List of RGJ advisors 2017/2018

No: 1

Name: Prof.Dr. Alongklod Tanomtong

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Keywords: Cytogenetics, Animal Cytogenetics, Fish Cytogenetics, Genetics and Biology

Summary of research:

The taxonomic classification of the common sheathfish is class Actinopterygii (ray-finned fishes), order Perciformes (catfishes), family Siluridae (sheathfish), genus Micronema and species Micronema apogon. Three species of the genus Micronema have been recorded in the Mekong river including Thailand and Cambodia. Sheathfish, resemble each other strongly and probably have similar ecological characteristics (Rainboth 1996). The Sheathfish can be found in large rivers and adjacent streams and canals from Thailand to Cambodia, feeding on pelagic fishes in midwater to upper depths. Spawning occurs just before water levels begin to rise and moves into flooded riparian forests and probably out into floodplains during high water levels. Young of the year are first seen in July and being to move back into the rivers in October, where they remain until January. The fish are caught with seines, gill-nets, and hook-andline, sold fresh, dried and salted, or placed on ice for shipment to Thailand and Cambodia

This cytogenetic study, a report on karyotype analysis and chromosomal characteristic of the nucleolar organizer regions (NORs) of Sheathfish. The knowledge gained can provide useful cytogenetic information for further study on taxonomy and evolutionary relationship. Moreover, it contains basic information for the conservation, breeding, and chromosome evolution study in this fish.

List of RGJ advisors 2017/2018

No: 2

Name: Assoc.Prof.Dr. Arinthip Thamchaipenet

Program: Biological Science **Department: Genetics**

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Keywords: endophyte; actinomycete; biocontrol, plant-microbe interaction

Summary of research:

Endophytic actinomycetes residing in plants help plants by enhancement of plant growth, strengthen plants to stress and diseases by acting as PGPB by producing plant hormones (e.g. IAA) to stimulate plant growth, siderophores to scavenge irons, ACC deaminase to reduce stress ethylene; solubilizing rock phosphate and producing chitinase and secondary metabolites to protect plant from phytopathogens. This research will focus on such properties of endophytic actinomycetes towards inhibition of phytopathogens such as blast diseases in rice plants. Molecular interaction between endophyte, blast fungi, and rice will be deeply investigated by transcriptomic analysis. The results of gene expression profiles and rice physiology will be elucidate to understand the interaction of blast fungi and the action of endophyte to inhibit blast disease.

List of RGJ advisors 2017/2018

No: 3

Name: Asst.Prof.Dr. Boosayarat Tomapatanaget

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Faculty: Science **University: Chulalongkorn University**

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Keywords: molecular sensor, nanomaterials, fluorescence, visual change

Summary of research:

Our works encompasse many aspects of supramolecular chemistry, particularly in applications such as the design and synthesis of molecular sensors for anions, cations, amino acids, monosaccharides, nucleotides and biogenic amines. Molecular sensors or chemosensors are molecules which are capable to recognize and to give signals for specific analytes in the real time. Signaling is given by the cooperation of the basic function of the components such as a binding site and a signaling unit. Molecular recognition is a process involved interactions between host and guest which do not define only binding event but this process requires the selectivity between the host and the guest. The molecular recognition of biological targets has formed a major part of host-guest chemistry. Moreover, the hybrid organic/inorganic based on nanomateries for sensing purposed have been a great interests in our researches. Some of the ongoing research involves the use of nanoparticles fabricated on 3D microfluidic devise for the determination bio-compounds by visually fluorescence approach. The interesting nanomaterials that we have focused on such as graphehe quantumdot, silica nonoporous, coordination self-assembly nanomaterials.

List of RGJ advisors 2017/2018

No: 4

Name: Asst.Prof.Dr. Chanatip Samart

Program: Chemistry **Department: Chemistry**

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Keywords: Deoxygenation; bio-oil; upgrading; catalyst; pyrolysis

Summary of research:

Petrochemical and fuel were produced from fossil as non-renewable resource which was depleting and becoming world crisis. From this reason, the resource for petrochemical and fuel have been changed to renewable resources including biomass. Our research work interests the conversion of biomass to chemical and fuel via thermochemical reactions. Moreover, heterogeneous catalyst will be developed and applied in the chemical reaction to improve the activity and selectivity to desired product. High quality bio-oil is a one of our interesting product. They could be produced by pyrolysis of fast growth biomass but their quality is low due to high oxygen content. In our study, the catalyst will be developed to get rid of the oxygen from bio oil through three different mechanisms as decarboxylation, decarbonylation and dehydration. In addition, the bio-oil can be not only use as fuel but it can be apply for resource of aromatic compound. Therefore, high efficient catalyst in aromatic production will be studied for biomass conversion to aromatic feedstock. In our research, we aimed to utilize biomass base resources such as fast growth plants, agricultural waste and non-edible vegetable oil to forward “Green Carbon Process”.

List of RGJ advisors 2017/2018

No: 5

Name: Assoc.Prof.Dr. Charongpun Musikavong

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Keywords: oil palm; rice; rubber; sugarcane; sustainability assessment

Summary of research:

The concept of sustainable development is widely considered as a process to maintain a stable relationship between human activities and the environment. Agricultural sector is also one of the major contexts that generates substantial environmental impacts. Agricultural system directly connecting with the well-being of humans and economy also occupies a place in ongoing process of sustainable development in Thailand. The primary objectives of this study are to measure the environmental and ecological footprints of modern agriculture in Thailand, to develop indicators for sustainability assessment of agricultural commodity and to provide the effective indicators to track the production supply chain. Five different types of agricultural products such as rice, cassava, sugarcane, palm oil, and rubber are selected to do case studies. Rice, sugarcane, and rubber have been playing vital roles as important agricultural corps in Thailand socio-economic development. Cassava is also a cash crop produced by small farmers and it is also estimated that the national yield is higher than the world average. Oil palm is the important crop for food and energy in Thailand. In this study, the environmental impacts of these essential agricultural products of Thailand and develop the indicators for sustainable assessment will be addressed. First, the existing environmental indicator sets to gain a comprehensive understanding of challenges in sustainable assessment will be reviewed. Second, the classification criteria of different environmental indicator sets with Sustainable Assessment of Food and Agricultural systems (SAFA) guidelines published by Food and Agricultural Organization of United Nations (FAO) will be compared. The SFFA guidelines consider four dimensions in sustainability assessment such as governance, environment, social and economic. Applying the SFAF indicators into the case studies of our research will improve in-depth exploration of limitations and challenges of developing sustainable indicators in Thailand. Finally, our goal is to attempt to define the appropriate sets of our own indicators to monitor ecological and economic sectors of sustainable agricultural system and to contribute to the policymaking.

List of RGJ advisors 2017/2018

No: 6

Name: Assoc.Prof.Dr. Rungtip Chuanchuen

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Keywords: Antimicrobial resistance, Cabapenem, Colistin, ESBL, Foodborne pathogens

Summary of research:

Emergence and spread of resistant bacteria is one of the greatest global issues that impact public health, animal health, society and economy. Food animals and their products are blamed as one of the major sources of resistant bacteria. While most bacteria are now resistant to multiple drugs simultaneously, increasing prevalence of bacteria resistant to cephalosporins, colistin and cabapenems is a particular concern. Antimicrobial drugs in these three groups are last line antibiotics and very important for treatment of drug resistant infections. However, knowledge on either phenotype and genotype of resistance to cephalosporins, colistin and cabapenems in pathogenic bacteria is still limited. In this study project, we propose to perform phenotyping and genotyping characterization of resistance to cephalosporins, colistin and cabapenems in bacteria associated with food animals and farm environment. The methodology will include bacteria isolation, antimicrobial susceptibility test, detection of resistance mechanisms, transferability test and plasmid characterization.

List of RGJ advisors 2017/2018

No: 7

Name: Assoc.Prof.Dr. Chularut Prariyachatigul

Program: Microbiology **Department: Microbiology**

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Keywords: Pythium insidiosum, antifungal, therapy

Summary of research:

Mainly on medical mycology in many aspect:

- Extraction of Aspergillus antigen to evaluate the detection by immunodiffusion. (1985-90)

-Detection of systemic important fungi in Thailand by polymerase chain reaction. (1990-1997)

-Deposit of 18S rRNA gene of Pythium insidiosum in Gen Bank data/Development of In house detection kit for Penicillium marneffei (1997-2002)

-International patent for primer used in detection of Pythium insidiosum by nested polymerase chain reaction. (2002-2005)

-Screening for environmental organisms and herbs that produce anti-Pythium insidiosum substances.(2005-2010)

-Extraction, purification, analyse the structure of the potent substance that inhibit Pythium insidiosum.(2010-2015)

-Analysis of the elemental changing of Pythium insidiosum by synchrotron light.(2015-2017)

In the past 15 years , mainly focus on Pythium insidiosum because this organism is the problem that cause pythiosis which occur mostly in Thailand. There have no effective drug to treat pythiosis because it is not true fungi. To develop the anti-P. insidiosum drug and mechanism of action is in process and waiting for collaboration.

List of RGJ advisors 2017/2018

No: 8

Name: Assoc.Prof.Dr. Darunee Wattanasiriwech

Program: Materials Engineering **Department:**

Faculty: School of Sceince **University: Mae Fah Luang University**

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Keywords: Geopolymer composite, compression strength, fire resistance,

Summary of research:

Geopolymers are non-crystalline aluminosilicate polymers that are formed by mixing alkali-silicate solutions with reactive aluminosilicate materials under normal temperature (RT – 120 °C) conditions.

Developing low cost and energy-saving methods for manufacturing ceramics is always desirable and is now one of the most challenging research topics in the ceramics industry. In addition to saving energy, reduction of CO2 emissions is also a priority. Our previous works on improvement of thermal and mechanical properties of geopolymer-ceramic composites gave desirable results. However, presence of microcrakcs according to dehydration was the major drawback for this material for applications above 400 °C. Improvement of thermal properties will be explored in this research. Strengthening of the products will be done by incorporation of enhancement materials domestically available including waste from clay mining, ceramic tile companies etc. Formulation, characterisation and testing will be carefully designed.

List of RGJ advisors 2017/2018

No: 9

Name: Assoc.Prof.Dr. Ekawan Luepromchai

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Keywords: Wastewater treatment, photosynthetic bacteria, bacterial pigments, waste utilization, process optimization

Summary of research:

Purple non-sulfur bacteria (PNSB) are Gram negative bacteria which can grow as photoheterotrophs, photoautotrophs and chemoheterotrophs depending on the availability of carbon source, oxygen and light. The pigment of PNSB ranges from brown, red to red-purple, which are due to the different in carotenoid and bacteriochlorophyll contents and compositions. Currently, PNSB is popular for the application in wastewater treatment as well as for production of high valuable compounds such as amino acid, vitamin, hydrogen gas and photosynthetic pigments. This research will focused on carotenoid and bacteriochlorophyll extracted from PNSB pigments, which are generally used as coloring agents, food additives, and precursors for various drugs. The objectives of this study are to increase pigment content in selected PNSB and to utilize wastewater from sugarcane and/or bioethanol companies as carbon source for the bacteria. This wastewater have high COD and can pose environmental problem for the nearby environment. Various PNSB strains have been isolated from water resources in Thailand. They will be tested to select the most efficient pigment producers. The optimization for pigment production and wastewater treatment will be carried out by 2-stage experimental design. Firstly, the important nutrients in wastewater such as carbon, C:N ratio, iron, magnesium will be identified by using Plackett-Burmen design. The PNSB will be cultivated in small flasks under 2000 lux light. The optimum nutrients would provide the highest bacterial pigment production and efficient COD removal from the wastewater. Secondly, the optimum concentration of each significant factor will be studied by using Box-Behnken design. Then, the scale-up pigment production will be carried out in a simple bioreactor containing real wastewater with the optimum nutrients. The operation and design of bioreactor will be varied to achieve a simple and low-cost process for wastewater treatment. Finally, the characterization of carotenoid and bacteriochlorophyll from bacterial cells will be determined to see their potential applications as raw materials for biobased products. The acquired knowledge from this research could be applied to other agro-industries for promoting waste utilization and producing new valuable products.

List of RGJ advisors 2017/2018

No: 10

Name: Assoc.Prof.Dr. Jaroon Rungamornrat

Program: Civil Engineering **Department: Civil Engineering**

Faculty: Engineering **University: Chulalongkorn University**

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Keywords: Theoretical and applied mechanics, computational techniques, nano-mechanics, structural mechanics, mechanics of smart media

Summary of research:

The area of research interest mainly concerns the theoretical and applied mechanics with the particular focus on structural mechanics, solid mechanics, fracture/damage mechanics, mechanics of composites and smart materials, and nano-scale mechanics. Various types of problems related to those encountered in civil engineering applications (e.g., simulations of crack advances, fatigue life of components, repaired cracks, nonlinear responses of structures under various excitation) and other related disciplines (e.g., modeling of nano-scale objects such as elements, layers, cracks and indentations; simulations of hydraulic fracture process; modeling of cracks in coupled field media such as piezoelectric, piezomagnetic and piezoelectromagnetic materials, etc.) have been modeled and extensively investigated in the past decade. The development of novel solution procedures and the enhancement of computational performance of existing techniques are also of interest. Various aspects of several well-known numerical techniques including finite element methods (FEMs), boundary integral equation methods (BIEMs), scaled boundary finite element methods (SBFEMs), and the coupling of those techniques have been under investigation.

List of RGJ advisors 2017/2018

No: 11

Name: Assoc.Prof.Dr. Jasadee Kaewsrichan

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Keywords: Pharmaceutical analysis, Drug quality control, Quantitative analysis of drugs and related substances

Summary of research:

Drug quality control is an essential operation of pharmaceutical industries and for drugs sold in markets to ensure drug safety and consistent therapeutic actions. For new medicinal agents, more sophisticated analytical methods need to be developed for quality evaluation to meet requirements of standard pharmacopoeia.

List of RGJ advisors 2017/2018

No: 12

Name: Assoc.Prof.Dr. Joongjai Panpranot

Program: Chemical Engineering **Department: Chemical Engineering**

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Keywords: catalyst, biomass conversion, hydrogenation, CO2, fine chemicals

Summary of research:

On-going research in Prof. Joongjai's group mainly involves the development of highly efficient catalysts for various industrial applications which can be categorized into (i) catalysts for selective hydrogenation of acetylenic compounds such as acetylene, phenylacetylene, nitrostyrene, hexyn-1-ol, and 1-heptyne for fine chemicals and polymer industry, (ii) catalysts for metathesis reaction for on-purpose olefins production, (iii) environmental catalysts for industrial waste water treatment and H2S removal from biogas, (iv) catalysts for biomass conversion such as the production of furfuryl alcohol from furfural and the production of vanilyl alcohol from vanillin, methane production from CO2, and (v) nanomaterials synthesis by Unconventional methods.

List of RGJ advisors 2017/2018

No: 13

Name: Assoc.Prof.Dr. Kaemawich Jantama

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Keywords: METABOLIC ENGINEERING; FERMENTATION; BIOREFINERY; MICROBIAL TECHNOLOGY; BIO-BASED CHEMICALS

Summary of research:

Bio-refinery systems that integrate bio-mass conversion processes and are equipped to produce fuel, power, and bio-based chemicals from renewable resources are the focus of worldwide development due to concerns about scarce crude oil reserves, gradual increases in price, and environmental pollution. Metabolic Engineering is also a powerful tool to alter microbial metabolisms towards desired production pathways. Our research group employs metabolic engineering approach with various microorganisms including E. coli and K. oxytoca to produce value-added chemicals via fermentation from renewable biomasses including agricutural wastes including succinate, lactate, itaconate, and 2,3-butanediol. These chemicals are used as monomers to further produce biodegradable plastics, and specialty and commodity chemicals. Therefore, our research group tries to develop viable processes for the generation of biochemicals and biofuels for their sustainability. To comply with a sustainable concept, efficient pretreatment methods for cellulosic and hemicellulosic resources are currently developed to obtain high yield of fermentable sugars, but least levels of microbial inhibitors. In addition, research topics involving in developments of microorganisms via strain modifications or metabolic engineering and evolution for an efficient conversion of fermentable sugars, and effective fermentation processes that utilize hydrolysates derived from pretreated biomasses to biofuels and biochemicals are under our investigation.

List of RGJ advisors 2017/2018

No: 14

Name: Assoc.Prof.Dr. Khanitha Pudhom

Program: Chemistry **Department: Chemistry**

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Keywords: natural products, medicinal chemistry, biological assay

Summary of research:

Our group has been working on the isolation, characterization and biological activity of both novel and known natural products from Thai marine resources, particularly from mangrove plants and their endophytic fungi. It is because of the great biodiversity of the mangrove community. The pure compounds obtained have further been evaluated for their anticancer, anti-angiogenic, and anti-inflammatory activity to identify the one as anticancer therapeutic lead. The action mechanism of the potent compound has also been studied in our group to identify the target.

For endophytic fungi, the OSMAC (one strain-many compounds) approach has recently been used in our group to activate metabolic pathways to get metabolic products with rich variety of structures by systematic alteration of easily accessible cultivation parameters including the change of medium type, medium composition and the addition of some epigenetic modifiers.

List of RGJ advisors 2017/2018

No: 15

Name: Assoc.Prof.Dr. Kiattawee Choowongkomon

Program: Genetic Engineering **Department: Biochemistry**

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Keywords: Cancer, EGFR, nanobody, inhibitors, signaling pathway

Summary of research:

The dysfunction of the biochemical pathway at the protein level is one of the important factors that lead to cancer development and drug resistance. Kinases have been initiated as a therapeutic drug target because of their critical roles in signaling cascades and regulation of cellular activities. Nowadays, aberrant activity of the protein tyrosine kinase, especially the epidermal growth factor receptor (EGFR, ErbB) family, involve in cancer progressions such as cell proliferation, differentiation, angiogenesis, the inhibition of apoptosis and altered metabolism. Overexpression of EGFR is observed in approximately 62% of patients with non-small cell lung cancer (NSCLC), which is the largest subset of lung cancer and the major cause of cancer death around the world. Unfortunately, EGFR somatic mutants (T790M, L858R) were found in many patients that have been exposed to EGFR inhibitors for long times. Tthe patient continued to take gefitinib, approved cancer drug, as monotherapy. The symptoms have been observed that worsened and revealed progressive lung abnormalities. However, cancer signaling network have been poorly understood. Recently, proteomic approaches play a critical role in the functional analysis. Because of process information in a highly dynamic environment is complicated. According to mass spectrometry (MS) is powerful tools not only containing high sensitivity, accuracy, high speed of analysis but also routinely enable the identification of thousand proteins per experiment. Therefore, this is a magic tool to dissect cancer signaling pathway for evaluating how protein change when to expose to therapeutic agents. According to preliminary result, new inhibitors of EGFR were found as cell-penetrable humanized VH/VHH or nanobodie which lack of Fc fragments that bound specifically to the EGFR and HER2 tyrosine kinase domain will be characterized and produced. The epitope mapping results reveal that nanobodies specifically bind to the C-terminal tail of EGFR kinase domain. The cell-based results show that the IC50 of theirs were in the nanomolar range compared to a commercial drug such as erlotinib (20.05μM) in A549 cell lines. This indicates that VH/VHH can be used for a drug cancer treatment. Moreover, cell-penetrating peptide or Arginine-9 was introduced at N-terminus of nanobodies which make them entering into the cell.

List of RGJ advisors 2017/2018

No: 16

Name: Asst.Prof.Dr. Sarawut Kumphune

Program: Biomedical Sciences **Department: Biomedical Sciences**

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Keywords: myocardial ischemia, protease inhibitor, Ischemia-reperfusion injury, cardio-protection, mitochondria

Summary of research:

Heart attack or Myocardial Infarction is one of the leading causes of death around the world and predicted to be the major cause of morbidity and mortality in year 2030. Currently, the most efficient method of reducing mortality in such patients is to achieve rapid restoration of the blood to the ischaemic area in the heart or so-called “reperfusion”, by lysis or mechanical disruption of the occlusive coronary thrombus and plaque. Any strategies that slow the rate of ischaemic necrosis are likely to save many lives.

Myocardial ischemic injury lead to a secretion of the protease enzyme from the neighboring cells, as well as cardiac cell itself. This consequently led to a further destruction of cardiac cells. Thus, superficially at least, inhibition or reduction of protease activity have therapeutic potential in ischaemic heart disease.

Secretory Leukocyte Protease Inhibitor (SLPI) is a small protein containing protease inhibitory activity. SLPI has been known to inhibit the protease activity of many protease enzymes. Therefore, SLPI could protect the heart from ischaemic injury. The previous study as well as the results from our studies showed that treatment with SLPI before simulate condition of myocardial ischaemia potentially reduced cardiac cell death and injury. However, those studies were performed in cell culture level, which might not fully explain the functional information in the real heart organ and blood vessel. Therefore, this study aims to deermine an in vivo effect of rhSLPI in animal heart and vessel in myocardial ischaemia/reperfusion model.

List of RGJ advisors 2017/2018

No: 17

Name: Prof.Dr. Montarop Yamabhai

Program: Agricultural Biotechnology **Department: Biotechnology**

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Keywords: antibody, enzyme, high-throughput, microbiome, neutraceuticals

Summary of research:

The research involves the study of the effects of bio-innovations at the cellular and organismal level, using technology platforms and expertise of experts at Uppsala University and SciLifeLab. These include knowhow and technology that are not available in Thailand, namely the study of microbiome, epigenetics and metabolomics. These study required sophisticated bioinformatics tools and state-of-the art equipment such as next generation sequencing, mass-spectrometry-based investigation, bioimage informatics, and other high-throughput biosciences.

In the past decade the research in the "Molecular Biotechnology Laboratory" (MY Lab) at Suranaree University of Technology has been dealing with the development of platform for antibody and hydrolytic enzyme expression and engineering. Phage display of human scFv antibody library has been used to generate different specific antibodies against various health-related targets such as rabies virus, mycotoxins, and blood cancer cell. In addition, efficient systems for the expressions of enzymes, in E. coli and food-grade Lactobacillus plantarum, for biodegradation of agricultural wastes into mannan-oligosaccheride (MOS) and chito-oligosaccharide (COS) have been created. In the next step, the biological activities of these bio-innovations will be tested on cell lines, 3D cells, organoid, and human microbiota. In addition, we will also investigate the biological effect of MOS and COS in combination with traditional bioactive compounds that have been shown to have health benefits, such as Cordyceps, Lingzhi mushroom, or curcumin, in the form of nutraceuticals, on human volunteers. Systemic analysis will be observed in collaboration with host professor from Uppsala University who will be co-advisor of prospect Ph.D students upon further discussion as appropriated.

List of RGJ advisors 2017/2018

No: 18

Name: Assoc.Prof.Dr. Nakorn Tippayawong

Program: Energy Technology **Department: Mechanical Engineering**

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Keywords: Biomass and bioenergy, Gasification and pyrolysis, Plasma assisted reaction engineering, Emission control, Energy efficiency

Summary of research:

Biomass is one of the viable renewable sources that have great potential for heat, power and biofuel production to substitute petroleum based fuels. Potential gaseous fuels from biorenewable sources in Thailand include biogas and biomass derived producer gas. Non-thermal plasma is defined as a partially ionized gas where free electrons attain high energy level and high temperature but where neutral particles and ions carry negligible energy, and the overall temperature of the bulk gas remains low. Non-thermal plasma discharges have been widely applied in various areas such as surface modification, gas discharge lamps, low temperature plasma chemistry, and pollutant abatement. They may be applied to utilization of biorenewable energy. In this research, we are interested in application of non-thermal plasma technique possibly for tar removal process from biomass derived producer gas, or for biogas reforming process. (1) The impact of high tar content in the product gas stream from biomass gasification is a major barrier to the deployment of the technology, particularly where very clean gas streams are required such as for high efficiency internal combustion engines and fuel cells. Plasma technology may enable dry cleaning of producer gas. (2) Reforming biogas into synthesis gas or syngas is an interesting conversion process. The reforming process primarily produces hydrogen, carbon monoxide and carbon dioxide. Plasma may be used to produce hydrogen-rich gas from variety of hydrocarbon fuels (diesel, biogas, natural gas, gasoline, etc). The hydrogen rich streams can then be used for the production of high valued chemicals, and used in fuel cells.

List of RGJ advisors 2017/2018

No: 19

Name: Assoc.Prof.Dr. Nirundorn Matan

Program: Materials Science and Engineering **Department: Materials Science and Engineering**

Faculty: School of Engineering and Resources **University: Walailak University**

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Keywords: Internal stress, Online monitoring, Wood, Building, Restoring force measurement

Summary of research:

Online monitoring of internal stress generation within wood components used in buildings. Wood is hygroscopic material which could desorb or adsorb moisture with surrounding air. For relatively thick section of wood used in building, moisture gradient would develop across the wood section. The surface layer desorbs/adsorbs moisture in response to change in humidity of the surrounding air quicker than the inner core. This induces internal stress within the wood components as a result of differential shrinkage of wood material between the surface and the core layers. Damages such as cracks could develop if the tensile internal stress exceeds strength of the wood. Within this work, the restoring force technique developed at Walailak University, Thailand (Jantawee et al, 2016; Tomad et al, 2017) will be employed to online monitor the internal stress developed within wood components used in historical buildings in southern Thailand where humidity variation is relatively high throughout the year. Effect of various wood coatings on internal stress development will be performed. The information should be useful for the conservation of the historical wood buildings.

References:

Sataporn Jantawee, Satjapan Leelatanon, Prawate Diawanich and Nirundorn Matan (2016) “A new assessment of internal stress within kiln-dried lumber using a restoring force technique on a half-split specimen” Wood Science and Technology 50(6): 1277-1292. (https://link.springer.com/article/10.1007/s00226-016-0852-y)

Jaipet Tomad, Sataporn Jantawee, Wanchart Preechatiwong and Nirundorn Matan (2017) “Within-tree variability of internal stress generated during drying of rubberwood lumber” European Journal of Wood and Wood Product (Online). (https://link.springer.com/article/10.1007/s00107-017-1204-9)

List of RGJ advisors 2017/2018

No: 20

Name: Assoc.Prof.Dr. Panmanas Sirisomboon

Program: Agricultural Engineering **Department: Agricultural Engineering**

Faculty: Engineering **University: King Mongkut's Institute of Technology Ladkrabang**

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Keywords: Biomass energy, near infrared spectroscopy, Thailand, Nepal, Sweden

Summary of research:

Biomass such as Leucaena leucocephala and agricultural waste could be a superior green fuel for Thailand to take advantage of economic and environmental benefit by establishing good rule and regulation toward afforestation of energy crops without altering the food chain. Before selling the biomass for making pellet, commercially, the heating value, pyrolysis and combustion characteristics, and kinetics parameter must be recognized in advance so that it will get its actual monetary value instead of random cost per kilogram. So, in order to measure its properties without consuming more time as thermogravimetric analysis (TGA) (16-24 hrs/samples) and bomb calorimeter (50 min/sample) are lengthy process, a non-destructive near infrared (NIR) spectroscopy (2-3 minutes/sample for every parameters) is proposed for research. In addition, knowledge on kinetics of biomass decomposition mechanism helps us to determine the activation energy, pre-exponential factor and reaction order, which are essential parameter for the design of reactor and optimization of product. NIR spectroscopy is proposed for evaluation of kinetics parameters as well.

List of RGJ advisors 2017/2018

No: 21

Name: Assoc.Prof.Dr. Pharkphoom Panichayupakaranant

Program: Pharmaceutical **Department: Pharmacognosy and Pharmaceutical Botany**

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Keywords: Micromelum minutum; coumarin; green extraction; standardization; anticancer

Summary of research:

Name: Preparation of coumarins - rich Micromelum minutum leaf extract for prevention of cancer

Objectives:

1. To isolate coumarins that exhibit anticancer activity from M. minutum leaf extract and use them as the markers for establishment of quantitative HPLC method

2. To determine a suitable solvent for extraction of the coumarins as well as searching for an alternative green solvent for their extraction

3. To prepare the coumarins enriched leaf extract using a microwave assisted extraction

4. To determine the anticancer activity of the coumarins enriched leaf extract compared with its marker compounds

Background:

Micromelum minutum leaf extract exhibited cytotoxic activities against Leishmania major, lung adenocarcinoma and leukaemia cells. 8-Hydroxyisocapnolactone-2′,3′-diol has been reported as a strongly cytotoxic activity against T-lymphoblastic leukaemia (CEM-SS), promyelocytic leukaemia (HL60), cervical cancer (HeLa) and liver cancer (HepG2) cell lines, with IC50 values of 2.9, 2.5, 6.9, and 5.9 μg/mL, respectively. Moreover, the anticancer compounds were purified from the leaf extract using a bioassay guided isolation, namely 8-hydroxyisocapnolactone-2′,3′-diol, clauslactone E and minutin B. Both of them showed strong cytotoxic activity against lung adenocarcinoma (SBC3, A549) and leukaemia (K562, and K562/ADM) cell lines, with IC50 values of 3.7, 10.4, 12.1, and 10.8 μM for clauslactone E; 9.6, 17.5, 8.7 and 6.7 μM for minutin B; 8.8, 10.1, 16.9, and 10.1 μM for 8-hydroxyisocapnolactone-2’,3’-diol, respectively. 8-Hydroxyisocapnolactone-2′,3′-diol, clauslactone E, and minutin B are therefore used as the marker compounds for quantitative HPLC analysis.

Green extraction of natural product is challenges of 21st Century, protecting both environment and consumers at the same time. Principles of green extraction include innovation by selection of varieties and use of renewable plant resources, use of alternative solvents and principally water or agro-solvents, reduce energy consumption by energy recovery and using innovative technologies, production of co-products instead of waste to include the bio- and agro-refining industry, reduce unit operations and favor safe, robust and controlled processes, aim for a non-denatured and biodegradable extract without contaminants.

List of RGJ advisors 2017/2018

No: 22

Name: Assoc.Prof.Dr. Pipat Arunvipas

Program: Veterinary Medicine **Department: Large Animal and Wildlife Clinical ScienceFaculty: Veterinary Medicine** **University: Kasetsart University**

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Keywords: Dairy cow, epidemiology, mastitis, claw health, reproductive performance

Summary of research:

My name is Pipat Arunvipas. Now I am an associate professor at Department of Large Animal and Wildlife Clinical Science, Faculty of Veterinary Medicine, Kasetsart University. I got DVM degree in 1991 and work as lecturer at the beginning and then came to Atlantic Veterinary College, UPEI, Canada fir study abroad and received Master and PhD degree on dairy project. I have been stay on Prince Edward Island for 6 years. After I went back to Thailand in 2004, I have been work as the director of Veterinary Teaching Hospital Kamphaengsaen for 5 years, and work as the head of department for 4 years period. At the same time, I am still continue working on research work in dairy field focus on small holder farms in tropical area. Therefore, my research interest is focus on dairy cow, including infectious disease: bovine corona virus, bovine leukemia virus and protozoa such as, Neospora caninum and Toxoplasma gondii, udder health including subclinical and clinical mastitis and also milk components such as milk urea nitrogen, milk citric acid, claw health including lesions claw block and prevention, and also reproductive performance in dairy cow in tropical area. Nowadays, I have 11 international publications and 18 papers at national publications, and 5 more still to come. You can find out more information at research gate website.

List of RGJ advisors 2017/2018

No: 23

Name: Prof.Dr. Piti Sukontasukkul

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Keywords: rubberized concrete, thermal insulation, sound insulation

Summary of research:

Rubber is a big industry in Thailand. In term of production, Thailand is the world's largest producer and exporter of natural rubber accounting for about one-third of world supply. In 2015, Thailand produced about 4,314,975 tons of natural [1] which was the highest among the top ten rubber producing countries [2]. Thailand also ranked no.69 in number of vehicle per capita (206 vehicles per 1000 people) [3] and last year (2016), the Department of Land Transport reported the accumulative number of registered land vehicle of about 37 million vehicles [4].

Assuming that each vehicle changes their tyres every two year, this roughly yields number of wasted/abandoned tyres of about 50 million tyres per year. With the increasing number of wasted tyres, the wasted tyre management has recently become a challenging problem in Thailand. Burning them causes severe environmental problems. Dumping them in landfill requires large areas and also creates fire hazards and pest threats. Waste tyres are non-biodegradable. As a result, they will stay in the environment for long time.

For the solutions, according to UNEP, at the end of service life, most of the wasted tyres have three channels to go through (Fig.1). 1) Energy recover - the waste tyres are used as alternative fuel in some energy intensive industries such as cement kilns, pulp and paper mills, steel mills and thermal power stations, etc. 2) Material recycling or recovering - waste tyres can be used directly in construction such as boat bumpers, highway retaining walls, and embankment. Waste tyres can also be recovered into ground or crumb rubber or recycled into reclaimed rubber. Crumb rubber can be used in applications like rubber-modified asphaltic road, sport fields/tracks overlay, playgrounds rubber tiles, etc. 3) Landfill – some wasted tyres can be dumped directly to dumpster, landfill or left scattering around the country. Although it may look like there are suitable solutions for wasted tyres, still the amount of wasted tyres going through materials recycling and energy recovery are only small fraction of total waste tyres in Thailand. Large amount of waste tyres gets tossed around throughout the country.

This research aims to help solving wasted tyre problem and promote the use of crumb rubber by provide alternative application through cement and concrete material. Use of crumb rubber in concrete has been studied for at least two decades. Concrete mixed with crumb rubber or rubberized concrete are known for its light weight, high energy absorption, low strength and high elasticity. In general, because of its poor mechanical properties, the rubberized concrete is used mainly in non-structural lightweight, structural components subjected to vibration or insulated concrete applications. .

List of RGJ advisors 2017/2018

No: 24

Name: Assoc.Prof.Dr. Praneet Opanasopit

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Keywords: Mucoadhesive polymers; Nanoparticles; Chemotherapeutic agent; Bladder Cancer

Summary of research:

Cancer is a prominent cause of death around the world. The World Health Organization (WHO) reports that 8.8 million people worldwide died from cancer in 2015. Bladder cancer has a considerable impact on society. It has been ranked to be the ninth most common malignancy in the world. Systemically treatment for the bladder diseases often unsuccessful because it only a small fraction of administered drugs reaches the target site due to the unique anatomical properties of the bladder. Intravesical instillation therapy has become one of the standard procedures for the treatment of bladder cancer. The efficacy of the intravesical treatment depends on the residence time of the drug inside the bladder and the amount of the drug that can attach on to the urinary bladder wall and penetrate into it. Unfortunately, the chemotherapeutic agent can be quickly washed out during bladder emptying. This is resulted in the reduction in both the concentration and the retention time of the drug in the bladder. Therefore, there is a need for the further development of mucoadhesive materials for intravesical treatment in order to improve the efficacy of the existing drug delivery systems. Most of the available mucoadhesive polymers or materials cannot be able to sufficiently prolong the retention time of the delivery system. Until now, only a limit number of studies employed these functional groups, especially acrylate and maleimide, for developing novel mucoadhesive polymers and nanomaterials. Hence, this study aims to synthesize novel mucoadhesive nanoparticles for improved delivery of chemotherapeutic agent to the bladder. The polymers are newly synthesized to bear specific functional groups including maleimide, thiol and acrylate and subsequently employed to develop the chemotherapeutic agents (such as doxorubicin, cisplantin) loaded mucoadhesive nanoparticles. The physicochemical properties and mucoadhesive, drug loading efficiency, drug loading capacity, in vitro mucoadhesive properties, ex vivo mucoadhesive properties, in vitro drug release study and cytotoxicity of the mucoadhesive nanoparticles are investigated.

List of RGJ advisors 2017/2018

No: 25

Name: Asst.Prof.Dr. Prakorn Ramakul

Program: Chemical Engineering **Department: Chemical Engineering**

Faculty: Engineering and Industrial Technology **University: Silpakorn University**

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Keywords: membrane; Extraction; Solubility;

Summary of research:

The research is about the separation of metal ion, organic compound e.g. amoxicilin, levocetirizine from industrial waste and also separation of herb and pharmaceutical compound e.g. lycopene, cordycepin, andenosine etc, from plants. The method are liquid membrane and solvent extraction.

List of RGJ advisors 2017/2018

No: 26

Name: Prof.Dr. Sarawut Rimdusit

Program: Chemical Engineering **Department: Chemical Engineering**

Faculty: Engineering **University: Chulalongkorn University**

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Keywords: Polymer, Polymer Composites, Polymer Alloys, Polymer Blends

Summary of research:

We are working on polymer alloys and polymer composites for such applications as ballistic armor composites, bipolar plate materials for proton exchange membrane fuel, photosensitive polyimide for flexible printed circuit applications as well as polymer alloys for shape memory polymer applications. We are also specialized in polybenzoxazine science and technology, a novel type of phenolic resin with various interesting properties.

List of RGJ advisors 2017/2018

No: 27

Name: Asst.Prof.Dr. Saroat Rawdkuen

Program: Food Science **Department: Food Science and Technology**

Faculty: Agro-Industry **University: Mae Fah Luang University**

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Keywords: By-product utilization, Food Packaging, Gelatin, Oil seeds meal, Rice, Protein film

Summary of research:

By-products originating from agricultural and food processing are a considerable disposal problem for the agriculture and food industry because these waste streams emerge in huge quantities and are often direct impact on the economy and environmental pollution. However, at the same time by-products constitute a rich but yet underutilized source of valuable components, which may find application as ingredients in the food and non-food industries. As a result, numerous projects are currently directed toward the utilization of agricultural and food processing by-products such as animal based biomaterials (fish skin, bone, flesh, and internal organs) and plant based biomaterials (pineapple, mango, longan, banana, tea, sacha inchi, oilseeds, legumes, rice, etc.). There are many examples of active ingredients deriving from fish processing industry as well as plant based products industry, but in the present point of view we would like to focus on the potentialities and the current research projects related to the compounds and extracts deriving from agro-industrial disposable wastes in the food related utilization. The project is to highlight the potential of selected by-products as a source of bioactive/functional compounds in terms of emerging and conventional techniques for extraction, physico-chemical characterization and biological activity monitoring, and application of the extracts, fractions, and isolated compounds as functional food ingredients or bio-based materials for food packaging and others. Considering environmental effect and economic loss, agricultural and food processing by-products should be utilized in various innovative processes in the cause of beneficial product derivation.

List of RGJ advisors 2017/2018

No: 28

Name: Asst.Prof.Dr. Sirichai Songsermpong

Program: Food Science **Department: Food Science and Technology**

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Keywords: rice, food, processing, microwave, Radio Frequency

Summary of research:

I use the commercial microwave ovens to heat, stabilize, defrost, pasteurize, sterilize, dry, puff, bake blanch, fry and other process to food and rice to decrease the time, energy and cost and to increase the productivity, quality, innovations and more value added products. Most of the works have been supported by the food industries. The food industries also adopt these knowledge to improve the production process. Some of my research that is commercially available is the instant Kanomjeen and seasoning powder, instant khaoneowmoon and instant rice, puffed pork rind, puffed rice cracker, dragon fruit snack. We also conduct research on Properties of Rice Grain after Mild Heat Treatment by Radio Frequency Heating for Controlling Sitophilus Oryzae to serve Eureka design company. Moreover, we have connection with Prof. Juming Tang and Prof. Sablani at Washington state university for microwave pasteurization and microwave sterilization. I also have connection with Prof. Raghavan and Prof. Ramaswamy from McGill University in microwave processing of foods.

List of RGJ advisors 2017/2018

No: 29

Name: Asst.Prof.Dr. Siriwan Prapong

Program: Animal Health and Biomedical Sciences **Department: Physiology**

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Keywords: Leptospirosis; orally based vaccine; Field trial; swine; Veterinary Medicine

Summary of research:

Field trial test on Leptospiral orally based vaccine for swine for a benefit of ASEAN swine industries

Siriwan Prapong, D.V.M., M.S., Ph.D.

Thai swine industry is cited as the top performance among ASEAN countries. Although veterinarians and companies in veterinary products from Thailand have been exported to ASEAN countries, Leptospirosis is still among zoonotic diseases found in swine farms in ASEAN countries. My laboratory has developed genetically engineered proteins which had been proved their protectivity in hamster model. We also collaborated with Professor from Austria to develop the genetically engineered proteins into oral based form. We hope that this oral based vaccine will be transferred their protectivity better than injection form. The aim of this proposal is to do field trial vaccine test in piglet of ASEAN swine farms, either from Lao, Mianmar, or Vietnam. Whether our orally based vaccine will provide protectivity for leptospiral local serovars prevalence threatening serovars among swine in ASEAN countries will be evaluated.

List of RGJ advisors 2017/2018

No: 30

Name: Assoc.Prof.Dr. Soorathep Kheawhom

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Keywords: Zinc-air battery; Energy storage; Oxygen reduction reaction; Flow battery; Renewable energy

Summary of research:

Electrical energy storage (EES) systems are essential for effective utilization and integration of renewable energy sources (RESs) to a power grid. Also, they offer many benefits including improving the way energy is delivered, consumed, and generated. Besides, EESs are expected to become increasingly common given the growing importance of distributed generation of RESs. The most common kind of EES is the use of a battery. Lithium-ion batteries (LIBs) have been the most widely recognized EES device employed in various applications. Unfortunately, their limitations of high cost and safety issues are the primary barrier to their successful implementation. Besides, Lithium (Li) supply and its future production are far from adequate to use in large-scale EES systems. Also, the distribution of Li is limited.

Zinc-air batteries (ZABs) have exhibited high potential for various energy applications because of their very high energy densities. Besides, zinc (Zn) is an attractive anode because it is abundant, inexpensive, non-toxic and inherently safe. Also, Zn is the metal produced in the fourth largest quantity after iron (Fe), copper (Cu), and aluminum (Al). Moreover, Zn has widespread accessibility and availability throughout the world.

ZABs generate electricity through the electrochemical reaction of Zn and oxygen. During discharge, oxygen from air is reduced, while Zn metal undergoes oxidation and produces zincate and later changes to zinc oxide (ZnO). Zinc-air flow battery (ZAFB) is a kind of ZAB. In this system, Zn granules and the electrolyte, serving as reactants, are stored separately in external tanks and fed into the cells.

Regarding the design of ZAFBs, the morphology of the zinc anode has been found to be of great importance in achieving high electrochemical performance. For zinc regenerative system, zinc is regenerated from the spent electrolyte. The morphology control of regenerated zinc plays a significant role in determining its reusability and cyclability.

This project aims at investigating the effects of various parameters on zinc regeneration as well as the effects of the morphology of regenerated zinc on the performance of the ZAFBs. Besides, the effective method to control the morphology of regenerated zinc will be developed.

List of RGJ advisors 2017/2018

No: 31

Name: Prof.Dr. Suchart Siengchin

Program: Materials Engineering **Department: Materials and Production Engineering**

Faculty: The Sirindhorn International Thai German Graduate School of Engineering (TGGS)

University: King Mongkut's University of Technology North Bangkok (KMUTNB)

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Keywords: Composite materials; natural fiber; hybrid; processing; structure-property relationship

Summary of research:

The research methodology for materials processing and characterization is structured into the following phases for a systematic approach towards successful and timely completion of the proposed work.

Phase I - First year

Procurement of raw materials and preparation of thermoplastic copolymers modified shape memory and self-healing polymers. Investigation on the possibility of adding different bio-nano fillers into the modified matrix.

Phase II - Second year

Morphology and phase structure of shape memory and self-healing polymers will be examined by using SAXS, WAXS, SEM, TEM and AFM. Thermo-mechanical properties will be measured using UTM, DMA, DSC, and TGA. Shape fixity and shape recovery will be addressed by UTM and DMA. The interactions if any between the thermoplastic copolymers and epoxy thermoset is studied in detail using FTIR and NMR.

Phase III - Third year

In the last phase of the project, full attention will be given for product development, patenting and publication of papers

List of RGJ advisors 2017/2018

No: 32

Name: Assoc.Prof.Dr. Sudarat Jiamyangyuen

Program: Food Science **Department: Agro-Industry**

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Keywords: rice bran, near-infra-red spectroscopy (NIRS), classification, phytochemicals, gamma-oryzanol

Summary of research:

Name: Classification of rice bran quality based on phytochemical contents using near-infra-red spectroscopy (NIRS) analysis

Rice bran is an important gamma-oryzanol and vitamin E source. The benefits of rice bran oil related to health promoting have been widely reported and depends on quality of rice bran as a raw material. Therefore the interest on distinguish classes of rice bran based on phytochemical contents using NIRS is an objective of this study. NIRS technique can provide advantages over the conventional method as rapid, reproducibility, equivalent to most reference methods, low operation and labor cost, no required chemicals, great flexibility, and the capability of testing many constituents simultaneously.

NIRS has been applied to many types of agricultural products, including analysis of amylose, protein, and lipid content in rice. However, classification of rice bran quality as a screening criteria for rice bran oil production has not been investigated elsewhere.

In this study, rice bran samples from different locations of rice milling factory over Thailand, covering dry, cold, and rainy seasons, will be collected. Gamma-oryzanol and vitamin E (alpha, beta, gamma, and delta forms of tocopherols and tocotrienols) will be qualitatively and quantitatively analyzed using HPLC and results compared with predicted values provided by NIRS. NIRS used is Fourier transform near infrared (FT-NIR) spectrometer in reflection mode on 12,500–4,000 cm-1 (800–2,500 nm). The models will be assessed based on partial least squares (PLS) and discriminant analysis (PLS-DA).The software for multivariate analysis will be used in both spectrum pre-processing and model development. The optimum model will be selected by coefficients of determination (R2), root mean squared error of cross validation (RMSECV), ratio of standard error of validation to the standard deviation (RPD) and bias.

The overall precisions including reproducibility and repeatability will be performed. The results will confirm possibility of using NIR as an alternative technique to evaluate phytochemical contents of various rice bran varieties and then classified prior to being used as raw material for production of rice bran oil products as well as valued- added bioactive compounds obtained. The model is not only applicable in production, but also in quality assurance aspect which are beneficial for both industry and consumers in the long run.

List of RGJ advisors 2017/2018

No: 33

Name: Prof.Dr. Supayang Voravuthikunchai

Program: Microbiology **Department: Microbiology**

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Keywords: Bacteriology, natural product, pathogenic bacteria, drug development, industrial application

Summary of research:

List of RGJ advisors 2017/2018

No: 34

Name: Assoc.Prof.Dr. Suppasil Maneerat

Program: Agro-Industrial **Department: Industrial Biotechnology**

Faculty: Agro-Industry **University: Prince of Songkla University**

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Keywords: Lactic acid bacteria, Fermented shrimp, GABA, Starter culture

Summary of research:

In recent years, several reports have shown that traditional fermented foods are rich sources of microorganisms that show probiotic and hence health-promoting characteristics. Actually, lactic acid bacteria (LAB) are mostly considered as valuable probiotic organisms witnessing a long history of use, and many of them are designated generally recognized as safe (GRAS), carry the qualified presumption of safety (QPS) status and are food-grade microorganisms. While some LAB have shown a number of health-related properties, reports on probiotic LAB with increased gamma-aminobutyric acid (GABA)-synthesizing properties have been scarce so far. However, the use of chemically synthesized GABA as a food additive might be questioned by consumers. Accordingly, a safe method to produce GABA such as microbial fermentation is highly desirable. Because many LAB are beneficial to humans and animals, LAB would be the most suitable micro-organisms for GABA fermentation. Moreover, GABA produced by LAB is also acceptable for food usage owing to its being natural, safe and ecofriendly, and not affecting sensory characteristics of products. Kung-Som is a traditional Thai fermented shrimp made from main raw materials; sea white shrimp, sugar and salt depending on each traditional recipe. Kung-Som can be consumed both cooked and uncooked, and therefore strains used in the production of Kung-Som must be safe. If cooked, GABA definitely remains in Kung-Som as it is heat stable. Hence, consumers still obtain many health benefits from nutritional GABA. We found that L. futsaii CS3 not only had primary probiotic properties but also furthermore produces significant amounts of GABA during these cultivations. Enumeration of L. futsaii during the actual production process is however tedious due to the complex matrix and high salt content. Therefore, we aim to insert the gfp gene into L. futsaii CS3 to monitor the development of starter cultures during food fermentations by simple observations based on microscope. This research should thus give important indications on cultivation conditions that favor the development and proliferation of lactic acid starter cultures in fermented shrimp.

List of RGJ advisors 2017/2018

No: 35

Name: Assoc.Prof.Dr. Suwimol Asavapisit

Program: Environmental Technology **Department: Environmental Technology**

Faculty: School of Energy, Environment and Materials

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Keywords: waste utilization, hazardous waste, construction material, geopolymer, zeolite

Summary of research:

Waste Utilization in Environmental Work and Material Engineering (WUEM) Research Group is focusing on the use of both general industrial and agricultural wastes to minimize the amount of wastes going to landfill and the cost of landfilling. For environmental purposes, rice husk ash, coal fly ash, glass powder and, water treatment residue, for example, were used as solidification binder to immobilize heavy metal-containing wastes to reduce the release of toxic heavy metals to the environment or used to prepare landfill liner to prevent the leachate from contaminating the ground water. In addition, the reuse of wastes in material engineering has been conducted in several approaches for example, the use of general waste as cement replacement material in low-cost and lightweight construction materials, the synthesis of geopolymers and zeolites from alumino-silicate waste materials, the use of wastes as alternative raw materials for the manufacturing of cement and, the synthesis of cement clinkers at low temperature.

List of RGJ advisors 2017/2018

No: 36

Name: Assoc.Prof.Dr. Tawan Sooknoi

Program: Applied Chemistry **Department: Chemistry**

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Keywords: Catalysis; Zeolites; Adsorption;

Summary of research:

Our research unit focuses on the preparation and modification of supported catalysts for many reactions, such as hydrogenation-dehydrogenation, dehydration, and condensation to produce the valuable chemicals. The effect of reaction conditions is usually investigated for selective production of the desired products. Furthermore, understanding reaction mechanism and kinetics of heterogeneous catalytic system is also essential for research-based knowledge and industrial applications. Study on homogeneous catalysis is also important in order to design the better heterogeneous catalysts via immobilization the active complex/species on stable substrates. This is not only for improving the catalyst recovery, but also gaining benefit from the highly selective nature of homogeneous catalysts. In addition, we aim to explore catalytic activity of zeolites and nanomaterials. The properties of these materials, and likely the catalytic activities, are anticipated to be turned by a mere variation to the size, thanks to the quantum confinement effect. Moreover, the change of the catalytic properties can be varied by the shape and morphology of a catalyst.

List of RGJ advisors 2017/2018

No: 37

Name: Assoc.Prof.Dr. Thanate Ratanawilai

Program: Engineering **Department: Industrial Engineering**

Faculty: Engineering **University: Prince of Songkla University**

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Keywords: Wood-plastic composites ; Rubberwood; extrusion; mechanical behavior, thermal property

Summary of research:

Wood-plastic composites (WPCs) have become popular due to low cost, low maintenance, and eco-friendliness with good mechanical properties. WPCs are produced by mixing wood fiber into molten plastic matrices as well as coupling agents or the other additives, and then composite materials form through various processing methods such as compression, extrusion or injection molding. WPCs are extensively used in automotive industry as door inner panels and seat backs; and in construction as decking and fencing.

Wood fiber is one of the major materials in WPCs. There are many species of wood that found to produce WPCs such as pine, oil palm empty fruit bunch, bamboo, including rubberwood. Rubberwood lumber and root could be mainly utilized to manufacture furniture, toys, and packing materials. A large amount of wood waste in the forms of flour, sawdust, and chips is generated at different stages of processing in these industries. Some of the wood waste can be used as raw material to manufacture plywood, particleboard, and medium-density fiberboard. Therefore, the utilization of rubberwood waste as filler in polymer composites is great interest, which decreases environmental impacts but increases value of waste. The other major material of WPCs is plastic acting as a matrix. The most plastic wastes are typically consisted of polyethylene, polypropylene, polyvinyl chloride, polyethylene terephthalate, and polystyrene. Increasing the use of recycled plastics by blending with rubberwood wastes provides the chance of lessening wastes going to landfill, decreasing solid waste disposals, and reducing the costs of making the WPCs.

The usage of WPCs is mostly limited to non-structural interior applications due to the decrease of WPCs stability when exposed to exterior conditions. The main factors affected WPCs properties are humidity, sunlight, and temperature. When WPCs are applied in different environmental conditions, they are necessary to study the durability and stability of WPCs products as well as effects of the environmental conditions. The development of new material needs to be examined the mechanical, physical, dimensional stability, and durability properties of WPCs. The new information will facilitate informed decisions regarding manufacture of composites and helps target the most suitable end-use applications of such composites.

List of RGJ advisors 2017/2018

No: 38

Name: Assoc.Prof.Dr. Thawatchai Phaechamud

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Keywords: Natural resin, drug delivery, periodontitis treatment, vancomycin, in situ forming gel

Summary of research:

Natural resins will be exhibited new application in drug delivery systems in dosage form of in situ forming gel for periodontitis treatment with periodontal pocket local drug delivery. The utilization of these five natural resins as matrix former of in situ forming gel has not been reported previously. The mechanistic of matrix formation with unique transformation of vancomycin HCl-loaded natural resins in situ forming gel will be scrutinized. The utilization raw material of these natural resins from domestic wisdom could be promoted. The aims of this research are to investigate the controlled release of antimicrobial drug such as vancomycin HCl with five natural resins in dosage form of in situ forming gel, to understand the effect of injectable vehicles including DMSO, N-methyl pyrrolidone and 2-pyrrolidone on physicochemical properties including antimicrobial activities against periodontitis pathogen of vancomycin HCl-loaded natural resin in situ forming gel and to explain and create the schematic diagram of the mechanistic transformation of natural resins into matrix of in situ forming gel. Five natural resins (using in Thai and Myanmar galenical preparation or indigeneous medicine herbs) dissolved in injectable vehicles including DMSO, N-methyl pyrrolidone and 2-pyrrolidone using vancomycin HCl as model antimicrobial compound. The physicochemical properties of prepared formula are determined including density, viscosity-rheology, syringeability, in vitro gel formation, solvent diffusion and vancomycin HCl release behavior, in vitro matrix degradation, topographical change and antimicrobial activities against periodontitis pathogen. The statistical analysis is conducted for obtained data with ANOVA. The schematic diagram of mechanistical matrix transformation of natural resin in situ forming gel is created.

List of RGJ advisors 2017/2018

No: 39

Name: Assoc.Prof.Dr. Ubonrat Siripatrawan

Program: Food Science **Department: Food Technology**

Faculty: Science **University: Chulalongkorn University**

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Keywords: active food packaging, shelf life, hyperspectral imaging, electronic nose, chemometrics

Summary of research:

Active packaging, the new generation of food packaging, is gaining interest from researchers and industry due to its potential to provide food quality and safety benefits. Favorable active packaging systems are based on the incorporation of natural antimicrobial and/or antioxidative substances in food packaging materials in order to control undesirable changes of food qualities.

Chitosan, a linear polysaccharide of randomly distributed β-(1-4)-linked D-glucosamine and N-acetyl-D-glucosamine, is a functional biopolymer obtained from deacetylation of chitin. Chitosan is non-toxic, biocompatible, and biodegradable and thus is considered as an environmentally friendly packaging material. Chitosan is non-toxic, biocompatible, and biodegradable and thus is considered as an environmentally friendly packaging material. Our laboratory develops chitosan-based film incorporated with natural antioxidants and/or antimicrobials (e.g. essential oils, plant polyphenols) to be used as antimicrobial and/or antioxidant films and coatings for fresh produce and food applications.

Moreover, our laboratory also studies quality and shelf life evaluation of packaged food products and applies rapid and nondestructive techniques (e.g. electronic nose, optical spectroscopy, near-infrared spectroscopy) coupled with chemometrics for food safety and quality in packaged and stored foods.

List of RGJ advisors 2017/2018

No: 40

Name: Assoc.Prof.Dr. Uma Seeboonruang

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Faculty: Engineering **University: King Mongkut's Institute of Technology Ladkrabang**

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Keywords: water resource, groundwater, artificial recharge, conjunctive use, climate change

Summary of research:

A groundwater system is naturally dynamic and changes with time in response to both human activities and climate stresses. Pressures of overexploitation on groundwater resources largely stem from population growth, increased agricultural activities, and rapid urbanization and industrialization, especially in the Thailand. Climate change has also accelerated the already worsening state of groundwater resources and rendered the only available freshwater reserve less accessible. Climate change affects the hydrologic cycle and precipitation patterns. As the result, groundwater would be inevitably impacted directly by the change of groundwater recharge. The short and long term projected precipitation patterns between 2015-2039 and 2075-2099 are modified from a Thai government report and compared to the 1979-2006 baseline precipitation. The change in precipitation patterns are considered as the exposure factor of climate change. Risk or impact assessment indicates groundwater areal zones with low, medium, and high risks. The high risk zones are those must be carefully managed due to the extreme decrease or increase of precipitations in conjunction to highly sensitive groundwater system to the changes.

List of RGJ advisors 2017/2018

No: 41

Name: Prof.Dr. Ura Pancharoen

Program: Chemical Engineering **Department: Chemical Engineering**

Faculty: Engineering **University: Chulalongkorn University**

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Keywords: separation; solubility; toxic material; natural resource; liquid membrane.

Summary of research:

Various types of metals have been utilized in industrial processes such as heavy metals (Cu, Ni, etc.), hazardous metals (Pb, Hg, etc.), precious metals (Au, Pt, etc.), rare earth metals (La, Ce, etc.) and radioactive elements (U, Co etc.). After processing, however, wastewater contains these metals from a variety of applications. Nowadays, wastewater containing toxic heavy metals is one of the most serious environmental problems. If these metals accumulate in the body in sufficient concentration to cause poisoning, then serious damage may occur [1]. So these contaminated metals should be treated from the wastewater. Moreover, groundwater is commonly used for public water supplies which can be polluted by landfills, septic tanks, overuse of fertilizers and pesticides as well as these toxic heavy metals. Thus, to treat and purify water is necessary to protect human beings and the environment.

In pharmaceutical processes, enantiomers are widely used and consist of R-enantiomers and S-enantiomers. The separation of enantiomers to isolated enantiomers will enhance the efficiency of these drugs [2]. The separation of antioxidants from natural sources such as catechins from tea leaves is also useful to drug manufacturing [3]. After pharmaceutical processes, wastewater left behind can still contain antibiotics. Thus, it is important to treat wastewater before discharge to the environment in order to protect an evolution of antibiotic-resistant bacteria [4].

Organic compounds have been applied in many chemical processes and thereby are found to contaminate wastewater. These organic compounds in the wastewater cause much damage to the environment with the result that conditions such as low pH, high COD value and low biodegradability occur. Moreover, the accumulation of organic compounds in surface water also harms aquatic life, wildlife and humans [5-7]. Thus, the separation of organic compounds from the wastewater is also required.

[1] Arabian J. of Chem. 4 (2011) 361.

[2] J. of Chrom. A 1486 (2017) 20.

[3] J. of Memb. Sci. 471 (2014) 219.

[4] J. of Cleaner Pro. 112 (2016) 3097.

[5] Chem. Eng. Res. and Des. 126 (2017) 19.

[6] J. Ind.& Eng. Chem. 20 (2014) 2138.

[7] Sep. & Purif. Tech 66 (2009) 25.

List of RGJ advisors 2017/2018

No: 42

Name: Assoc.Prof.Dr. Waree Tiyaboonchai

Program: Pharmaceutical **Department: Pharmaceutical Technology**

Faculty: Pharmaceutical Sciences **University: Naresuan University**

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Keywords: Nanoparticles, cosmetics, lipid based delivery systems, ocular delivery system

Summary of research:

We aim to develop delivery systems that enhance drug bioavailbility and improve drug stability for pharmaceutics, cosmetics, food supplements and feed additives. The main research focuses on nano-formulations employing lipid and natural polymers as a carriers. Examples of these delivery systems are polymeric nanoparticles, solid lipid nanoparticles, liposomes, self-emulsifying drug delivery system (SEDDS) and solid dispersion. Recently,cosmetic products based on Thai natural products such as pigment extract of silk cocoon, pomegranate peel extract, mangosteen peel extract and curcumin were successfully developed using solid lipid nanoparticles (SLNs), that could help increase active ingredient stability. The clinical results revealed that compared to the cream base, curcumin loaded SLNs cream significantly improve skin wrinkles, hydration, biological elasticity and viscoelasticity. The polymeric nanoparticle system based on chitosan and dextran sulfate (CDNs) has been successfully developed to incorporate amphotericin B, a model drug, to reduce nephotoxicity. In addition, CDNs showed potential as a carrier for ocular deivery system. Examples of current research are as followed:

- Development of mucoadhesive nanoparticles for topical, oral, and ocular deliver system.
- Development of fibroin nanoparticles for cancer therapy

List of RGJ advisors 2017/2018

No: 43

Name: Asst.Prof.Dr. Warinthorn Chavasiri

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Keywords: natural products chemistry, methodology in organic synthesis, catalysis

Summary of research:

My research focuses on 3 main parts. The first one involves chemistry of natural products to search for bioactive compounds from natural resources including medicinal plants, mangrove plants and tropical weeds; secondary metabolites from microorganisms and lichens. The main biological activities concern with anti-infectious diseases activity. In addition, agricultural chemistry and chemical ecology are among the areas of interest. Second themes include methodology in organic synthesis with the aim to develop new methods for manipulation of organic molecules. Certain developed methodology will apply for transformation of natural products to more potent candidates both pharmaceutical and agricultural aspects. The third area involves the chemistry of catalyst, focusing on the homogeneous catalysis applied to fine chemicals production. In addition, metal impregnated to clay utilizing as heterogeneous catalyst will also be explored.

List of RGJ advisors 2017/2018

No: 44

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Keywords: Animal, antiviral, immunostimulatory, diagnostic, kit

Summary of research:

Our laboratory is currently working on three projects. The first project focuses on investigating antiviral and immunostimulatory properties of medicinal plant extracts and their purified constituents for livestock production. The second project focuses on the development of diagnostic test kit for canine diseases. The third project focuses on the development of diagnostic test kit for bovine diseases. There is a project in line which focuses on the development of diagnostic test kit for swine diseases.

List of RGJ advisors 2017/2018

No: 45

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Keywords: 5G, nonorthogonal multiple access (NoMA), resource allocation, multiple antennas, downlink

Summary of research:

Nonorthogonal multiple access (NoMA) has been proposed to be included in the 5th generation (5G) mobile system. Instead of orthogonal (or noninterfering) usage of the wireless channels among users, NoMA allows some interference between users and thus, gains freedom to communicate in all bandwidth or time or antennas. As a result, NoMA achieves larger spectral efficiency when compared to the current and past multiple-access schemes including frequency-division, time-division, or orthogonal frequency-division multiple access (FDMA, TDMA or OFDMA). To cancel interference, receivers in NoMA scheme must employ successive interference canceler (SIC), which increases additional complexity. In downlink, which refers to a basestation transmits to mobile users), proper allocation for user's transmit power must be performed for an effective SIC.

In this project, we assume that basestation has multiple transmit antennas and applies zeroforcing beamforming transmission with superposition coding to transmit messages of mobile users. Assuming frequency-division duplex, the basestation is not able to estimate the forward channel's information on its own and has to rely on channel state information (CSI) fed back from the mobile users. Since feedback channel is rate-limited, the basestation has limited or quantized CSI and hence, will allocate resource such as transmission power, time or, beam on such information. Thus, we are interested in studying and analyzing the effect of finite-rate feedback on user and system performance. With some understandings and insights, we may be able to propose effective or efficient resource allocation at the transmitter. We plan to verify of the analysis with numerical or simulation results.

List of RGJ advisors 2017/2018

List of RGJ advisors 2017/2018

No: 46

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Keywords: Natural rubber, Polymer composites, Properties, Biopolymer, Natural fiber.

Summary of research:

The research areas include the modification of natural rubber and natural fillers from natural resources to be used in polymer composites. Another research area is the study of biopolymer based on PLA and PBS as a matrix in biocomposites. Characterization includes the use of Synchrotron light scattering. Physical properties and processing relationship will be studied.