoon	G_G0034, G_G0009	Surawit Simarugumpai	K2_K0004
Supasilp Fuengfue	K2_K0020	Sureerat Tang	B5_B0197
Supason Wanichweacharungruang	B4_B0157 , C3_C0179 C3_C0183 , C3_C0191	Sureerat Chuliasat	F_F0055
Supason Pattanaargson	C4_C0168	Surin Thepsawat	B4_B0101
Supatchalee Supjarean	O2_O0008	Suriyan Suthiprapar	C5_C0274
Supatra Jinawath	J1_J0023	Suriyan Cha-Um	B4_B0053
Supawadee Pechoth	B1_B0091	Suriyan Cha-Um	B4_B0094 , B4_B0096 B4_B0098
Supawadee Namuangrek	C4_C0216	Suriyan Tunkijjanukij	B4_B0117
Supawadee Poompuang	B4_B0117	Suriyong Pongpiboonkul	D_D0070
Supawan Tirawanichakul	D_D0053	Susumu Yoshikawa	E_E0015
Supawan Tantayanon	H_H0028	Sutatip Siripaisampiat	E_E0068, E_E0085 E_E0094, C2_C0237
Supawut Benjakul	D_D0020	Sutee Udomcholphruet	O2_O0014
Supha Sirinam	D_D0073	Suteerut Kongchey	C2_C0030
Suphachai Samupitto	F_F0059	Suthat Fucharoen	O1_O0021
Suphachai Boonrod	I_I0022	Suthee Petcharavut	D_D0058
Suphapan Satchawan	C1_C0197	Suthida Traibut	B2_B0181
Suphaporn Phongmanee	B2_B0174	Suthida Rattanaaburee	C3_C0063
Supharat Sangsawong	C1_C0176	Suthum Sniomsak	E_E0049
Suphathida Aumtong	I_I0001	Sutipa Tanapongpipat	B4_B0105, B4_B0108 B4_B0170 , B4_B0173 B4_B0180
Supisara Kongprachya	C1_C0049	Sutkhet Nakasathien	B4_B0117 , F_F0054
Supitcha Chaiwongfui	B1_B0001	Suttawan Imurai	E_E0102
Supon Sumran	D_D0066	Sutthathorn Suwannaratana	B1_B0092
Supon Ananta	E_E0067	Suttipan Pavasupree	E_E0018
Supom Nuchadomrong	B5_B0012 , F_F0001	Sutisak Suknaisit	G_G0035
Supot Hannongbua	C4_C0265 , C4_C0074 C4_C0166 , C4_C0229 C4_C0027	Suvit Punnachalya	J1_J0025
Supphadate Sujinnapram	D_D0011	Suwit Boonprong	B5_B0114
		Suwabun Chirachanchai	C3_C0191
		Suwakon Janta	C1_C0081
		Suwanna Saysin	C5_C0276

Suwanna Vejabhikul	C5_C0132 , O2_O0007 O2_C0015	Teraboon Poljanakaron	C1_C0184
Suwanna Niemsanit	B2_B0018	Thada Tangsinsuk	C4_C0156
Suwanna Saysin	C6_C0046	Thana Arunwattanachok	C2_C0178
Suwat Pabchanda	C1_C0105 , C4_C0002	Thanakorn Naenna	B5_B0143 , B5_B0147 H_H0035
Suwat Jantha	C1_C0031	Thanaphol Boriboonkaset	B4_B0094
Suwat Pabchanda	C2_C0102 , C2_C0104 E_E0053	Thanapong Ksrethadumrongdat	E_E0088
Suwimol Chinkangsadam	B1_B0022	Thanapong Chuachun	E_E0109
Suwimol Naranatad	C4_C0162	Thanaporn Laathanachareon	B4_B0119
Suwimon Ruengsri	C5_C0052	Thanawan Tejangkura	B4_B0066
Suwipa Saen-On	C4_C0265	Thanawat Darvanichkul	C1_C0172
Suwit Pechhuayluk	D_D0025	Thanee Sukglin	B1_B0126
Suwit Madsaw	E_E0027	Thanh N. Truong	C4_C0267
Suwit Phethuawluk	J2_J0001	Thanida Srihawong	B5_B0177
Suwit Wuthisuthimethavee	B5_B0206	Thanida Chaiyapoom	D_D0058
Sybilie Neidhart	F_F0012	Thanit Praneenararat	C3_C0098
		Thanomsin Distapom	C5_C0198
		Thanu Marayong	B1_B0013
	T	Thanusit Burinprakhon	D_D0069
T.Veerapraditsin	B2_B0113	Thanyalak Yongkongkaew	B4_B0166
T. Yaibok	J2_J0036	Thanyapat Thiantongin	C4_C0039
Tada Nakorloy	E_E0055	Thanyarat Sawatsuk	C1_C0123
Takashi Aoki	B5_B0037	Thanyarat Udommaneethanakit	C4_C0188
Takeshi Zendo	B5_B0130	Thararat Supasiri	B5_B0056 , B5_B0141 B5_B0202
Taksawan Thongaram	B4_B0149 , B4_B0170		
Tanakan Ongkeaw	E_E0055	Tharathip Sreesattabud	E_E0006
Tanakorn Osoltchan	C4_C0015 , D_D0058 O_O0064 , E_E0022 K2_K0029	Tharinee Saleepochn	C1_C0213
		Thavorn Supaprom	B4_B0204 , H_H0037
		Thawat Donsakul	B1_B0207 , B1_B0205 B1_B0206
Tanapan Phattamamon	B1_B0167	Thawatchai Phaecharud	M_M0004
Tanaporn Tansakul	D_D0069	Thaweesak Songsarn	B3_B0060
Tanasom Tunsanngkam	H_H0016, H_H0017 H_H0020, H_H0026	Thaweesak Chieochansin	H_H0011 , H_H0019
		Thaweewat Khuangthip	D_D0030
Tanatchaporn Utairungsee	B4_B0105	Theerachai Bongkam	E_E0101
Tanatorn Tongsumrit	I_I0033	Theeraphan Machan	C5_C0048, C5_C0276 C5_C0046
Tanawat Tittabutr	E_E0047		
Tanawut Tantmongcolwat	B5_B0143 , H_H0035	Theeraphon Piacharn	B5_B0145 , C3_C0163 C3_C0167
Tanawut Chailungkam	K2_K0012		
Tanikan Thongchai	E_E0049	Theerapol Thurakitserree	C2_C0003
Tanin Nanok1,2,	C4_C0216	Theerasak Luechapongthip	I_I0025
Tanin Nutaro	D_D0060	Thidarat Suksangpleng	B2_B0089
Tanin Nutaro1	D_D0061	Thidarat Kunawong	C2_C0207
Tanitha Chatsuwarn	H_H0018	Thidarat Chotkhun	C2_C0224
Tanu Marayong	B1_B0021	Thidarat Wangkam	D_D0059
Tanwawan Duangthongyou	C2_C0237	Thidarat Supasai	D_D0072
Tapanee Hongratanaworakit	M_M0003	Thiranee Khumiumlert	E_E0101, D_D0031 D_D0032
Tapawitra Pongpawe	B1_B0205		
Tarnlip Pattana	I_I0003	Thirasuda Prasert	H_H0005
Tasana Punjansing	B1_B0208	Thitikone Kuntama	B1_B0017
Tasane Jamjanya	B5_B0080	Thitikorn Chanyatham	D_D0041 , D_D0005 D_D0033 , D_D0039
Tassanee Eamkamon	B4_B0140 , I_I0026		
Tavidsa Lohana	G_G0012	Thitikom Boonkoom	E_E0057
Tavisakdi Ramingwong	N1_N0004	Thitima Lhinhatrakool	C3_C0091
Tawatchai Kangkarnano	C1_C0126	Thitima Bhussorn	C1_C0131
Taweesak Janduang	C4_C0170	Thitima Rukachaisinkul	C3_C0252 , C3_C0254
Tawesin Navarat	C3_C0018	Thitina Gaewdang	D_D0005 , D_D0033 D_D0039 , D_D0041
Tawun Remsungnen	C4_C0180 , C4_C0240		
Teamchai Buatjai	I_I0048	Thitnun Monhaphol	C4_C0168
Teera Tanachavijit	E_E0091	Thitiporn Petudom	E_E0100
Teerakiat Kerdcharoen	D_D0068 , C4_C0015 E_E0022 , E_E0076 K2_K0014, K2_K0029	Thitirat Insalee	K2_K0026
		Thitirat Mantim	C1_C0203
Teeranan Nongnual	C4_C0240	Thitiyaporn Prayoonmahisorn	B2_B0190
Teerasak Kamwana	D_D0015	Thittiya Phongern	I_I0018
Tepkanya Promkatkeaw	K2_K0015	Thongchai Suanwang	E_E0056

	W	Watanu Ono	D_D0017
W Pschl	D_D0065	Watcharapong Saelae	E_E0060
W Pfeiler	D_D0065	Watcharee Nettsingha	O2_O0007
W. Chairat	N1_N0012	Watcharin Noothong	J1_J0037
Wachirapunt Puntgrawee	E_E0094	Watson Jindacum	C1_C0185
Wae-Asae Waehamad	E_E0040	Wattana Tanming	B1_B0125
Walaiporn Prissanaroon Ouajai	E_E0091	Wattanasak Sawedtasakrawpan	E_E0018
Walailak Wikittlak	M_M0001	Waya Sengpracha	E_E0013
Wanaruk Saipunkaew	B1_B0092	Weena Sithrakarn	C1_C0245
Wanatchara Impath	B3_B0079	Weena Chutimanitskul	O2_O0017
Wanchai Subsingha	J1_J0002	Weenawan Somphon	O1_O0022
Wanchan Nopparit	F_F0032	Weerachai Phutthawong	C3_C0008 , I_I0037
Wandee Wattanachaiyingcharoen	B1_B0055		C3_C0033 , E_E0013
Wandee Onreabroy	D_D0037 , E_E0055	Weeradech Kiratitanavit	E_E0056
Wanida Wonsawat	C1_C0171	Weerah Wongkham	B1_B0194 , B1_B0195
Wanisa Salaemae	B3_B0163	Weerapong Chewpraditkul	D_D0022
Wanlapa Aeungmairepirom	C1_C0119	Weerawan Sithgornkul	B4_B0066
Wanna Wimolwattanapun	C1_C0270	Weerawan Waiyawat	C1_C0148
Wannakarn Nitayarek	C1_C0006	Weon Ritusso	H_H0003
Wannapa Yuanboonlim	C2_C0025	Werasak Surareungchai	B4_B0119
Wannapong Triampo	I_I0032 , D_D0044	Wesley B. Jones	D_D0038
	I_I0031	Wetchasart Polyam	B1_B0161 , B1_B0182
Wannee Srinuttrakul	C1_C0031 , J1_J0011	Wichai Kosiratana	F_F0049
	E_E0031	Wichai Lati	I_I0048
Wannipa Suksawat	B3_B0007	Wichai Snsukha	B1_B0088
Wanpen Rattanarungsi	C1_C0069	Wichai Kosiratana	B4_B0184
Wanpen Panyeam	H_H0039	Wichai Ponthanakasem	H_H0039
Wansiri Pitakkeattikul	C1_C0144	Wichean Piwbang	C2_C0104 , E_E0053
Wansuk Senanan	B3_B0132 , B3_B0135	Wichan Magtoon	B1_B0206 , B1_B0207
Wantana Mongkolvisut	C3_C0087	Wichukorn Phuthong	J1_J0034
Wantana Kiyubun	C4_C0035 , O1_O0002	Wijitar Dungchai	C1_C0171
	O1_O0003 , O1_O0019	Wikrt Phinnub	B1_B0167
Wanthana Phimsuwan	I_I0020	Wilai Chomchai	E_E0083
Wanwarang Pathaichindachote	B5_B0077 , B5_B0111	Wilat Noonpakdee	B5_B0130
Wanwimol Makboonsonglarp	H_H0029	Wilairat Wongthep	E_E0037
Wanwisa Sudprasert	B4_B0040	Wilairat Cheewasedtham	F_F0055 , I_I0043
Wanwisa Srinuanchai	C5_C0132	Wilawan Phakthong	C1_C0077
Wanwisa Pattanasinwisawa	O1_O0019	Wilaiwan Somchue	C1_C0190
Waradon Chutrong	C1_C0068	Wilaiwan Sakdee	B1_B0017
Waralak Pimdee	C2_C0210	Wilart Rndom	H_H0010
Warangkana Soksom	C1_C0047	Wilart Pompimon	O2_O0010
Waraporn Nolkong	B1_B0176	Wilasinee Hanpongpan	E_E0078
Waraporn Methawriyasit	O2_O0027 , B2_B0172	Wilatsana Pori	G_G0017
Waraporn Sinnawin	C1_C0126	Wilawan Mahabusargam	C3_C0063
Wararak Thavonnan	B6_B0209	William H. Daly	H_H0028
Warasrin Sorlek	B4_B0173	William H. Mattheus	D_D0028 , D_D0010
Waratchaya Tamarit	E_E0014		D_D0027
Warawut Tiyaopongpattana	C1_C0142 , C1_C0145	Wimol Naksata	E_E0026
Warayuth Sajomsang	H_H0028	Wimolsiri Pongtaveevai	B4_B0171
Waret Veerasal	C1_C0260 , C1_C0263	Wimon Chanchaem	H_H0038
Warinthorn Chavasiri	F_F0032	Wimonrat Trakampruk	E_E0003 , E_E0046
Warunee Varanyanond	G_G0015 , G_G0027		E_E0047 , I_I0002
	F_F0035 , G_G0003	Wimonrut Thongphuton	D_D0013
	G_G0015	Win Chaeychomsri	G_G0025 , F_F0027
Warunee Srisongkram	J1_J0002	Winai Oungpipat	C1_C0144
Warunee Thanapane	O2_O0009	Winit Cholsprasert	O2_O0023 , O2_O0026
Wasan Sirisungworawong	C1_C0029 , C1_C0184	Winita Punyodom	E_E0026 , H_H0031
Wasana Cheusook	B1_B0182	Winya Dungkaew	C2_C0155
Wasana Pinyochon	H_H0021	Winyoo Sangthong	C4_C0228
Wasin Wongwila	C1_C0180	Wipa Chungjatupornchai	B3_B0115
Wasinee Pongprayoon	B4_B0053	Wipapan Pongcharoen	C3_C0037
Wasinee Phonri	C2_C0145	Wipaphorn Jaikua	O2_O0004
Wasna Jaturonrusmee	K2_K0016	Wiparat Bootsayitrus	B1_B0004
Wasana Parawach	H_H0003	Wiparat Khunghar	I_I0052
Wasu Pathom-Aree	B2_B0054		

Wipawee Baebprasert	B5_B0036 , B5_B0035 B5_B0044 , B5_B0102 B5_B0103	Yong Poovorawan	H_H0019 , H_H0027 H_H0033 , B3_B0120 H_H0011 , H_H0021 C3_C0177 , C3_C0179 C2_C0178
Wiphaphan Ubon	I_I0043	Yongsak Srtana-Anant	A_A0001 , A_A0005 A_A0008
Wipob Suttana	O2_O0026	Yongwimon Lenbury	E_E0067
Wirach Taweeseda	E_E0050	Yongyut Laositaworn	C3_C0062
Wirach Wongphathanakul	C1_C0117	Yongyuth Tundulawessa	M_M0007
Wiranee Sriviang	H_H0029	Yonyut Rojanasakul	F_F0027
Wiraporn Maithong	O_D0009	Yosapong Temsiripong	E_E0015
Wirat Sangkawsit	C1_C0047	Yoshikazu Suzuki	N2_N0002 , N2_N0014
Wirat Nwatananun	C6_C0132	Yoshio Sato	J1_J0008
Wirawan Nuchchanart	B4_B0117	Yoshiyuki Iemoto	O1_O0022
Wiriya Suwanet	O_D0062	Yun Liu	B1_B0129
Wiroj Limtrakarn	J1_J0014 , J1_J0033	Yun-Kiam Yap	C5_C0274
Wirot Kesonbua	B1_B0123	Yupa Mongkolsook	C6_C0275
Wirote Pranithanchai	C3_C0111	Yupa Mongkolsook	C4_C0093
Wirunya Keawwattana	E_E0056	Yupa Thunyasinikul	B2_B0010 , B4_B0090 G_G0026
Wirut Wongpakdee	C2_C0025	Yupakit Puangwerakul	C1_C0241 , C1_C0142
Wisanu Thongchai	C6_C0045 , C5_C0046 C5_C0276	Yupaporn Sameenoi	H_H0034
Wisitree Kongcharoensuntorn	B1_B0004 , O2_O0004	Yutana Pongpiriyadacha	C1_C0135
Witale Jwramonakul	C2_C0101	Yuttasak Chamui	D_D0053
Wilayaporn Pornchuti	B4_B0199	Yuthana Tirawanichakul	F_F0051
Witham Pansinwrote	E_E0041	Yuwadee Aunthasoot	
Wittanee Hetrakul	D_D0037		
Wittaya Ngeontae	E_E0088 , C1_C0119		
Wiwaporn Soodsawang	C4_C0109		
Wolfgang Arit	E_E0081		
Wolfgang Moller	C3_C0087		
Wolfgang Kraus	C3_C0089		
Wongsin	B1_B0056		
Wonput Hongsachart	B2_B0151		
Woradee Lurchachaiwong	H_H0033		
Woraluk Mansawat	C3_C0137		
Woranan Nakbenpote	I_I0035 , I_I0041		
Woranul Suwanwisut	C2_C0108		
Woraphong Khawprapan	E_E0096		
Worapong Usawakesmanee	G_G0017		
Worawan Bhanthumnavin	C3_C0137 , C3_C0140 C3_C0177		
Worawan Mallithong	C1_C0142		
Worawan Bhanthumnavin	C2_C0178		
Worayut Thayavivat	C1_C0199		
Worapong Theimsorn	E_E0103		
Wuthichai Chantarachot	C1_C0270		
Wutthinun Raksajit	H_H0029		
Wuttinan Rekmangkhor	C1_C0119		
Wuttinani Konglud	O2_O0009		
Wuttinun Raksajit	B5_B0035 , B4_B0101 B5_B0036 , B5_B0044 B5_B0102 , B5_B0103		
Wuttipong Singdung	C1_C0133		
	Y		
Y. Chikagawa	G_G0019		
Yanee Pongpaibul	C1_C0103		
Yaneenart Suwanwong	B4_B0168		
Yanyong Lotha	E_E0036		
Yaowapha Jirakattikul	F_F0035		
Yaowarat Sinsathitkul	A_A0003		
Yasuaki Einaga	C1_C0203		
Yindee Kittyanant	H_H0045		
Yingsak Kralpinit	B2_B0178		
Yodchai Porhion	E_E0111		
Yodsakorn Unkham	E_E0069		

Exhibitor List STT.32

#	Exhibitor Name	Country
1	AGILENT TECHNOLOGY (THAILAND) CO., LTD.	Thailand
2	ANALYIK-JENA (THAILAND) CO., LTD.	Thailand
3	APPLICATION DEFINE CO., LTD.	Thailand
4	ARCHEMICA INTERNATIONAL CO., LTD.	Thailand
5	BANGKOK ADVANCED TECHNOLOGY CO., LTD.	Thailand
6	BANGKOK HIGH LAB CO., LTD.	Thailand
7	BANG TRADING 1992 CO., LTD.	Thailand
8	BARA SCIENTIFIC CO., LTD.	Thailand
9	BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.	Thailand
10	BIO ACTIVE CO., LTD.	Thailand
11	CHARNIN ENERGY CO., LTD.	Thailand
12	C.E.COMBINATION CO., LTD.	Thailand
13	C.E.INSTRUMENT (THAILAND) CO., LTD.	Thailand
14	CHARAN ASSOCIATES CO., LTD.	Thailand
15	CoAx GROUP CORPORATION	Thailand
16	DESIGN ALTERNATIVE CO., LTD.	Thailand
17	DIETHELM LIMITED	Thailand
18	GAME & TOY	Thailand
19	GREEN BANYAN CO., LTD.	Thailand
20	HARIKUL GROUP CO., LTD.	Thailand
21	ITS (THAILAND) CO., LTD.	Thailand
22	JEBSEN & JEBSEN MARKETING (T) CO., LTD.	Thailand
23	KINETICS CORPORATION LTD.	Thailand
24	LECO INSTRUMENT (THAILAND) CO., LTD.	Thailand
25	LIGAN SCIENTIFIC CO., LTD.	Thailand
26	LIO LAB LTD., PART.	Thailand
27	LOGOT MARKETING CO., LTD.	Thailand
28	MAJOR SCIENTIFIC PRODUCTS	Thailand
29	MATHEMATICS ASSEMBLY (ชมรมคณิตศาสตร์) *	Thailand
30	MEDITOP CO., LTD.	Thailand
31	METHROM SIAM CO., LTD.	Thailand
32	METTLER-TOLEDO (THAILAND) LTD.	Thailand
33	MINOR COOPERATION CO., LTD.	Thailand
34	MIS SOFTTECH CO., LTD.	Thailand
35	MULTI EDUCATION CO., LTD.	Thailand

#	Exhibitor Name	Country
36	NANMEE BOOK CO., LTD.	Thailand
37	OFFICIAL EQUIPMENT MANUFACTURING CO., LTD.	Thailand
38	OSKON CO., LTD.	Thailand
39	PHADA EDUCATION CO., LTD.	Thailand
40	PERFECT VISION MULTIMEDIA CO., LTD.	Thailand
41	PERKINELMER LTD.	Thailand
42	PETRO - INSTRUMENTS CORP., LTD.	Thailand
43	P.INTERTRADE EQUIPMENT CO., LTD.	Thailand
44	PCL HOLDING CO., LTD.	Thailand
45	PONDPOL INSTRUMENT CO., LTD.	Thailand
46	SAENGVITH 2000 CO., LTD.	Thailand
47	SAGOLLA VIDEO CO., LTD.	Thailand
48	SE-EDUCATION PUBLIC CO., LTD.	Thailand
49	SCIENCE AND TECHNOLOGY TRADE ASSOCIATION	Thailand
50	SCIENCE TECH CO., LTD.	Thailand
51	SCIENTIFIC PROMOTION CO., LTD.	Thailand
52	SIAMESE INSTRUMENT CO., LTD.	Thailand
53	SITHIPORN ASSOCIATES CO., LTD.	Thailand
54	THAI UNIQUE CO., LTD.	Thailand
55	THAIPOLY MEDIC CO., LTD.	Thailand
56	THANES DEVELOPMENT CO., LTD.	Thailand
57	T.S.T. TECHNOLOGY CO., LTD.	Thailand
58	VERTICAL CHROMATOGRAPHY CO., LTD.	Thailand
59	WORLDWILD TRADE THAI CO., LTD.	Thailand