Book of Abstract

International Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR) 2019

Bioenergy and Bio-based Chemical Products for National Sovereignty and Self-Reliance

Swiss-Belinn Kristal Kupang Hotel, Kupang, East Nusa Tenggara, Indonesia

October 7th - 9th, 2019

Book of Abstract

International Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR) 2019

"Bioenergy and Bio-based Chemical Product for National Sovereignty and Self-Reliance"

7th-9th October 2019
Swiss-Belinn Kristal Kupang Hotel
Kupang, Nusa Tenggara Timur
Indonesia

Organized by:

Chemical Engineering Study Program
Faculty of Industrial Technology
Institut Teknologi Bandung

Faculty of Agricultural Technology
Universitas Kristen Artha Wacana

About International Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR) 2019

The first higher education in Indonesian Chemical Engineering was established at ITB in 1941. International Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR) 2019 is an annual seminar held by the Chemical Engineering Study Program of ITB in collaboration with other institutions, usually located in Bandung. In this year, however, the International Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR) 2019 is going to be held in Kupang, the Province of East Nusa Tenggara (NTT) for three days, starting from October 7th to October 9th, 2019. Bringing forward the theme of "Bioenergy and Bio-based Chemical Products for National Sovereignty and Self-Reliance", the STKSR 2019 inviting scholars and practitioners from all around the world to contribute in this event. The aim of STKSR 2019 is to promote the implementation of EBT (Energi Baru Terbarukan/Renewable Energy) in Timor Island, NTT supporting the government program of national sovereignty and self-reliance. Throughout the procession of this seminar, there will be collaborations between the Department of Chemical Engineering of ITB, Faculty of Agricultural Technology of Universitas Kristen Artha Wacana (UKAW) Kupang, the City Government of NTT, and Directorate General of Renewable and Conservation Energy (EBTKE), Ministry of Energy and Mineral Resources of the Republic of Indonesia (ESDM).

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Message from Rector of Institut Teknologi Bandung

Honorable keynote speakers, presenters, and participants of the International Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR) 2019,

It is my great pleasure to welcome you on behalf of Institut Teknologi Bandung to this Seminar. I hope you are in a good health and spirit to follow all the activities of the Seminar.

STKSR has become a prestigious annual event of research dissemination and knowledge sharing among chemical engineering communities in Indonesia as well as neighboring countries.

This year, in collaboration with Universitas Kristen Artha Wacana (UKAW), the city of Kupang, the Government of East Nusa Tenggara Province, and Directorate General of Renewable and Conservation Energy (EBTKE), Ministry of Energy and Mineral Resources of the Republic of Indonesia (ESDM), the seminar raise the theme of "Bioenergy and Bio-based Chemical Products for National Sovereignty and Self-Reliance". ITB thanks all the collaborators, because we believe that ITB is not only for ITB and the more people get involved will produce better results. I praise the committee for choosing Kupang as the seminar location, hence introducing it to wider scientific community.

Nominated as the world's richest nation in terms of biodiversity, Indonesia has many resources to be explored. It is our legacy as well as obligation to elaborate process cultivating valuable products from these enormous bioresources and maintain their sustainability. Therefore, we encourage youth and motivated professionals to develop and share their innovations in STKSR 2019. We believe the seminar will bring productive discussion and fruitful collaborations. Together we are shaping the future of Bioenergy and Bio-based chemical Products for National Sovereignty and Self-Reliance.

The success of this seminar would not be possible without the support from all stakeholders; therefore, I would like to express our gratitude and appreciation to our sponsors, collaborators, committees, and participants for making STKSR 2019 a grand success.

Warm regards,

Rector,

Prof. Dr. Ir. Kadarsah Suryadi, DEA

Message from Rector of Artha Wacana Christian University

First of all, Praise and gratitude is offered to God for allowing the 2019 Internasional Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR) to be jointly organized by the Chemical Engineering Study Program, the Industrial Faculty Technology - ITB and Faculty of Agricultural Technology – UKAW in Kupang-NTT. This seminar is a part of initial program of the collaboration between Industrial Technology Faculty (FTI) - ITB with Faculty of Agricultural Technology (FTP) - UKAW. This STKSR seminar is hold for the first time outside ITB Bandung after the age of Chemical Engineering Study Program reached 78 years and for the first time, FTP UKAW as wel establish cooperation with FTI ITB in all Tri Dharma Fields.

UKAW is proud and pleasure to welcome ITB's openness to share experiences, knowledge and strengths in the field of science and technology development, research and scientific publications as well as transmit experiences in field of bio-based materials processing industry. Through the momentum of sharing research output and scientific publications, which will be held at the STKSR 2019, it is hoped that academics, researchers and industry circles in NTT can contribute ideas to the public regarding various achievements of scientific and technological products that can support the nation's civilization.

The collaboration between FTI ITB and FTP UKAW would be a gateway for UKAW to show its contribution to the Nation, especially to East Nusa Tenggara Province. This momentum is also major steps that will help accelerate the development of institutional research and science development capacity in UKAW and NTT in general in achieving food independence and energy sovereignty. Through this seminar opportunity, ITB as one of the supervisory institutions in Indonesia is expected to be able to transmit a variety of knowledge capabilities and technological wealth that is undoubtedly, so that it can help UKAW in achieving its vision as one of the center of excellent universities in Indonesia.

Finnaly, I highly welcome the 2019 Internasional Seminar on Chemical Engineering Soehadi Reksowardojo (STKSR), and fully support its implementation in Kupang. I would also like to express my deepest gratitude to the Dean of FTI ITB who has willing to collaborate with FTP UKAW. Hopefully, in the future this collaboration will be further enhanced into collaboration between Bandung Institute of Technology (ITB) and Artha Wacana Christian University (UKAW) for broader goals and objectives. May God bless us.

Warm regards,

Rector,

Ayub U.I. Meko

Message from Chairman of STKSR 2019

Dear Colleagues,

On behalf of the Organizing Committee of International Seminar on Chemical Engineering Soehadi Reksowardojo, I am honorable to welcome you all to STKSR 2019. This year, the Seminar raises the topic of "Bioenergy and Bio-based Chemical Products for National Sovereignty and Self-Reliance", expanding the scopes into multidisciplinary platform.

As we all aware with the global issues of climate change and energy crisis, STKSR 2019 is intended to be the first step toward the frontier of petroleum-to-bio-based movement, especially for our society in Eastern part of Indonesia. Being blessed with great varieties of natural resources, Indonesia should be able to achieve it's national independent and self-reliance in terms of bioenergy and bio-based materials.

STKSR 2019 is enriched by plenary lectures and parallel oral presentations from scholars and industrial practitioners coming from 5 countries as well as Indonesian government agencies representatives. We have received more than a hundred abstracts, among which one fourth comes from the Eastern part of Indonesia; we are sincerely grateful for your great enthusiasms and contributions. Also, for those of you who return to STKSR again and again, thank you for your continued friendship, scientific sharing, and kind support.

Taking place in Kupang, STKSR 2019 could not be made possible without the great support from our counterparts in Universitas Kristen Artha Wacana. They have arranged several social functions (welcoming dinner, gala dinner, and excursions) so that all of you may leverage your community outreach and collaborative partnerships as well as experience the Kupang exotic beauty and warm hospitality.

Finally, the committee is most grateful to all sponsors for providing funds. And I, personally, thank all the committee members, all the plenary and invited speakers, as well as all oral presenters for their kind efforts and contributions in making this conference a grand success. I hope all of you enjoy the whole programs.

Warm regards,

Chairman of STKSR 2019,

Antonius Indarto, S.T., M.Eng. PhD.

Sub-Theme

1. Bioenergy (BE)
2. Bio-based Materials (BM)
3. Bio-based Chemicals & Pharmaceuticals (BCP)
4. Biomass Upgrading & Utilization (BUU)
5. Sustainable Process & Technology Development (SPTD)

Keynote Speakers

1. Viktor Laiskodat, S.H.
   Governor of Nusa Tenggara Timur

2. Edi Wibowo, M.T.
   Fund Disbursement Director of Badan Pengelolaan Dana Perkebunan Kelapa Sawit (BPDPKS)

3. Ario Setyawan
   President Director of PP Energi

4. Prof. Dr. Ocky Karna Radjasa, M.Sc.
   Director of Research and Community Service, Ministry of Research, Technology, and Higher Education

5. Prof. Dr. Atsushi Fukuoka
   Institute for Catalysis (ICAT) Professor Hokaido University (Advisor to the President)

6. Dr. Ir. Tatang Soerawidjaja
   Chairman of Ikatan Ahli Bioenergi Indonesia (IKABI)

7. Prof. Dr. Ir. Subagjo
   Chairman of Catalyst and Reaction Engineering (CaRE) ITB

8. Prof. Dr. I. G. Wenten
   Chairman of Downstream Process Laboratory ITB, Membrane Technology Expert

Invited Speakers

- **Maslan Lamria**
  School of Food and Advanced Technology College of Sciences, Massey University, New Zealand
  "Producing Drop-in Biofuel from Marginal Land-Based Feedstock in Sumba Island, Indonesia: A Systems Dynamics Analysis"

- **C.B. Rasrendra**
  Pusat Rekayasa Katalisis, Institut Teknolog Bandung, Ganesha 10 Bandung
  "Pengembangan Katalis dan Teknologi Produksi Bio-BTX Berbahan Mentah Tandan Kosong Sawit"

- **Jenny Rizkiana**
  Department of Chemical Engineering, Institut Teknologi Bandung, Indonesia
  "Co-gasification of Non-Demineralized and Demineralized Coal with Biomass"

- **Heru Setyawan**
  Department of Chemical Engineering, Institut Teknologi Sepuluh November, Indonesia
  "Using Coir Fibers as a Carbon Source when Preparing N-doped Carbon Aerogel for Electrocatalyst in Metal-Air Batteries"

- **Supriyono**
  Department of Chemical Engineering, Faculty of Engineering, Universitas Brawijaya, Indonesia
  "Electrochemical Impedance Spectroscopy Study of Activated Carbon from Coconut Fiber Doped by Fe_3O_4 for Na-ion Batteries"

- **Tjokorde Walmiki Samadhi**
  Department of Chemical Engineering, Institut Teknologi Bandung, Indonesia
  "Production of Potassium Carbonate from Oil Palm Waste Ashes Using a Bench-Scale Extractor"

- **Istiqomah Rahmawati**
  Department of Chemical Engineering, Faculty of Engineering, Universitas Jember, Indonesia
  "Molecular Modeling of Antioxidant Agent by QSAR Study of Cafeic Acid Derivatives"

- **Orchidea Rachmaniah**
  Department of Chemical Engineering, Institut Teknologi Sepuluh November, Indonesia
  "The Effect of Acids on the Alkaloid Yield in Pressurised Water Extraction of Narcissus pseudonarcissus"

- **I. G. N. G. Bidura**
  Faculty of Animal Science, Udayana University, Indonesia
  "Effect of Moringa oleifera Leaf Powder in Diets on Laying Hens Performance, B-Carotene, Cholesterol, and Minerals Contents in Egg Yolk"

- D. Mujahidin
  Department of Chemistry, Institut Teknologi Bandung, Indonesia
  "Transformation of Eugenol into Coniferyl Esters, Providing Added Value to Indonesian Clove"

- I. G. P. Wiratama
  Department of Chemical Engineering, Faculty of Industrial Technology, Parahyangan Catholic University, Indonesia
  "Simulation and Parametric Study of The Innovated Process to Purify Bioethanol with Ethylene Oxide Hydration as An Auxiliary Reaction"

- Ardiyan Harimawan
  Department of Chemical Engineering, Institut Teknologi Bandung, Indonesia
  "Influence of Hydrocarbon Concentration in Produced Water on Biofilm Formation and Corrosion of Carbon Steel by Bacillus megaterium"

- Dony Sihotang
  Department of Computer Science, Universitas Nusa Cendana, Indonesia
  "Sensitivity Analysis of Fuzzy Simple Additive Weighting to Determine Land Suitability for Corn in Kupang Regency"

- Muhammad Mufti Azis
  Department of Chemical Engineering, Universitas Gadjah Mada, Indonesia
  "Kinetic Studies of Turpentine Isomerization Using Hydrochloric Acid and Acetic Acid as Catalysts"

- Antonius R.B. Ola
  Department of Chemistry, Universitas Nusa Cendana, Indonesia
  "Isolation, Identification and Antimicrobial Activity of Secondary Metabolite Compounds Endophytic Fungi from Anona (Leaves *Annona squamosa* L.) Growing in Dry Land"

- Tri Partono Adhi
  Department of Chemical Engineering, Institut Teknologi Bandung, Indonesia
  "Thermal Conversion and Gas-liquid Separation for Mercury Removal from Crude Oil"

General Program of STKSR 2019

Sunday, 6 October 2019 (Welcoming Dinner at Aston Hotel, Kupang)	
17.00 - 19.00	Registration
17.30 - 20.00	Welcoming Dinner
Monday, 7 October 2019 (Seminar Day 1)	
07.30 - 08.00	Registration
08.00 - 08.10	Opening ceremony
08.10 - 08.35	Speech from Nusa Tenggara Timur Governor
08.35 - 08.50	Opening ceremony + photo session
08.50 - 09.00	Dance Performance
09.00 - 09.20	Morning tea/Coffee break
09.20 - 10.40	Plenary Session 1
10.40 - 11.00	Pannel Discussion
11.00 - 12.30	Lunch
12.30 - 14.15	Pararel Session 1
14.15 - 14.45	Afternoon Tea/Coffee Break
14.45 -16.30	Pararel Session 2
18.00 - 20.30	Gala Dinner at Swiss-Belinn Kristal Kupang
Tuesday , 8 October 2019 (Seminar Day 2)	
08.00 - 08.05	Opening ceremony
08.05 - 09.45	Plenary Session 2
09.45 - 10.10	Pannel Discussion
10.10 - 10.25	Morning tea/Coffee break
10.25 - 12.10	Pararel Session 3
12.10 - 13.10	Lunch
13.10 - 14.40	Pararel Session 4
14.40 - 15.10	Afternoon Tea/Coffee Break
15.10 - 16.25	Closing Ceremony
Wednesday, 9 October 2019 (Excursion Program)	

List of Abstract

Bioenergy (BE)	
BE-01	Producing Drop-in Biofuel from Marginal Land-Based Feedstock in Sumba Island, Indonesia: A Systems Dynamics Analysis
BE-02	Study of Electrode Modification and Microbial Concentration for Microbial Fuel Cell Effectivity from Molasses Waste and Reduction of Heavy Metal Cr(VI) by Continue Dual Chamber Reactor
BE-03	Mass Fractions and Yields of Chemical Components in Biomass Pyrolysis Products
BE-04	Biomass Gasification of Candlenut Shell and Coconut Coirs with the Updraft Gasifier Method Being Alternative Fuel
BE -05	Process Variables Effect on Product Composition in Biohydrocarbon Synthesis via Metal Soap Decarboxylation
BE-06	Phytoplankton (Microalgae) as an Alternative of Renewable Energy Sources
BE-07	Biogas Production using Manure from KPBS Pangalengan's Dairy Farm and Its Role in Reducing Citarum River Pollution
BE-08	Catalyst and Production Technology Development for Oil Palm Empty Fruit Bunches-based Bio-BTX
BE-09	UV Light Pre-Treatment of Pd/TiO_2 for Catalytic Organic Oxidation
BE-10	The Effect of H_2O_2 in Strengthening Fluazinam as a Fungicide in The Growth Phase of Green *Haematococcus pluvialis*
BE-11	Extraction of Saturated and Polyunsaturated Fatty Acids from Biodiesel Products to Reduce Iodine Number of Biodiesel Products
BE-12	Bayah Natural Zeolite to Upgrade the Quality of Bio Crude Oil from Empty Fruit Bunch Pyrolysis
BE-13	Simulation of Sugarcane Bagasse Conversion to Syngas in Downdraft and Fluidized Bed Gasifer using ASPEN PLUS
BE-14	Co-gasification of Non-Demineralized and Demineralized Coal with Biomass
BE-15	Production of Biofuel by Low Temperature Fischer-Tropch using Co-K/γ-Al_2O_3 Catalyst
BE-16	Thermal Cracking Process of Waste Cooking Oils using Iron (Fe) Catalysts to Produce Biofuel
BE-17	Green Diesel Production from Crude Palm Oil (CPO) using Catalytic Hydrogenation Method
BE-18	Effect of Metal Type on Pyrolysis of Metal Soaps to Produce Bio-Gasoline
BE-19	Hybrid Coal: Effects of Coal and Biomass Types Towards Product Quality
BE-20	Biohydrocarbon Production for Jet Fuel from Palm Oil Derivative Products
BE-21	Surface Modification of Activated Carbon from Oil Palm Empty Fruit Bunch by Nitric Acid for Supercapacitor Electrode Material

Bio-based Materials (BM)	
BM-01	Using Coir Fibers as a Carbon Source when Preparing N-doped Carbon Aerogel for Electrocatalyst in Metal-Air Batteries
BM-02	Tauc Plot Software: Calculating Energy Gap Values of Organic Materials Based on UV-Vis Absorbance Spectrum
BM-03	Morphological Study of Bio-based Poly(L-lactic acid) Crystals in the Blend with Amorphous Polymeric Diluent
BM-04	Hydroxyapatite Production from Cuttlebone as Bone Scaffold Material Preparations
BM-05	Production of Activated Carbon Through Co-Pyrolysis of Vacuum Residue and Dehydrated Castor Oil
BM-06	Coating of Mercapto Modified Silica on Iron Sand Magnetic Material for Au(III) Adsorption in Aqueous Solution
BM-07	Synthesis of Mercaptoethyl Carboxylate from Palm Fatty Acid Distillate: Water Removal by Azeotrophic Distillation
BM-08	Production of Potassium Carbonate from Oil Palm Waste Ashes Using a Bench-Scale Extractor
BM-09	Lithium and Calcium Recovery by Activated Carbon from Coconut Shell Char
BM-10	Corn Skin/Polyester Bio-Composites: An Experimental Study on Notch Tensile Strength
BM-11	Kapok Fiber as Potential Oil-Absorbing Material: Modification Mechanism and Performance Evaluation
BM-12	Red Shift of The Photophysical Properties from Protonated Small Molecule in Solid State
BM-13	Bentonite Basal Spacing Variation on PLA-Bentonite Nanocomposite Synthesis for Food Packaging
BM-14	The Influence of Ag Concentration on The Antibacterial Properties of Plastic Made from Silica Immobilized with EDTA-Ag Composed with Chitozan
BM-15	Electrochemical Impedance Spectroscopy Study of Activated Carbon from Coconut Fiber Doped by Fe_3O_4 for Na-ion Batteries
BM-16	Oil Palm Empty Fruit Bunch Ash Valorization Through Potassium Extraction
BM-17	Production of Activated Carbon Through Co-Pyrolisis of Vacuum Residue and Gum Rosin
BM-18	Plant Extract-Assisted Biosynthesis of Zinc Oxide Nanoparticles and Their Antibacterial Application
BM-19	Graphitization of Coconut Shell Charcoal for Sulfonated Mesoporous Carbon Catalyst Preparation and Its Catalytic Behaviour in Esterification Reaction
BM-20	The Tensile Characteristics of Biocomposite Material Reinforced by Corn Skin
BM-21	Plant Extract-Assisted Biosynthesis of Zinc Oxide Nanoparticles

Bio-Based Chemicals & Pharmaceuticals (BCP)	
BCP-01	Molecular Modeling of Antioxidant Agent by QSAR Study of Cafeic Acid Derivatives
BCP-02	Antioxidant Extraction Based on Black Rice (*Oryza Sativa* L. *Indica*) to Prevent Free Radical
BCP-03	Analysis of Production Kojic Acid from Endophytic Fungi Aspergillus flavus from Anonna Leaves (*Annona squamosa*) using an OSMAC Approach.
BCP-04	Improved Synthesis and Antibacterial Activity of 1-Monoolein
BCP-05	Identification of Plants Natural Dye by Meto Tribe in South Central Timor
BCP-06	Chemical Products of Essential Oil from Timorese Aromatic Plants
BCP-07	Quality and Mineral Content of Local Salt from Kupang, East Nusa Tenggara
BCP-08	The Effect of Acids on the Alkaloid Yield in Pressurised Water Extraction of *Narcissus pseudonarcissus*
BCP-09	Effects of Garlic Extract (*Allium sativum*) Administration on Total Cholesterol Level of White Rats (*Rattus norvegicus*)
BCP-10	The Lactic Acid Bacteria of Bebontot Spent Chicken Meat and Antioxidant Activity of Their Isolates
BCP-11	Chemicals Compotion and Antibacterial Activity of Essential Oils of Guava Leaves (*Psidium guajava* L.)
BCP-12	Control of Ice-Ice Disease in Farming Red Algae *Kappaphycus alvarezii* (Doty) Doty through the Application of Diversification Method
BCP-13	The Characterization of Ca/Mg/Zn Basic Soaps Derived from Palm Stearin
BCP-14	Amino Acid and Fatic Acid Profiles in Se'i Tuna, Processed with Liquid Smoke and Se'i Pampis as Its Derivative During Storage
BCP-15	Effect of *Moringa oleifera* Leaf Powder in Diets on Laying Hens Performance, B-Carotene, Cholesterol, and Minerals Contents in Egg Yolk
BCP-16	Synthesis of Mercaptoethyl Ester of Palm Fatty Acid Distillate: Comparison of Dehydration Methods
BCP-17	Grain Quality of Rice (*Oryza sativa* L.) Cultivar Menthik Wangi of Organic Farming Yields
BCP-18	The Quality and Mineral Content of the Community Salt Conventional in Kupang City and Kupang District, East Nusa Tenggara Province
BCP-19	Identification of Biomordant in Hundihopo Village, East Rote District, Rote Ndao Regency
BCP-20	The Effect of Sour Soy Milk and Fermented Cassava Tape Added to Drinking Water Toward Production and Quality of Chicken Meat
BCP-21	Synthesis and Characterization of Modified γ-Alumina-NaA and γ-Alumina-NaX Zeolite Composites as Methanol Dehydration Catalysts in Synthesis Dimethyl Ether (DME)
BCP-22	Transformation of Eugenol into Coniferyl Esters, Providing Added Value to Indonesian Clove
BCP-23	Production of Sulfonated Methyl Ester Using a Falling Film Reactor and Its Application for ASP Flooding

BCP-24	Central Composite Design Based Statistical Modeling for Curcuminoids Extraction of *Curcuma zeodaria* using Choline Chloride Based of Natural Deep Eutectic Solvents (NADES)
BCP-25	Synthesis of Maleic Modified Rosin Ester from Pine Resin
BCP-26	Quality of Egg Isa Brown Gaves Ration Flour Skin Dragon Fruit (*Hylocereus polyrhizus*) Fermentation
BCP-27	Application of Biosurfactant for Bio-Detergent Formulation

Biomass Upgrading & Utilization (BUU)	
BUU-01	Effect of Cationic CTAB Surfactants on The Performance of Graphene Electrode for Supercapacitor
BUU-02	Isolation, Identification and Antimicrobial Activity of Secondary Metabolite Compounds Endophytic Fungi from Anona (Leaves *Annona squamosa* L.) Growing in Dry Land
BUU-03	Sludge Biogas Made from Cow Feces Increases Rice (*Oryza sativa* L.) 'Segreng' Growth in Green House Scale
BUU-04	Synthesis of Activated Carbon from Salacca Peel with Hydrothermal Carbonization for Supercapacitor Application
BUU-05	Increasing the Yield of Powder and Bioactive Materials during Extraction and Spray Drying of Dragon Fruit Skin Extracts
BUU-06	Large Scale Synthesis of Carbon Nanotube from Palm Oil Mill Effluent (POME) by Pyrolysis Using Tubular Furnace and Their Application in Supercapacitor
BUU-07	Secondary Metabolites of Some Varieties of *Caulerpa species*
BUU-08	Kinetic Studies of Turpentine Isomerization Using Hydrochloric Acid and Acetic Acid as Catalysts
BUU-09	Kinetics Study of Fatty Acid Methyl Ester to Fatty Alcohol on Copper-Manganese Catalyst
BUU-10	Analysis of Density and Diversity of Seagrass: Case Study in Munaseli Village, Pante Deere Village, and Sub-District of Kabola, Alor Regency
BUU-11	Performance Efficiency of Sand Media Amended with Biochar for Phosphorus Removal using Column Filtration
BUU-12	Calcium Soap from Palm Fatty Acid Distillate (PFAD) for Ruminant Feed: The Effect of CaO Quality on Reaction Temperature
BUU-13	Production of Valuable Chemical Compounds by Endopyhtic Fungi Isolated from Plants
BUU-14	Secondary Metabolites Compound of Gorgonian Sea Plumes (Genus *Rhumpella*, *Isis* and *Ellisella*) from Maumere Waters-East Nusa Tenggara Indonesia
BUU-15	Thermal Conversion and Gas-liquid Separation for Mercury Removal from Crude Oil
BUU-16	Preliminary Study on Utilization of Waste Chocolate Condensate as Cocoa Powder
BUU-17	Production of Bioactive Materials for Food Additives from Dragon Fruit Skin Extracts: Effect of Pre-treatment and Extraction Methods
BUU-18	Analysis of Chemical Profile and Antibacterial Activity of Endophytic Fungi from Anona (Leaves *Annona squamosa* L.) Growing in Dry Land

BUU-19	Optimization of Medium Composition for The Production of Monascus purpureus Pigments Through Solid-state Fermentation
BUU-20	Ethnobotany Study of Lontar Tree (*Borassus flabellifer* L.) at Raijua Island
BUU-21	Performance of Hollow Fiber Polypropylene Membrane Diffuser for Wet-Free CO_2 Absorption

Sustainable Process & Technology Development (SPTD)	
STPD-01	Simulation and Parametric Study of The Innovated Process to Purify Bioethanol with Ethylene Oxide Hydration as an Auxiliary Reaction
SPTD-02	Photoreduction of Carbon Dioxide to Produce Formic Acid in Aquatic Phase
SPTD-03	The Effect of Pressure and Compression Ratio on Biogas Upgrading to Biomethane with CO_2 Absorption Using Pressurized Water
SPTD-04	Insect Diversity Profile of Mangrove Ecosystem in Menipo Nature Tourism Park, East Amarasi, East Nusa Tenggara
SPTD-05	Small Scale Biogas Upgrading by Carbon Dioxide Fixation with Calcium Hydroxyde Solution Using Bubble Column Contactor
SPTD-06	Acid Effect in The Improvement of Extraction Yield and Antioxidant Activity in Tomato
SPTD-07	Influence of Hydrocarbon Concentration in Produced Water on Biofilm Formation and Corrosion of Carbon Steel by Bacillus megaterium
SPTD-08	Extraction of Free Fatty Acids from Rice Bran Oil by Renewable Solvents: Equilibrium Data and Number of Equilibrium Stages
SPTD-09	Analysis of Iron (Fe), Phosphate (PO_4^{3-}) and Sulfate (SO_4^{2-}) in Hot Water in Tubbe Village and Aramba Village, Pantar Tengah District, Alor - NTT
SPTD-10	Conceptual Design on The Integrated CO_2 Mineralization Process with Sugar Plant
SPTD-11	Aspen Hysys Simulation for Production of Treated Distillate Aromatic Extract (TDAE) by Furfural Extration Process
SPTD-12	Electroreduction of CO_2 to Formic Acid with Pb-Sn Alloy Cathode
SPTD-13	Sensitivity Analysis of Fuzzy Simple Additive Weighting to Determine Land Suitability for Corn in Kupang Regency
SPTD-14	Comparison of Liquid Product Character from PFAD Metal Soap Decarboxylation by Batch and Continue Process
SPTD-15	Principal Component Analysis with Successive Interval in K-Means Cluster Analysis
SPTD-16	Prediction of Student Learning Outcomes using Naive Bayesian Algorithm (Case Study of Tama Jagakarsa University)
SPTD-17	Simulation and Parametric Study of The Innovated Process to Purify Bioethanol with Ethylene Oxide Hydration as An Auxiliary Reaction
SPTD-18	$FeCl_3$ Coagulant Production from Waste Pickle Liquor using Electrolysis
SPTD-19	Protein Cj0391c Structure and Interaction with Lipid Bilayer Membranes
SPTD-20	Enhancement of Aromatic Content in Catalytic Cracking of Palm Oil to Biofuels using Zeolite-based Catalyst

Keynote Abstracts

National Research Priority 2020-2024

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Abstract

National Research Plan (RIRN) 2017-2045 has been established with a vision that Indonesia is competitive and sovereign based on science and technology. RIRN has the following goals: improving scientific and technological literacy; increasing the capacity, competence and synergy of research; and promoting national economy based on science and technology.
To implement RIRN, Indonesian government has created a five year national research plan (PRN) 2020-2024, covering 9 research focuses, 80 themes, 416 topics and 49 innovative products. There are 9 research focuses including agriculture and foods, new and renewable energy, health and medicine, transportation, engineering products, defence and security, maritime, socio humanity, art culture and education, multidisciplinary and cross-sectors (disaster, biodiversity, stunting-nutrition, climate change, water-environment).
About 70% of the total research budget will be dedicated to national research flagship (9 research focuses, 30 themes, 47 topics and 49 innovative products), while the remaining 80 themes, 369 topics will be covered through Ministerial research flagship with 30% of the remaining research budget.

Keywords: RIRN, PRN, National Research Priority 2020-2024.

Technological Innovation: A Strategic Approach in Building the Nation's Competitiveness

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Abstract

Knowledge is the most important driving force for socio-economic development that determines the competitiveness of a nation. Innovation in science and technology as the foundation of industrialization is, therefore, the key to create added value increasing the Gross Domestic Products (GDP). This paper covers a brief introduction to various worldwide innovative experiences in developing the Nation's competitiveness. Countries that have invested heavily in developing their human resources to the highest possible levels have leaped forward, leaving others behind. In general, education, science, and technology are among the most important pillars that determine the progress. Knowledge-based technological innovation and transformation of higher education are, therefore, a necessity. However, a blurred portrait of Indonesia's science and technology development requires reconstruction of thought and grand design strategy to revitalize national research and scientific institutions. A path of change and hope for the future are proposed. Strategic transformation steps are formulated. The concept of an intellectual property-based economy is discussed. In closing, a strong national politics of technology is formulated based on Habibienomics and Wijoyonomics.

Catalytic Conversion of Cellulose and Chitin into Chemicals

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Abstract

Cellulose is a polymer of glucose linked by β-1,4-glycosidic bonds. Depolymerization of cellulose gives cello-oligosaccharides and glucose (Figure 1), which are expected to be platform chemicals to valuable compounds [1]. However, selective hydrolysis of cellulose has been a challenge in biorefinery due to the recalcitrance of cellulose. We found that carbon materials bearing weak acid sites hydrolyzed cellulose to soluble oligosaccharides [2]. Further hydrolysis of the oligomers to glucose is performed in dil. HCl.

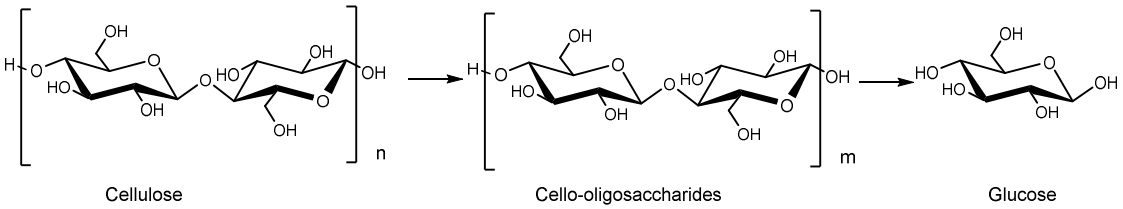

Figure 1. Hydrolysis of cellulose to glucose via oligomers.

We also found depolymerization of chitin to *N*-acetylglucosamine (NAG). Mechanocatalytic depolymerization is effective to decompose chitin to soluble oligomers, and further hydrolysis forms NAG in a good yield [3]. We reported further conversion of NAG into organonitrogen compounds such as ADI and AcGly (Figure 2) [4,5].

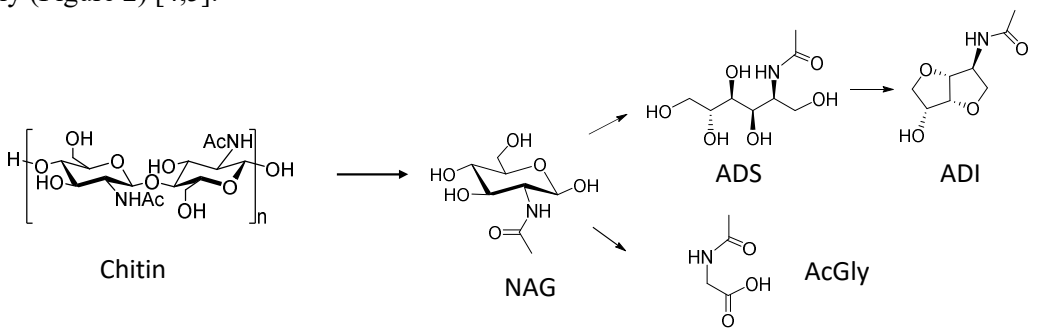

Figure 2. Hydrolysis of chitin to NAG and further conversion of NAG into organonitrogen compounds..

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Catalyst Technology Development for Industries

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Abstract

The catalyst plays a very important role in reaction process units of the chemical industry. Nowadays, almost every chemical industry product is produced through a process that utilizes catalyst services. In 2018 the world's need for catalysts is estimated at 24 billion US dollars. The value is not very large, but the value generated by the use of the catalyst can reach 13-17 trillion US dollars. Indonesia's needs are also quite large, currently estimated at 600 million USD per year, and almost all catalysts must be imported from abroad. A small portion is produced in Indonesia with a license from abroad.

Of all the catalysts used in industry, in fact only 40% is sold freely in the market, the other (60%) is produced for industrial use by the developer and technology licensors. The monopoly on the use of catalysts is of course intended to enable the owners of catalyst formulas and technology to stay ahead in market competition. This fact has encouraged many industries to try to be independent in the catalyst field. So should Indonesia.

Mastery of catalyst production technology has very strategic value for a country's economy. The development of industrial catalysts requires a strong research team. Therefore, the development of catalysts in Indonesia at this time, should be jointly carried out by research institutions, universities and industries. Basic research to produce a good catalyst formula is carried out in research institutes and/or universities, while the performance test of catalysts using pilot scale reactors and commercial scale reactor, has to be performed by industry.

Since 1996 the Laboratory of Catalysis and reaction Engineering ITB (CaRE-ITB) has been collaborating with several industrial partners to carry out research and development of catalysts. After going through a very long period and efforts, which are not easy, now several types of catalysts have been produced and even been used in the commercial scale reactors in chemical and refinery industries. This paper describes the ups and downs of the CaRE-ITB research team in producing and delivering research results in the laboratory to the industry.

Pengembangan Katalis untuk Penggunaan di Industri

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Abstrak

Katalis memegang peran sangat penting pada penyelenggaraan dan pengembangan industri kimia. Dewasa ini hampir setiap produk industri kimia dihasilkan melalui proses yang memanfaatkan jasa katalis. Pada 2018 kebutuhan dunia akan katalis diperkirakan mencapai 24 milyar dolar Amerika. Nilai yang tidak terlalu besar, tetapi nilai yang dibangkitkan dengan penggunaan katalis tersebut dapat mencapai 13-17 trilyun dolar Amerika. Kebutuhan Indonesia juga cukup besar, saat ini diperkirakan mencapai 600 juta USD per tahun, dan hampir seluruhnya harus diimpor dari luar negeri. Sebagian kecil saja diproduksi di Indonesia dengan lisensi dari luar negeri.

Dari seluruh katalis yang digunakan di industri, sebenarnya hanya 40% yang dijual bebas di pasaran, lainnya (60%) diproduksi untuk digunakan sendiri oleh industri pengembangnya. Monopoli penggunaan katalis ini tentu saja dimaksudkan agar pemilik formula dan teknologi katalis dapat tetap unggul dalam persaingan pasar. Kenyataan ini telah mendorong banyak industri untuk berusaha mandiri dalam bidang katalis. Demikian pula seharusnya Indonesia.

Penguasaan teknologi produksi katalis memiliki nilai sangat strategis bagi ekonomi suatu negara. Pengembangan katalis industrial membutuhkan tim peneliti yang kuat. Oleh karena itu pengembangan katalis di Indonesia saat ini, sebaiknya dilakukan bersama oleh lembaga penelitian, perguruan tinggi dan industri. Penelitan dasar hingga menghasilkan formula katalis yang baik dilakukan di lembaga penelitian dan/atau perguruan tinggi, sedangkan pengujian kinerja katalis menggunakan reaktor skala pilot dan skala komersial, dilakukan di industri.

Sejak 1996 Laboratorium Teknik Reaksi Kimia dan Katalisis ITB telah bekerjasama dengan beberapa mitra industri untuk melaksanakan penelitian dan pengembangan katalis. Setelah melalui masa yang sangat panjang dan upaya yang tidak mudah, saat ini beberapa jenis katalis telah dihasilkan dan bahkan telah digunakan di industri. Makalah ini memaparkan tentang suka duka tim peneliti Laboratorium Teknik Reaksi Kimia dan Katalisis dalam menghasilkan dan mengantarkan hasil penelitian di laboratorium hingga ke industri

.

Potential Fatty Oil Production Trees in Nusa Tenggara: Non-Palm Oil Resources for Biodiesel and Biohydrocarbon fuel Production

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Abstract

Nowadays, food and non-food grades oil-producing trees become the focus of development in many countries because their main constituent (i.e., fatty acids) is closely similar to the fossil-fuel hydrocarbons so that they may easily converted to biodiesel and biohydrocarbon biofuel. Palm tree, which is Indonesia's main commodity for fatty oil production, cannot grow well in the Nusa Tenggara region. However, Nusa Tenggara actually has several potential oil-producing trees which, if developed and cultivated in the form of plantations, can also be relied upon for economic growth and the supply of biofuel raw materials. Some of them, namely Moringa (*Moringa oleifera*), kesambi (*Schleichera oleosa*), bintangur or nyamplung (*Calophyllum inophyllum*) and buteis or pongam (*Pongamia pinata*) and even potential multipurpose (not only produce oils but also other potential products). Therefore, this paper mainly discusses these trees and the characteristics of their fatty oils, as well as various other potential economic products that potentially be produced from their cultivation.

Pohon-Pohon Potensial Penghasil Minyak-Lemak Di Wilayah Nusa Tenggara: Sumber Non-sawit untuk Produksi Biodiesel dan Bahan Bakar Biohidrokarbon

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Abstract

Pohon-pohon penghasil minyak lemak pangan maupun non-pangan kini menjadi fokus pengembangan banyak negara, karena penyusun utama minyak lemak, yaitu asam-asam lemak, sangat mirip dengan hidrokarbon-hidrokarbon penyusun bahan-bahan bakar minyak (BBM) sehingga mudah dikonversi menjadi biodiesel maupun bahan-bahan bakar nabati (BBN) biohidrokarbon. Pohon (kelapa) sawit, yang kini menjadi andalan utama Indonesia untuk produksi minyak lemak, tak bisa tumbuh baik di wilayah Nusa Tenggara. Akan tetapi, di wilayah ini sesungguhnya terdapat beberapa pohon-pohon potensial penghasil minyak lemak yang jika dikembangkan dan kemudian dibudidayakan dalam wujud perkebunan dapat juga diandalkan untuk pertumbuhan ekonomi dan penyediaan bahan mentah BBN. Beberapa di antaranya, yaitu kelor (*Moringa oleifera*), kesambi (*Schleichera oleosa*), bintangur atau nyamplung (*Calophyllum inophyllum*) dan buteis atau pongam (*Pongamia pinata*) bahkan berpotensi multiguna (tidak hanya menghasilkan minyak-lemak tetapi juga produk-produk potensial lain). Makalah ini terutama membahas pohon-pohon ini dan karakteristik minyak-minyak lemaknya, serta aneka produk berpotensi ekonomi lain yang bisa dihasilkan dari pembudidayaannya.

Bioenergy (BE)

BE-01

Producing Drop-in Biofuel from Marginal Land-Based Feedstock in Sumba Island, Indonesia: A Systems Dynamics Analysis

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Abstract

To improve the sustainability, liquid biofuel can be produced by growing oil crop feedstock on marginal land and using innovative conversion technology. Throughout the Indonesia Archipelago where oil fuel imports are high, marginal land is abundant. In addition, appropriate conversion technologies are under development.

This study assessed the future potential for drop-in biofuel (DBF) production from *Pongamia pinnata* oilseeds crops as driven by various policy and technical parameters, and by applying a systems dynamics approach. A systems model was developed to simulate the dynamics of DBF technology as it is developed at national level. The potential use of marginal land in Sumba Island was taken as a case study to assess the projected DBF production as well as gross regional domestic product (GRDP) increase by 2045.

The model outputs proved there is an interrelationship between biofuel development and the political element, especially the level of sense of urgency by the country's President (SU). In enhancing DBF production, and hence increasing GRDP, the SU can be increased and sustained by empowering a future vision for the nation. Given a maximum SU that can be maintained over time, 100% of liquid fuel self-sufficiency could be reached in Sumba by 2033. Then the GRDP increase from DBF-related revenues would exceed the current total GRDP.

BE-02

Study of Electrode Modification and Microbial Concentration for Microbial Fuel Cell Effectivity from Molasses Waste and Reduction of Heavy Metal Cr(VI) by Continue Dual Chamber Reactor

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Abstract

Industry in Indonesia is rapidly growing, one them is the textile and textile products industry. Due to rapid growth of the industry, the amount of waste produced is also increasing where the textile production produces liquid metal waste which amounts to 80% of the total amount of water used in the batik process. One of metal which existed the most is chromium. Microbial Fuel Cell (MFC) is a promising alternative because of its ability to reduce Cr^{6+} metal waste while processing organic waste and producing bioelectric (double track research). In addition, molasses waste is of particular concern because of its high production of 1.56 million tons which still contains 50-60% of sugar which has potential to be degraded and further utilized, as MFC substrate agent. Shewanella oneidensis is a good bacterial agent to degrade molasses substrate and is capable of producing high energy densities of 2 W/m^2. Therefore, in a study of the reduction of Cr(VI) and molasses waste with MFC using Shewanella oneidensis and continuous dual batch systems to obtain optimum results. In this study, the effects of carbon modification and bacterial concentrations on MFC electricity production and chromium reduction will be analysed. The research variables were 10^9 and 10^{11} of bacterial concentrations. In addition, carbon electrodes will also be modified with rice husks and strong acid-base to improve MFC performance.

Keywords: microbial fuell cell, reduction of Cr metal, shewanella oneidensis, waste.

BE-03

Mass Fractions and Yields of Chemical Components in Biomass Pyrolysis Products

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Abstract

Biomasses are converted into energy through various methods. One of them is a pyrolysis method. The products are bio-pyrolysis oil (BPO), bio-pyrolysis gas (BPG) and bio-char (BC) and gas products through a thermal decomposition process. A pyrolysis oil consists of large number compounds that is formed by the main chemical elements as carbon (C), hydrogen (H) and oxygen (O). This research aims to predict the released chemical component compositions with known chemical structures in light gas (LG) and bio-pyrolysis oil (BPO) products by developing new predictive models. The predictive models were developed from the equation of first order chemical reaction for each component in BPG and BPO products. The development of a predictive models involve the coal-biomass type number (NCT), temperature (T), heating rate (b), pre-exponential factor (A), activation energy (Ea), the mass fraction of the chemical component (yi), the mass yield of the component (Yi). The investigated temperature ranged from in the temperature range 600-1400 K. Two sets of wood pyrolysis experiments that are available in literatures were used to validate and verify the developed models. There were 8 released chemical components in the BPG product and 40 components in the BPO product that were quantified their mass fractions and mass yields with a wide range of temperature and heating rates. Only 12 chemical components in the BPO product are reported in this paper. The pseudo activation energy for each component in the BPG and the BPO was successfully quantified as a polynomial function of the temperature. With the present result, the mass fraction and yiled for each chemical component that was released in the pyrolysis proses is predictable within the range of the temperature above.

Keywords: mathematical modeling, pyrolysis, light gaseous, bio pyrolysis oils, thermal decomposition, biomass.

BE-04

Biomass Gasification of Candlenut Shell and Coconut Coirs with The Updraft Gasifier Method Being Alternative Fuel

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Abstract

Lately, the use of fossil fuels has caused a number of environmental problems such as global warming as a result of greenhouse gas emissions, has led to increased fuel prices and increasingly erratic availability. These was encourages the interest of researchers to find alternative fossil fuels sourced from renewable raw materials. Candlenut shells and coconut fiber are high-potential plantation and agricultural commodities in East Nusa Tenggara. Statistical data shows that candlenut production reached 1,262.38 tons, while coconut reached 68,496 tons in 2016. The by-products of shells and coir can be used as a good raw material for the gasification process into alternative fuels. One of the established gasification processes in the industry is updraft gasifier. This research has varied the use of candlenut shells and coconut coirs in the range of 0-100% to study the characteristics of its gasification products. The purpose of this study were to determine the effect of variations of candlenut shells and coconut coirs on syngas ignition time; the effective time of the gasification process, and to find out the best variation between candlenut shells and coconut fiber on gas products (syngas) updraft gasifier. The results obtained indicate that the process of gasification of candlenut shells and coconut coirs using updraft gasifier was very influential at the time of ignition of syngas, and the effective time of gasification. The highest syngas ignition time was obtained in a variation of 50% candlenut and 50% coconut husk which was 43.14 minutes and the lowest was a variation of 0% shells and 100% coconut husk which was 39.75 minutes. While the highest effective time of the gasification process was obtained by variations of 100% candlenut and 0% coconut husk which was 33.13 minutes and the lowest in variations of 75% shells and 25% coconut husk which was 37.40 minutes. The best gasification process was shown in a variation of 50% candlenut shells and 50% coconut husk.

Keywords: gasification, updraft gasifier, candlenut shell, coconut coirs.

BE-05

Process Variables Effect on Product Composition in Biohydrocarbon Synthesis via Metal Soap Decarboxylation

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Abstract

The recent demand of green energy sources has driven technology development into production of renewable fuels. Among the types of renewable fuels, biohydrocarbon is one of the most attractive form. It can be applied onto current automotive machine without blending with fossil fuel. Biohydrocarbon can be produced from plant oils via decarboxylation of metal soap. In this paper, a study was established to determine the effect of several process variables on the biohydrocarbon product composition. Variables evaluated were plant oil source and decarboxylation reaction time. Each type of processing variables shows tendency into different industrial application of biohydrocarbon.

Keywords: biohydrocarbon, decarboxylation, lipolysis, metal soap, renewable fuel.

BE-06

Phytoplankton (Microalgae) as an Alternative of Renewable Energy Sources

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Abstract

At present, primary energy resources for various industrial activities including transportation and electricity still rely on fossil sources, such as oil and gas and coal. The fossil resources are thinning over time and causing uncertain price increases, inventories are increasingly limited and causing various environmental effects due to emissions of greenhouse gases produced due to the burning of these fossils. Various biological resources in Indonesia can be used as a source of raw material for the production of renewable fuels instead of fossils. Research on phytoplankton (microalgae) as an alternative source of renewable energy has been carried out. This research was conducted in Kupang Bay which has been known as a habitat for life and breeding of Algae. The purpose of this study is to obtain data on the existence and type of algae that can be utilized as an alternative renewable energy source. The research method used was laboratory observation and testing to find out the types of algae in Kupang Bay. The results showed that there were 34 types of microalgae, including those from the Dinophyceae and Bacillariophyceae classes which had cell wall compositions in the form of cellulose, glucan and oil (triglycerides) that had the potential to be extracted and used for the manufacture of renewable fuels and other valuable chemicals.

Keywords: microalgae, phytoplankton, renewable energy, fuel.

BE-07

Biogas Production using Manure from KPBS Pangalengan's Dairy Farm and Its role in Reducing Citarum River Pollution

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Abstract

Dairy farms are potential organic source i.e. cow dung, for producing biogas. This paper presents a study on biogas production from a dairy farm in Pangalengan, South Bandung Area. We installed the Tenari Model biogas reactor with 4 m^3 volume. Composition and amount of produced biogas were analysed. Its effect on reducing water contaminants in Citarum River were studied by monitoring the reactor water effluent and mapping the river watershed. The produced biogas could supply daily cooking gas for the farm sufficiently.

Keywords: biogas, dairy farm manure, pangalengan, water pollution, citarum river.

BE-08

Catalyst and Production Technology Development for Oil Palm Empty Fruit Bunches-based Bio-BTX

Pengembangan Katalis dan Teknologi Produksi Bio-BTX Berbahan Mentah Tandan Kosong Sawit

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Abstract

The abundant production of oil palm empty fruit bunches (OPEFB) has opened challenges and opportunities for the utilization of these "wastes" into high economic value biochemicals. The lignocellulosic biomass OPEFB is an attractive raw material for benzene, toluene, and xylene aromatic compounds (also known as BTX) production. This paper presents the isolation process of the lignin fraction and the development of the ZSM-5 zeolite catalyst for the conversion of solvents and the lignin fraction isolation from OPEFB for Bio-BTX production. Isolation of the lignin fraction was carried out using γ-valerolactone (GVL) as a solvent which could also be produced from the OPEFB cellulose fraction. Isolation of lignin from TKS is carried out at 180°C. The lignin and solvent fractions were further reacted to BTX in fixed bed reactors operated in the temperature range of 400-500°C using Zn/ZSM-5 based catalyst. The effect of adding Mg (0.5-1% -b) to the Zn/ZSM-5 catalyst was systematically studied. The catalytic activity of the modified catalyst can be fully recovered indicated by the continuous increase of the BTX acquisition product to 36.30% -mol C at 120 minutes without any reduction in the lifespan of the catalyst after regeneration.

Ketersediaan limbah tandan kosong sawit (TKS) yang melimpah memberikan tantangan dan kesempatan pemanfaatan limbah tersebut menjadi bahan kimia basis nabati yang bernilai ekonomi tinggi. TKS yang merupakan biomassa lignoselulosa merupakan bahan mentah yang atraktif untu produksi senyawa aromatik benzen, toluen, dan xilen (dikenal sebagai BTX). Makalah ini mempresentasikan proses isolasi fraksi lignin dan pengembangan katalis zeolite ZSM-5 untuk konversi pelarut dan fraksi isolasi lignin dari TKS untuk produksi Bio-BTX. Isolasi fraksi lignin dilakukan dengan menggunakan pelarut γ-valerolactone (GVL) yang dapat diproduksi dari fraksi selulosa TKS. Isolasi lignin dari TKS diselenggarakan pada temperatur 180°C. Fraksi lignin dan pelarut direaksikan lanjut menjadi BTX pada reaktor unggun tetap yang dioperasikan pada rentang temperatur 400-500°C dengan menggunakan latalis berbasis Zn/ZSM-5. Efek penambahan komponen Mg (0,5-1%-b) pada katalis Zn/ZSM-5 dipelajari secara sistematik. Aktitivas katalis diuji Aktivitas katalis modifikasi dapat sepenuhnya terpulihkan dengan perolehan BTX yang terus meningkat hingga 36,30%-mol C pada menit ke-120 dan tidak mengalami pengurangan umur katalis setelah regenerasi.

BE-09

UV Light Pre-Treatment Of Pd/TiO_2 for Catalytic Organic Oxidation

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Abstract

Activation of oxygen species is a key reaction stage in various thermal catalytic processes. Here we use UV light pre-treatment to improve oxygen activation step by palladium loaded on TiO_2 (Pd/TiO_2). UV light pre-treatment boosted catalytic oxidation performance by altering metal oxidation state, including palladium in metallic (Pd^0) and oxide forms (PdO and PdO_2) and by altering oxygen vacancy defect which were studied by X-ray photoelectron spectroscopy (XPS) and electron paramagnetic resonance (EPR) measurements, respectively. The impact of metal loading on the alteration of defect and metal oxidation state was investigated. It demonstrated that at 1.5% Pd loading exhibited the highest oxygen vacancy defect and PdO species which mimicked the organic oxidation profile. Oxygen vacancy defect acted as trapping agent of photo-generated electron which further transferred to Pd nanoparticles, while Pd^0 and PdO species acted as photogenerated electron sink which further activate oxygen species and oxidize organic molecules. The findings have positive implications for system reliant on activation of oxygen species (e.g. fuel cell) and organic oxidation where the light pre-treatment approach can provide a non-thermal and versatile means to promote better catalytic performance.

Keywords: oxygen activation, light pre-treatment, Pd/TIO_2, defect, dark catalysis.

BE-10

The Effect of H_2O_2 in Strengthening Fluazinam as a Fungicide in the Growth Phase of Green *Haematococcus Pluvialis*

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Abstract

One of the potential resources for bioenergy and biochemical products is Haematococcus pluvialis. However, these microalgae are vulnerable to chytrid infection when the cells are transitioning from the green flagellates' stage to the resting stage, as a result the productivity of their biomass is low. The objective of this research was to evaluate the effects of hydrogen peroxide, including those which were combined with fungicide fluazinam on the growth of H. Pluvialis. The variables used in this research were the different doses of H_2O_2 (30%), which were combined and not combined with fluazinam and frequency of H_2O_2 treatment. The initial cell number of Haematococcus pluvialis was 15×10^4 cells/Ml culture medium. The 4 different fungicide treatment during 11 days were given as follows: (1) 0.0467 Ml H_2O_2/L liquid culture dosed every day; (2) 0.0467 Ml H_2O_2/L liquid culture dosed every day for only 3 days and then every two days; (3) same as (2) but combined with single dose 0.5 ppm of fluazinam on the first day; (4) 0.0583 Ml H_2O_2/L liquid culture dosed every day for 2 days then every two days and as a comparison there was a culture without fungicide addition. The culture which was treated with hydrogen peroxide combined with fluazinam showed the highest cell density of 6×10^5 cells Ml-1 at the 11^{th} day (multiplied 4 times). In conclusion, the treatments with hydrogen peroxide is effective against chytrid infection, moreover in combination with fluazinam. The synergy gave protection from the presence of chytrid for periods of time.

Keywords: biochemicals sources, bioenergy sources, chytrids infection, fluazinam, hamenatococcus pluvialis, hidrogen peroxide.

BE-11

Extraction of Saturated and Polyunsaturated Fatty Acids from Biodiesel Products to Reduce Iodine Number of Biodiesel Products

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Abstract

In the last 10 years Indonesia has succeeded in realizing the production and commercial use of oxygenated biofuel/bioethanol and bioethanol, even has applied mixing biodiesel into diesel to up to 20%-volume (or known as a B20 mixture). This success has at least helped reduce imports of fuel oil (BBM) such as diesel and gasoline, but no more than 20%. The rest (i.e at least 80%) must still be imported and will cause severe pressure on the country's balance of payments, because the current volume of fuel imports is no less than 50% of domestic needs. The quality of Indonesian biodiesel products generally still has a high melting point and low oxidation stability. Diesel engine fuel consists of a mixture of methyl ester fatty acids (FAME: Fatty Acids Methyl Ester). Many constituent components are limited or not large (7-14 components). The most important component is the methyl esters of lauric, myristic, palmitic, stearic, oleic, linoleic and linolenic acids. Methyl esters of polyunsaturated fatty acids (linoleic, linolenic, eleostea-rat) are not good because they have a low demonic rate and very low oxidative stability. While methyl esters of saturated fatty acids have a superior demonic rate but have a high melting point (bad, higher than the requirements given by SNI). Related to the amount of unsaturated fat in biodiesel, it can reduce the quality of biodiesel such as acid numbers, moisture content and the emergence of sludge. Based on the current condition of biodiesel quality, to improve the quality of biodiesel produced can be done by reducing the amount of unsaturated fats present in the biodiesel product. The initial step that must be done is to separate biodiesel products into saturated biodiesel with the characteristic iodine number <30-40, and unsaturated biodiesel with an iodine number > 70. This can be done through a fractionation process. Extraction was carried out using $AgNO_3$ with variations in the ratio of biodiesel feed to solvents. The results obtained, the best ratio to eliminate the levels of polyunsaturated free fatty acids in biodiesel products is 1:2 with an iodine value of 47.38 gr I_2/(100 gr).

BE-12

Bayah Natural Zeolite to Upgrade The Quality of Bio Crude Oil from Empty Fruit Bunch Pyrolysis

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Abstract

Currently, the fuel oil for transportation and industry was provided mostly from fossil fuel. Due to the limitation of fossil fuel, the alternative resource of fuel oil can be supplied from renewable resource such as biomass from palm oil plantation. Empty fruit bunch (EFB) is waste from fresh fruit bunch processing in palm oil mill. The EFB can be converted to bio crude oil through pyrolysis in the temperature 400-600°C. The quality of bio crude oil must be upgraded before utilizing for transportation and industrial oil due to high impurity. Esterification of bio crude oil can produce more better the quality of bio crude oil by using zeolite as catalyst. The purpose of this research was to investigate the properties of bayah natural zeolite for upgrading the quality of bio crude oil from EFB pyrolysis. Bayah natural zeolite was activated in NaOH solution in thesome concentration between temperature 100-120°C. The physical properties of Bayah natural zeolite activation was checked by XRD, SEM EDX and BET. The optimum ratio of Si/Al for Bayah natural zeolite activation was 3.91 and pore surface area 150 m^2/g.

Keywords: empty fruit bunch (efb), pyrolysis, bio crude oil, natural zeolite.

BE-13

Simulation of Sugarcane Bagasse Conversion to Syngas in Downdraft and Fluidized Bed Gasifer using ASPEN PLUS

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Abstract

Sugarcane bagasse is generated in large quantities during the processing of sugarcane in the sugarcane in the sugar industry. For a country like Idonesia with its vast agricultural residues such as sugarcane bagasse, it is imperative to have an efficient power generation system. Gasification of sugarcane bagasse is a carbon dioxide emission neutral source of energy and also has the advantage of syngas production. Syngas composition varies based on gasification technology used and can be adapted to specific applications. Among the gasification technologies that are widely used are downdraft and fludized beds.
The objective of this work, therefore, is to find the capacity of each technology in terms of syngas production which is simulated using Aspen Plus. The sugarcane bagasse used in the simulation was obtained from PG Gempolkrep Mojokerto, East Java. The results show that at the ratio of steam to biomass equal 1.0, H_2 decreases with increasing temperature both with downdraft and fluidized bed gasification. CO increases with increasing temperature in the downdraft gasification, but decreases with increasing temperature in fluidized bed gasification. At temperature 750°C, H_2 increases with increasing the ratio of steam to biomass, but decreases with increasing the ratio of steam to biomass. Meanwhile, CO decreases with increasing the ratio of steam to biomass for both downdraft and fluidized bed gasification. From the aspect of CO_2 produced, it can be concluded that fluidized bed gasification is more environmentally friendly than downdraft gasification.

Keywords: sugarcane bagasse, gasification, downdraft, fluidized bed, syngas, simulation, Aspen Plus.

BE-14

Co-gasification of Non-Demineralized and Demineralized Coal with Biomass

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Abstract

Cogasification of lignite and biomass is considered as an alternative ways to overcome the problems arise if they are gassified separately. Furthermore, cogasification is also expected to give a technical benefit due to the presence of synergy effect. However, in some cases, synergy effect is not happening mainly due to the high content of silica in coal. The present study focused on demineralization of lignite to reduce its silica. Demineralization is done by HF leaching at 70°C for 4 hours. The effect of demineralized coal to the gasification performance is analyzed by mixing lignite and palm empty fruit bunches (EFB) at various rasio both for non-demineralized lignite (BLM) and lignite demineralized (BLD). The results show that negative synergy effect presents during cogasification. The negative synergy effect of two combinations is caused by the high content of silica and alumina from the empty fruit bunches (EFB). The lignite demineralization cogasification produces a lower H_2 yield than BLM because it also dissolves the mineral content which functions as a catalyst for cogasification synthesis.

Keywords: cogasification, empty fruit bunches, HF demineralization, lignite, syngas.

BE-15

Production of Biofuel by Low Temperature Fischer-Tropch using Co-K/γ-Al_2O_3 Catalyst

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Abstract

Fischer Tropsch is a heterogeneous catalytic chemical reaction which converts a mixture of hydrogen and carbon monoxide (syngas) into a hydrocarbon product with varying chain length by polymerization reaction on the surface of the catalyst. The hydrocarbon produced from Fischer Tropsch reaction using bio-syngas is biofuel (diesel, kerosene, gasoline) that can replace petroleum-based fuels. Cobalt catalyst with potassium promoter and γ-Al_2O_3 support has been successfully synthesized in Catalysis and Reaction Engineering (CaRE) laboratory, Institut Teknologi Bandung (ITB). Co-K/γ-Al_2O_3 catalyst was prepared by dry impregnation method on the γ-Al_2O_3 support under alkaline conditions. Catalysts were characterized using X-Ray Diffraction (XRD), temperature program reduction (TPR), and N_2 physisorption measurements such as Barrett-Joyner-Halenda (BJH) and Brunauer-Emmett-Teller (BET) methods. Co-K/γ-Al_2O_3 catalyst activity was evaluated using fixed bed reactor with various flow rates and temperatures which is still classified as Low Temperature Fischer Tropsch (LTFT) process. The best results were obtained at minimum syngas flow rate and highest reaction temperature with a total pressure of 20 bar. The results show CO and H_2 conversion was 96.6% and 82.31% respectively. Selectivity value of the hydrocarbon product was calculated using the Anderson Shultz Flurry (ASF) equation. The greatest selectivity value was obtained for C5+ product with selectivity value was 86.07 % wt.

Keywords: biofuel, low temperature ficher tropsch, cobalt, potassium, operating condition.

BE-16

Thermal Cracking Process of Waste Cooking Oils using Iron (Fe) Catalysts to Produce Biofuel

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Abstract

Generally, there are 2 (two) methods of converting waste cooking oils into biofuel, namely by esterification of triglycerides into methyl esters (biodiesel), and utilizing thermal cracking of catalysts and hydrogenation to produce green diesel. The presence of oxygen content in waste cooking oils-free fatty acids will cause the formation of CO or CO_2 gas during the cracking process, so it is necessary to inject hydrogen to prevent it. In this study, an analysis of operating conditions, the characteristics of the biofuel produced, and the effect of the use of iron (Fe) catalysts were studied to convert used-cooking oil to biofuel. The hydrogenation of waste cooking oil is carried out at pressures of 30 and 40 psia, with heating temperature conditions of 250-350°C and operational pressures of 800-1000 psia. The maximum yield obtained was 31.7% (v) at 350°C and the use of 0.1% wt Fe catalyst. The resulting biofuel had a density of 0.8314 gr/ml, and calorific value10152.66 cal/gr. By analysis contain of biofuel had C10-C15 5.5%(v), C15-C18 40.27%(v), C18-C20 38.78%(v), and > C20 15.45%(v), respectively.

Keywords: thermal cracking, waste cooking oils, iron (Fe) catalysts, biofuel.

BE-17

Green Diesel Production from Crude Palm Oil (CPO) using Catalytic Hydrogenation Method

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Abstract

Green diesel is an alternative solution for solving problems using biomass energy as a fuel source. The advantages of this second-generation green diesel or biodiesel (Gen-2nd) are capable of reaching cetane numbers 70-90, far higher than the Gen-1st biodiesel performance of cetane numbers 50-65, respectively. The production process is through hydrogenation reactions with hydrogen injection of 4-9 Mpa, the use of heterogeneous NiMo/Al_2O_3 catalysts, and takes place in temperatures of 280 – 380°C. The need to design this catalytic hydrogenation reactor to convert crude palm oil (CPO) into green diesel fuel is good and safe when operating at high pressures and temperatures. The optimum operation was obtained by varying the amount of CPO oil raw material and NiMo/Al_2O_3 catalyst used in producing the best percent yield and green diesel characterization. At a temperature of 315°C, the highest yield was 68.2%, where the number of products began to decline above these temperature conditions. The green diesel specifications obtained have met diesel oil standards (Directorate General of Oil and Gas, 2016) by testing density, kinematic viscosity, water content, flash point, calorific value, and cetane numbers.

Keywords: green diesel, crude palm oil, hydrogenation, NiMo/ Al_2O_3.

BE-18

Effect of Metal Type on Pyrolysis of Metal Soaps to Produce Bio-Gasoline

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Abstract

The metal basic soap from oleic acid submitted to pyrolysis to produce gasoline-like hydrocarbon fuels (bio gasoline). The pyrolysis carried out in semi-batch reactor at 450°C and a feeding rate 5 gr/15 min. The influences of various metal (Ca, Mg, Zn) hydroxides which are used to made basic soap have been examined. The bio hydrocarbon of basic metal soap were characterized by GC-FID and FT-IR, showing the formation of paraffins, iso-paraffins, olefin, ketone and aromatict. The liquid fraction derived from pyrolysis of metal basic soap was dominated by gasoline (C7-C11) fraction hydrocarbon. Maximum yield of light C7-C11 hydrocarbon fraction 82.3 %-mol of Ca basic soap and the highest yield of biohydrocarbon reached 34.77 wt.% from pyrolysis of Mg basic soap.

BE-19

Hybrid Coal: Effects of Coal and Biomass Types Towards Product Quality

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Abstract

Coal is an abundant source of energy in Indonesia, but the reserves are dominated by low-rank coal, which is less favorable to be utilized. Indonesia also has various biomass that have potential to be used as an alternative energy source. Combining low-rank coal and biomass in a co-torrefaction process resulted a hybrid coal: an upgraded solid fuel which has higher calorific value than its original coal. The aims of this research are to analyze the effect of different biomass and coal blends on hybrid coal yield, calorific value, energy yield, and non-neutral CO_2 emission reduction. This study utilized two types of coal, that are X and Y, and three different types of biomass: (a) sugarcane bagasse, (b) rubberwood, and (c) empty palm fruit bunch that are being most widely found in Indonesia. The blends consist of 30%wt biomass were co-torrified in a vertical tubular furnace reactor for 60 minutes with temperature 300°C in an inert environment and ambient pressure. Solid yields of hybrid coal founded in range from 57.0 to 63.8% which different types biomass gave significant effect. Calorific value was increased 37.6-44.1% to 5681-6288 kcal/kg from its original coal. The energy yield ranges from 77.0-89.0%. The product reduced non-neutral CO_2 emission within range of 18.1-22.2%.

Keywords: biomass, coal, co-torrefaction, energy yield, hybrid coal, solid yield.

BE-20

Biohydrocarbon Production for Jet Fuel from Palm Oil Derivative Products

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Abstract

Jet biofuel can be produced from vegetable oils and fats that are rich in lauric acid and myristic acid. Palm kernel oil is known to contain 47.8% lauric acid and 16.3% myristic acid. Jet biofuel production by the thermochemical method through decarboxylation of basic soap made from palm kernel oil has been extensively studied. The objective of this study was to produce jet biofuel from basic soap made from palm kernel oil. Several metal compounds from the acetate group were selected for use in making basic soap. Decarboxylation of soap was carried out at 350°C and atmospheric pressure for 5 hours in the semi-batch reactor. Zinc metal enhances yield of jet biofuel after decarboxylation of soap. Approximately 40 and 62 weight% of the jets biofuel had been obtained in this experiments.

BE-21

Surface Modification of Activated Carbon from Oil Palm Empty Fruit Bunch by Nitric Acid for Supercapacitor Electrode Material

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Abstract

Oil palm empty fruit bunch is one of abundant biomass resources that can be utilized as raw material for high-value products such as activated carbon. Activated carbon has a high surface area and porosity that is suitable as an electrode for supercapacitor. Wettability can increase the specific capacitance of supercapacitors and can be improved through surface modification. In this study, the production of activated carbon was done trough hydrothermal carbonization with $ZnCl_2$ as an activating agent and activation by pyrolysis at 800°C under a carbon dioxide flow. Activated carbon was modified by oxidation treatment with nitric acid using reflux. This study investigated the effect of nitric acid concentration on surface modification of activated carbon from oil palm empty fruit bunch as a supercapacitor electrode material. Activated carbon was applied as an electrode material for symmetrical supercapacitor cell. Unmodified activated carbon, modified activated carbon with 1 M and 6 M nitric acid have a specific capacitance of 14.76 F/g, 7.36 F/g, and 4,24 F/g, respectively. Increasing the nitric acid concentration leads to an increase in hydrophilicity of activated carbon and a decrease in the specific capacitance.

Keywords: activated carbon; biomass; surface modification; nitric acid; supercapacitor.

Bio-based Materials (BM)

BM-01

Using Coir Fibers as a Carbon Source when Preparing N-doped Carbon Aerogel for Electrocatalyst in Metal-Air Batteries

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Abstract

Carbonaceous materials have attracted fabulous research interest in energy storage and conversion technologies due to their excellent properties such as large specific surface area and high electrical conductivity. Carbon aerogel is one of the most important carbon materials for such purposes. Here, we proposed to use coir fibers as the raw material to prepare N-doped carbon aerogel for use as electrocatalyst towards oxygen reduction reaction (ORR). ORR plays a key role in metal-air battery and some types of fuel cell technologies. First, a new method using ammonia-urea system was proposed to prepare lignocellulose aerogel possessing high surface area, large pore size and large pore volume. N-doped carbon aerogel was obtained by carbonization of the prepared lignocellulose aerogel. The N-doped carbon aerogel was able to inherit the three-dimensional highly porous network of the lignocellulose aerogel. Ammonia, in this case, not only served as the solvent for lignocellulose, but also the source of nitrogen doping and in exfoliation of carbon to form defects of a few layer disorders that increased the surface area and pore. The N-doped carbon aerogel can be used as a promising metal-free electrocatalyst for ORR in alkaline media following 2-electron transfer mechanism.

Keywords: coir fibers, lignocellulose, carbon aerogel, metal-free electrocatalyst, ORR.

BM-02

Tauc Plot Software: Calculating Energy Gap Values of Organic Materials Based on UV-Vis Absorbance Spectrum

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Abstract

Studies on bio-organic materials for optoelectronic devices have increased recently, mainly due to the low cost of the materials. Electrical properties of the materials are important to review whether a material is suitable for optoelectronic applications. The energy gap is an important parameter to investigate electrical properties of materials and therefore the band gap value has to be determined accurately. The energy gap of a semiconductor material can be calculated from its absorption spectrum using the Tauc plot method. In this article, we design a software based on the Tauc plot method (taucplot4dotz), using data taken from our previous studies including UV-Vis absorption spectrum of Sukun leaves and Gamal leaves. Results obtained are more accurate since we use both horizontal dan vertical linear extrapolation lines. Our results show that energy gap values for Sukun leaves and Gamal leaves are 3.033 Ev and 1.833 Ev respectively.From the results, it can be concluded that the software provides a simple and accurate calculation of energy gap values of materials, from which one can further investigate the potential of the materials suitable for optoelectronic devices based on bio-organic materials.

Keywords: Tauc-plot method, organic materials, energy gap, absorbance, UV-Vis spectrum.

BM-03

Morphological Study of bio-based Poly(L-lactic acid) Crystals in the Blend with Amorphous Polymeric Diluent

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Abstract

Morphological detail of highly anisotropic Janus-face spherulites formed by crystallization of poly(L-lactic acid) (PLLA) in the blend with amorphous poly(methyl methacrylate) (PMMA) was probed using polarized optical (POM), atomic-force (AFM), and scanning electron (SEM) microscopes. The phase separation and the shape memory of the polymeric crystals were investigated to discern the formation of two faces differing in optical birefringence, growth rate, and crystal size and assembly. Interior lamellar arrangements governing the contrast morphological structures within the spherulite have been successfully revealed through an extensive fracturing and selective etching with proper solvents. Two configurations of lamellae, differing in their long axes and shapes, concomitantly grow in two perpendicular directions into a half-and-half Janus-face spherulite, optically and morphologically. This study exemplifies the possibility of tailoring the arrangement of polymeric crystals in the presence of amorphous diluent.

Keywords: PLLA, biopolymer, crystal morphology, shape memory, phase separation.

BM-04

Hydroxyapatite Production from Cuttlebone as Bone Scaffold Material Preparations

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Abstract

Capture fishery of cuttlefish in Indonesia has increased recently. This has an impact on the amount of by-product waste, one of which is cuttlebone, which potentially contain calcium oxide (CaO) that can be used as a source of calcium in the production of hydroxyapatite. This study aims to find the chemical characteristics of cuttlebone, determine and analyze variations of calcination temperatures on the extraction of CaO and hydroxyapatite produced from the cuttlebone. The research was divided into three stages: characterization of chemical composition of cuttlebone, CaO extraction and hydroxyapatite synthesis with combination of hydrothermal method at 200°C for 6 hours and calcination temperature of 800°C, 900°C and 1,000°C for 1 hour. Results showed that the cuttebone has a moisture content percentage of 3.54±0.11, ash 89.61±0.26, lipid 0.32±0.19, protein 4.78±0.23, carbohyrate 5.29±0.02 and mainly in the form of calcium carbonate ($CaCO_3$). Calcination treatment of 700°C for 6 hours obtained pure CaO without carbonate impurity. Hydroxyapatite obtained by a combination of the hydrothermal and calcination treatment of 1,000°C for 1 hour has a calcium phosphate (Ca/P) ratio of 1.66, crystalline level of 90.10%, amorphous 9.90 and morphology of rod-shaped particles.

Keywords: waste, calcination, calcium oxide, hydroxyapatite.

BM-05

Production of Activated Carbon through Co-Pyrolysis of Vacuum Residue and Dehydrated Castor Oil

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Abstract

Crude oil refineries in Indonesia produce much waste in the vacuum distillation as vacuum residue, but its utilization is still low. As heavy oil residue, vacuum residue contains high aromatics and therefore high carbon which can be utilized as raw material to produce high surface area activated carbon (AC). Vacuum residue containing isotropic aromatics can be pyrolysed to form anisotopic aromatics which has high crystalline content thus increasing mechanical strength of AC. Co-pyrolysis of vacuum residue and conjugated double bonds can reduce C/H atomic ratio favourable for porosity development to improve surface area of AC. In the present work, vacuum residue was mixed with dehydrated castor oil as conjugated double bond source, then followed by pyrolysis at heating rate of 5°C/min until 450°C and holding time 90 minutes. Castor oil can be obtained from castor oil plants, which are widely grown in Indonesia, by extraction process of castor bean. Dehydration of castor oil used a catalyst of sodium bisulfate to obtain conjugated double bonds. Product of co-pyrolysis of vacuum residue and dehydrated castor oil was used as a precursor to prepare for activation and carbonization. The activation was conducted by activating the precursor with KOH solution and followed by carbonization at heating rate of 5°C/min until 700°C and holding time 30 minutes. The amount of dehydrated castor oil added to vacuum residue was varied at 0%, 5%, 10%, and 15% weight of vacuum residue. Adding dehydrated castor oil was expected to improve BET surface area of AC porosity.

Keywords: activated carbon, dehydrated castor oil, vacuum residue, pyrolysis.

BM-06

Coating of Mercapto Modified Silica on Iron Sand Magnetic Material for Au(Iii) Adsorption in Aqueous Solution

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Abstract

The functionalized silica coating merkapto on iron sand magnetic material (MM/SiO_2/MBI)has been done through sol-gel process. The successfully synthesized Material is used as adsorbent (MM/SiO_2/MBI) in the Adsorpi Au(III) process. Material characterization is carried out with an adsorbent stability test against acids. Adsorption is performed in a batch system and an unadsorption Au (III) ion is analyzed with the Atomic Absorption Spectrophotometer (AAS). Characterization results indicate the synthesis of PB/SiO_2/MBI adsorbent has been successfully performed. The coating of iron sand magnetic material enhances stability to acid. Adsorbent (MM/SiO_2/MBI) is capable of adjudisorate ion Au (III) with the highest adsorption occurring at pH 1. Kinetics review indicates that the adsorption of the ion (III) is following the second order pseudo kinetics with a value of $k \times 10^{-3}$ g/mg. Minute and adsorption isotherme follow the isotherme pattern of Langmuir with an adsorption capacity of 125 mg/g.

Keyword: mercapto group, Au (III), modified, silica, adsorption, iron sand.

BM-07

Synthesis of Mercaptoethyl Carboxylate from Palm Fatty Acid Distillate: Water Removal by Azeotrophic Distillation

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Abstract

Polyvinyl chloride (PVC) is commonly used as construction materials such as pipe, roof, floor, and cable insulation. The main weakness of PVC is the fact that it can degrade due to thermal treatment even at 80°C. Organotin compounds are known to be a good thermal stabiliser for PVC. Mercaptoethyl carboxylates, made from mercapto ethanol and fatty acids, are used as raw material for producing organotin based PVC thermal stabilizer. This research aimed to study the synthesis of mercaptoethyl carboxylates using palm fatty acid distillate (PFAD) as raw material and using azeotrophic distillation for removing water which was produced as a byproduct. The experiments were carried out in a batch reactor at atmospheric pressure using cyclohexane and benzene as entrainers. The ratio of solvent-to-PFAD was varied during the experiments. The performance of the synthesis was evaluated by measuring sulfhydryl content and yield of the product. It was found that the sulfhydryl content and yield were in the ranges of 5.8 – 7.7% and 57-77%, respectively. A minimum solvent-to-PFAD ratio of 2 was required to obtain adequate sulfhydryl content and yield. No significant differences in sulfhydryl content and yield were found between cyclohexane and benzene as solvents. A 2k experimental design showed that sulfhydryl content in the product was significantly affected by solvent-to-PFAD ratio and mercapto ethanol excess and their interaction as well. On the other hand, yield was influenced ingnificantly by mercapto ethanol excess only.

Keywords: Mercaptoethyl carboxylate, Palm Fatty Acid Distillate, azeotrophic distillation.

BM-08

Production of Potassium Carbonate from Oil Palm Waste Ashes using a Bench-Scale Extractor

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Abstract

In the process of growth, oil palm plants need high amounts of nutrients which are mostly stored in the oil palm fruit bunches (FFB). The processing of FFB produces wastes such as oil palm empty fruit bunch (OEFB), fiber, and shell. Combustion of the wastes produces ashes that may contain high potassium, in the form of potassium carbonate (K_2CO_3). K_2CO_3 recovered from the ashes can be utilized for producing potassium chloride fertilizer that mainly used in the palm oil plantation. This study aims to define a bench-scale mass balance extraction process for the recovery of K_2CO_3 from palm oil waste ashes, to support the cycle of potassium utilization in the palm oil industry. Optimum ashing conditions for oil palm waste is 400 °C for 2 hours. Potassium from the ashes can be optimally recovered by 3-stage batch extraction at 80 °C for 3 hours, using ash:water ratio 1:2. The highest potassium yield concerning total potassium content in the ash is obtained from OEFB ash, with the potassium yield of 89.89%. Meanwhile, potassium yield obtained from the ashes of shell, fiber, and boiler is 18.75%; 14.22%; and 20.36%, respectively. The produced salt from OEFB ash is dominated by K_2CO_3 of 70.28%.

Keywords: OEFB, fiber, shell, extraction, potassium carbonate.

BM-09

Lithium and Calcium Recovery by Activated Carbon from Coconut Shell Char

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Abstract

Spent rechargeable batteries and electronic waste are become a future challenge. The precious metal inside should be recovered for pursuing a circular economy society. In here, lithium phosphate battery has been dismantled and leached the cathodes by acids solution to produce metal solutions. The metal content will be separated by simple adsorption mechanism using activated charcoal. Coconut shell char has been activated by KOH in several temperature settings and then tested to adsorb lithium and calcium ions in the leaching solution. The capacity of adsorption and selectivity between the ions were investigated. The adsorption capacity is strongly related with the activation temperature and KOH/char ratio. Higher activation temperature and agent ratio tend to provide better activated carbon for metal ion adsorption. It is found that Li ions has lower affinity toward the surface of carbon especially in low concentration than Ca ions.

BM-10

Corn Skin/Polyester Bio-Composites: An Experimental Study on Notch Tensile Strength

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Abstract

The aim of this study is to investigate the effect of notch geometries (square and circular form) on tensile strength of corn skin fiber (CSF) polyester biocomposite under static condition experimentally. The tensile tests were run according to ASTM D5766. It is found that the tensile strength produced a different behaviour between square notch and circular notch of CSF biocomposite. The tensile stress of CSF biocomposite with circular notch generated ≈ 25% - 35% higher than CSF biocomposite with square notch. Furthermore, the tensile modulus of CSF biocomposite with circular notch was 50%-60% higher compared to CSF biocomposite with square notch. This difference of strength characteristics possibly due to the fabrication process and higher stress concentration of square notch of CSF biocomposite. From damage point of view, CSF biocomposite with square and circular notch shown brittle behaviour and matrix cracking initiated the damage propagation at the edge of the notch. Fiber breakage was found as the final damage mechanism of the CSF biocomposite with square and circular notch.

Keywords: corn skin fiber, biocomposite, square notch, circular notch, tensile.

BM-11

Kapok Fiber as Potential Oil-absorbing Material: Modification Mechanism and Performance Evaluation

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Abstract

Kapok fiber has gained considerable attention as a potential oil-absorbing material due to its lipophilicity, hydrophobicity, and configuration of its middle lumen which is the key component of its high oil absorption capacity. However, the weak structural integrity of the fiber greatly retards its application. The aim of this study is to develop a reinforcement method for kapok fiber to enhance its reusability and oil recovery. Oil-sorption capacities of several modified kapok (*Ceiba pentandra*) fibers have been evaluated to resolve the oil-polluted water issues. Oxidation using sodium chlorite ($NaClO_2$) followed by sol-gel coating with tetraethylorthosilicate (TEOS) and sponge formation via freeze-drying method successfully enhance the structural integrity of the fiber yet reduce its hydrophobicity. Further coating the sponge with organosilane such as dodecyltrimethoxysilane (DTMS) using chemical vapor disposition method recovers the superhydrophobicity of the fiber. The best performance achieves an oil-sorption capacity of 48.56 g-oil/g-fiber and can maintain 54% of its oil-sorption capacity even after ten reuse cycles.

Keywords:kapok fiber, natural absorbent, bio-based material, structural integrity, oil-sorption capacity.

BM-12

Red shift of the Photophysical Properties from Protonated Small Molecule in Solid State

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Abstract

In this work, we present red shif of the photophysical properties from protonated small molecule in solid state. To realize this objective, we used 4',4''''-(1,4-phenylene bis (2,2':6',2"-terpyridine) (Phtpy) as a small molecule and camphorsulfonic acid (CSA) as acid for protonation. For pristine Phtpy, its maxima absorption is 300 nm and no color emission by irradiation UV lamp at 365 nm. After a certain amount of CSA solution was added in chlorofom solution of Phtpy, the maxima absoprtion of protonated Phtpy is 350 nm indicating red shif of absorption spectrum takes place. Upon direct excitation at wavelength of 300 nm, the range of photoluminescence (PL) spectrum of Phtpy is from 320 to 580 nm with its maxima value is 360 nm. Interestingly, upon direct excitation at wavelength of 350 nm, the range of PL spectrum of protonated Phtpy is from 370 to 680 nm with its maxima value is 465 nm at it emits blue color emission which is consistent by irradition with UV lamp at 365 nm. This red shift is affected by protonation using CSA. As a result, the gap between high occupied molecular orbital and lower unoocupied molecular orbital of Phtpy decreased which is indicated red shif of abosrption and PL spectra. This red shift induces the energy gap of protonated Phtpy is smaller than it of pristine Phtpy. Finally, the remarkable red shif of phophysical properties of Phtpy as small molecule demonstrated that this material has great potential for application in sensing and other photonic devices with high performances.

Keywords: red shif, photophysical properties, small smolecule, CSA, protonation.

BM-13

Bentonite Basal Spacing Variation On PLA-Bentonite Nanocomposite Synthesis for Food Packaging

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Abstract

In this study, bentonite was used as a filler in the synthesis of polylactic acid (PLA) nanocomposite. In order to improve the mechanical property of PLA-bentonite nanocomposite, the bentonite was treated using two different surfactants, namely octadecylamine (ODA) and trimethyl strearylammonium chloride (TSC) at two different concentration (20 and 40 mmol). These treatments affected the basal spacing of bentonite stacks, as measured by x-ray diffraction (XRD) analysis. Significant increase in basal spacing was obtained when TSC 40 was used. Fourier Transform Infrared Spectroscopy (FTIR) suggest that this increase was caused by the incorporation of surfactant into the bentonite stacks. The incorporation of bentonite together with PLA further increase the basal spacing further. Consequently, most of the PLA-bentonite nanocomposite can form intercalation structure, while sample containing TSC 40 formed exfoliation structure. This exfoliation structure resulted in a film with the best tensile strength and water vapor permeability compared to the others. When used as bread wrapper, film containing TSC 40 showed the lowest reduction in water activity, almost similar with the bread sample wrapped in conventional plastic. Interestingly, the bread wrapped with TSC 40 film was not covered by fungus as opposed to the bread wrapped in conventional plastic, showing the potential of the nanocomposite film as food packaging.

BM-14

The Influence of Ag Concentration an The Antibacterial Properties of Plastic Made from Silica Immobilized with EDTA-Ag Composed with Chitozan

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Abstract

Antibacterial plastic is made by using composites of silica gel immobilized EDTA-Ag that composed with chitosan. Silica gel was made with three variations of Ag concentration at 10^{-3}, 10^{-4} and 10^{-5} M and then tested for its antibacterial activity against *Escherichia coli* and *Staphylococcus aureus*. Results of antibacterial test showed that the immobilized EDTA-Ag silica gel product could inhibit the growth of *Staphylococcus aureus* with the diameter of zone inhibition at 15.9 mm which was larger than *Escherichia coli* observed around 15.6 mm at the lowest Ag concentration of 10^{-5} M. This result showed that higher concentration of Ag led to the decrease of antibacterial activity. The obtained products were then synthesized into plastic with variations of chitosan weight at 0.3 and 0.7 grams. The antibacterial test confirmed that the plastic had strong antibacterial properties with the diameter of zone inhibition for *Staphylococcus aureus* was 16.7 mm larger than *Escherichia coli* at 15.9 mm. The percentage of degradation was found around 6.02 to 63.17% while water absorption test for plastic with chitosan 0.3 gram was 86.51% and for plastic with 0.7 gram chitosan was 16%. This indicates that more chitosan additions is able to expand antibacterial properties and reduce the absorption of plastic against water.

Keywords: silica gel, chitosan, antibacterial, plastic.

BM-15

Electrochemical Impedance Spectroscopy Study of Activated Carbon from Coconut Fiber Doped by Fe_3O_4 for Na-ion Batteries

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Abstract

This study focuses on evaluating electrochemical properties using the Electrochemical Impedance Spectroscopy (EIS) method of activated carbon doped by Fe_3O_4 as cathode of Na-ion batteries. Activated carbon was obtained from the carbonization of coconut fibers with H_3PO_4 as activator at a temperature of 600°C for 3 hours. Dopping Fe_3O_4 is done to improve the properties of the electrochemical properties of activated carbon. Nyquist plot evaluation was carried out in the initial conditions (0% of COS), 35%, 70%, and 100% of the SOC in the first, second, and fifth cycles. The value of electrolyte resistance, thin layer surface resistance, charge transfer resistance are obtained from modeling with equivalent circuit approach based on the Nyquist plot. The electrochemical properties comparison between activated carbon without doped by Fe_3O_4 and activated carbon doped by Fe_3O_4 was also studied in this study. This study shows that the diffusion coefficient value of activated carbon without doped by Fe_3O_4 is bigger than activated carbon doped by Fe_3O_4. It can be indicating that both the passivating film on the surface of activated carbon doped by Fe_3O_4 as cathode and the channels for lithium ion transfer are mostly formed during the first charge/ discharge process. The current density of activated carbon doped by Fe_3O_4 is bigger than activated carbon without doped by Fe_3O_4. This is difference between these two materials for their electrochemical performance.

Keywords: activated carbon, batteries, electrochemical impedance spectroscopy, Fe_3O_4.

BM-16

Oil Palm Empty Fruit Bunch Ash Valorization through Potassium Extraction

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Abstract

Oil palm empty fruit bunch (OPEFB) is a by-product of palm oil processing that is considered as solid waste. It is produced in a large amount, counting up to 23% of the fresh fruit bunch (FFB). The burning of OPEFB produces ash that contains many compounds; one of them is potassium. Potassium can be potentially recovered as potassium carbonate by solid-liquid extraction with water. This study aims to investigate a method to recover potassium from OPEFB ash for further processing into potassium-based fertilizer. This research consists of pyrolysis process of OPEFB into char, then the char is analysed by TGA in order to determine the ashing temperature. Temperature of of 250°C, 400°C and 550°C are chosen. It is followed by solid-liquid extraction process with the amount of F:S ratio of 1:4, 1:5, and 1:6, respectively. From the AAS analysis result, it is known that the highest potassium concentration is obtained at temperature of 400°C with F:S ratio = 1:6, with the potassium concentration of 49,94 %-w/w. This value is suitable for liquid fertilizer.

Keywords: OPEFB, potassium carbonate, extraction, ashing.

BM-17

Production of Activated Carbon through Co-Pyrolisis of Vacuum Residue and Gum Rosin

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Abstract

Activated carbon (AC) can be produced from vacuum residue (VR) due to its high content of isotropic aromatics and therefore carbon content. AC are widely used in gas separation, solvent recovery and organic polution removal. As a bottom product of petroleum vacuum distillation,VR still lacks utilization and ends up as waste. Pyrolysis of VR can change isotropic aromatics to anisotropic ones which contain high crystalline carbon and therefore improve mechanical strength of AC. Gum rosin (GR) as a source of conjugated double bonds can be added in co-pyrolysis with VR which reduces C/H atomic ratio of co-pyrolysis feedstock to control pyrolysis to obtain high surface area. GR is obtained from pine trees available in Sumatera and Kalimantan. In this work, GR added was varied at 0, 5, 10, and 15%wt of VR. Synthesis of AC was conducted in 3 stages, the first, pyrolysis of mixture of VR and GR at heating rate of 5°C/min until 450°C and hold for 90 minutes under a nitrogen flow of 100 Ml min^{-1} to produce AC precursor, the second, activation of the precursor with KOH solution, and the third, carbonization of the AC precursor at heating rate of 5°C/min until 700°C and hold for 30 minutes under a nitrogen flow of 100 Ml min^{-1}. The AC precursor was characterized by FTIR and ultimate analyzer (UA) and AC by BET surface area, FTIR, SEM, and UA. It is expected the addition of GR would improve BET surface area and total pore volume of AC porosity.

Keywords: activated carbon, gum rosin, co-pyrolisis, activation, vacuum residue.

BM-18

Plant Extract-Assisted Biosynthesis of Zinc Oxide Nanoparticles and Their Antibacterial Application

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Abstract

ZnO nanoparticles are multi-purposes materials which can be synthesized by several methods, including physical and chemical routes. A novel synthesis method of ZnO nanoparticles is the biological method using plant extracts as a reducing and capping agents, such as the fruit extract of Averrhoa bilimbi. Plant extracts is superior agents for synthesizing nanoparticles because it provides essential phytochemical substances as reductor, capping agents, and free from toxicants. In this study, the effects of precursor concentrations and the amount of plant extract on the nanoparticles formation and morphology were investegated. The characteristics of ZnO particles were studied by UV-Vis spectroscopy, XRD, FTIR, TEM, and DLS. The study showed that formation of ZnO nanoparticles occured after five hours reaction at 70°C, as indicated by color change of the solution. ZnO nanoparticles formation were confirmed by the maximum absorption at the wavelenght of 372 nm and XRD analysis. FTIR analysis showed that the as-synthesized ZnO contained significant organic compound on its surface, especially compared to commercial ZnO. Reduction reactions using A.bilimbi produce nanoparticles in the size from 35.4 to 59.5 nm with round shape and some agglomeration that were observed by TEM. The ZnO antibacterial property was tested against planctonic and biofil Escherichia coli. The result showed that as-synthesized ZnO have comparable antibacterial antibiofilm property as the commercial ZnO nanoparticles at low concentration. Interestingly, this property were diminished when as-synthesized ZnO nanoparticles were used at high concentration.

BM-19

Graphitization of Coconut Shell Charcoal for Sulfonated Mesoporous Carbon Catalyst Preparation and Its Catalytic Behaviour in Esterification Reaction

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Abstract

Here, we reported the utilization of coconut shell charcoal used for solid acid catalyst and its performance in the esterification reaction of acetic acid and methanol. The graphitization of coconut shell charcoal was carried out by the calcination and KOH activation at temperature of 400°C for an hour and continued at temperature of 800°C for an hour under nitrogen flow resulted graphitic carbon. The effect of the addition of KOH activation was observed by varied the weight ratio of coconut shell charcoal as raw material (RM) and KOH. The selected weight ratio of RM:KOH were 1:1, 1:2, and 1:4. The resulted graphitic carbon was sulfonated by heating with the sulphuric acid to obtain solid acid catalyst. The sulfonic time was evaluated for 5 and 10 hours. The generated particles were characterized to examine the morphology, the crystallinity, the specific surface area, the chemical bonding, and the ionic capacity using Scanning Electron Microscopy (SEM), X-Ray diffraction (XRD), nitrogen gas absorption-desorption, Fourier Transform Infrared Spectroscopy (FTIR), and titration method. The best condition for graphitization of raw material is the use of RM:KOH = 1:4 resulting the highest surface area reaching 1259.67 m^2/g and the most dominant of the sulfonic group of $-SO_3$ bond. Increasing the sulfonating time from 5 to 10 hours led to the increase of the yield of esterification reaction from 85.00 to 96.57% for graphite synthesized using RM:KOH = 1:4.

BM-20

The Tensile Characteristics of Biocomposite Material Reinforced by Corn Skin

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Abstract

The main focus in the present work is to study the corn skin as reinforcement for polyester biocomposite. The effect of reinforcement type of short fiber and discontinuous chip form on the tensile properties was studied. The corn skin materials have been treated by NaOH chemical treatment and used as the reinforcement of polyester biocomposite by hand lay-up fabrication method. The tensile test was carried out according to ASTM D3039. The tensile strength characteristics of stress and modulus showed a different behaviour between the two types of reinforcement where corn skin fiber (CSF) biocomposite generated ≈ 30%-35% higher than corn skin chip (CSC) biocomposite. This difference characteristics due to the slight different of specimen thickness and affect the calculation of stress and modulus value. Furthermore, from physical properties point of view, larger surface area of CSC compared to CSF which still contains lignin layer after NaOH chemical treatment could be an influence to decrease the interfacial bonding between polyester as the matrix and CSC as the reinforcement. The tensile damage charateristics shown the brittle behaviour and propagated perpendicular to the loading direction. Matrix cracking and interfacial debonding were identified as the main two damage modes of the CSF biocomposite and CSC biocomposite where the final failure dominated by fiber pull out and chip fracture.

Keywords: corn skin, biocomposite, reinforcement type, tensile.

BM-21

Plant Extract-Assisted Biosynthesis of Zinc Oxide Nanoparticles

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Abstract

ZnO nanoparticles are multi-purposes materials which be synthesized by several methods, including physical and chemical routes. A novel synthesis method of ZnO nanoparticles is biological method using plant extracts as a reducing and capping agents, such as the fruit extract of Averrhoa bilimbi. Plant extracts is superior agents for synthesizing nanoparticles because it provide essential phytochemical substances as reductor, capping agents, and free from toxicants. Biological synthesis is efficient and eco-friendly method because of involving mild operation system, whereas physical and chemical methods are costly method because they conducted using complex equipment, toxic solution, and harsh operation system. Effects of precursor concentrations and the amount of plant extract on the nanoparticles formation and morphology were investegated. The characteristics of ZnO particles were studied by UV-Vis spectroscopy and XRD. Total phenol of the fruit extract that is available as a reducing and capping agents was 124.285 mg GAE/100 gr sample. The prelimanary study showed that formation of ZnO nanoparticles occured after five hours reaction at 70°C, as indicated by color change of the solution from clear aqueous to cloudy white or yellowish brown. ZnO nanoparticles formation were confirmed by the maximum absorption at the wavelenght of 370 nm. Based on calculation using Debye-Scherrer's equation, average crystalline diameter of ZnO particles were 81.85 nm.

Keywords: ZnO nanoparticles, averrhoa bilimbi, biosynthesis.

Biochemical & Pharmaceutical (BCP)

BCP-01

Molecular Modeling of Antioxidant Agent by QSAR Study of Cafeic Acid Derivatives

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Abstract

Molecular modelling using Quantitative Structure and Activity Relationship (QSAR) has been performed on caffeic acid derivatives previously studied as effective antioxidant agent. This research focus on a set of experimetally IC50 value data of 4 caffeic acid derivatives. The mathematical method multi linear regression calculation was used to build the QSAR model. QSAR analysis was employed on fitting subset using log (1/IC50) as dependent variable and atomic net charges aromatic carbons, dipole moment and partition coefficient in n-octanol/water as independent variables. The PM3 method was used to calculate the quantum chemical descriptors, chosen to represent the electronic descriptors of molecular structures. The relationship between log (1/IC50) and the descriptors was described by resulted QSAR model. The resulted QSAR model for caffeic acid derivatives as antioxidant is presented below:

-7.858 + 1.149 dipol + 0.485 logP – 61.68 C5

R=1; R2=0.999; SE=0.008; F=342

QSAR model for caffeic acid derivatives showed partition coefficient of n-octanol/water, dipole moment, and atom charge in C5 gave significant effect to the antioxidant activity. The calculated PRESS (Predicted Residual Error Sum of Square) value was 6.69E-05 which indicates the calculated log (1/IC50) using QSAR Hansch Model of caffeic acid derivatives is similar with experimental data.

Keywords: QSAR study, antioxidant, caffeic acid derivatives.

BCP-02

Antioxidant Extraction Based on Black Rice (*Oryza sativa* L. *indica*) to Prevent Free Radical

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Abstract

Free radicals are molecules which in their outer orbit have one or more unpaired electrons, they are very labile and very reactive. This molecules has an important role in tissue damage and pathological processes in living organisms. Antioxidants are compounds that can inhibit oxidation reactions, by binding free radicals. The antioxidants produced by the human body are very limited, so we need the intake of antioxidants from outside, especially those from food. Research on antioxidant extraction based on black rice (*Oryza sativa* L.*indica*) to prevent free radicals has been carried out. This research was conducted using the DPPH method to measure the ability to capture free radicals and FRAP method to measure antioxidant capacity. The aim of this study was to obtain data on the level of antioxidant activity contained in black rice and its effect to counteract free radicals. The results showed that the ability to capture free radicals contained in the DPPH anthocyanin extract was 25 ppm. While using the FRAP method, the results of black rice anthocyanin extract have a high antioxidant capacity of 824 ± 17.24 µM. It is evident that the DPPH method used to show in anti-oxidant extracts based on black rice can capture free radicals, while the FRAP method proves that antioxidants in black rice have the capacity to prevent free radicals in the body.

Keywords: free radicals, antioxidant, black rice, DPPH method, FRAP method.

BCP-03

Analysis of Production Kojic Acid from Endophytic Fungi *Aspergillus flavus* from Anonna Leaves (*Annona squamosa*) Using an OSMAC Approach

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Abstract

An analysis of production kojic acid of endophytic fungi Aspergillus flavus from anonna leaves (*Annona squamosa*) has been done in three media, namely: rice (*Oryza sativa*), sweet corn (*Zea mays* L.) and waxy corn (*Zea mays ceritina*) media using an OSMAC (One Strain-Many Compound) approach. The grown fungi were macerated using ethyl acetate and quantitatively analyzed the content of kojic acid using HPLC. The intrapolation peak area of kojic acid's content in each fungal medium to the regression equation of standard kojic acid resulted in the concentration of kojic acid in 5 mg/Ml in each extract respectively 0.157464 mg/Ml (3.149%) for rice media extract, 0.29994 mg/Ml (5.998%) for sweet corn media extract, and 0.11139 mg / Ml (2.226%) for waxy corn media extract. Pure kojic acid from extract fungi on rice media was obtained from the results of fractionation using VLC in 90% DCM fraction. LC-MS/MS analysis of 90% DCM fraction obtained 5-hydroxymethyl furoic acid, Deoxypaeonisuffrone, Hordenine-O-α-L-rhamnopyranoside and Lobelanine. Whereas based on the results of NMR analysis it was found that the 90% fraction of DCM was kojic acid.

Keywords: endophytic fungi, aspergillus flavus, osmac, secondary metabolites, kojic acid.

BCP-04

Improved Synthesis and Antibacterial Activity of 1-Monoolein

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Abstract

Synthesis of 1-monoolein has been carried out through two steps reaction: transesterification of ethyl oleate and 1,2-acetonide glycerol in a presence of sodium carbonate as a catalyst followed by deprotection using an Amberlyst-15 catalyst in ethanol. Transesterification reaction of ethyl oleate produced 1,2-acetonide-3-oleoyl glycerol as a yellow liquid with a yield of 74%. Meanwhile, deprotection of the intermediate compound afforded 1-monoolein as an unstable white soft solid in a yield of 51.16% and melting point at 35-37 °C. Antibacterial activity assay of 1-monoolein showed inhibition activity toward *S. aureus* and *E. coli* at a concentration of 500 µg/mL.

Keywords: synthesis, ethyl oleate, 1-monoolein, antibacterial.

BCP-05

Identification of Plants Natural Dye by Meto Tribe in South Central Timor

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Abstract

Information of plant species, natural dyes and the dyeing process of the yarn of ikat weaving in South Central Timor are still minimal and not well documented. Therefore, the aim of this study was to identify of natural dye in South Central Timor. Sampel were collected by exploration methods. Parts of plants, dyeing process, and kinds of color were recorded based on observation, interview with craftsmen and documentation. Our results showed that there are 7 plants species were successfully identified, *Curcuma longa* L., *Indigofera tinctoria* L., *Morinda citrofolia* L., *Phylantus reticulates poir*, *Scheleichera oleosa* L., *Phaseolus lunatus* L., and *Tectona grandis*. The plant organs used as a source of natural dye are leaves, barks, rhizome, and roots. The method of processing was to be burned, crushed, boiled and soaked and the color produced was red, purple, yellow, black, brown, green, blue and orange.

Keywords: natural dye, ikat weaving, identification, meto tribe, south central timor.

BCP-06

Chemical Products of Essential Oil from Timorese Aromatic Plants

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Abstract

Indonesia has been known to be rich of aromatic plants and one of the primary sources of the world supply of essential oil. In this study, aromatic plants were collected from Flores and Timor Island and evaluated their essential composition. The upper part of purple *Ocimum basilicum*, white and pink fruit of *Psidium guajava*, *Cymbopogon nardus* and *Syzygium aromaticum* were distilled using Clevenger apparatus. The essential oils were then analyzed their chemical composition using GC-MS and tested their activity against pathogenic bacteria and fungi and also for their potential as fruit flies attactrants. The result showed that essential oil from leaves of *O. basilicum* and *S. aromaticum* are able to be developed as fruit flies attractant while the essential oil of *Psidium guajava* can be developed as antibacterial agents.

Keywords: essential oil, antibacterial, fruit flies attractant.

BCP-07

Quality and Mineral Content of Local Salt From Kupang East Nusa Tenggara

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Abstract

The production of conventional salt produced by the community is still below the standard set. This study aims to analyze the quality of conventional salt and minerals content. The sample is taken by random sampling method. Analysis of moisture content based on the AOAC method, NaCl content based on the method of wet dewatering and mineral content using Inductively Coupled Plasma Optical Emission Spectrophotometer (ICP-OES). The quality of conventional salt is produced based on the criteria for the content of NaCl, water content and the content of Iodine is still below the Indonesian National Standard. The mineral content of magnesium, calcium and potassium is still in the range of Indonesian National Standard.

Keywords: conventional salt, Iodine, minerals

BCP-08

The Effect of Acids on the Alkaloid Yield in Pressurised Water Extraction of *Narcissus pseudonarcissus*

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Abstract

A pressurised water (PW) extraction of galanthamine from *Narcissus pseudonarcissus* bulbs was performed and compared the yield with that of conventional acidified water extraction followed by a subsequent purification step for the alkaloids from the aqueous layer after basification as well as a methanolic soxhlet extraction. The pressurised water (70 °C, 150 bar, 45 min) yielded as much galanthamine as a benchmark exhaustive methanolic-soxhlet extraction (ca. 3.50 mg/g), while acid-base extraction with 1% of HBr (v/v) at 65 °C for 3 h gave a lower yield (ca. 2.65 mg/g). Besides galanthamine the total alkaloid profile included the following Narcissus alkaloids lycoramine, O-methyloduline, norgalanthamine, epi-norgalanthamine, narwedine, oduline, haemanthamine, O-methyllycorenine, and a haemanthamine derivate were identified. PW better soaked and swollen the matrix of N. Pseudonarcissus bulbs than soxhlet. Though a high yield was obtained, the further purification needs to be improved to obtain an economically feasible industrial extraction.

Keywords: acid-base extraction, galanthamine, *Narcissus pseudonarcissus*, pressurised water extraction.

BCP-09

Effects of Garlic Extract (*Allium sativum*) Administration on Total Cholesterol Level of White Rats (*Rattus norvegicus*)

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Abstract

Background : Hypercholesterolemia is one of the non-contagious diseases which is the main cause of death globally. Accumulation of excessive cholesterol or hypercholesterolemia will be atherosclerosis which cause strokes and cardiovascular diseases such as coronary heart disease. Garlic has an active agent allicin which an alkaloid compound, can be used to reduce cholesterol levels, in addition: vitamin C and niacin.
Objective : Knowing that effect of garlic extract (*Allium sativum*) administration to decrease cholesterol total levels on white rats (*Rattus norvegicus*) which are deliberately hypercholesterol.
Method : Experimental research through pre test-post test with control group design approaching in laboratory. Research sample was 25 of white rats selected randomly and divided to 5 groups are normal control group and treatment group.
Results : Data analysis by One Way Anova showed that cholesterol total levels on the 32 day, 33 day, 37 day and 42 was significance value of $p < 0.05$, its means the statistical test showed that given the garlic extract (*Allium sativum*) can reduce cholesterol total levels in white rats with hypercholesterolemia.
Conclusion : There is the effect of garlic extract (*Allium sativum*) on decreasing cholesterol total levels in white rats (*Rattus novergicus*) with hypercholesterol and a significant value ($p < 0.05$).

Keywords: Garlic Extract, *Allium sativum*, Allicin, Hypercholesterol.

BCP-10

The Lactic Acid Bacteria of Bebontot Spent Chicken Meat and Antioxidant Activity of Their Isolates

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Abstract

Bebontot or buntilan of spent chicken a novel Balinese traditional meat fermented product. Species-specific PCR assays were used to confirm the identity of the LAB strains, discriminated 63 profiles out of 72 LAB isolates. *Pediococcus pentosaceus* was dominant, followed by *Lactobaccillus plantarum* were the main species of bebontot. *Lactobaccillus plantarum* had strong radical scavenging activities of 1.1-Diphenyl-2-picrylhydrazyl, DPPH than *Pediococcus pentosaceus*.
The lactic acid bacteria (LAB) of bebontot or buntilan (Balinese traditional meat fermented product) of chicken breast meat of spent laying hen had been identified and these LAB were distributed as 58.33% *Pediococcus acidilactici* strain LMG 17680 and 41.67% *Pediococcus acidilactici* strain O-mls-1 at 0 day of the batters. The result observed at the end of fermentation (5 days) dried under the sun were isolate consist of 56.25% *Pediococcus pentosaceus* strain Ni 1386; 20.83% *Lactobaccillus plantarum* strain PA21 and 8.33% *Lactobacillus plantarum* strain Ni 1002. The average inhibition concentration (IC) of radical scavenging activity (RSA) of 1.1-diphenyl-2-picrylhydrazyl, DPPH after innoculation (0 day) was 66.83±3.55% and after 5days of fermentation was 83.37±4.06%. It is interesting to note that LAB isolates of bebontot spent-hen chicken breast meat of properness (nor isolated from human or infant feces) and could be benefit for antioxidant activity to process functional meat products for human consumption.

Keywords: identification, antioxidant activity, LAB isolates, bebontot.

BCP-11

Chemicals Compotion and Antibacterial Activity of Essential Oils of Guava Leaves (*Psidium Guajava* L.)

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Abstract

Essential oil of the *Psidium guajava* L. leaves (guava leaf) from two different places on Timor Island was obtained by distillation method. The chemicals composition was determined by GC-MS analysis to identify their chemotypes. Moreover, antibacterial activity of these volatile oil against selected bacteria was studied. The yield of guava leaf oils are 0.45% and 0.48%. Limonene was the major identified oxygenated monoterpenoid (35.49% and 19.49%), wheares trans-Caryophyllene was the major identified oxygenated sesquiterpenoid (29.76% and 24.58%). The antibacterial activity of guava leaf oil was pronounced against *S. aureus* and *E. coli* showed a higher activity. This results shows that the volatile oil of guava leaves can be a good candidate for an antibacterial agent.

Keywords: essential oil, Guava leaf oil, antibacterial, trans-Caryophyllene.

BCP-12

Control of Ice-Ice Disease in Farming Red Algae *Kappaphycus alvarezii* (Doty) Doty through the Application of Diversification Method

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Abstract

The farming of red algae *Kappaphycus alvarezii* (trade name *Eucheuma cottonii*) has grown rapidly in East Nusa Tenggara since 1999, which has contributed significantly to increasing the income of community and region. The biggest problem faced since a decade ago is the ice-ice disease phenomenon which attacks farming of *K. alvarezii*, reducing production to only left 10%, drastically reducing the farmer's income. This experimental study aimed to minimize the ice-ice disease infestasion in farming of *K. alvarezii* through the application of diversification methods.

This research was conducted in the farming area of *K. alvarezii* in Sulamu Waters on July-September 2018. Experimental method was tested in order to minimize ice-ce disease investation. As threatment, three longline nylon ropes were used with three replicates. The first line was placed by *Gracilaria sp.* seeds; the second line was placed by *K. alvarezii* seeds; while the third line was placed by *Sargassum polycystum* seeds. Conventional farming method carried out by local farmers is used as control. The parameters tested were disease incidence and intensity as well as growth rate. Physical-chemical factors of waters such as temperature, salinity, and currents were taken as supporting data.

The result showed that both treatment and control showed investation of ice-ice disease. Farming with treatment using *Gracilaria sp.* and *Sargassum polycistum* gave better resistant to ice-ice disease compared to the one without (control). The treatment showed less incidence and intensity to ice-ice disease compared to control. The incidense showed higher value in control, ranged between 0.3-0.45% compared to the treatment, ranged between 0.12-0.38%. While in terms of intensity, the treatment showed lower infection of ice-ice disease, the value ranged between 0.05-0.43%, compared to control, the value ranged between 2.1-17.195%. The contrary hapend related with growth rate. The control showed better absolut growth (mean 978.6 gram) compared to the treatment (mean 961.6 gram).

BCP-13

The Characterization of Ca/Mg/Zn Basic Soaps Derived from Palm Stearin

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Abstract

Production of metal basic soaps become an interesting process to be developed because it could be applied as a potential precursor to produce bio-hydrocarbon. The objectives of this study were to characterize the metal basic soaps using TGA, FT-IR and XRD instrument. In this paper, the saponification process was conducted by direct reaction method of palm stearin with metal hydroxides ($Ca(OH)_2$, $Mg(OH)_2$, dan $Zn(OH)_2$) at 185 °C for 3 hours. From the TG curves, it appears that in the heating with the temperature range between 20-800 °C, the decomposition of Mg and Zn basic stearin were occurred once, while Ca basic stearin was occurred twice. Based on the infrared spectrum, the hydroxyl groups were found on all the metal basic soaps. The main characteristic diffraction peaks of metal basic soaps were observed at 19,88° (Ca basic stearin); 21,47° (Mg basic stearin); and 18,85° (Zn basic soaps). This work demonstrates the feasibility of producing metal basic soaps with high total alkali content (around 49%-mol) and yield (>90%-w).

Keywords: alkali content, alkaline-earth, biohydrocarbon, direct reaction, palm stearin.

BCP-14

Amino Acid and Fatic Acid Profiles in Se'i Tuna, Processed with Liquid Smoke and Se'i Pampis as Its Derivative During Storage

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Abstract

Se'i tuna processed with liquid smoke and its derivative products in the form of pampis Se'i tuna, is an engineering product of smoked fish from smoked fish which has been traditionally processed. This product is attractive and in demand to many people. A study has been carried out to determine the amino acid and fatty acid profiles using fresh tuna as raw material, after being processed into se'i tuna and pampis Se'i tuna during storage at cold temperatures and room temperature. The study was designed with a completely randomized design and variables measured were amino acids and fatty acids by using GC MS method. The results obtained 15 types of amino acids and five types of fatty acids, dominated by Oleic Acid. There are three omega 3 fatty acids, two omega 6 fatty acids and two omega 9 fatty acids, two DHA and two EPA. The content of amino acids and fatty acids in Se'i and pampis Se'i tuna slightly changed during the process; however, they were not change during storage at room temperature at day 12 and cold storage on day 12 and day 30. Se'i tuna products processed with liquid smoke and its derivative products in the form of pampis se'i contain amino acids and fatty acids which indicated that this product is nutritious.

Keywords: Se'i, liquid smoke, pampis, amino acids, fatty acids, nutritious

BCP-15

Effect of Moringa Oleifera Leaf Powder in Diets on Laying Hens Performance, β-Carotene, Cholesterol, and Minerals Contents in Egg Yolk

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Abstract

The present study was designed to investigate the influence of Moringa oleifera on Laying Hens Performance, β-carotene, cholesterol, and minerals contents in egg yolk. Two hundred and forty 30 weeks of healthy laying hens with homogeneous body weight in a complete randomized design with four treatments and 6 replications. Laying hens were randomly divided into four groups: M0: diets without administration of Moringa oleifera leaves, M1: diets with 2% Moringa oleifera leaves; M2: diets with Moringa oleifera leaves 4%; and M3: diets with 6% Moringa oleifera leaves, repectively. Each treatment consisted of six replication cages with 10 birds randomly assigned to each cage. This study showed that administration of the Moringa leaves powder were increased significantly different on egg productions, egg mass, feed efficiencies, yolk colour, shell thickness, Mg and Ca contents in eggshell, but not the efficiency of feed consumption. The administration of 2-6% Moringa leaves powder in diets results in significantly lower of yolk cholesterol contents. It was concluded that supplementation of 4-6% Moringa leaves powder in diets, increased egg production, egg mass, feed efficiencies, yolk colour, shell thickness, β-carotene, Mg and Ca contents in the yolk, but decreased yolk cholesterol contents in laying hens.

Keywords: yolk color, feed efficiencies, shell thickness.

BCP-16

Synthesis of Mercaptoethyl Ester of Palm Fatty Acid Distillate: Comparison of Dehydration Methods

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Abstract

This research was aimed to evaluate the synthesis of mercaptoethyl ester of palm fatty acid distillate (PFAD) where water as a byproduct was removed by using vacuum and azeotropic distillations. The reactions were done in a batch reactor using PTSA as a catalyst. The performances of the synthesis reaction were evaluated by measuring the sulfhydryl content and yield of the product. Compared to dehydration by vacuum distillation, dehydration by azeotropic distillation gave lower sulfhydryl content and yield but faster reaction completion. Azeotropic distillation gave sulfhydryl content and yield in the range of 6–7% and 57–74%, respectively. Vacuum distillation gave sulfhydryl content and yield in the range of 7–9% and 75–85%, respectively.

BCP-17

Grain Quality of Rice (*Oryza Sativa* L.) Cultivar Menthik Wangi of Organic Farming Yields

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Abstract

Organic rice is believed to have better nutrition than rice conventional (1). Not all organic rice grain is consumed. Most of the organic cultivation yields will be used as seed. Viability test is one of the quality test of rice seed. Viability is seed vitality that can be shown as a physiological and biochemical phenomenon (2). Seed that have high vigor will achieve high productivity levels as well (3) . The aims of this research was to analyze the quality of rice cultivar Menthik Wangi of organic farming yields. The quality of rice seeds was tested by measuring the viability of seed (Sadjad method) and crude fat content. The test results demonstrate the viability of the grain has a 100% germination, 100% growth potential maximum, simultaneity grew 99.33%, 97.33% vigor index, T50 2.33, and seed moisture content 10.67%. The fat content was conducted by soxhlet method and analyzed by T-test. The results show that organic rice has a higher fat content (0.53%) than non-organic rice (0.24%). It can be concluded that rice seed cultivar Menthik Wangi of organic farming yields has a higher viability and better nutritional value of the non-organic rice grain.

Keywords : grain quality, viability, Menthik Wangi, organic and rice

BCP-18

The Quality and Mineral Content of the Community Salt Conventional in Kupang City and Kupang District, East Nusa Tenggara Province

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Abstract

The production of conventional salt produced by the community salt processing in the city of Kupang and Kupang district has a quality at below the standards set. This study aims to analyze the quality of conventional salt and minerals content. The sample is taken by random sampling method. Analysis of moisture content based on the AOAC method, NaCl content based on the method of wet dewatering and mineral content using Inductively Coupled Plasma Optical Emission Spectrophotometer (ICP OES). The quality of conventional salt is produced based on the criteria for the content of NaCl, water content and the content of Iodine is still below the Indonesian National Standard. The mineral content of magnesium, calcium and potassium is still in the range of Indonesian National Standard.

Keywords: conventional salt, iodine, minerals.

BCP-19

Identification of Biomordant in Hundihopo Village, East Rote District, Rote Ndao Regency

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Abstract

Information of plant species, mordants and the mordanting process of the yarn of ikat weaving in Hundihopo village are still minimal and not well documented. Therefore, the aim of this study was to identify of biomordant in Hundihopo Village. Sampel were collected by exploration methods. Parts of plants, mordanting process, and kinds of color were recorded based on observation, interview with craftsmen and documentation. A total of 12 species were traditionally used as biomordants in Hundihopo village namely *Sterculia foetida* L., *Erythrina varegata*, *Areca catechu* L., *Ceriops tagal*, *Datura metel*, *Calotropis gigantea*, *Abrus precatorius* L., *Symplocos sp*., *Jatropha curcas* L., *Citrus aurantifolia*, beura dan faliti. The plant organs used as a source of mordant are leaves, barks, fruits, and seeds. The method of processing was to be burned, crushed, boiled and soaked and the color produced was red, black and yellow.

Keywords: Identification, biomordant, ikat weaving, Hundihopo village.

BCP-20

The Effect of Sour Soy Milk and Fermented Cassava Tape Added to Drinking Water toward Production and Quality of Chicken Meat

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Abstract

Now there are many opportunities in the development of production and accompanied by an increase in the quality of broiler chicken meat carcasses through biotechnology engineering, namely the use of Lactic Acid Bacteria (LAB) as probiotics, sourced from a result of fermentation traditional cassava tape and sour soy milk. Completely randomized design (CRD) were used which consisted of six treatments and four replicates. Each replicate consist of five chickens. The chicken was raised for 5 weeks and then slaughtering was done two times or two chickens in each replicate, so we had 48 sample to be analyzed. The treatments are as follow: drinking water not added probiotic as control (A); 1% of "tape ubi" in 1 liter water (B); 2% of "tape ubi" in 1 liter water (C); 1% of sour soymilk in 1 liter water (D); 2% of sour soymilk in 1 liter water (E); 1% of "tape ubi" + 1% sour soymilk in 1 liter water (F). The experimental commercial diets for starter phase (aged 1-3 weeks) was given councentrate type CP 511 and CP 512 for finisher phase (aged 3-5 weeks). The experiment started used the chicken aged 1 week with average weight of 174 – 181 g/birds. In conclusion of the research, had potential benefits improved for carcass production and quality broiler chicken meat, showed that increase of total protein serum, hight density lipoprotein (HDL) and also increasing organoleptic characteristic, also effect significantly decrease of total cholesterol and low density lipoprotein (LDL). It was sugested consumed the broiler chicken carcass meat to improved safety and healthy consumers.

Keywords: LAB probiotic, sour soy milk, "tape ubi", production; quality, chicken meat.

BCP-21

Synthesis and Characterization of Modified γ-Alumina-NaA and γ-Alumina-NaX Zeolite Composites as Methanol Dehydration Catalysts in Synthesis Dimethyl Ether (DME)

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Abstract

Dimethyl ether (DME) is of great interest due to its wide application. It is currently being demonstrated for use as an alternative diesel fuel or substituting LPG for household. DME production via methanol dehydration reaction is affected by textural properties and catalyst surface acidity. The experimental study of textural properties in addition to surface acidity of both γ–Al_2O_3 prepared in this study and modified γ–Al_2O_3 over zeolite A and X mixing were conducted. The catalysts were characterized by N_2 adsorption-desorption, X-Ray diffraction (XRD), and temperature programmed desorption of ammonia (NH3-TPD). Referring to N_2 adsorption/desorption isotherm using the Brunauer-Emmerr-Teller (BET) equation, the catalysts were observed possessing high specific surface area (170–279 m^2 g^{-1}) and pore diameters of 5.6 – 8.8 nm (mesoporous). The XRD patterns of all catalysts still reveals clear peaks of γ–Al_2O_3 components. The strength of the acid sites of alumina modified with zeolite A is categorized as medium acid sites, whereas by modified by zeolite X varies.

BCP-22

Transformation of Eugenol into Coniferyl Esters, Providing Added Value to Indonesian Clove

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Abstract

Indonesia is the largest clove producing country. Most of the products are exported as clove oil. Eugenol is the main component in clove oil and has a selling price of US$5.0 per kg in the world market. Transformation of eugenol into derivative products with higher selling value and benefits will provide high added value to Indonesian clove. Coniferyl alcohol is a derivative product of eugenol which is widely used in food and cosmetics because of its strong antioxidant properties. Its price reaches US$345.0 per gram. In this study, eugenol was transformed into coniferyl esters in 3 steps. The phenol group was first protected as acetate or benzoate. Bromination of the allyl group then produced a dibromide which was subsequently converted to coniferyl esters through a simultaneous dehydrobromination-nucleophilic substitution step. One of the esters, 4-O-benzoyl coniferyl acetate, was produced with a total yield of 42% from eugenol. Hydrolysis of coniferyl esters will produce coniferyl alcohol. Transformation of eugenol into coniferyl alcohol has not been widely reported. This approach offer some advantages. The reagents are less expensive, each step is quite simple and takes place at low temperature. Therefore the reaction can be scaled up readily to gram scale.

Keywords: antioxidant, bromination, coniferyl alcohol, eugenol.

BCP-23

Production of Sulfonated Methyl Ester using a Falling Film Reactor and its Application for ASP Flooding

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Abstract

One of type enhanced oil recovery (EOR) method is chemical injection. Chemicals can be injected into system such as hydrolyzed polyacrylamide, surfactants, and sodium carbonate. Decreasing of the IFT value is influenced by surfactant. Methyl ester sulfonate (MES) is a surfactant which has surface-active properties, biodegradability, superiority of detergency, and not sensitive in water hardness. This study concerns on sulfonation of ME using SO_3 dissolved in oleum compounds (e.g. $H_2SO_4.SO_3$) and reacted in falling film reactor. Sulfonated methyl ester was produced from esterification of vegetable oils, palm kernel oil (PKO) and coconut oil (CNO). Sulfonation was carried out in a falling film reactor at heating temperature is 70°C and equipped with cooling water to help heat transfer. MES products were characterized by Fourier Transform Infra-Red (FTIR) and results show that there are S=O and O-H groups which write a sulfonation reaction has occurred. Phase diagram test was carried out to decide compose MES, co-surfactant, and formation water. Comparison of compose MES/co-surfactant/isotropic formation water is 1:20:27, which co-surfactant used is ethanol. Based on the IFT test data show that the MES from CNO produces the lowest IFT for light oil or waxy oil, which is equal to 11.4 Mn/m and 10.3 Mn/m. The effect of MES concentration on phase behavior is increase with more surfactant concentration and then decreases after passing the greatest conditions. Obtained oil is 12 to 23% OOIP (Original Oil In Place). The biggest acquisition was ASP flooding of 23.53% OOIP.

Keywords: methyl ester, sulfonated methyl ester, EOR, biosurfactant.

BCP-24

Central Composite Design Based Statistical Modeling for Curcuminoids Extraction of *Curcuma zeodaria* using Choline Chloride Based of Natural Deep Eutectic Solvents (NADES)

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Abstract

Ionic type of Natural Deep Eutectic Solvents (NADES) consists of choline chloride and organic acids, i.e. choline chloride-citric acid (CCCA) and choline chloride-malic acid (CCMA) is known as the most suitable liquefied solvent for curcuminoids extraction from Curcuma zeodaria. Previously, a successful laboratory scale extraction of curcuminoids from *C. zeodaria* was conducted in 5 Ml capacity; indicated that solvent per feed ratio (S/F) and extraction time are the two important variables for yielding high extraction rate of curcuminoids. Therefore, a central composite based design is used to optimize the extraction parameters such S/F (3/10, 5/10, 7/10), time extraction (18, 20, and 22 h), and stirring speed (200, 250, and 300 rpm) for 500 Ml and 1000 Ml extraction capacity of curcuminoids from *C. zeodaria*. It was observed that stirring speed is the most influential parameters among the studied parameters. However, due to the low bulk density of *C. zeodaria* powder, a homogenous mixed of *C. zeodaria* in the extraction tank was barely achieved; hence a low yield of curcuminoids is obtained.

Keywords: choline chloride, curcuminoids, DES, extraction, NADES.

BCP-25

Synthesis of Maleic Modified Rosin Ester from Pine Resin

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Abstract

Pine resin is mainly composed of rosin with a composition up to 90%; the rest is turpentine. Rosin is a chemical derived from plants that have multiple applications like paint, toners, varnishes, and as chemical additives. Rosin itself is an organic compound called diterpene tricyclic with carboxylic group on one of its chains. Because of the presence of double bond and carboxylic group, rosin is a relatively unstable compound. Double bond will be prone to oxidation and carboxylic group will be reactive to metals and is corrosive. To improve the stability of rosin, modifications must be done. This research focuses on two methods of modification; esterification with glycerol and saturation with maleic anhydride. Esterification reacts with carboxylic groups to form ester while maleic anhydride will react with the double bond; both reactions are intended to lower the number of their respective reactant. Based on this experiment conducted in this research; rosin must first be esterified with glycerol then followed by saturation with maleic anhydride. Esterification is done at 250°C for six hours without vacuum with 1:3 glycerol to rosin mole ratio meanwhile the saturation is done at 150°C for an hour with vacuum with 1:1 maleic anhydride to rosin ratio. Oxidation test indicates that the product is more stable than unmodified rosin with 0.5% decrease in clarity.

Keywords: rosin, modified, esterification, glycerol, saturation, maleat.

BCP-26

Quality of Egg Isa Brown Gaves Ration Flour Skin Dragon Fruit (*Hylocereus polyrhizus*) Fermentation

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Abstract

The objective of this study was to study the quality of egg Isa Brown received a fermented dragon fruit meal ration (*Hylocereus polyrhizus*) for 4 weeks. The design used was Completely Randomized Design (CRD) with 3 treatments, 5 replications in which each replication consisted of 10 chickens so that the total chicken used was 150 heads. The treatment given were: R0: ration without fermentation dragon fruit skin flour, R1: ration with 5% fermentation dragon fruit skin flour, and R2: ration with 5% fermentation dragon fruit skin flour, + 1% Calsium.Variabel observed: egg production, egg weight, exterior and interior egg shell weight, egg thick , HU. The results showed treatment of R0; R1, and R2 are not significantly different ($P > 0.05$) for yolk colours, pH, index, but % egg production, egg weight, HU, egg thickness ,R1 and R2 is significantly different ($P<0.05$) than R0. Conclude this research that quality of egg Lohmann Brown gaves ration fermentation flour skin dragonfruit (*Hylocereus polyrhizus*) 5% (R1) and with 5% fermentation dragon fruit skin flour + 1% Calsium (R2) increase the egg production, egg weight, HU, egg thick,

Keywords: egg weight, dragon fruit flour, HU, quality, yolk color.

BCP-27

Application of Biosurfactant for Bio-Detergent Formulation

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Abstract

Biosurfactants also known as biological surface active agents are a group of surface active agents which are produced by a variety of microorganisms. Biosurfactants possess the characteristic property of lowering surface tension, increase the solubility of poorly soluble compound, low toxicity, non-allergenic, and biodegradable. Growing public awareness about the environmental friendly health care and associated product has stimulated the search for ecofriendly compounds in laundry detergents. In this research the application of biosurfactants in the formulation of a washing powder was investigated. Variation of biosurfactants and its mixture with sodium tripolyphosphate as a builder and sodium sulphate as filler was applied to washing of cotton fabric which was contaminated with known amounts of edible oil. The effects of washing time, Ph, rasio of biosurfactants and builder was examined. The formulation presented in this study was also compared with some commercial detergents for the stains removal efficiency. The results showed that the biosurfactants formulation was effective in stain removal from the fabric.

Keywords: biosurfactant, biodetergent, stain, biodegradable.

Biomass Upgrading & Utilization (BUU)

BUU-01

Effect of Cationic CTAB Surfactants on the Performance of Graphene Electrode for Supercapacitor

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Abstract

Graphene is a two-dimensional sp^2 bonded carbon nanostructure packed in a honeycomb crystal lattice. Graphene has high theoretical surface area and high electrical conductivity, promising applications as electrode for supercapacitor. There are many methods to produce graphene, such as mechanical exfoliation using scocth tape, reduction of graphene oxide, and chemical vapor deposition. An alternative simple method to produce graphene is pyrolysis. Previous study shows that production of graphene from biomass via two stage pyrolysis has increased surface area but the capacitance is still low to be applied as electrode for supercapacitor. This study aims to hydrophilize graphene by using cetyl trimethylammonium bromide (CTAB) as surfactant. In this study, graphene is prepared from palm kernel shell using two stage pyrolysis method (the first stage was at 350°C followed by the second stage at 900°C) using $FeCl_3$ as catalyst and $ZnCl_2$ as activating agent, and give 16% yield. The morphology of produced graphene sheets were analyzed using scanning electron microscope and transmission electron microscopy, while its structures are examined using Raman scattering, X-ray diffraction, and Fourier transform infrared. These analysis show that the two stages pyrolysis produce multilayered graphene. The surface properties were analyzed by nitrogen adsorption–desorption measurements, which show some mesoporous graphene product with surface area of 351.27 m^2/g. Experimental results indicate that modified graphene is more hydrophylic than unmodified one, but according to the cyclic voltammetry analysis, specific capacitance of modified graphene (11.91 F g^{-1}) is lower than unmodified graphene (43.87 F g^{-1}).

Keywords: graphene, palm kernel shell, pyrolysis, surfactant, supercapacitor.

BUU-02

Isolation, Identification and Antimicrobial Activity of Secondary Metabolite Compounds Endophytic Fungi from Anona (Leaves *Annona squamosa* L.) Growing in Dry Land

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Abstract

Research on isolation, identification has been carried out and antimicrobial activity of secondary metabolites of endophytic fungi from anona (*Annona squamosa* L.) that grow on dry land. The research stages included growing endophytic fungi from samples on PDA media, followed by isolation of pure endophytic fungi. Furthermore, cultivation was carried out using rice and maceration media using ethyl acetate solvent. The extract obtained was then carried out chemical analysis and antibacterial activity test. Endophytic fungal species that are isolated are *Aspergillus niger*. Analysis LC-MS/MS obtained five types of compound components namely ephedradine A, ergosine, Ia, mudanpioside H and trichosanic acid. Antibacterial activity test results on gram positive bacteria *Staphylococcus aureus camp*. shows strong resistance response with DDH of 16.1 mm whereas in gram negative bacteria *Escerichia coli* 0175H7 and *Salmonella enteritidis* ATCC 6939 shows a moderate resistance response with DDH of 9.6 mm and 11.3 mm.

Keywords: *Annona squamosa*, endophytic fungi, antibacterial.

BUU-03

Sludge Biogas Made from Cow Feces Increases Rice (*Oryza sativa* L.) 'Segreng' Growth In Green House Scale

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Abstract

The cow releases feces about 10 kilograms per day. Cow feces will still become garbage or only become manure if not used as biogas material. Biogas is a gas produced by anaerobic activity or fermentation from organic materials, such as cow feces. The main content of biogas is methane gas. The by-product of biogas is biogas sludge. Sludge biogas is the mud that comes out of the biogas reactor outlet section This mud still contains nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca) and iron (Fe). Rice is the main food commodity plant in Indonesia. Segreng is variety of rice which one of the Gunung Kidul Regency germplasm. He purpose of this study was to analyze the growth of Segreng rice which was given the treatment of biogas sludge and determining the optimum dose of sludge biogas fertilizer in Segreng rice plant. The study was conducted in 4 treatments, namely doses of 0 Ml (control), 4 Ml, 8 Ml, 12 Ml and 24 Ml sludge biogas every polybag containing one individual plant. Polybag contains 5 kg soil. The parameters measured were plant height, leaf number, number of tillers and leaf chlorophyll content. The research design used was a Completely Randomized Design (CRD). The results obtained were tested by One Way Anova followed by DMRT Test with a confidence level of 95% ($\alpha = 0.05$). The results showed the highest plant height and leaf number in plants treated with 4 Ml sludge biogas. While the highest chlorophyll content and number of tillers were obtained in control plants. Then the optimum dose for plant height and number of leaves is 4 Ml per polybag.

Keywords: biogas, feces, growth, sludge, segreng rice.

BUU-04

Synthesis of Activated Carbon from Salacca Peel with Hydrothermal Carbonization for Supercapacitor Application

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Abstract

Supercapacitor is considered as promising technology in energy storage system (EES) because of high power, large currents, and excellent cycle stability. In this study, activated carbon was used as the constituent material for electrodes because it owns porous structure with large surface area, owns high conductivity, low cost, and renewable Activated carbon was synthesized from salacca peel by hydrothermal carbonization and chemical activation with KOH. Salacca peel was chosen as a precursor because it has high fixed carbon content and low ash content, but usually discarded as a waste. This research focused on the effect of operating pressure in the hydrothermal carbonization process. The the operating pressure used will determine the water phase in the hydrothermal process, where in this study the pressure is adjusted so that the water is varied in the vapor phase and liquid phase (subcritical water). In hydrothermal carbonization, temperature was varied at 225°C and 250°C with the carbonization time of 5 hours. Chemical activation using KOH as activating agent was done after obtained the hydrochar from hydrothermal carbonization process. Produced activated carbons were characterized by nitrogen adsorption-desorption, scanning electron microscope, Fourier transform infrared, X-ray diffraction, and Raman spectroscopy. Electrochemical properties of these carbons were characterized by cyclic voltammetry, galvanostatic charge-discharge, and electrochemical impedance spectroscopy. It is found that the largest surface area of produced activated carbons could be obtained is 2907.31 m^2/g and the largest capacitance of supercapacitor is 15.57 F/g.

Keywords: activated carbon, salacca peel, hydrothermal carbonization, subcritical water, supercapacitor.

BUU-05

Increasing the Yield of Powder and Bioactive Materials during Extraction and Spray Drying of Dragon Fruit Skin Extracts

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Abstract

Dragon fruit skin as waste from juice processing has been reported to be rich in bioactive materials. One potential utilization of dragon fruit skin is to produce bioactive materials as natural antioxidants and colorants for food industry by extraction and spray drying processes. This study aims to observe the quality (total phenolic compounds/ TPC, betacyanin and betaxanthin contents, and antioxidant activity) of the extracts and spray-dried products, and the quantity (powder yield) obtained by the use of different types and amounts of spray drying agents. Two drying agents were introduced during spray drying in this study, which were maltodextrin and whey protein isolate (WPI). The result shows that a lower extraction solvent to solid ratio may result in a lower yield of TPC, betacyanin and betaxanthin contents, and also antioxidant activity of the dragon fruit skin extracts. In addition, maltodextrin and WPI were found to be able to significantly increase the yield from spray drying, with the highest powder yield (72.7 $\pm$ 8.4 %) was obtained for the use of 40% maltodextrin as the drying agent, compared with 9.5 $\pm$ 1.8 % of that for the control. Furthermore, it was found that the spray-dried product could recover more than 90% of the TPC and betacyanin in the extracts, which indicates that spray drying may be suitable for the heat-sensitive materials, like bioactive materials in the dragon fruit skin extracts.

Keywords: antioxidant, food colorants, extraction.

BUU-06

Large Scale Synthesis of Carbon Nanotube from Palm Oil Mill Effluent (POME) by Pyrolysis using Tubular Furnace and Their Application in Supercapacitor

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Abstract

The utilization of Palm Oil Mill Effluent (POME) is advantageous to reduce environmental problems and increase its value as a source of carbon. Carbon nanotube (CNT) was synthesised by pyrolysis of POME and ferrocene mixture at 900°C under flowing nitrogen atmosphere. CNT is compatible as electrodes for energy storage device such as supercapacitor. The study investigated process for the large-scale formation of CNT from POME. The synthesis consists of POME polymerization, pyrolysis, and CNT characterization. Additionally, before pyrolysis, CNT collecting system was applied in tubular furnaces. The result showed that this process produced CNT with diameter of 47-100 nm, surface area of 1635.5 $m^2.g^{-1}$, pore size of 1.4 nm. XRD analysis, 2Θ of 26.58° indicated structure of graphite C(002), Raman spectra resulted ratio IG/ID of 1.16 indicated higher graphite than disorder. CNT was characterized and applied as electrode material for supercapacitor which exhibits specific capacitance of 13.98 $F.g^{-1}$.

Keywords: CNT, POME, pyrolysis, supercapacitor.

BUU-07

Secondary Metabolites of Some Varieties of *Caulerpa species*

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Abstract

Several species of Caulerpa have been investigated and bioactive principles, such as caulerpin and caulerpicine have been isolated from a number of them. Caulerpin produces mild anesthetic action, difficulty in breathing, sedation and loss of balance. The toxic syndrome has been reported to be somewhat similar to that produced by ciguatera fish poisoning. The neurotropic activity of caulerpicine is thought to be of clinical value. Tropical green algae, and a few of their temperate relatives have yielded a number of bioactive metabolites and some of these are believed to be used by the algae as a chemical defense against herbivorous animals. This research was aimed to determine the secondary metabolites compound of some varieties of *Caulerpa species*. Chromatography and Spectrophotometric method was using to conduct this research. The result shows that Caulerpin and caulerpicin presence on five species of Caulerpa species Caulerpa racemosa Siquijor, *Caulerpa lentillifera* wild and farm from Mactan, *Caulerpa clavifera* Mactan and *Caulerpa lentillifera* cultured in the common garden. Higher absorbance of both compounds caulerpin and caulerpicin found in wild *Caulerpa lentillifera* from Mactan while the lowest absorbance of caulerpin found in *Caulerpa racemosa* collected from Siquijor, whereas the lowest absorbance of caulerpicin found in the cultured *Caulerpa lentillifera* in the common garden.

Keywords: metabolites, *Caulerpa species*, absorbance.

BUU-08

Kinetic Studies of Turpentine Isomerization Using Hydrochloric Acid and Acetic Acid as Catalysts

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Abstract

Turpentine is a non-wood forest products derived from pine trees. Turpentine oil can be produced from the distillation of pine tree sap (family Pinaceae). The main component of turpentine is α-pinene. Turpentine can be used as raw material for various application such as paints, solvents, pharmaceuticals and rosin. The objectives of present study was to investigate the isomerization products of turpentine oil with two acid catalysts: hydrochloric and acetic acid. Here, the influence of acid concentration was investigated by using various concentrations of hydrochloric and acetic acid concentrations between 0.4 to 1 M. The experiments were carried out in a batch reactor equipped with heater, condenser, and stirrer. The reaction temperatures were maintained at 150°C and reaction time of 6 h. The resulting products from turpentine isomerization were analyzed using GC-MS. The initial screeing was conducted by using only hydrochloric acid as catalyst with concentration of 1, 0.7 and 0.4 M. The results showed that the three largest isomerization products obtained were trans sabinene hydrat, α-terpinolen, and camphene. Further, combination of acetic acid and hydrochloric acid as catalyst was also investigated by verying the molar ratio of HCl:Acetic Acid=0.5 : 1 and 1:1. The dual catalyst gave a number of isomerization products, namely trans-sabinene, α-terpinen, and δ-Carene. Furthermore, a global kinetic model was develop to investigate the kinetic parameter of the reaction based on the experimental results.

Keywords: turpentine, isomerization, hydrochloric acid, acetic acid, kinetics.

BUU-09

Kinetics Study of Fatty Acid Methyl Ester to Fatty Alcohol on Copper-Manganese Catalyst

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Abstract

Fatty alcohol (FA) can be produced by hydrogenating of fatty acid methyl ester (FAME) using copper-based catalyst. Copper-Chrom (Cu-Cr) is the best catalyst for high pressure reaction condition which is copper as main active component and chrom as promoter. Since Cr use has been banned due its toxicity, many researchs focuse on finding other metal as Cr replacement. Manganese (Mn) is considered as a good replacement since its environtment friendly and cheaper. The aim of this research is to find kinetic equation of hydrogenation FAME to FA using commercial catalyst, Cu-Mn. FAME with methyl laurate and methyl myristate as the main compounds is used as feedstock. The main products are lauryl alcohol and myristyl alcohol. The reaction was carried out in an isothermal continuous fixed bed reactor under conditions of temperature 220 – 240°C, pressure 50 bar, and liquid hourly space velocity (LHSV) 5-12.5 hr^{-1}. The kinetic equation is determined using power law model. The data showing that FAME hydrogenation on copper – manganese catalyst is the half order reaction with an the activation energy value is 86.32 kJ/mol and the Arrhenius constant value is $5.87x10^6$ M0.5/s.

Keywords: kinetic equation, FAME hydrogenation, Fatty alcohol, Copper-manganese catalyst.

BUU-10

Analysis of Density and Diversity of Seagrass: Case Study in Munaseli Village, Pante Deere Village, and Sub-District of Kabola, Alor Regency

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Abstract

Seagrass is a flowering plant (Angiospermae) that lives submerged in a water column and develops well in shallow and estuarine waters. Seagrass beds are very beneficial for coastal ecology as well as human life. This is because the seagrass ecosystem greatly supports the sustainability of fisheries resources in Indonesia. Information on the distribution and condition of seagrass somewhere needs to be well documented. This information is the basis for local communities to arrange appropriate management policies. Alor Regency is one of the remote areas in the border area of NKRI which has a high seagrass potential. Research showing the initial results of case studies of seagrass species diversity and density at three locations in Alor regency (Munaseli beach, Pante Deere beach, and sub-district of Kabola). The results of the research obtained that there were 7-8 types of seagrasses from 2 families (Hydrocharitaceae and Potamogetonaceae) in these 3 locations. The highest density seagrass species was Thalassia hemprichii with 177 stands.m^{-2} for Munaseli village, and 333 stands.m^{-2} for Pante Deere village and sub-district of Kabola. Seagrass conditions in all three locations were categorized as healthy with average cover >60%.

Keywords: alor, hydrocharitaceae, potamogetonaceae, seagrass.

BUU-11

Performance Efficiency of Sand Media Amended with Biochar for Phosphorus Removal Using Column Filtration

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Abstract

Increase of nutrient concentrations from wastewawater could cause a significant impact of water quality deterioration. Thus, it is crucial to regulate nutrient concentrations from wastewater effluents before the effluents are discharged to environment. Establishment of wastewater treatment is a one of the solutions. This study investigated the efficiency of columns filtration using sand media amended with biochar to remove phosphorus in the laboratory scale. The experimental design consisted of 7 packed columns based on the proportion of biochar in the sand media (0 – 25%). The columns were fed with 100 Ml phospate solution (10 mg/L) at the flow rate 66.6 Ml/h. The same steps were also performed using combination of PO_4^{3-}-P (10 mg/L) and NH_4^+-N (10 mg/L) solution. The results showed that phosphate concentration in the outflow decreased smoothly and in line with the increase of biochar percentage in the sand media. It means that the availability of biochar in the media influenced the amount of phosphorus adsorbed into media.

Keywords: column experiment, biochar, phosphorus, sand media, filtration.

BUU-12

Calcium Soap from Palm Fatty Acid Distillate (PFAD) for Ruminant Feed: The Effect of CaO Quality on Reaction Temperature

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Abstract

Indonesia is the largest palm oil producer in the world which contributes to 58% of the world's total palm oil production in 2018. Palm fatty acid distillate (PFAD) is palm oil refinery by-product that contains lots of free fatty acids. Previous research related to the production of calcium soap has successfully found the right stoichiometry and operating conditions at the laboratory and bench scale. This research examined the influence of CaO active concentration on the reaction temperature of calcium soap production on the pilot scale. First, molten PFAD, CaO solids, and water are feed into CSTR. The mixture will be released at a certain temperature and will flow from CSTR to the screw reactor and belt conveyor. The experimental result shows that the rate of temperature increment in experiments using CaO with active concentration of 79% is greater than CaO of 72%. This may be caused by the difference amount of heat released during the reaction, viscous mixture properties which then give the effect on the mass transfer process between reaction components. The result also shows that there is 14% - 19% temperature difference between the calculated and measured temperature, which is predicted due to heat loss particularly caused by evaporation during the reaction.

BUU-13

Production of Valuable Chemical Compounds by Endopyhtic Fungi Isolated from Plants

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Abstract

Natural products have always been an integral part of medical therapy. Many drugs have been developed from natural products mostly derived from plants. For example, the most effective anti cancer compounds– anthracyclines, vinbristin, vincristine, paclitaxel and campothecins – produced by plants. However, productions of these highly valuable compounds have threatened the existence of the plants as it requires a large number of materials from plants. This paper highlights the potential and importance of endophytic fungi as the producers of highly valuable compounds as it needs only a small amount of material from plants. For example, anticancer drugs like paclitaxel, vincristine and vinblastin were more common found in endophytic fungi than in plants. Moreover, the methods of activation of silent biosynthetic of endophytic fungi using epigenetic modifiers and co-culture with bacteria was also discussed. Our results suggested that mimicking the natural ecology in laboratory condition can expand the chemical diversity of endophytic fungi especially the production of antibiotic compounds using the mix culture approach.

Keywords: valuable chemical compounds, endophytic fungi, anticancer drug.

BUU-14

Secondary Metabolites Compound of Gorgonian Sea Plumes (Genus *Rhumpella*, *Isis* and *Ellisella*) from Maumere Waters-East Nusa Tenggara Indonesia

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Abstract

The abundance and diversity of gorgonian sea plumes in the marine waters of Maumere - East Nusa Tenggara was interested to explore in secondary metabolites research. The purpose of this study was to identifying the gorgonian sea plumes, and secondary metabolites component that have a biological activity. Identification was based on schleritic forms, and phytochemical tests on gorgonian extract of sea plumes. Maceration method was using for the extraction and secondary metabolite test using Harborne method. The results found three gorgonian genera, namely : *Rumphella*, *Isis* and *Ellisella*. The highest yield of gorgonian extract of *Rumphella sp*, was 7.84%. Secondary metabolites components identified were alkaloids, flavonoids, quinone, steroids, triterpenoids, tannins/ phenolics and saponins.

Keywords: *Ellisella*, *Gorgonian*, *Rumphella*, *Schlerit*.

BUU-15

Thermal Conversion and Gas-liquid Separation for Mercury Removal from Crude Oil

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Abstract

An improved process for mercury removal from crude oil has been developed. The occurence of mercury in such crude oil was found to be dominantly in the basic form of ionic non-volatile non-metalic species. Due to its high solubility, the non-volatile ionic mercury cannot be removed from a crude oil by gas stripping unless it is proceeded by preheating stage which converts various forms of mercury to elemental metalic mercury. Benefiting available kinetic data from literature and from our own experiments, the basic phenomena of thermal conversion followed by gas-liquid separation was modeled and simulated using Aspen Hysys. Peng-Robinson fluid package was used with adjusment on some binary interaction parameters to validate the transient experimental data on temperatur, liquid volume, and ionic, elemental, total mercury concentrations. The model was also applied to simulate the effect of temperature on the conversion and removal efficiency of serial continuous thermal reactor and vapor-liquid separator.

Keywords: mercury removal, crude oil, thermal conversion, v-l separation, gas stripping.

BUU-16

Preliminary Study on Utilization of Waste Chocolate Condensate as Cocoa Powder

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Abstract

The chocolate condensate, a side product of roasting process in chocolate production, contains mostly volatiles and liquid chemical compounds similar to the cocoa beans. Currently, it is only considered only as a waste although some important chemicals could be obtained by extraction. This study purposes to extract valuables chemicals, such as pyrazine that has a strong aroma to chocolate, from chocolate condensate using 3 different solvents, ie. n-hexane, toluene and ethanol. Later, cocoa powder production from chocolate condensate was developed comparing two different drying methods (spray dryer and tray dryer) and analyzed using FTNIR, FTIR, and GC-MS.

Keywords: chocolate condensate, extraction, roasting, tray dryer, spray dryer, pyrazine.

BUU-17

Production of Bioactive Materials for Food Additives from Dragon Fruit Skin Extracts: Effect of Pre-treatment and Extraction Methods

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Abstract

Dragon fruit is one of the tropical fruits that can be grown in Indonesia. The skin of dragon fruit, which is accounted for 30-35% of the whole fruit, is usually thrown away as waste. Previous studies have reported that dragon fruit skin contains bioactive materials, such as antioxidant compounds, phenolic compounds, and natural pigment (anthocyanin and betacyanin). This study aims to produce bioactive extract from extraction and spray drying of dragon fruit skin that is rich in phenolic and pigment compounds, so that it can be used as food additives.The variation that was used in this study includes the application of drying as pre-treatment of dragon fruit skin and the extraction methods (maceration and Soxhlet extraction). The obtained extracts were evaluated for the amount of total phenolic compounds and pigments (anthocyanin and betacyanin). Drying of dragon fruit skin was found to yield lower amounts of bioactive materials, which may occur due to the thermal degradation even though a low drying temperature was used. In addition, maceration method was found to give a higher amount of bioactive materials compared with Soxhlet method. The extraction with the highest yield of bioactive materials was obtained by the use of fresh dragon fruit skin and maceration for 240 minutes, that gave amounts of anthocyanin, betacyanin, and total phenolic compounds of 0.08, 0.04, dan 0.35 mg/g fresh dragon fruit skin, respectively.

Keywords: extraction, antioxidant, natural colorant.

BUU-18

Analysis of Chemical Profile and Antibacterial Activity of Endophytic Fungi from Anona (Leaves *Annona squamosa* L.) Growing in Dry Land

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Abstract

A research dealing with profile analysis of endophytic fungi chemical compounds and antibacterial activity test has been done. The aims of this study was to determine the content of bioactive compounds and to determine the antibacterial activity of endophytes fungi of anona leaves. The methods used in this study are culture, maceration, high perfomance liquid chromatogaphy analysis, fractionation, liquid chromatography mass spectroscopy analysis and diffusion disc method for anti-bacterial analysis. The results of maceration produced ethyl acetate and methanol extract with yield percentages of 0.1424 and 4.0263%. From the HPLC analysis showed the presence of compounds in anona leaf endophytic mushroom extract. The result of fractionation from methanol extract produced 70% pure compound. Ethyl acetate extract produced 5 types of compounds from LC-MS / MS analysis namely Deoxypaeonisuffrone, Isaindigodione, Pterosine R, Schizonepetoside and Trichosanic acid. Results of antibacterial activity tests on *Staphylococcus aureus* and *Eschericia coli* bacteria showed that 70% dicloromethane pure compound has strong antibacterial activity against *Staphylococus aureus* bacteria which is 10.3 mm.

Keywords: annona squamosa, endophytic fungi, antibacterial.

BUU-19

Optimization of Medium Composition for the Production of *Monascus purpureus* Pigments through Solid-state Fermentation

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Abstract

Colorants are component that is commonly added to many kinds of product, including food products. Regardless of its effectiveness and lower price, the effects of synthetic colorants towards human's health become a challenge for food colorant industries. Production of natural food colorant using microorganism as the producing agent is a promising prospect because microorganism has a high growth rate. *Monascus purpureus* can produce a set of natural pigments consist of yellow (monascin and ankaflavin), orange (rubropunctatin and monascorubrin) and red (rubropunctamine and monascorubramine) pigment.
The objective of this research is to optimize the micronutrient composition in the medium for the production of Monascus pigment through solid-state fermentation using the job's tears (Coix lacryma-jobi L) as the substrate. Response surface method (RSM) is used to optimize the concentration of four substrate components: MSG, NaCl, KH_2PO_4, and $MgSO_4$. From the experiment, it is found that the maximum red pigment is produced with added micronutrient with composition of (w/w): MSG 1,496%, NaCl 1,0%, KH_2PO_4 3,515% and $MgSO_4$ 0,206%. The yellow pigment is maximally produced with additional micronutrition with composition of (w/w): MSG 1,5%, NaCl 1,0%, KH_2PO_4 2% and $MgSO_4$ 0,2%. Biomass is maximally produced in the medium with with additional micronutrition with composition of (w/w): MSG 1,41%, NaCl 1,01%, KH_2PO_4 5,0% and $MgSO_4$ 0,2%. Among those nutrients, MSG gives the biggest impact on the increasing of pigment and biomass production.

Keywords: *Monascus purpureus*, Solid-state fermentation, Pigment, Coix lacryma-jobi L, Response surface methodology.

BUU-20

Ethnobotany Study of Lontar Tree (*Borassus flabellifer* L.) at Raijua Island

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Abstract

The aims of the study were to determine the utilization of Lontar Plant (*Borassus flabellifer L.*), its organ used in relation with the culture of the Savu community. Data were colleted using semi-structured techniques interviews,field observations, questionnaire, preference and and direct matrix ranking with index of cultural significance. Data were analyzed to calculate the indexvalue of cultural significance which was included 3 aspects, namely the use value (q), the intensity value (i), and the exclusivity value (e) of the plant and were described qualitatively. The results showed that the utilization of plants in the cultural life of the Savu community was very high. The utilization of plant parts was carried out by cutting, slicing, tapping and weaving. The parts mostly used were the roots, stems, stalks, leaves, flowers, and fruit.

Keywords: ethnobotany, lontar tree, borassus flabellifer l, index of cultural significance, savu cultural.

BUU-21

Performance of Hollow Fiber Polypropylene Membrane Diffuser for Wet-Free CO_2 Absorption

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Abstract

The capture of carbon dioxide (CO_2) from gaseous streams has gained a great interest and becomes an important process in many industrial areas. This includes the capture of CO_2 from natural gas in order to meet the specifications required by consumers as well as CO_2 capture from flue gas to mitigate increasing concentration of CO_2 in the atmosphere. Membrane-based technologies have been drawing a great attention for carbon capture applications due to their advantages such as low cost, low energy, flexible in operation, and modularity. The membrane can also be integrated with another process such as gas absorption, combining the benefit of both processes as applied in membrane contactor. However, the operation of membrane contactor is still limited by wetting phenomenon which affects its performance stability. In this study, hollow fiber polypropylene membrane diffuser was proposed for providing wet-free CO_2 absorption. The influence of operating pressure on CO_2 concentration and retention time was investigated. In addition, the effect of membrane hydrophobicity was also observed.

Keywords: bubble gas; carbon capture; CO_2 separation; hydrophobicity.

Sustainable Process & Technology Development (SPTD)

SPTD-01

Simulation and Parametric Study of the Innovated Process to Purify Bioethanol with Ethylene Oxide Hydration as an Auxiliary Reaction

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Abstract

By the conventional process, to purify bioethanol from fermentation reactor or bioreactor is relatively high cost, since the purity of bioethanol in the bioreactor output is very low (just around 20%) and there is azeotropes between bioethanol with water. Therefore, in the conventional process, distillation column and adsorption column is needed in order to get bioethanol with purity of 99.5% or above. In this research, an innovated process to purify bioethanol in a reactive distillation column with auxiliary reaction of ethylene oxide hydration was proposed. The auxiliary reaction broke the water/bioethanol azeotrope. Impacts of the ethylene oxide loading, the reflux ratio, and the bottoms rate were investigated by simulating the process in Aspen Plus software. The results revealed that the innovated bioethanol purifying process theoriticaly could produce bioethanol with the purity of 99.9%.

Keywords: bioethanol, ethylene oxide, process innovation, simulation.

SPTD-02

Photoreduction of Carbon Dioxide to Produce Formic Acid in Aquatic Phase

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Abstract

Photoreduction of carbon dioxide is one of the promising method to reduce greenhouse gas emission. Carbon dioxide can be converted into organic chemical that has higher economic value by utilizing light energy. One of the favorable product is formic acid which is can be used as hydrogen-carrier. For this process, photocatalyst plays important role as it can increase the rate of reaction and as well as the selectivity as such more desirable product can be produced. The objective of present study is to develop photocatalyst which can significantly catalyze the photoreduction process of CO_2 to form formic acid. Zinc titanate doped with aluminium is used as the base photocatalyst. Photoreduction process is held in room condition using three 2800 lm lamp. Qualitative analysis of the product is done by silver solid test and acidity test while quantitative analysis is done by High Performance Liquid Chromatography (HPLC) test. The silver solid test results confirm that formic acid is formed during process. Based on acidity profile data, anthocyanin as photosensitizer could increase higher acidity in the mixture than melanin. However, the concentration of formic acid in the solution is still very low so that it cannot be detected by HPLC.

Keywords: photocatalyst, photosensitizer, photoreduction, formic acid, carbon dioxide.

SPTD-03

The Effect of Pressure and Compression Ratio on Biogas Upgrading to Biomethane with CO_2 Absorption using Pressurized Water

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Abstract

Palm Oil Mill (PKS) produces liquid waste in the form of palm oil mill effluent (POME), which is produced from condensate stew, hydrocyclone water, and sludge separator. POME needs to be processed because it contains organic carbon with a COD more than 40 g / L and a nitrogen content of about 0.2 and 0.5 g/L as ammonia nitrogen and total nitrogen. At present, one way to treat POME is by converting POME into biogas using anaerobic ponds. Biogas produced generally contains 60% methane (CH_4) and 40% carbon dioxide (CO_2). Biogas can be purified into biomethane through the technology of CO_2 separation, for example by CO_2 absorption using water. This study evaluates the optimum pressure and feed compression stage in biogas upgrading into biomethane. The results show the rate of circulation of water needed to separate CO_2 from biogas feed decreases with increasing absorber pressure due to increased solubility of CO_2 in water. Water circulation pumps and biogas compressor works increase due to the increase in pressure difference needed. The optimum pressure of the biogas biogas purification unit into biomethane is within the range of 7-10 bar. At the same absorber pressure, the overall unit price for the case with 1 stage of feed compression is smaller than the case with 2 stages of feed compression. However, it could not have been concluded yet that the process with 1 compression stage is more economical overall than the 2-stage compression process because of the disadvantages of higher methane loss, resulting in smaller biomethane products.

Keywords: CO_2 absorption, biogas, biomethane, POME, water stripping.

SPTD-04

Insect Diversity Profile of Mangrove Ecosystem in Menipo Nature Tourism Park, East Amarasi, East Nusa Tenggara

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Abstract

Insects are one of the biotic components that make up the mangrove ecosystem. The diversity of insects is believed to be used as one of the bio-indicators of the condition of the mangrove ecosystem. This study aimed at determining the profile of insect diversity in the mangrove ecosystem in Menipo Nature Tourism Park, East Amarasi, East Nusa Tenggara. The study was conducted in February 2018 to June 2018. Insect capture was carried out using the yellow pan trap method. Data analysis was done quantitatively to determine the profile of mangrove insects. The profile of mangrove insect diversity was determined based on species richness index, Shannon-Wienner diversity index, evenness index, and Jaccard similarity index. The results showed that there were 14 species, 11 families, and 5 orders with a total number of 56 individuals in mangrove ecosystem of Menipo Nature Tourism Park. Genetic wealth of mangrove buffer was still relatively low (R1 <3.5). The diversity of mangrove insects was classified as moderate (H '= 1-3). All mangrove insects had almost the same level of evenness (E <1). The similarity index of mangrove insects in Menipo Nature Tourism Park, East Amarasi ranges from 0.18 to 0.5, meaning that the similarity of mangrove insect species among the three stations was different from each other.

Keywords: insects, mangroves, Menipo Nature Tourism Park.

SPTD-05

Small Scale Biogas Upgrading by Carbon Dioxide Fixation with Calcium Hydroxyde Solution Using Bubble Column Contactor

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Abstract

Biogas is a potential and promising renewable energy and as a carbon source to meet energy needs for rural as well as for urban in Indonesia. Biogas typically consists of methane (50–70%), carbon dioxide (30–45%), traces of water vapour and hydrogen sulfide. The presence of methane causes it combustible, while carbon dioxide, besides being non-combustible, constrains its compressibility thereby making it difficult to be stored in containers.
In this work, the raw biogas from small scale digester was upgraded by counter-current contacting it with a saturated $Ca(OH)_2$ solution in a bubble column contactor to fixating CO_2. The bubble column comprises of a cylindrical column 7.3 cm in diameter and 100 cm high and is equipped with a perforated plate gas distributor. Raw biogas was fed into bottom column through gas distributor, while saturated $Ca(OH)_2$ solution was fed into liquid surface at top column with constant flow rate. The effect of ratio raw biogas to $Ca(OH)_2$ solution flow rate with different liquid height and concentration of $Ca(OH)_2$ solution on CO_2 captured were investigated. The composition of biogas inlet and outlet were measured using Gas Chromatography. The results showed that CO_2 content in biogas exit decreased from 32.2% to 9.87%, while CH_4 content increase from 67.8 to 90.13%. The effect of increasing the liquid height from 50 to 80 cm on CO_2 captured is not significant. However, the effect of increasing the $Ca(OH)_2$ concentration on CO_2 captured is not significant. The effect of increasing the concentration of $Ca(OH)_2$ solution on CO_2 absorption is slightly significant.

Keywords: biogas upgrading, fixation, carbon dioxide, bubble column.

SPTD-06

Acid Effect in the Improvement of Extraction Yield and Antioxidant Activity in Tomato

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Abstract

Tomato is one of the most common vegetables which can be found abundantly in every countries. Within the harvest time, a lot of tomatoes become waste due to its high water content. Appropriate drying strategy followed by product diversification need to be observed to solve this problem. In the other hand, nowadays people awareness of healthy lifestyle is increasing dramatically. One of the most important functional foods which can support this issue is antioxidant.
In this work, we used tray dryer for 7 hours at temperature of 60°C to prevent the damage. Further, we used soxhletation and maseration methods in ethyl acetate (which has low toxicity, unlike other organic solvents) with variation of F:S and extraction time. To promote the cell disruption, in order to increase the extraction yield and antioxidant activity, we added citric acid with concentration of 5 and 10 %-w/w. Citric acid indeed could enhance the yield, but mostly it decreased the antioxidant activity, due to the side reaction towards 5-hydroxymethylfurfural. The highest yield of soxhletation is 50,54 %-w (F:S=1:20, t= 6 h, and 15 %-w/w of citric acid) and maseration is 100 %-w (with F:S=1:20, t= 3 days, and 5 %-w/w of citric acid). We got a strong antioxidant through soxhletation with IC50 = 50,9 ppm (F:S=1:15 and t= 4 h, without citric acid). While for the maseration, the best result we could get is IC50= 357,773, which is classified as very weak (F:S=1:20, t= 3 days, and 5 %-w/w of citric acid).

Keywords: tray dryer, antioxidant, extraction, maseration, soxhletation, antioxidant activity, IC50, acid effect, yield, tomato, citric acid.

SPTD-07

Influence of Hydrocarbon Concentration in Produced Water on Biofilm Formation and Corrosion of Carbon Steel by *Bacillus megaterium*

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Abstract

Produced water, the largest wastewater from oil and gas well, is highly toxic and corrosive. Corrosion in produced water systems can be caused by microorganisms (Microbially Induced Corrosion). In order to determine the effects of produced water composition on the corrosion of carbon steel by Bacillus megaterium, carbon steel coupons were immersed in synthetic produced water hydrocarbon concentration of 60 mg/L, 565 mg/L and natural produced water. Results showed that the highest corrosion rate occurred in the medium with 60 mg/L of hydrocarbon and the lowest corrosion rate in the medium with 565 mg/L of hydrocarbon. Results also showed that *Bacillus megaterium* inhibits corrosion of the carbon steel. FTIR detected protein, carbohydrates, and lipids as the composition of biofilm. XRD detected magnetite (Fe_3O_4) as the main corrosion product. EIS and SEM detected the layer system of carbon steel immersed in produced water system were biofilm and corrosion product.

Keywords: bacillus megaterium, biofilm, biocorrosion, carbon steel, hydrocarbon, produced water.

SPTD-08

Extraction of Free Fatty Acids from Rice Bran Oil by Renewable Solvents: Equilibrium Data and Number of Equilibrium Stages

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Abstract

Rice bran, a byproduct of rice milling, is a source of edible oil. Rice bran oil has been recognized as a healthy oil since it contains vitamins and antioxidants and has the best balance of saturated, monounsaturated, and polyunsaturated fats. It can help lower harmful cholesterol and fight free radicals. Rice bran, however, contains lipase enzymes which hydrolyse triglycerides resulting in high free fatty acid contents. Saponification is the conventional method for deacidification of edible oil. However, it results in high neutral oil lost when applied to edible oils with high free fatty acid content. Liquid-liquid extraction using alcohols has been considered as an alternative to saponification. The design and operation of liquid-liquid extraction requires liquid-liquid equilibrium data. The liquid-liquid equilibrium data found in the literatures were obtained using a single fatty acid. This work is aimed to measure the liquid-liquid equilibrium data and to calculate the required number of equilibrium stages for extracting of free fatty acid from rice bran oil. Renewable alcohols, ethanol and isopropanol, were selected as solvents. The measurements of equilibrium data were carried at 25°C using aqueous ethanol and isopropanol as solvents. Fatty acid mixtures were prepared by hydrolysing rice bran oil. It was found that ethanol has higher selectivity but has lower distribution coefficient than isopropanol. For the same solvent, increasing water content resulted in higher selectivity but lower distribution coefficient. The complete data were presented in ternary diagrams. Using the obtained diagrams, graphical calculations on liquid-liquid extraction have been done. For the feed fatty acid contents of 30% in the feed and the raffinate fatty acids content in range of 10% to 2.5%, the minimum solvent-to-feed ratio was found in the range of 1 to 5. In addition, using solvent-to feed ratio between 2 to 5, the number of extraction stages required was in the range of 1 to 8.

Keywords: rice bran oil, free fatty acid, aqueous alcohol, equilibrium data, equilibrium stage.

SPTD-09

Analysis of Iron (Fe), Phosphate (PO_4^{3-}) and Sulfate (SO_4^{2-}) in Hot Water in Tubbe Village And Aramaba Village, Pantar Tengah District, Alor-NTT

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Abstract

Clean water standards are tasteless, colorless and odorless. Hot water in Tube and Armada villages is used by the community for drinking, cooking, washing, bathing and other needs. However, the physical parameters of the water no longer meet the standard because it is slightly colored and has a distinctive of sulfur. The low quality of water affects the people who consume the water. The main problem is clearly seen in the teeth of the people in Tube and Armada villages which are generally yellow. Therefore, it is important to analyzed water quality to determine the levels of iron (Fe), phosphate (PO_4^{3-}), and sulfate (SO_4^{2-}) in hot water in Tubbe Village and Armada Village, Pantar Tengah District. Iron content testing is carried out using an atomic absorption spectrophotometer. Testing of phosphate and sulfate was used UV-Vis spectrophotometer. The results of measurements of hot water samples in Tube Village showed that the iron (Fe) 0.04 mg/L, phosphate (PO_4^{3-}) 0.09 mg/L and sulfate (SO_4^{2-}) 11,31mg/L. This value is below the maximum level threshold according to Minister of Health Regulation No. 149 of 2010. The results of the Armada Village are 0.04 mg/L; 0.09 mg/L and 11.31 mg/L for iron (Fe), phosphate (PO_4^{3-}) and sulfate (SO_4^{2-}). This value is above the threshold of calcium content according to Minister of Health Regulation No. 149 of 2010.

Keywords: hot water, iron (Fe), phosphate (PO_4^{3-}), sulfate (SO_4^{2-}), Tubbe village, Armada village.

SPTD-10

Conceptual Design on the Integrated CO_2 Mineralization Process with Sugar Plant

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Abstract

Sustainable development goals set the challenge to achieve in the next ten years. All the stakeholders including industries have been forced to take serious action in preserving the environment. Therefore, recycle of waste into energy and valuable chemicals have become attention in industries.
The energy penalty and cost are the main barriers of the Carbon Capture Utilization and Storage (CCUS) technology application, furthermore, considering suitable design for each industrial process. In this study, a conceptual process design for waste from sugar manufacturer is investigated. Sugar industry produces waste in the form of gas, solid, and liquid. The gas waste is the flue gas from boiler; solid waste is the mud from filter press; also liquid waste from washing and distilleries. Integrated waste treatment could be done by using the CO_2 from the flue gas to convert the mud which contains minerals such as Magnesium and Calcium
The step proposed for sugar industry waste management is by capturing the CO_2 from the boiler and absorb it into the mineral solution extracted from mud. The mud will undergo the extraction using Ammonium Chloride to extract the minerals and then using the mixture of Hexane and Toluene for wax recovery. The alkali extracted from the mud then will be converted into Calcium Carbonate and Magnesium Carbonate via single absorption and mineralization. The paper will assume the process and calculate the mass and energy balance for the proposed scheme. The feasibility of the process will be the outcome expected from the conceptual design.

Keywords: sustainable, CCUS, sugar, waste, CO_2, mineralization.

SPTD-11

Aspen Hysys Simulation for Production of Treated Distillate Aromatic Extract (TDAE) by Furfural Extration Process

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Abstract

TDAE can be produced from DAE by extracting the polycyclyc aromatic (PCA) components using furfural as solvent. Used as process oil in the rubber and tyre industries, TDAE has to meet restriction of PCA content less than 3%-wt, which is equivalent to the content of carcinogenic polyaromatic hydrocarbon (PAH) less than 10 ppm. To enable extraction, DAE liquid has to be mixed with diluent (hexane) in a ratio of approximately 1:1 by volume. This mix feed will then be mixed with the furfural solvent to obtain raffinate phase containing TDAE product and the extract phase containing HACE (high aromatic concentration extract) byproduct. The challenge of this process is to find the optimal solvent to mix feed (S/F) ratio and operating temperature to maximixe the yield of TDAE while meeting the restriction on maximum PCA content, minimum total aromatic content of about 25%-wt, and kinematic viscosity at 100°C of about 10 cSt. The use of process simulator Aspen Hysys was demonstrated to be very beneficial for this purpose. The complex DAE feed was first modeled with pure components to represent PAH, PCA, Non-PCA, and oil. The composition of DAE was then validated to give the bulk properties and boiling point curve as closely as possible to the data. With the defined feed, the extraction proses was simulated using Peng-Robinson fluid package and validated with experimental data of multi-stage batch extraction to obtain the required binary interaction parameter values of furfural with all other components. The applicability of the model was then demonstrated to simulate the characteristic of continuous extraction column for production of TDAE.

Keywords: TDAE, PCA, PAH, furfural, extraction, simulation.

SPTD-12

Electroreduction of CO_2 to Formic Acid with Pb-Sn Alloy Cathode

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Abstract

Greenhouse gases especially CO_2 must be reduced in order to minimalize the effect of global warming. Hence, electrochemistry reduction of CO_2 which can convert CO_2 to another high economic value compound should be developed. The CO_2 electrochemistry reduction is done by varying catholyte type of $KHCO_3$ and $NaHCO_3$. Experiment is carried out with Pb-Sn cathode, Pt-Ir anode, and 0.1 M H_2SO_4 as anolyte. CO_2 was bubbled to be dissolved in a 400 Ml catolyte with a bubbling flow rate of 75 Ml/minute. Based on the experiment, it can be concluded that $KHCO_3$ electrolyte gives higher amount of formic acid product and higher faradaic efficiency. Electrolyte concentration and cell voltage in the range of 0.1-1 V are directly proportional to product amount and faradaic efficiency. The optimum amount of formic acid that can be produced from this experiment is 9400 µmol, by using 0.5 M $KHCO_3$ catholyte. This variation has provided a faradaic efficiency of 67.19% and conversion of 0.326%.

Keywords: CO_2, electrochemistry, formic acid, global warming, reduction.

SPTD-13

Sensitivity Analysis of Fuzzy Simple Additive Weighting to Determine Land Suitability for Corn in Kupang Regency

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Abstract

The change in geographical state such as weather and climate make it difficult for farmers to prepare adequate land for corn cultivation. This research analyzes the fuzzy simple additive algorithm used to determine land suitability in Kupang Regency and the use of sensitivity analysis to obtain information on the most ductile variables. Two testing models were conducted in this research, namely accuracy and sensitivity tests. The results of accuracy test showed 80% precision, while sensitivity showed that rainfall, soil depth, and C-organic were highly sensible with a percentage of 100%, followed by slope and soil texture at 66.66%. Furthermore, the irrigation system, spring, and level of disaster had a percentage of 33.33%.

Keywords: sensitivity analysis, fuzzy simple additive algorithm, corn, land suitability.

SPTD-14

Comparison of Liquid Product Character from PFAD Metal Soap Decarboxylation by Batch and Continue Process

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Abstract

A continuous process that can be run well will benefit the world of industry in the future. This paper investigated the effect of decarboxylation process on the composition of liquid product character. The decarboxylation carried out in batch and continuous process. Metal soap that used for decarboxylation are made from Palm Fatty Acid Distillate (PFAD) with mix metals oxide Zn, Mg and Ca. Decarboxylation in batch reactor carried out at 400°C for 5 hour, while by continuous process carried out at 400°C with feed flow rate 3.75 gr/minutes. Theoretically, the yield of a batch process based decarboxylation are 76.6 weight-% and continue process are 73.37 weight-%. The liquid product has been fractionated to separate short chain hydrocarbon that is C7-C10 (gasoline fraction) and medium-long chain hydrocarbon or greater than C11 (green diesel fraction). Green diesel fraction showed that alkane content from batch higher than continuous process. Whereas, continuous process producing higher ketone products than batch process. GC-FID analysis showed a similarity of total hydrocarbon (alkane, iso-alkane and alkene) in both batch and continue process.

Keywords: decarboxylation, metal soap, batch process, continuous process, hydrocarbon, green diesel.

SPTD-15

Principal Component Analysis with Successive Interval in K-Means Cluster Analysis

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Abstract

K-Means Cluster is a cluster analysis for continuous variables with the concept of distance used is a euclidean distance where that distance is used as observation variables which are uncorrelated with each other. The case with the type data that is correlated categorical can be solved by making categorical data into numerical data by the method called successive interval and then used Principal Component Analysis. Applied this method in poverty data of East Nusa Tenggara Province in K-Means cluster obtained that Principal Component Analysis with Successive interval obtained variables that take effect to the cluster formation are toilet, fuel,and job.

SPTD-16

Prediction of Student Learning Outcomes using Naive Bayesian Algorithm (Case Study of Tama Jagakarsa University)

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Abstract

Assessment of student learning outcomes is the most important part in a learning process. Student achievement can be determined based on the achievement of final grades in certain subjects. Student final grades can be used to evaluate and predict student achievement in the future. This research was conducted to analyze the Naïve Bayesian Classifier (NBC) algorithm in predicting the final grades of students in the future based on student final grade data in the previous semester. This study is useful for students to improve their grades, according to their predicted weaknesses through this research (wake-up calling). The results of this study indicate that NBC successfully classifies data with an accuracy of 94.2446%.

Keywords: Naive Bayes Classifier, Wake up Call, prediction.

SPTD-17

Simulation and Parametric Study of the Innovated Process to Purify Bioethanol with Ethylene Oxide Hydration as an Auxiliary Reaction

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Abstract

By the conventional process, to purify bioethanol from fermentation reactor or bioreactor is relatively high cost, since the purity of bioethanol in the bioreactor output is very low (just around 20%) and there is azeotropes between bioethanol with water. Therefore, in the conventional process, distillation column and adsorption column is needed in order to get bioethanol with purity of 99.5% or above. In this research, an innovated process to purify bioethanol in a reactive distillation column with auxiliary reaction of ethylene oxide hydration was proposed. The auxiliary reaction broke the water/bioethanol azeotrope. Impacts of the ethylene oxide loading, the reflux ratio, and the bottoms rate were investigated by simulating the process in Aspen Plus software. The results revealed that the innovated bioethanol purifying process theoriticaly could produce bioethanol with the purity of 99.9%.

Keywords: bioethanol, ethylene oxide, process innovation, simulation.

SPTD-18

$FeCl_3$ Coagulant Production from Waste Pickle Liquor using Electrolysis

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Abstract

Pickling is a typical method used in a cold milling plant to remove impurities from hot rolled coil by immersing the coil in strong acidic solution. The spent acidic solution or waste pickle liquor (WPL) requires certain waste treatment before it can be disposed to environment because of its metallic ion and acid content. WPL contains a number of metallic ions that can be utilized as ferric chloride coagulant. The purpose of this paper is evaluate the kinetics of Fe^{2+} oxidation into $FeCl_3$ and the performance of the ferric chloride coagulant using the proposed electrolysis configuration. The electrolysis process was conducted in ambient condition with voltage 3 & 6 V, electrolysis time of 120 minutes, and addition of excess NaCl or HCl. The result shows that metal impurities in WPL and excess chlorine do not significantly affect the Fe^{2+} conversion. It can also be concluded that the optimum condition for electrolysis is using 6V of voltage, 90 minutes of electrolysis time, and excess chlorine at 0% stoichiometry.

SPTD-19

Protein Cj0391c Structure and Interaction with Lipid Bilayer Membranes

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Abstract

The identification of virulence mechanisms associated with *Campylobacter jejuni* is important for future development of an anti-Campylobacteriosis vaccine, as this is an effective way to reduce the number of cases. The important start for that is by identifying the secreted proteins of this pathogen. One of them has been studied recently is Cj039lc, which was identified as an o-helical pore toning protein (PFP) and causes apoptosis in chicken macrophage cells. This protein was then expressed, purified and analyzed for the interaction with lipid bilayer membrane in this study as it was thought that the mechanism of apoptosis might be similar to the cytotoxicity mechanisms of other o-helical toxins. The major research aim of this study is to determine whether or not Cj0391c could penetrate and disrupt the membrane as an α-PFP, thus testing the hypothesis that this could be the mechanism by which Cj039lc triggers apoptosis. The potential interaction of protein and membrane was evaluated using Small Angle X-Ray Scattering (SAXS) and Dynamic Light Scattering (DLS). Although the results did not show the indication of the protein insertion into the membrane, insight was obtained into optimal expression and purification methods for Cj0391c and the likely shape of this protein since the size and shape of protein Cj0391c was also identified by SAXS analysis.

Keywords: *Campylobacter jejuni*, Cj039lc, pore toning protein, apoptosis, α-PFP, lipid bilayer membrane, SAXS, DLS

SPTD-20

Enhancement of Aromatic Content in Catalytic Cracking of Palm Oil to Biofuels using Zeolite-based Catalyst

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Abstract

The catalytic cracking of palm oil over zeolite H/ZSM-5 catalyst for the production of biofuels was studied in a micro fixed-bed reactor system operated at atmospheric pressure, a reaction temperature of 500°C and weight hourly space velocities (WHSV) of 2.6 h^{-1}. Palm oil is considered as an alternative and sustainable feedstock for the production of biofuels in which these fuels are known as environmentally friendly owing to its free of nitrogen and sulfur content. It is interesting to note that as for the future mass production, the catalytic cracking technology of palm oil may employ the available infrastructure in the refining process of fossil fuel. In the present work, the aromatic content in biofuels that is highly valuable can be enhanced using zeolite H/ZSM-5 catalyst. Series of H/ZSM-5 catalysts were varied by their Si/Al ratios. The catalytic cracking results show that the aromatics distribution in biofuels increases in the following Si/Al ratio order of H/ZSM-5 catalyst: 80 > 38 > 25. It appears that for the formation of aromatics needs milder acidity since the higher number of acids lead to the cracking products of more gaseous and heavy aromatic products. These results may further support the feasibility of biofuels to meet new regulation of petroleum, petrochemical and fine chemical sectors processed by environmentally benign feedstock.

Keywords: catalytic cracking, palm oil, zeolite, ZSM-5, aromatic, biofuel.

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