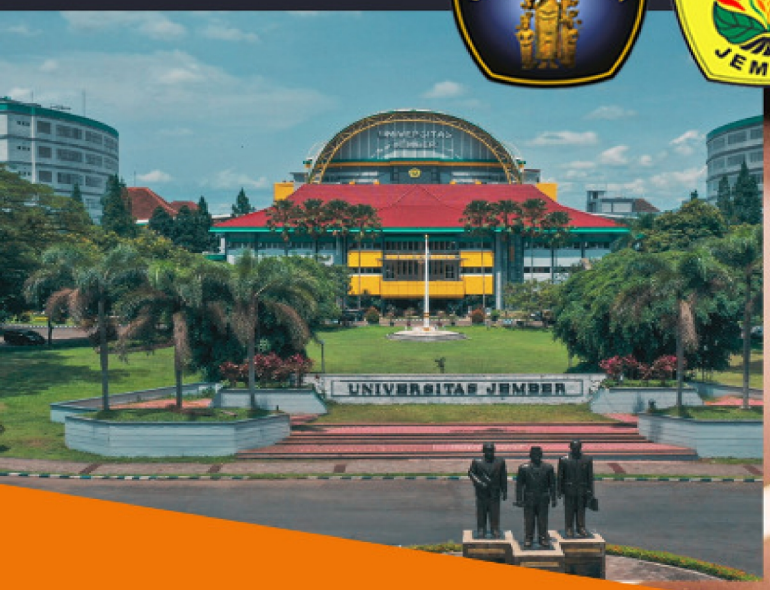
3rd International Conference on Chemistry & Material Science

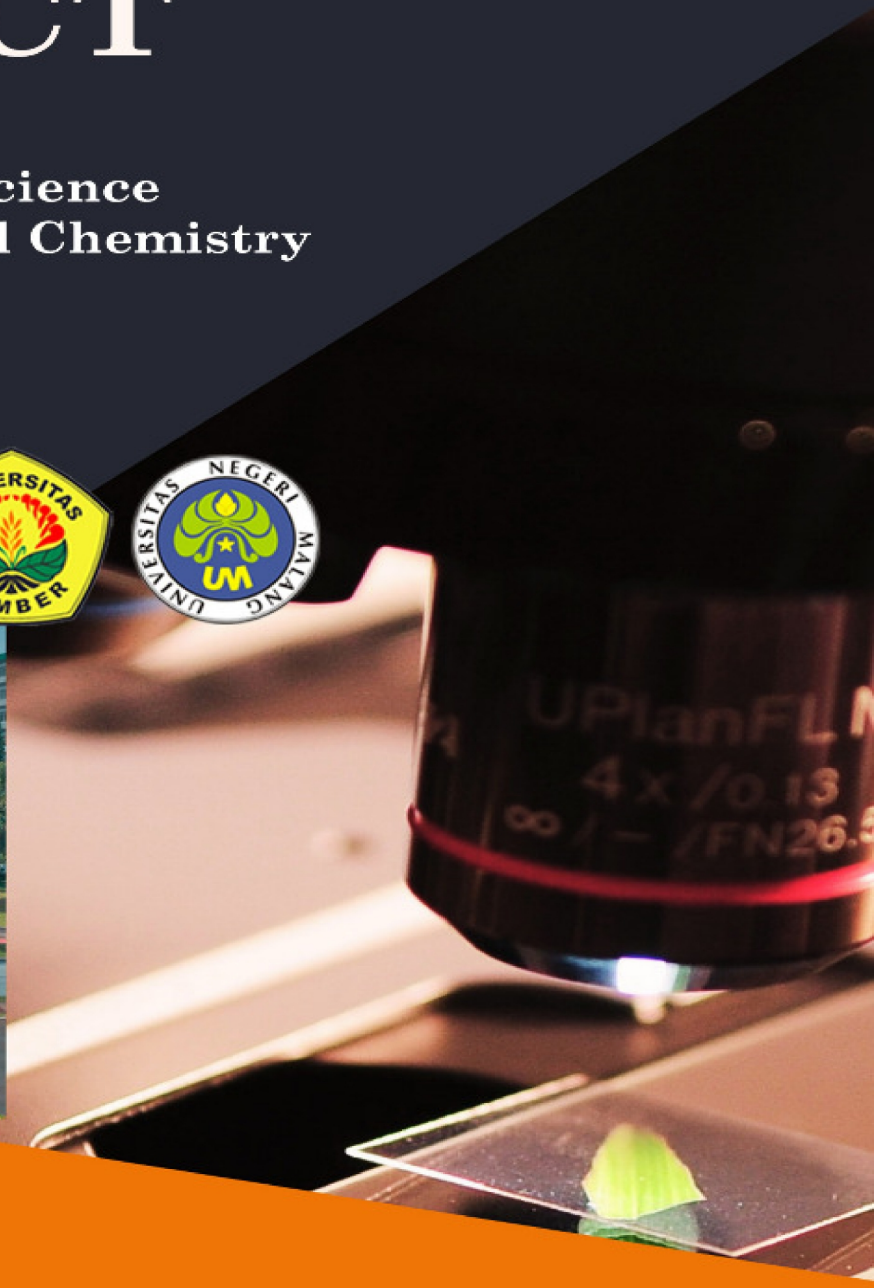
IC2MS

BOOK OF ABSTRACT

Innovation on Material Science for Sustainable Industrial Chemistry

October 12-13, 2021





Department of Chemistry,
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University of Jember

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GENERAL SCHEDULE

GENERAL SCHEDULE

Day 1 (Tuesday, 12nd October 2021)

Time (GMT+7)	Activity	Room	Chairperson
08.00 – 08.10	Registration	**https://unej.id/ic2msday1** **Meeting ID:91312837224** **Passcode: password** (Zoom Meeting Platforms)	Committee
08.10 – 08.15	Opening		MC
08.15 – 08.20	**Welcoming Speech** **Dr. A.A.I. Ratnadewi** Chief Executive 3rd IC2MS		MC
08.20 – 08.25	**Consortium Committee Speech** **Dr. Bambang Piluharto, M.Si.** Host of 3rd IC2MS		MC
08.25 – 08.30	**Opening Speech** **Dr. Ir Iwan Taruna, M.Eng** Rector of Universitas Jember		MC
08.30 – 09.30	**Keynote Speaker 1** **Prof. Yong-Chien Ling** Tsing Hua University, ROC		Moderator **Drs. Zulfikar, Ph.D.**
09.30 – 10.30	**Keynote Speaker 2** **Prof. Byung-Dae Park** Kyungpook National University, Republic of Korea		Moderator **Drs. Zulfikar, Ph.D.**
10.30 – 11.30	**Keynote Speaker 3** **Dr. Hasliza Bahruji** Universiti Brunei Darussalam		Moderator **Drs. Zulfikar, Ph.D.**
11.30 – 12.30	Break		Committee
12.30 – 15.00	**Parrallel Session 1** **Invited Speaker:** **Ana Safitri, Ph.D. (Room 1)** Department of Chemistry, Universitas Brawijaya **Invited Speaker:** **Drs. Zulfikar, Ph.D (Room 2)** Department of Chemistry, Universitas Jember **Invited Speaker: Dr. Irma Puspita Kusumaningrum (Room 3)** Department of Chemistry, Universitas Negeri Malang **Invited Speaker: Nanang Masruchin, Ph.D. (Room 4)**	Room 1 https://unej.id/IC2MSParallelRoom1 Meeting ID: 304 902 2934 Room 2 https://unej.id/IC2MSParallelRoom2 Meeting ID: 996 7412 6157 Passcode: ic2ms2021 Room 3 https://unej.id/IC2MSParallelRoom3 Meeting ID: 634 099 3835 Room 4 https://unej.id/IC2MSParallerRoom4 Meeting ID: 333 068 5510	Moderator: Drs. Achmad Sjaifullah, Ph.D. Moderator: Drs. Sudarko, Ph.D. Moderator: Suwardiyanto, Ph.D. Moderator: Agung B. Santoso, M.Si.

	Research Center for Chemistry, Indonesian Institute of Science (LIPI), Indonesia		
15.00 – 15.30	Break		Committee
15.30 – 17.00	**Parrallel Session 2**	Room 1 https://unej.id/IC2MSParallelRoom1 Meeting ID: 304 902 2934 Room 2 https://unej.id/IC2MSParallelRoom2 Meeting ID: 996 7412 6157 Passcode: ic2ms2021 Room 3 https://unej.id/IC2MSParallelRoom3 Meeting ID: 634 099 3835 Room 4 https://unej.id/IC2MSParallerRoom4 Meeting ID: 333 068 5510	Moderator: Drs. Achmad Sjaifullah, Ph.D. Moderator: Drs. Sudarko, Ph.D. Moderator: Suwardiyanto, Ph.D. Moderator: Agung B. Santoso, M.Si.

Day 2, (Wednesday, 13rd October 2021)

Time (GMT+7)	Activity	Room	Chairperson
08.00 – 08.15	Registration		Committee
08.15 – 10.00	**Parrallel Session 3**	Room 1 https://unej.id/IC2MSParallelRoom1 Meeting ID: 304 902 2934 Room 2 https://unej.id/IC2MSParallelRoom2 Meeting ID: 6340993835 Room 3 https://unej.id/IC2MSParallelRoom3 Meeting ID: 3330685510 Room 4 https://unej.id/IC2MSParallerRoom4 Meeting ID: 91311613422 Room 5 https://unej.id/IC2MSParallerRoom5 Meeting ID: 99674126157 Passcode: ic2ms2021	Moderator: Agung B. Santoso, M.Si. Moderator: Dr. Bambang Piluharto, M.Si. Moderator: Yudi A. Sulistiyo, M.Si. Moderator: Ika Oktavianawati, M.Sc. Moderator: Drs. Sudarko, Ph.D.
10.00 – 10.30	Break (Coffee Break)		Committee

10.30 – 12.30	**Parrallel Session 4**	Room 1 https://unej.id/IC2MSParallelRoom1 Meeting ID: 3049022934 Room 2 https://unej.id/IC2MSParallelRoom2 Meeting ID: 6340993835 Room 3 https://unej.id/IC2MSParallelRoom3 Meeting ID: 3330685510 Room 4 https://unej.id/IC2MSParallerRoom4 Meeting ID: 94166744655 Room 5 https://unej.id/IC2MSParallerRoom5 Meeting ID: 99674126157 Passcode: ic2ms2021	Moderator: Agung B. Santoso, M.Si. Moderator: Dr. Bambang Piluharto, M.Si. Moderator: Yudi A. Sulistiyo, M.Si. Moderator: Ika Oktavianawati, M.Sc. Moderator: Drs. Sudarko, Ph.D.
12.30 – 13.30	Break (Lunch and Pray)		
13.30 – 14.30	**Keynote Speaker 4** **Prof. David Lennon** University of Glasgow, UK	**https://unej.id/ic2msday2** (Zoom Meeting Platforms) Meeting ID:92820561439 Passcode: password	Moderator **Suwardiyanto, Ph.D.**
14.30 – 15.30	**Keynote Speaker 5** **Prof. Russel Howe** University of Aberdeen, UK		Moderator **Suwardiyanto, Ph.D.**
15.30 – 16.30	**Keynote Speaker 6** **Prof. Manabu Abe** Hiroshima University, Japan		Moderator **Suwardiyanto, Ph.D.**
16.30 – 17.00	Closing		Committee

ABSTRACT

KEYNOTE AND INVITED SPEAKER

Determination of Anti-Inflammatory Potency of Aqueous Extract from *Ruellia tuberosa* L. as Anti-Inflammatory Through Molecular Docking Study

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ABSTRACT

This work investigates anti-inflammatory activity from aqueous extracts of R. tuberosa L. through in silico molecular docking. The ligands used in the study were betaine, daidzein, and hispidulin. Cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2) as the target enzymes were docked to the ligands, using HEX 8.0 program, and visualized using the Discovery studio visualizer software v16.1.0.15350. The docking results showed that all ligands bound to COX-1 and COX-2. The binding energies of betaine to COX-1 and COX-2 were -147.9 cal/mol and -289.2 cal/mol, respectively. Daidzein bound to COX-1 and COX-2 with the binding energies -251.6 cal/mol and -258.6 cal/mol; while hispidulin bound to COX-1 and COX-2 resulted in the binding energies of -279.1 cal/mol and -289.2 cal/mol. Daidzein and hispidulin interacted to COX-1 and COX-2 to the same amino acid residues, whereas betaine had bound to the different amino acid sites. The similarity of amino acid sites in the enzymes between hispidulin and daidzein indicated that those compounds can be used as substitution to one another. Daidzein and hispidulin do not have selective anti-inflammatory activity toward COX-1 or COX-2; while betainehas potential to have selective anti-inflammatory toward COX-2.This work investigates anti-inflammatory activity from aqueous extracts of R. tuberosa L. through in silico molecular docking. The ligands used in the study were betaine, daidzein, and hispidulin. Cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2) as the target enzymes were docked to the ligands, using HEX 8.0 program, and visualized using the Discovery studio visualizer software v16.1.0.15350. The docking results showed that all ligands bound to COX-1 and COX-2. The binding energies of betaine to COX-1 and COX-2 were -147.9 cal/mol and -289.2 cal/mol, respectively. Daidzein bound to COX-1 and COX-2 with the binding energies -251.6 cal/mol and -258.6 cal/mol; while hispidulin bound to COX-1 and COX-2 resulted in the binding energies of -279.1 cal/mol and -289.2 cal/mol. Daidzein and hispidulin interacted to COX-1 and COX-2 to the same amino acid residues, whereas betaine had bound to the different amino acid sites. The similarity of amino acid sites in the enzymes between hispidulin and daidzein indicated that those compounds can be used as substitution to one another. Daidzein and hispidulin do not have selective anti-inflammatory activity toward COX-1 or COX-2; while betainehas potential to have selective anti-inflammatory toward COX-2.

CO_2 hydrogenation to C_1 and C_{2+} hydrocarbon on PdZn bimetallic catalysts

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ABSTRACT

Catalytic activity of PdZn bimetallic catalyst was determined for direct hydrogenation of CO_2 to C_1 and C_{2+} products. Variation of support such as ZnO, TiO_2 and ZSM-5 at different Si/Al ratios were investigated to control product selectivity. Several synthesis methods including sol immobilisation, wet impregnation and chemical vapour impregnation were utilised in order to develop well-dispersed PdZn bimetallic alloy on the support. Surface acidity was investigated using NH_3 TPD and pyridine adsorption-infrared analysis to provide the information of acid strength and the number of Bronsted and Lewis acidity of the catalysts. The effect of calcination and reduction temperatures were also investigated with on catalytic performance of the catalysts. Microscopic analysis showed the presence of monometallic Pd and PdZn alloy following H_2 reduction in which the PdZn alloy responsible for CO_2 hydrogenation to methanol. The presence of ZSM-5 as acid support catalysed the produced methanol into dimethyl ether via dehydration reaction. Higher olefin was detected suggesting a C-C coupling reaction takes place on PdZn surface. In the presence of excess ZnO, the alloying process continued during CO_2 hydrogenation reaction causing slight deactivation of the catalysts. The role of ZnO is suggested to provide interfacial layer to adsorb the hydrogen spill over from Pd to form PdZn alloy which also inhibiting CO_2 methanation reaction. The presence of high concentration ZnO also affected the stability of the catalysts due to further alloying of Pd to PdZn.

Phosgene synthesis catalysis: towards a reaction model

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Glasgow, G12 8QQ, UK

ABSTRACT

Phosgene is an important intermediate used in the industrial manufacture of polyurethanes, polycarbonates, pharmaceuticals and agrochemicals. It is typically manufactured industrially via the gas phase reaction between carbon monoxide and chlorine over an activated carbon catalyst.

$$CO_{(g)} + Cl_{2(g)} \rightleftharpoons COCl_{2(g)}$$

Despite wide industrial application, there are surprisingly few reports of phosgene synthesis catalysis in the scientific literature. Against this background, the authors have recently examined aspects of phosgene synthesis catalysis over a commercial grade activated carbon. The presentation will describe a programme of work that seeks to define an understanding of the surface chemistry that facilitates sustained phosgene production. Investigations of the reaction were undertaken within the University of Glasgow's Chemical Process Fundamentals Laboratory [1]. Kinetic studies coupled with mass balance measurements provide insight as to how mass is partitioned in the process [2]. That perspective is then supplemented with an examination of adsorption and desorption characteristics of reagents and product, which culminates in a proposed reaction model for how CO and Cl2 combine over activated carbon to produce phosgene at high selectivity [3].

Photochemical Release of 2,2,6,6-Tetramethylpiperidine-1-oxyl (TEMPO) Radical from Caged Nitroxides by Near Infrared Two-photon Irradiation and Its Cytocidal Effect on Lung Cancer Cells

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ABSTRACT

Nitroxides (aminoxyl radicals) are persistent open-shell species owing to the delocalization of the unpaired electron and the negligible dimerization reactivity. In addition to the easy-handling character, nitroxides are highly sensitive to the electron paramagnetic resonance (EPR) spectroscopy and redox reactions. Therefore, the diverse and crucial applications of nitroxides, such as fluorophore-nitroxide probes, contrast agents in magneticresonance-imaging (MRI), polarization transfer agents for nuclear-magnetic-resonance (NMR), and radical batteries, have been developed and utilized not only in chemistry, but also in biology, physiology, and energy science. Furthermore, the efficient synthesis of polymers with narrow molecular mass distribution has been accomplished using nitroxide as a mediator, which is so-called NMP (nitroxide-mediated polymerization). Nitroxide-mediated synthesis of ketones from alcohols is also well utilized in organic synthesis. The huge numbers of research studies concerning nitroxides clearly indicate that new methods for generating nitroxides largely contribute the development of future science and technology. Especially in physiological studies, the spatiotemporal control of generating nitroxides would be key to investigate the role of redox-active nitroxides in oxidative stress of life phenomenon.

In 1997, Scaiano and coworkers reported a triplet-xanthone sensitized generation of 2,2,6,6-tetramethylpiperidine-1-oxyl (TEMPO) radical using the ultraviolet 355 nm irradiation. The de-aerated conditions are necessary for the triplet-sensitized generation of TEMPO. The photochemical reaction was applied for the initiation of polymerization reactions. For physiological studies, however, the photochemical release of nitroxides should be achieved under air. Recently, we have developed two-photon (TP)-responsive photo-labile protecting group1 with simple cyclic stilbene structures such as 2-(4-nitrophenyl)benzofuran (NPBF) in the NIR region of 710-760 nm for uncaging of bioactive substances such as glutamate and Ca2+.2 Herein, we report the synthesis of new caged nitroxides (nitoxide donors) having the TP-responsive NPBF chromophore and their NIR TP-

triggered generation of TEMPO radical under the atmospheric air conditions. Since free radicals induce cytotoxicity due to their strong DNA-damaging activity, they play important roles as anticancer therapeutic agents. Among the free radicals, nitroxides including TEMPO radical have unique phenotype, which act as not only radical scavenger, but also anticancer agents. Because of their unique phenotype described above, nitroxides are not toxic to host normal cells and exhibit toxicity only to tumor cells. Thus, nitroxides are ideal candidate as anticancer therapeutic agents. Based on these knowledge, the cytocidal effect of released radical on lung cancer cells in vitro was tested in addition to the fundamental study.

Nanocellulose-Based Functional Composite Materials for Detecting pH or Color Change

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ABSTRACT

This presentation aims to provide an overview of nanocellulose-based functional composite materials for detecting pH or color change. Methods of isolating nanocelluloses such as acid hydrolysis, ammonium persulfate (APS) oxidation or TEMPO-oxidation are employed to obtain cellulose nanocrystals (CNCs) or cellulose nanofibrils (CNFs), whose properties are characterized with various methods. The surfaces of these nanocelluloses were also modified to build chemical bonds with pH-indicators such as bromocresol green (BCG), bromocresol purple (BCP) or neutral red (NR) that had been activated prior to its reaction. Chemical reactions between these nanocellulose and pH-indicator were also characterized with various methods. Composites of nanocellulose/pH-indicator were incorporated into polymer matrix to prepare pH-sensitive color-changing films. In addition, CNF-based hydrogels impregnated with anthocyanin are also tested for detecting color change. These films are tested for pH or color change to develop nanocelluose-based functional composite materials, including color reversibility, leaching resistance, and mechanical properties. These results suggest that the nanocellulose/pH-indictor composites have a great potential as functional indicator films for detecting pH or color change, in particular, in food storage.

Keywords: Nanocellulose, surface modification, pH-indicator, pH-sensitive color change.

Vibrational Spectroscopy of Zeolite Catalysts: New Techniques

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ABSTRACT

Infrared spectroscopy has been used for many years to study molecules adsorbed within microporous zeolite catalysts, and to observe in-situ catalytic reactions. The vibrational frequencies determined from the infrared spectrum can identify adsorbed species and probe their interaction with active sites in the zeolite, and reaction pathways can be studied by observing the time dependence of the infrared spectra.

This lecture will describe three quite new spectroscopic approaches to obtaining vibrational spectra of molecules adsorbed in zeolites.

- Inelastic neutron scattering (INS). This technique obtains vibrational frequencies by measuring the energies of neutrons inelastically scattered from the sample due to excitation of vibrational modes. The advantages (and disadvantages) of INS compared with infrared spectroscopy will be illustrated with a recent study of alkene oligomerization in ZSM-5 (1-4).
- Infrared microspectroscopy of zeolite single crystals (IMS). Using a synchrotron infrared source, it is possible to measure spectra very quickly (within 100 m sec) from molecules adsorbed in single crystals of zeolite catalysts at reaction temperatures. Coupled with MS analysis of evolved products, IMS has been used to obtain new insight into the mechanisms of carbon-carbon bond formation in methanol to hydrocarbon catalysis over ZSM-5 (5,6). A recent study using IMS to follow alkene oligomerisation in ZSM-5 will be described here.
- Two dimensional infrared spectroscopy (2DIR). This very new technique uses femtosecond pulsed lasers to simultaneously irradiate a sample at different infrared frequencies and observe the responses. 2DIR can observe coupling between different vibrational modes and the dynamics of vibrational excited state formation and decay. The potential of 2DIR for studying molecules adsorbed in zeolites will be illustrated with a recent study of water adsorbed in ZSM-5.

Acknowledgements: The INS work is a collaboration with David Lennon at University of Glasgow and Stewart Parker at the ISIS Neutron Source, Rutherford Appleton Laboratory. IMS is performed at the Diamond Synchrotron Light Source and is a collaboration with Paul Wright at the University of St Andrews. 2DIR is a collaboration with Paul Donaldson at the Central Laser Facility, Rutherford Appleton Laboratory.

Development Array Sensor For Detecting Robusta Coffee Aroma

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ABSTRACT

The detection of coffee aroma is a chemical analysis technique in a complex sample and becomes an interesting challenge. Sensor arrays are an option for detecting complex volatile compounds, with a systematic detection principle, where each response characteristic individually contributes to the overall performance of the detection system. In this research, the sensor array is designed, optimized and evaluated its performance, it is a basis for its use and application. Robusta coffee from several plantations in East Java was selected as a sample for identification and classification based on coffee aroma. The results show that the gas sensor types MQ2, MQ3, MQ6, MQ7, MQ8, MQ9, MQ135 and MQ136, are suitable for use in accordance with the repeatability of measuring water vapor and coffee steam with RSD < 5%. The sensor array shows the ability to classify with various approaches such as Principal Component Analysis, Confusion Matrix and Artificial Neural Network.

Development of Cross-Linked Carboxymethyl Kappa Carrageenan Coated Nanomagnetite As Copper Ion(II) Adsorbent

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ABSTRACT

This research is a development research to synthesize Cu(II) selective ion adsorbent material. The material developed is nanomagnetite coated with carboxymethyl kappa-carrageenan (CMKC) which is crosslinked with citric acid, and Cu(II) ions are printed on its surface. This study also tested the performance of the adsorbent to determine the optimum contact time and selective adsorption capacity of Cu(II). This research was carried out in three steps, (1) nanomagnetite synthesis,(2) CMKC synthesis, (3) CMKC coating on nanomagnetite, Cu(II) ion printing and crosslinking with citric acid (C6H8O7), spectral characterization using Fourier Transform Infra Red (FTIR), crystallinity by X ray Diffraction (XRD), and analysis of adsorption ability using Atomic Adsorption Spectrophotometer (AAS). The results show that nanomagnetite has been successfully synthesized by coprecipitation from a mixture FeSO4.7H2O dan FeCl3.6H2O with NaOH as a reactant. The XRD diffractogram shows a peak of 29.8˚; 35.47˚; 43.26˚; 56.97˚; and 62.83˚, and the peaks of the FTIR absorption spectrum appeared at 582.19 cm^{-1} and 448.04 cm^{-1}, the average diameter of the synthesized material grains was 32 nm. The spectral and morphological character data above confirm the formation of CMKC nanomagnetite synthesized from kappa carrageenan reacted with NaOH and monochloroacetic acid, the formation of CMKC has been confirmed by FTIR spectrum analysis which proves the conversion of hydroxyl groups in k-carrageenan to carboxyl groups. The synthesized nanomagnetite was coated with CMKC, printed with Cu(II) ions and crosslinked with citric acid, this process produced an adsorbent with an average diameter of 63 nm, the surface texture was folded. The adsorbent has an adsorption capacity of 5.5715 mg Cu(II)/g, with an optimum adsorption contact time of 60 minutes. The layer on the surface of the adsorbent became scaly and cracked after being used for the Cu(II) ion adsorption process, which was followed by desorption with HNO_3.

Keywords: Nanomagnetite, Carrageenan, Adsorbent, Cu(II).

Retrospective of Dioxin-like Compounds Monitoring in Taiwan Environment and Food

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ABSTRACT

The United Nations Environment Programme (UNEP) define persistent organic pollutants (POPs) as a set of toxic chemicals persistent in the environment and able to last for several years before breaking down. The later known “Dirty Dozen” includes polychlorinated biphenyls (PCBs), polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) are the initial focusing POPs in 1995. The toxic and notorious 10 PCDDs, 7 PCDFs, and 12 PCBs are grouped together and named dioxin-like compounds (DLCs). These lipophilic DLCs can accumulate in the fatty tissue of living animals and via food chain magnified in human beings, leading to adverse health effects. The presentation focus on our efforts in developing analytical chemistry methods to determine DLCs in Taiwan environment and food related samples by mass spectrometry methods as means to resolve problem on public issues. The subjects include (1)Probing E-waste recycling issue by determining DLCs in sediment and fish samples from the Er-Jen river, (2)Long-term monitoring Hsinchu municipal solid waste incinerator (MSWI) PCDD/Fs released to nearby ambient air and soil as a means to reduce the doubts of neighboring residents about local environmental load and safety; (3)Reassess and clarify both PCDD/DFs and Co-PCBs toxicity in contaminated rice-bran oil are responsible for the disease "Yu-Cheng“, (4)A total diet study: to estimate DLCs intake from food in Taiwan and advise regulatory control levels of PCDD/Fs in foods and practice good dietary behavior. The motive, means, and achievement of each case will be presented to demonstrate wisely use of analytical chemistry to public concerned environment and food issues is indispensable. This practice is profoundly beneficial to society and worth continuous dedication from academic.

Keywords: polychlorinated biphenyls, polychlorinated dibenzo-*p*-dioxins, polychlorinated dibenzofurans, mass spectrometry, environment, food.

Nanocellulose Production with Eco-Technology Concept and Its Applications

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ABSTRACT

Cellulose is the most abundant and ubiquitous biopolymer on earth which supports the plant cell wall, secreted from bacterial cellulose, and also the component of algae, and sea animal such as sea squirt or tunicate. In fact, cellulose presence in biocomposite called lignocellulose which compose of lignin, and hemicellulose. In that biocomposite, cellulose acts as reinforcing agent due to the high modulus strength up to 125 GPa and tensile strength of 2 GPa of crystalline cellulose which further can be isolated into elementary fibrils with the size approximately 3 nm. The method to obtained nanocellulose require high energy, harsh chemical, time consuming with low yield. Therefore, that drawbacks hinder the commercialization of nanocellulose. In this talk, we are proposed some ecofriendly-technology concepts to produce nanocellulose. The methods include the production of nanocellulose with the utilization of low-cost raw materials, using organic acid combination, less energy, effective processing involving catalyst, one step processing approaches, and focusing on high yield product. Further, the characterizations and applications of nanocellulose for new sustainable advanced materials are highlighted.

Keywords: nanocellulose, ecofriendly technology, application, advanced materials.

ABSTRACT

PARALLEL SESSION

Catalyst Selectivity of $Mg_{1-x}Fe_xF_2$ in The Reaction Synthesis of Vitamin E

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ABSTRACT

In this research the application of MgF_2, Fe_2O_3 and $Mg_{1-x}Fe_xF_2$ (x=0.025; 0.050; 0.100 and 0.150 mol) studied as catalyst in vitamin E synthesis reactions. The catalyst was prepared by the sol gel method then characterized by X-Ray Diffraction (XRD) and the acidity test was determined by Fourier Transform Infrared (FTIR)-pyridine and Brunauer, Emmett and Teller (BET) surface area by nitrogen adsorption. The doped Fe has the same structure as MgF_2 and also has the same acidity as indicated by the presence of Lewis and Brønsted acid sites. The results showed that the highest activity was obtained on the MgF_2 catalyst, which was 98.47% while the highest selectivity for vitamin E was obtained from the catalyst $Mg_{0.85}Fe_{0.15}F_2$ that was 79.36%.

Keywords: doping, activity, vitamin E, selectivity, $Mg_{1-x}Fe_xF_2$.

The Leaves Extract Utilisation for Hematite Nanoparticles Fabrication

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ABSTRACT

Fabrication of Hematite nanoparticles (α-Fe_2O_3) using Cajanus cajan (L.) Millsp leaves extract (CCL) was deciphered in this recent study. Secondary metabolites in CCL act as reducing agents and capping agents in the synthesis of Hematite nanoparticles. The active compounds in CCL were described using phytochemical tests, FTIR, and GC-MS. Hematite formation through the green synthesis was confirmed using FTIR, XRD, and UV-DRS Spectrophotometer instruments. The wavenumbers 453, 552, and 615 cm^{-1} are vibration absorption from stretching Fe-O bonds. The diffraction pattern of the Hematite nanoparticles shows that the value of 2θ corresponds to JCPDS No. 33-0664 with an average crystallite size of ± 28 nm. Using the Kubelka-Munk equation, the measured optical band gap is 2.2 eV. TEM images show the size distribution of the hematite nanoparticles of 45-70 nm.

Keywords: Hematite nanoparticles, green synthesis, leaves extract, secondary metabolites.

Experimental Study of Polyurethane Foam Absorption of Transportation Exhaust Gas Pollutants in Pondok Labu City South Jakarta

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ABSTRACT.

Motor vehicles are a significant source of polycyclic aromatic hydrocarbon (PAH) emissions. A better understanding of the relationship between fuel composition and PAH emissions is needed to determine whether fuel reformulation is a viable approach to reducing PAH emissions. The content of Poly Aromatic Hydrocarbons contained in the fuel with the largest concentration is as follows: types of phenanthrene, anthracene, fluoranthene, fluorene, Pyrene. This study aims to 1. Determine the Poly Aromatic Hydrocarbon (PAH) pollutant emitted by the exhaust of city vehicles in the area of Pondok Labu, South Jakarta, through direct absorption from the exhaust at a certain time and speed of gas flow. 2. Passive PAH determination by placing Polyurethane Foam (PUF) adsorbent at the Pondok Labu market intersection, which is an area where 8 public transportation routes pass and road conditions are relatively congested. LMW type PAHs that can be adsorbed by PUF adsorbents are PAHs that have 2-3 benzene rings consisting of Naphthalene, Acenaphthylene. While the PAH type HMW with 4-6 benzene rings consisting of Fluoranthene, Pyrene, Benzo (a) anthracene, Chrysene, Benzo (b) fluoranthene, Benzo (a) pyrene, and Benzo (ghi) perylene. Direct absorption of PAHs in the exhaust of city vehicles with time variables of 1, 3, and 5 hours, obtained the total concentration of PAHs which have 5 and 6 aromatic rings was 2.3269 ppm, 2.3998 ppm, 4.0929 ppm which increased with increasing time. While the absorption of PAH at the intersection on the 7th and 14th-day variables was 5.7317 ppm or 46.94% and 6.4749 ppm or 53.0569%. Two- and three-ringed PAH particle fractions were not detected, while only 2.68% of the four-ringed PAHs were fluoranthene. Studying the experimental PUF adsorbent for direct and indirect PAH absorption, it was found that two types of PAHs which have 5 and 6 aromatic rings that are carcinogenic can be absorbed with the largest concentration at 20 grams of PUF.

Keywords: Polyurethane Foam (PUF), Polycyclic Aromatic Hydrocarbon (PAH), Public Transport Pollutant.

One Step Synthetic Method Material of p-Tert.Butylcalix[4]arene Derivative via Direct Benzoylation: Mechanism Models

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ABSTRACT

The aim of research the synthesis of material TBMTCA/5,11,17,23-tetra(t-butyl)-25-monohydroxy-26,27,28-tribenzoyloxycalix[4]arene (derivative 2) material were by one step synthesized by benzoylation reaction of 5,11,17,23-tetra(tbutyl)-25,26,27,28-tetrahydroxycalix[4]arene (TBCA)[3,4] and benzoyl chloride is (1: 3,7) mol and the refluxing 3 hours at room temperature and predicted mechanism reaction models. The product reaction of synthesis were carried out by means of FTIR and 1H-NMR spectroscopy. The results material of 5,11,17,23-tetra(t-butyl)-25-monohydroxy-26,27,28-tribenzoyloxycalix[4]arena TBMTCA) synthesized was light yellow crystallin having melting point 306-309^{0}C in 90,2 % yields.

Keywords: t-butylcalix[4]arene (TBCA), t-butyl-tribenzoyloxycalix[4]arene (TBMTCA) benzoylation , material, mechanism.

Preparation and Application of Calixarene Derivatives Bearing Benzoyl Groups For Removal Fe(III) Cations

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ABSTRACT

The aim of research of synthesis 5,11,17,23-tetra-(t-butyl)-25-monohydroxy-26,27,28-tribenzoiloxycalix[4]arene (TBMTCA) and Fe(III)-TBCA[23] as adsorbent of Fe(III)-TBMTCA have bearing benzoyl group from benzoyl chloride in the 5,11,17,23-tetra(*tert*-butyl)-25-monohydroxy-26,27,28-tribenzoyloxycalix[4]arenes (TBMTCA) via benzoylation reaction and its application as adsorbent for adsorption Fe(III) cations. Adsorption study was conducted using method batch system with various and optimized pH, exposure time, and initial concentration of metal ions. The optimized conditions obtained were pH of 5, and exposure time of 90 minutes its Fe(III)-TBCA[23] and TBMTCA adsorbent for Fe(III) cations, respectively. A study of the kinetic model showed that Fe(III)-TBCA[23]and Fe(III)-TBMTCA cations followed the Lagergren kinetics model with an adsorption rate constant of 9.21 x 10-3 min-1 and 4,61 x 10-3min-1 respectively. Both Fe(III)-TBCA[23] and Fe(III)-TBMTCA adsorption isotherm followed Langmuir isotherm model with adsorption capacity was 156.09 mg/L and 164.81 mg/L, respectively. Adsorption energy for Fe(III)-TBCA[23] and Fe(III)-TBMTCA was 7.01 kJ/mol and 8.07 kJ/mol. Respectively.

Keywords: TBMTCA, Adsorbent, Fe(III) cations, Langmuir isotherm, Adsorption Energy, Adsorption Capacity, Rate Constant.

Determination of Cystatin C Using Paper-based Analytical Devices for Early Detection of Renal Failure

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ABSTRACT

Renal failure is often detected when it has reached the last stage. The amount of cystatin C in blood serum can be used as a biomarker for early identification of renal function failure. This work presents a fast and environmentally friendly microfluidic paper-based analytical device (μPAD) to determine the amount of cystatin C in the synthetic blood serum samples. Functionalized gold nanoparticles (AuNPs) are prepared by capping the surface of AuNPs with papain to form AuNPs-papain. The aggregate of functionalized AuNPs-papain and Cu^{2+} ion can be formed due to coordination interaction between Cu^{2+} ion and papain attached to AuNPs. In the presence of cystatin C, the amount of aggregate decreases because the functionalized AuNPs-papain will bind easily with cystatin C as the substrate of papain. The intensity of aggregate on μPAD is scanned using a paper scanner. The difference intensity of aggregate in the presence of cystatin C is proportional to the concentration of cystatin C in the synthetic blood serum sample. The linearity range obtained by this work was 0.5-10.0 mg/L with regression of $y = 0.3302x + 3.488$ and linearity of $r^2 = 0.998$. The limit of detection (LOD) and limit of quantitation (LOQ) were 0.511 (3xSD/slope) and 2.044 mg/L (12xSD/slope), respectively. The linearity range and the LOD are wide enough to detect cystatin C in normal people or people with renal diseases.

Keywords: renal failure, cystatin C, gold nanoparticles (AuNPs), papain, microfluidic paper-based analytical device (μPAD).

Colorimetric Determination of Albumin to Creatinine Ratio Using Paper-based Analytical Devices for Rapid Detection of Kidney Disfunction

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ABSTRACT

Diabetic nephropathy is a common complication of diabetes, which can lead to chronic renal failure in patients. Chronic kidney disease (CKD) is a condition characterized by abnormalities and loss of kidney function. Early detection of nephropathy can prevent the progression of this disease to CKD. In this work, both albumin (ALB) and creatinine (CRE) were used as biomarkers for detecting albumin to creatinine ratio (ACR) using paper-based analytical devices (PADs) by applying the alkaline picrate and bromocresol purple (BCP) reagents as the reagent solutions. ALB detection was performed by a dye-binding method using BCP reagent resulted in the color change from yellow to purple, while CRE detection was based on the Jaffe reaction using picric acid in an alkaline solution resulted in the color change from yellow to orange. The color changes were photographed by a digital camera and the pictures' color intensity (RGB) were evaluated using ImageJ. The ACR in synthetic samples was measured using the calibration curve constructing by plotting logarithmic of ACR (mg g^{-1}) against the Δ intensity ALB/CRE ratio.The accuracy of ACR determination in synthetic samples were found in the range of 75.70 – 99.98%, whereas their standard deviations were in the range of 0.01 – 0.02, showing relatively good accuracy and high precision of the proposed method. The detection limits (LOD) for albumin (ALB) and creatinine (CRE) were 8.2 $mg.dL^{-1}$ and 5.1 $mg.dL^{-1}$, respectively. The fast, cheap, and easy-to-use method for ACR detection could be attributed to the proposed method. Additionally, it has relatively good accuracy and high precision, and it can potentially be used as an alternative technique for early detecting or screening kidney disease.

Keywords: albumin, creatinine, dye-binding, Jaffe reaction, paper-based analytical devices

Effect of Sodium Tripolyphosphate Concentration on Precipitated Calcium Carbonate (PCC) Particle Size

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ABSTRACT

Limestone will have an increased value if it is synthesized into PCC which is limestone with a higher purity and brightness level. This study aims to determine the effect of solution pH on calcium content on PCC formation and to determine the effect of sodium tripolyphosphate (NaTPP) concentration on PCC particle size. Variations in the pH of the solution used, namely pH 7, 8, 9 and 10, the levels of Ca in PCC were analyzed using AAS. Variations in the concentration of sodium tripolyphosphate used were 1, 2.5, 5 and 7.5%. PCC was synthesized using the caustic soda method and the addition of NaTPP was carried out before carbonation. PCC was characterized by XRD and FTIR spectrophotometer. Based on the results of the analysis using AAS, the highest Ca concentration in PCC was obtained at pH 8. Characterization using FTIR spectrophotometer on PCC with the addition of NaTPP, showed absorption at a wave number of 563.94 cm-1 which indicated the presence of phosphate groups in PCC due to the addition of NaTPP. Characterization using XRD showed that the synthesized PCC had calcite crystals. Based on calculations using the Scherrer equation, the optimum particle size obtained with the addition of 1% NaTPP was 99.67 nm with the average Scherrer equation and 71.02 nm with the modified Scherrer equation.

Keyword: calcium carbonate, concentration, particel size.

$SnWO_4$/ZnO heterostructure synthesized by *Muntingia calabura* L. leaf extract and its photocatalytic activity

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ABSTRACT

In this study, $SnWO_4$/ZnO heterostructure has been successfully constructed by *Muntingia calabura* L. leaf extract (MCE). We conducted phytochemical tests to qualitatively detect the presence of secondary metabolites such as alkaloids, saponins, flavonoids, and tannins, which play an essential role in the formation of $SnWO_4$/ZnO. The photocatalytic activities of pristine $SnWO_4$, pristine ZnO, and $SnWO_4$/ZnO heterostructure were evaluated for the degradation of methylene blue under visible light irradiation. To investigate the photocatalytic activity $SnWO_4$/ZnO heterostructure in the visible region, the conditions without visible light irradiation (adsorption effect) and photocatalyst (photolysis effect) were also studied. $SnWO_4$/ZnO heterostructure shows the highest degradation percentage of 80,86 % within 120 min, compared to pristine $SnWO_4$ and ZnO, which exhibit the degradation percentage of 69,48 and 40,41%, respectively. The enhanced photocatalytic methylene blue degradation could be attributed to the formation of $SnWO_4$/ZnO heterostructure as a result of the decreased optical bandgap from 3,06 to 2,68 eV. Importantly, this work demonstrates a simple eco-friendly, and low-cost green synthesis method to produce $SnWO_4$/ZnO with good photocatalytic activity for dyes degradation under visible light irradiation.

Keywords: $SnWO_4$/ZnO heterostructure, *Muntingia calabura* L., photocatalytic activity, methylene blue.

Preparation of CuO-$Gd_2Ti_2O_7$ by Two-Phase System using Acmella uliginosa Leaf Extract and Its Photocatalytic Performance Under Visible Light

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ABSTRACT

CuO-Gd_2Ti,O_7 has been prepared by a two-phase system, consisting of polar precursor solution and non-polar hexane fraction of Acmella uliginosa leaf extract (AUE). The secondary metabolites in AUE have an important role in the synthesis of CuO-Gd_2Ti,O_7. In specific, alkaloid acts as the source of a weak base to produce hydroxide ions in the synthesis of the metal oxide. Meanwhile, saponin and terpenoid are used as the capping agent, to stabilize the particle formation of CuO-Gd_2Ti,O_7. The optical bandgap value for CuO-Gd_2Ti,O_7 measured by UV-Vis DRS significantly decreased from 3.68 to 1.78 eV compared to CuO-Gd_2Ti,O_7. The photocatalytic activity of CuO-Gd_2Ti,O_7 degrading Malachite Green (MG) was investigated under visible light illumination. As a result, CuO-Gd_2Ti,O_7 showed the MG degradation percentage of 75.40% after 90 min of illumination time, which is 1.7 times higher than the MG degradation percentage over Gd_2Ti,O_7. This improved photocatalytic activity is ascribed to the narrower optical bandgap Gd_2Ti,O_7 after decorated by CuO, which effectively work in the visible region. This research suggests a novel method to prepare alternative photocatalyst for the degradation of malachite green under visible light illumination.

Keywords: CuO-Gd_2Ti,O_7, two-phase system, Acmella uliginosa., photocatalytic activity.

The Effect of Column Length and Duration of Water Distillation on The Profile of Essensial Oil From Java Citronella (*Cymbopogon winterianus*) Leaves

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ABSTRACT

Citronella oil is considered as one of the important commodities on the essential oil productions in Indonesia. The export growth of citronella oil reached about 9-10% and contributed for 6.89% to the essential oil export revenue. Therefore, the research and development of distillation process in obtaining qualified citronella oil meeting industrial standard requirement are encouraged. This study aims to determine the effect of column length and duration of distillation on the profile of citronella oil. The extraction of citronella oil from java citronella (*Cymbopogon winterianus* Jowitt ex Bor) leaves was carried out by water distillation method which is also known as hydrodistillation. The oil yield resulted from distillation with various column lengths, simple column (11 cm) later called as S; simple column added with fractionation column (30 cm) called as SF30; and fractionation column (75 cm) called as SF75, were 2.38%; 2.27% and 2.44%, respectively. Moreover, the refractive index for S; SF30; and SF75 columns in the order were 1,4661; 1.4673 and 1.4680. Standard requirement for qualified citronella oil states that it should contain citronellal as its main volatile compound in addition of geraniol and citronellol as two other marker compounds. This research showed that the volatile compounds of citronella oil obtained from distillation with a simple column (S) contained citronellal without any geraniol and citronellol. Citronella oil of SF30 contained citronellal and geraniol, while the SF75 contained citronellal, geraniol and citronellol. Based on these data, further distillation was carried out in SF75 set up for 3 hours, and the essential oil products were collected every 30 minutes and subjected to GCMS analysis. The highest yield of citronella oil was obtained from first fraction (f1) collected at the first 30 minutes of distillation in the number of 1.8970 ± 0.0846% of dry weight basis. The pattern of oil yield during 3 hours distillation showed that it decreased significantly from f1 into the second 30 minutes (f2) and then decreased gradually until the sixth fraction (f6). GCMS analysis showed that the best citronella oil was produced from f1 which showed the highest abundance of oxygenated compounds reached about 97.48%, and the content of citronellal, geraniol and citronellol were 65.87%, 18.15%, and 8.32%, respectively.

Keywords: citronella oil, hydrodistillation, column length, citronellal.

Application of Response Surface Methodology in Optimizing Condition of Phenolic Compounds Extraction from Cocoa Pod Husk Waste (*Theobroma cacao* L.) using Ultrasonic Assisted Extraction (UAE) Method

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ABSTRACT

Cocoa pod husk is one of the most waste of cocoa, which not utilizes properly. As well as parts of the cocoa, cocoa pod husk also contains several active compounds like flavonoids and polyphenols. This research aims to analyze the content of phenolic compounds from cocoa pod husk extract. The Design Expert vs11 program with Response Surface Methodology (RSM) and Box-Behnken Design modeling was used to select process conditions from a combination of factors producing the optimal responses. Phenolic compounds were extracted using the Ultrasonic Assisted Extraction (UAE) method. Extraction parameters that were varied included extraction duration, ultrasound power, and material:solvent ratio. Analysis of total phenol content was carried out using the Follin-Ciocalteu method and observed using visible light spectroscopy. Relationship between variables and the response of total phenol was modeled by Y = 145,50659 – 17,7693A + 1,29148B + 5563,3941C – 0,030108AB + 343,34234AC + 59, 54583BC + 0,282160A^2 - 0,008468B^2 - 1,10175 E+05C^2 (A is duration extraction; B is the ultrasound power; C is material:solvent ratio). The optimum value of total phenol is 804.83 mg GAE/g with the condition extraction time of 25 minutes, power extraction of 180 watt, and the material:solvent ratio of 0.06 g/mL.

Keywords: Cocoa Pod Husk, Ultrasonic Assisted Extraction (UAE), Follin-Ciocalteu, Design Expert, Total Phenol.

Potencies Powder Sugar Apple (*Annona squamosa*) and Watermelon Mesocarp (*Citrullus lanatus*) as Inhibitory Pancreatic Lipase and Xanthine Oxidase

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ABSTRACT

Obesity is caused by fat accumulation resulted from the performance of pancreatic lipase enzyme, while gout is caused by the increase of uric acid in the blood due to the imbalanced production and excretion of uric acid. These diseases can be maintained by reducing foods contain high purines (gout), high carbohydrates and fats (obesity). Orlistat is synthetic drug which use to reduce excess fat in the body to inhibit pancreatic lipase enzyme, while allopurinol is synthetic drug which use to reduce uric acid levels. The drugs will inhibit active site pancreatic lipase and xanthine oxidase enzyme. Both of synthetic drugs have several side effects on healthy so it is urgent to find out a drug which has little side effect from nature such as fruits. There are several steps in this research design includes (1) preparations of sugar apple and watermelon mesocarp; (2) characterization using SEM-EDX; (3) qualitative phytochemicals test; (4) investigate the inhibitory relative of sugar apples to one tablet orlistat; and (5) investigate the inhibitory relative of watermelon mesocarp to one tablet allopurinol. The results showed that the percentage yield of sugar apple was 8,183% and the percentage yield of watermelon mesocarp was 2,459%. Characterizations with SEM showed that average of diameter particles of sugar apple powder and watermelon mesocarp were 20,167 μm and 17,236 μm. The EDX analysis showed that sugar apple contains element K (0,60%) while watermelon mesocarp has several mineral: Mg (0.47%), Al (0.33%), P (0.60%), Cl (0.79%), K (3.02%), and Ca (0.39%). Both of brewed sugar apple and watermelon mesocarp contained secondary metabolites flavonoid and polyphenol. The inhibitory activity of brewed 1.5 g/150 mL sugar apple to pancreatic lipase enzyme was 18.05% while the inhibitory activity of brewed 1.5 g/150 mL watermelon mesocarp to xanthine oxidase was 19.75%. Therefore, it can be concluded that extracts sugar apple and watermelon mesocarp have potentials to be natural drugs with double benefit as anti-obesity and anti-gout.

Keywords: pancreatic lipase, xanthine oxidase, watermelon mesocarp, sugar apple, obesity, uric acid, orlistat, allopurinol.

Preliminary Study of On-site Aqueous Chemical Laboratory Waste Treatment Based on Lean Manufacturing Concept

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ABSTRACT

This preliminary study aims to explore the possibility of lean manufacturing concept in the on-site treatment of aqueous waste of chemical laboratory. Laboratory chemical's availability, course learning objective, module sustainability, and status of the waste were taken for consideration in this study. This study used Fundamental Chemistry Laboratory of the Chemistry Department in Brawijaya University - Malang as an example and consist of several stages, namely (1) choice of chemicals used in the lab practice (practicum), (2) incorporation of course learning objectives, (3) prediction of possible waste (types and amounts) into the practicum module, and (4) on-site waste treatment and chemical analysis. The preliminary study reveals that this concept can be implemented in educational chemical laboratory and has wide range of possibilities, which may open innovations in waste treatment technologies. Particularly in this study, implementation of the concept resulting in: (a) greener chemical supply for the laboratory practice, (b) lower cost of laboratory management, (c) simple and effective waste treatment, and (d) lower waste status (volume and toxicity). This study may have different result if it is applied in different type of chemical laboratory, thus further study in a wider range of chemical laboratory is needed. Nevertheless, integration of waste treatment in laboratory management with the educational curriculum is compulsory and remains a challenge.

Keywords: lean, management, laboratory, waste, treatment.

Synthesis of Anion-dependent Zinc(II)-Niacinamide Complexes by Layered Solution Method

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ABSTRACT

Zinc(II) complexes are well-known for having diverse biological activity and commonly used as antibacterial agents. To explore their biological activity, N-donor ligands such as niacinamide can be used as the ligand (L). This study aims to synthesize zinc(II)-niacinamide complexes using various source of zinc(II) salts and various Zn(II):niacinamide molar ratios. The syntheses were conducted by a layered solution method at room temperature for 21 days using water and methanol as the solvents. Only solid products were characterized by FTIR, melting point test, anion identification qualitative test, and SEM. The synthesis produces colorless crystals from the sulfate and the chloride reactions, while other reaction from the acetate and nitrate salts did not produce any solids. In the crystal form, the chloride acts as free ion, while the sulfate act as ligand. Therefore, different anion of the Zn(II) salt lead to different result. The molar ratio of Zn(II):niacinamide affects the mass of the synthesized complex, in which the larger molar ratio used, the greater mass of the crystal obtained. Based on characterization by FTIR, melting point test, and anion identification qualitative test, the colorless crystal obtained from the sulfate and the chloride reactions were predicted to be complexes of [Zn(L)x(SO4)] and [Zn(L)x]Cl2, respectively.

Keywords: anion, Zn(II) complex, niacinamide, layered solution method, molar ratio

Synthesis of Anion-dependent Copper(II)-Niacinamide Complexes by Layered Solution Method

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ABSTRACT

Copper(II) and its compounds are often used in the medical treatment because of their potential antibacterial activities. To explore their possible antibacterial activity, Cu(II) can complexed with N-donor ligands, one of which is niacinamide (L). This study aims to investigate the effect of different anion of the copper(II) salts on the synthesis of Cu(II)-niacinamide complex in various Cu(II):niacinamide molar ratios. The anions were sulfate, nitrate, chloride, and acetate, whereas the molar ratios of Cu(II):niacinamide were 1:2, 1:4, and 1:6. The syntheses were conducted by a layered solution method using water and methanol as the solvents at room temperature for 21 days. Characterization by FTIR, melting point test, anion identification qualitative test, and SEM were performed only on the solid products. Experimental data reveals that the synthesis yielding various solid products, namely light blue crystals (sulfate), dark green crystals (acetate) and light blue microcrystalline powder (chloride). The anion of Cu(II) salt affects the solid formation of Cu(II)-niacinamide complex, in which sulfate, chloride and acetate anions produce crystalline solids while nitrate anion was not produce any solids. These anions act as free ion in the crystal lattice (chloride) or act as ligand (sulfate and acetate). The molar ratio of Cu(II):niacinamide affects the mass of the synthesized complex in which the larger the molar ratio used, the greater the mass of the product obtained (except in the acetate reaction). Based on the characterization by FTIR, melting point test, anion identification qualitative test and SEM, the solid products obtained from the sulfate, chloride, and acetate anions were predicted to be complexes of [Cu(L)x(SO4)], [Cu(L)x]Cl2, and [Cu2(L)4(CH3COO)2], respectively.

Keywords: anion, Cu(II) complex, niacinamide, layered solution method, molar ratio

Synthesis of Rice Husk Magnetic Nanoparticle Biocomposites: Evaluation on Rice Husk Fiber Concentration and Characterization

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ABSTRACT

The utilization of rice husk become cellulose could be a potential as raw material for biocomposites. Rice husk is lignocelluloses which contain of 36.6% of cellulose. The biocomposites is combination of cellulose material and magnetic nanoparticle (MNPs). This research is focus to investigate the composition of rice husk fiber which affects to properties of rice husk magnetic nanoparticle biocomposites (RHB). The dry rice husk (RH) was grinded in to 60 mesh in size and continuing for delignification to get cellulose fiber. Delignification process was conducted by adding 40% v/v of RH into 1% w/v of NaOH at 80°C for 2 h under stirred. Synthesis of biocomposites was prepared by solvothermal method, the delignified rice husk (RH-D) was put in to ethylene glycol, $FeCl_3.6H_2O$, and 1.6-hexanediamine at ± 200°C for 6 h. The best composition for biocomposites properties was achieved at 1.25% of RH-D. Magnetic nanoparticle was growth on surface of fibers which around size of 30-50 nm. The magnetic properties was confirmed which consist of 93% of iron and specific peak at 36°, 43°, and 57° which measured by X-Ray Fluorescence (XRF) and X-Ray Diffraction (XRD), respectively. The Fourier Transformed Infrared (FT-IR) was identified for Fe-O bending vibration and N–H on biocomposites at 580 cm^{-1}1640 and cm^{-1}, respectively. Amine concentration on biocomposites about 2.9 mmol/g. Stability thermal of RHB showed more higher stability than that RH-D which observed up to 1000°C. The enhance properties of biocomposites, such as iron content, and amine group on surface may affect to reactivity of biocomposites toward a wide range of applications.

Keywords: rice husk, magnetic nanoparticle, biocomposites, solvothermal, fiber.

A Review: Synthesis of Amphiphilic Material and Its Potential in Catalysis System of Biodiesel Synthesis

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ABSTRACT

Biodiesel is classified as a high demand energy in Indonesia, so the production process needs to be optimized to be effective and efficient. Biodiesel production through the transesterification reaction always produces waste as a by-product, such as glycerol, residual fatty acids, residual alcohol, and residual alkaline species. The problem is, the separation of the mixture resulting from the transesterification reaction is still difficult to do. Many studies use traditional methods (such as washing and steaming) and they appear to be ineffective. Alternatively, research needs to be expanded on the synthesis of materials with special designs for the separation of the mixture resulting from the transesterification reaction. Therefore, we review a unique material design, namely amphiphilic material. By Design, this material is made as a heterogeneous inorganic material and only has two solubility active sites, such as hydrophilic and hydrophobic. This material has been studied about the synthesis method used, the success of the synthesis, and its structural properties. Next, we have described the challenges and problems in the synthesis of this material. In addition, we have formulated a catalysis system design for the separation of the transesterified mixture, so that it can estimate the steps of the biodiesel product catalysis process.

One-Pot Catalytic Oxidation for Transforming Eugenol to Vanillin Using $ZnAl_2O_4$ Catalyst

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ABSTRACT

In this study, $ZnAl_2O_4$ catalyst was synthesized with the capability of transforming eugenol to vanillin through One-Pot Catalytic Oxidation. $ZnAl_2O_4$ was synthesized from $Zn(CH_3COO)_2$. $2H_2O$ and Al_2O, using the wet-impregnation method, and characterized by FTIR, XRD, and SEM. One-Pot Catalytic Oxidation was conducted by heating under reflux at 150°C using nitrobenzene and a certain amount of $ZnAl_2O_4$ catalyst (4% and 7%) for 2 and 3 hours of reaction. Catalytic Oxidation is also carried out without catalyst as a comparison. The vanillin product was confirmed by GC and spectral data achieved from UV-Vis, FTIR, and mass spectrometry. The results revealed that transforming eugenol to vanillin using $ZnAl_2O_4$ catalyst provides a better selectivity value than without using the catalyst. The use of 4% and 7% catalyst give the best results with conversion rate at 100%, but selectivity value found better at 4% of loading catalyst with 100% for 2 hours reaction, and 94% for 3 hours reaction. While 7% of loading catalysts give selectivity values at 82% and 85%, respectively for 2 hours and 3 hours. On the other hand, vanillin without catalyst also provides a conversion value at 100%, with 88% for selectivity value.

Keywords: Eugenol, Vanillin, $ZnAl_2O_4$, Oxidation, Catalytic.

ZSM-5-Based Catalyst: A Valuable Approach toward Biodiesel Production. A Review

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ABSTRACT

ZSM-5-based catalysts are versatile catalytic systems for a wide range of laboratory studies. The chemical composition, ion exchange, and pore size structure attributes of zeolites are responsible for their extensive catalytic applications. Generally, ZSM-5 catalysts are used with variation of impregnation of transition metal for esterification and transesterification process. Esterification and transesterification are both of the important and routinely processes in diverse fields of organic synthesis. It has a long history in laboratory work due to its versatility for biodiesel production. This review intends to give a detailed insight into the significance of ZSM-5-based catalysts for biodiesel production, such as the used method of its synthesis, the structural characterization with XRD, XRF, and SEM instrument. Then, this article describes about the potential of ZSM-5-based catalysts for biodiesel production with its yield. So, we can get the information of the optimation of ZSM-5-based catalysts that can catalysis in esterification and transesterification process for biodiesel production.

Keywords. ZSM-5, heterogeneous catalysis, impregnation, transition metal, biodiesel.

Extraction Efficiency of Recent Macrocyclic Ligand for the Separation of Heavy Metal Ions by Liquid-Liquid Extraction: A Review

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ABSTRACT

Many industrial products such as automotive, electronics, jewelry, household products, and other industrial products use heavy metals as their materials. However, heavy metal ions tend to accumulate in environment. Therefore, the separation of heavy metals is a priority for environmental protection. Liquid-liquid extraction is the most widely applied separation technique by industry for wastewater treatment. Extraction efficiency depends on the use of extractants that are selective in forming complexes with metal ions. Many types of extractants have been studied and were able to separate heavy metal ions. However, the effectiveness and selectivity were not good enough. A carrier is added to the system to improve the extraction performance. The research method used in this article was literature study, which is a review of articles related to the topic in the ten years publishing period (2011 – 2020). The macrocyclic ligands developed for liquid-liquid extraction were calixarene and its derivatives, crown ether and its derivatives, resorcinarenes and their derivatives, and other macrocyclic ligands. These ligands were developed for the extraction of heavy metals such as Ag(I), Hg(I), Hg(II), Pb(II), Cr(III), Cd(II), Cu(II), Co(II), Ni(II), and Zn(II). The ability of macrocyclic compounds to separate metal ions was greatly influenced by their functional groups. The sulfur atom in modified macrocyclic ligands was a functional group that acts as a soft base. Metal ions which are soft acids were more attracted to the sulfur groups so that the extraction efficiency of the modified macrocyclic compounds was better than the unmodified ones. In addition, the influence of pH, ligand concentration, type of solvent, and agitation time resulted the extraction efficiency in the range of 50 – 100%. Based on these results, it can be concluded that macrocyclic ligands have potential to increase the extraction efficiency of heavy metals in the liquid-liquid extraction method.

Keywords: Macrocyclic ligand, liquid-liquid extraction, heavy metal ions, extraction, efficiency.

Computational Analysis on The Development of New Technetium-99m-labeled Pentapeptide for Cancer Molecular Imaging Targeting Integrin $\alpha_5\beta_1$

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ABSTRACT

Cancer continues to be a major leading cause of death despite huge efforts dedicated to developing anticancer drugs. Radiopeptide is currently used for targeted therapy and diagnosis of cancer. The structure selection of new radiopeptide should be determined to minimize the decrease in binding affinity because of metal radioisotope and its chelator. In this research, the interaction of radiopeptides based on technetium metal on RGD binding pocket of integrin α5β1 and synergy pocket of integrin α_5 was analyzed by molecular docking simulation using Autodock Vina and Autodock 4. Pentapeptide Pro-His-Ser-Cys-Asn (PHSCN) has two possible conformations to interact with integrin α_5 which is predicted could be labeled in two possible positions. Even though the results showed that the binding value of radiolabeled compounds was lower than PHSCN's, some radiolabeled compounds in this simulation might have biological activity. The use of HYNIC-EDDA as a chelator produces better value than DTPA and MAS3. Radiolabeling procedures in the N-terminal position of the peptide are preferable and have higher affinity than C-terminal modification. Further laboratory experiments are required to confirm the activity of EDDA-Tc-HYNIC-PHSCN-NH_2 on the integrin $\alpha_5\beta_1$ receptor.

Keywords: radiopeptide, technetium, integrin $\alpha_5\beta_1$, computational simulations.

Characterization of Crude Extract of Protease from *Bacillus megaterium* TR-10 as Efforts to Support Halal Collagen Production Process

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ABSTRACT

Bacteria that produce proteases are called proteolytic bacteria, one of which is *Bacillus megaterium* TR-10. The crude protease extract produced must be characterized to determine the optimum conditions. This research was carried out in several stages including the type of protease (pH) in the range of pH 5-9, the effect of metal ions Fe^{2+}, Mn^{2+}, $Mg2^{+}$, $Zn2^{+}$, Cu^{2+}, and specific inhibitors (EDTA) with various concentrations of 0.01 M; 0.025 M; 0.05 M; and 0.1 M. The last characterization was to test its selectivity to scales, skin, bones, and tails that were explored from milkfish. The results of the characterization of the crude extract of the protease produced from *Bacillus megaterium* TR-10 showed that the protease produced was neutral at pH 6 with an activity of 8.1195 U/mL and was a metalloprotease. This is because the addition of metal ions increased activity, from 2.4989 to 4.8151 U/mL and when the addition of EDTA there was a decrease in activity so that it could be said that EDTA was an inhibitor. The protease produced is also selective for scales, skin, bones, and skin.

Keywords: Optimization Production of Protease, Characterization of Protease, *Bacillus megaterium*.

The Potency of Natural Dyes from Kesumba Seeds Extract (Bixa orellana L.) for Identification of Animal Fats by UV-vis Spectrophotometry

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ABSTRACT

This study aims to identify animal fats by UV-vis spectrophotometric method using natural coloring reagents from the extract of kesumba seeds (Bixa orellana L.), as an alternative to the carcinogenic diazonium reagent. Animal fat samples (LH1, LH2, LH3, LH4) used are the result of rendering crude fat. Kesumba seeds extract were obtained by maceration method using methanol solvent, then the extract components were analyzed using LC-MS/MS. Animal fat identification test was carried out by analyzing the respective UV-vis spectra profiles of the four animal fats, kesumba seeds extract, and animal fat added with reagents of kesumba seeds extract using ethyl acetate as solvent. The result of the LC-MS/MS analysis of the kesumba seeds extract showed the presence of bixin compound which is suspected to be the contribution of natural dyes from the extract. The UV-vis spectrum profile of this kesumba seeds extract displayed four absorption bands with wavelenght of 484, 452, 431, and 294 nm. Spectrophotometric analysis of the animal fats LH1, LH2, LH3, and LH4 without kesumba seeds extract exhibited different UV-vis spectrum profiles. The addition of kesumba seeds extract to the animal fats also showed different profiles of the UV-vis spectrum, but the profile obtained was different from the UV-vis spectrum profile of animal fats without the addition of kesumba seeds extract reagent. Based on the results, it can be concluded that the types of animal fats LH1, LH2, LH3, and LH4 can be identified by UV-vis spectrophotometry using ethyl acetate as solvent and with natural dyes from the extract of kesumba seeds.

Keywords: Animal fat, Kesumba, Bixa orellana L., UV-vis spectrophotometry, LC-MS/MS

Synthesis of The Modified Surface Functional Group of Activated Carbon from The Coffee Ground and Its Application for Removal of Nitrate from The Tofu Industry Processing Wastewater

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ABSTRACT

The spent coffee grounds were successfully converted into powdered activated carbon by means of carbonization at 400oC. The activated carbon was then modified its surface functional groups using hydrochloric acid as the activating agent. The modified activated carbon was characterized by using SEM and FTIR analysis for its surface morphology and surface functional groups. The modified activated carbon has the characteristic and density capacity of being a potential material used in the adsorption process of wastewater treatment, which refers to adsorb of atoms, ions, and molecules on its surface material. In this study, the modified activated carbon was applied for the treating of tofu industry wastewater that contains high nitrate ions. The purpose of this study was to determine the performance of the modified activated carbon from coffee grounds as an adsorbent to reduce nitrate contents of tofu wastewater on the adsorption process. Experimental batch adsorption showed a decrease in the concentration of nitrate parameters from 28.6 mg/L to 1.2 mg/L and 95.80% removal efficiency at equilibrium contact time was of 180 minutes, pHe of 7, room temperature, stirring rate of 100 rpm, and adsorbent dose of 2g/L. The results showed that the nitrate removal efficiency was comparable to the commercial activated carbon. Moreover, it found the nitrate removal from the tofu industry wastewater using the modified activated carbon from coffee grounds is favorable than commercial activated carbon. The highest efficiency in nitrate adsorption was due to its different morphology and surface properties.

Keywords: coffee ground, activated carbon, modified surface functional groups, tofu wastewater, nitrate removal, adsorption.

Determination of Ammonia in Pond Water by Gas-Diffusion Flow Injection Analysis (GD-FIA)-Spectrophotometry using Minnieroot Flower (Ruellia tuberosa) as Natural Reagent

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ABSTRACT

Pond is an artificial ecosystem which is useful for pisciculture. In pond water, ammonia is one of pollutant agent generated from fish metabolism and feed degradation. The purpose of this research is to find out the optimum conditions of gas-diffusion flow injection (GD-FI) spectrophotometry for the determination of total ammonia. The optimization parameters included concentration of NaOH and Ruellia tuberosa extract, the length of mixing coil, and sample volume. The principle of total ammonia determination is based on the reaction of NH4+ and NH4OH in donor stream with NaOH to form alkaline NH3 gas. The NH3 gas will then diffuse through the hydrophobic PTFE membrane into acceptor stream containing Ruellia tuberosa extract. The presence of NH3 gas in the acceptor stream changed the Ruellia tuberosa extract color into green which monitored at maximum wavelength of 620 nm. The GD-FI spectrophotometry was also validated based on the linearity, selectivity and accuracy. Under the obtained optimum conditions of 1M NaOH, 5% extract, 120 cm mixing coil, and 200 µL sample volume, the proposed method showed a very good linearity at the range ammonia concentration from 0 – 1000 ppm with high correlation between concentration and absorbance (R2 = 0,993). The result of selectivity test indicated that the method was selective against sulfite and nitrite compound up to 1500 ppm with %error value < 10%. The GD-FIA-spectrophotometry has been applied to measured ammonia concentration in pond water with satisfied results shown by the high recoveries in the range of 95% - 105%.

Keywords: Ammonia, gas-diffusion flow injection analysis, pond water, selectivity, spectrophotometry

Biosynthesis Silver Nanoparticle Using Extract of Tomato (*Solanum lycopersicum*) for The Development of Spectrophotometric Mercury Detection

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ABSTRACT

The need of metal nanoparticles has been growing exponentially as they can be used in a large number of applications including analytical method of detections. This study was focused on the green synthesis of silver nanoparticles (AgNPs) using natural reagent of *Solanum lycopersicum* extract, and the resulted red-brown AgNPs was used to develop a spectrophotometric method for mercury(II) determination. The detection of mercury(II) was based on the decrease of color intensity of the red-brown AgNPs in the presence of mercury(II). The presence of mercury(II) re-oxidized the red-brown AgNPs in the solution to colorless silver(I) ions. The higher concentration of mercury, the more decrease of the red-brown AgNPs color intensity. This research was conducted to synthesize AgNPs using bioreductant of Solanum lycopersicum extract and to determine the optimum conditions for mercury(II) detection including concentration of AgNPs and reaction time. The obtained optimum conditions were used to determine the measurement range of mercury(II) and to determine the concentration of mercury(II) in whitening cream samples. The result showed that AgNPs was successfully synthesized using *Solanum lycopersicum* extract resulted a red-brown solution with maximum absorbance of 411 nm. The optimum conditions for mercury detection were obtained under concentration of silver nanoparticles of 4.86 mg/L and time of reaction of 3 minutes. Under these optimum conditions, the proposed method showed excellent linear calibration for mercury from 0-4 mg/L with a very good correlation (R2 of 0.997) between concentration and delta absorbance of AgNPs solution before and after the addition of mercury(II) with detection limit of 0.062 mg/L. The developed method has also been applied to determine mercury(II) in cosmetics with fairly satisfied results.

Keywords: Green synthesis, AgNPs, Solanum lycopersicum, mercury, spectrophotometry.

The Effect of Various Stirring Speed in the Synthesis of Oleic Imidazoline as an Introduction to Pre-Scale Up Synthesis

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In this study, oleic imidazoline for corrosion inhibitor has been successfully synthesized from triethylenetetramine (TETA) and oleic acid (OA) pro-analysis as precursors using the reflux method at 140°C for 12 hours using various stirring speeds of 1250 and 1500 rpm with conversion percentage values of 92.52+0.00% and 90.59+2.10%, respectively. Kinetic data of the reaction was determined by measuring the acid value. According to the acid value, the kinetic orders of stirring speed of 1250 and 1500 rpm were found to be pseudo-first and second orders, respectively. The oleic imidazoline was purified by solvent extraction method, identified using TLC, and determining physical data, such as density (0.914 g/mL), viscosity (199.07 N/m^2), and solubility in various organic solvents. The optimum reaction conditions were then applied to the pre-scale up synthesis using technical OA with the composition of OA 80.80%, linoleic acid (LNA) >18%, and stearic acid (SA) >6%. The pre-scale up synthesis using technical OA afforded a percentage conversion value of 91.17%. The pre-scale up synthesized product then was characterized using UV-Vis, FTIR, NMR and LC-MS. Characterization using LC-MS confirmed that the imidazoline mixture was consisted of three compounds, namely oleic, linoleic, and stearic imidazoline. The pre-scale up synthesis carried out under optimum conditions succeeded in providing imidazoline products with oleic imidazoline as the main product, with a high percentage conversion value.

Keywords: oleic imidazoline, triethylenetetramine, oleic acid, corrosion inhibitor, kinetic, physical properties, pre-scale up.

Flavonoid Content Screening and Antioxidant Activity of Indonesian Cinnamon Extract (*Cinnamomum burmannii*)

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ABSTRACT

Flavonoids can act as an antioxidant agent that can be used as an additive in cosmetics to prevent skin aging according to their radical scavenging activities. In this study, a preliminary test was conducted to extract phenolic compounds from cinnamon (Cinnamomum burmannii) by using the maceration method with various solvents (ethanol, ethyl acetate, and acetone). According to the qualitative flavonoid test, all solvents used were able to extract flavonoid from cinnamon. Determination of flavonoid content was carried out by the colorimetric method using aluminium chloride (AlCl3) with quercetin as a standard. Furthermore, antioxidant activity was determined from the IC_{50} value of the radical scavenging activity using the DPPH method and ascorbic acid was used as a positive control. The ethanol extract was chosen for further study in large-scale extraction because it showed the highest flavonoid content (0.01749 8.0 x 10^{-5} mg QE/g extract) and the best antioxidant activity (IC_{50} 16,2679 ppm) compared to the ethyl acetate and acetone extracts. Ethanol large-scale extract of cinnamon contained flavonoid, alkaloid, tannin, and terpenoid based on qualitative phytochemical tests. The flavonoid content and antioxidant activity of large-scale cinnamon ethanol extract was 0.01382 4.8 x 10^{-5} mg QE/g extract and IC_{50} 15.6993 ppm, respectively. Based on LC-MS analysis, cinnamon extract contained carvone, catechins, syringic acid, protocatechualdehyde, caryophyllene alcohol, eugenol, and coumarins, while GC-MS analysis showed the presence of (E)-cinnamaldehyde, 2,4-di-tert-butylphenol, and methyl palmitate. Cinnamon extract is expected to be used for further application in the cosmetic industry.

Keywords: antioxidant, cinnamon, Cinnamomum burmannii, extraction, flavonoid.

Characterization of Lignin Peroxidase From *Phanerochaete chrysosphorium* ITB isolate

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ABSTRACT

The aim of this study was to characterize lignin peroxidase (LiP) obtained from *Phanerochaete crysosporium* ITB isolate. The characterizations included lignin peroxidase molecular weight, the pH and working temperature of the crude extract of the enzyme, its stability to temperature, the effect of metal ions and inhibitors, their precipitation with ethanol, the comparation of the storage stability of crude extract, the precipitated of ethanol and the resuspension of the precipitated of ethanol. The LiP was suspected to be other LiP isoenzyme with molecular weight of 34 kDa. Crude extract of LiP has high activity at pH between 3 until 5, at 26 until 32 degree Celsius, has good thermal stability, its activity is lost due to the presence of Pb^{2+} ion, decreased to 78 until 90 percentage due to K^{+}, Co^{2+}, Fe^{2+}, Cd^{2+}, Mg^{2+} and Cu^{2+} ion, decreased to less than 40% because EDTA, Na+, Cr3+ and Hg2+ ion, were not affected by Mn2+ and Zn2+ ion, but increased in the presence of NaN_3, Ni^{2+}, and Ca^{2+} ion, could not be precipitated with the optimum ethanol at 64% ethanol saturation which resulted in an increase in specific activity of 2.3 times, the crude extract storage at zero degree Celsius was more stable than the precipitate resulting from ethanol precipitation and resuspension from ethanol precipitation. With these characteristics, the crude extract of LiP from *P. chrysosporium* ITB isolate has good potential to be used as a decolorization agent in textile waste.

Keywords: lignin peroxidase, *Phanerochaete crysosporium*, characterization.

Directed Study Of Pine's Rosin Reaction Non-Precious Metal Catalyst

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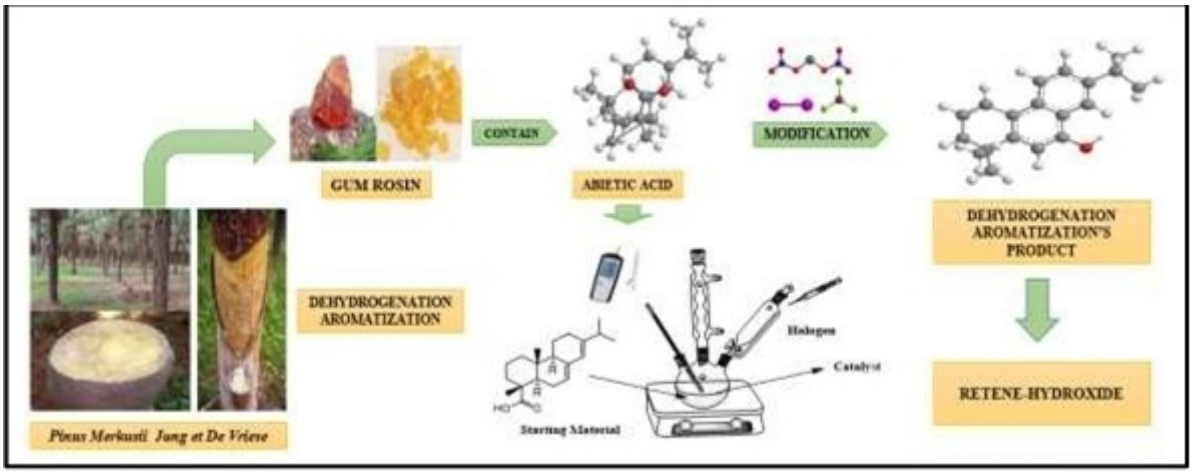

ABSTRACT

Pine's rosin of *Pinus merkusii Jung at de Vriese* is produced industrially from a distillation process of pine sap. The high of Indonesian total production lead the main derivatization strategic into several derivates to fulfill the market demand. The general methodology for transformation reported involving the use of palladium (Pd) and platinum (Pt)-based catalyst, which both are precious metal's catalyst to proceed oxidative dehydrogenative-aromatization of the rosin. Selectivity reaction provided dehydroabietic acid in high yield. This paper reports non-precious metals-based catalyst such as iron (Fe), Zinc (Zn), or copper (Cu) with Iodine (I_2) were applied to deliver the reaction. It was found that, the similar product was isolated include with several by-product. The product are determined based on LC-MS/MS, UV-Vis and ATR-FTIR spectroscopy.

Keywords: Pinus merkusii; rosin; oxidative-dehydrogenation; dehydrogenation-aromatization; abietic acid (AA); dehydroabietic acid (DHA); non-precious metal's catalyst.

Catalyst of Ag-Zn/ZSM-5 For The Convertion of Glycerol to Ethenol

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ABSTRACT

The purpose of this study was to determine the effectiveness of the conversion of glycerol into ethanol using an Ag-Zn/ZSM-5 catalyst with ultrasonic assistance at a temperature of 60°C with variations in sonication time of 2 hours, 4 hours, and 6 hours. This research was carried out in 4 stages, namely: (1) activation of ZSM-5 with NH4Cl, (2) Impregnation of Ag metal, Zn metal and a mixture of Logan Ag and Zn metal, (3) Characterization of ZSM-5 catalyst resulting from activation and impregnation, (4) ultrasonic-assisted conversion of glycerol to ethanol with time variations.The characterization of the catalyst used XRF, XRD, acidity and surface area analysis, while the GC tool was used to analyze the results of the conversion of glycerol into ethanol. The results showed that the Zeolite ZSM-5 was successfully impregnated with a mixture of Ag and Zn metals as evidenced by XRD analysis, namely that there was a similarity of peaks at an angle of 2Θ with the JCPDS standard and the results of XRF analysis were obtained that impregnated Ag and Zn metals were 13.3 wt% and 10.7 wt%. Optimum degradation time for glycerol conversion glycerol to ethanol using Ag-Zn/ZSM-5 catalyst with ultrasonic assistance at a temperature of 60°C is 4 hours with a yield of 45 wt%.

Keywords: Ag-Zn/ZSM-5, ethanol, glycerol, catalyst, zeolite.

Synthesis and Characterization of pH and Thermoserponsive Nanogels of Poly(N-vinylcaprolactam-co-N-methylolacrylamide) Using Emulsion Polymerization

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ABSTRACT

Temperature and pH responsive nanogels are nano-sized hydrogel materials that have potentials to be applied in controlled drug binding and release systems. Poly(N-vinylcaprolactam) (PNVCL) has been proven to be thermoresponsive with cloud point transition (Tc) temperatures ranging from 32-38˚C. Poly(N-methylolacrylamide) (PNMA) on the other hand is considered to have pH responsive properties and has also been used to regulate Tc in thermoresponsive copolymers. In this study, a pH and temperature responsive nanogels of poly(N-vinylcaprolactam-co-N-methylolacrylamide) (P(NVCL-co-NMA)) were synthesized by emulsion polymerization via free radical polymerization (FRP). In this study, the monomer composition and concentration of N,N'-methylenebisacrylamide (MBA) as crosslining agent were varied to study their effect on the responsivity of nanogels to temperature and pH.. FT-IR and 1H-NMR analysis proved the polymerization was successful. UV-Vis characterization and particle size analyzer (PSA) showed that nanogels with a monomer composition of NVCL and NMA of 75% and 25%, respectively, and using 4% of MBA showed Tc around 37˚C at pH 7.4. In addition, Tc nanogels increased with increasing concentration of NMA monomers in nanogels. The increase in MBA percent will decrease the Tc of the synthesized nanogels. P(NVCL-co-NMA) nanogel was also shown to show pH response with increasing Tc value at acidic pH.

Keywords: Nanogel, N-vinylcaprolactam, N-methylolacrylamide, poly(N-vinylcaprolactam-co-N-methylolacrylamide), responsive polymers.

Development of the GD-µPAD (Gas Diffusion Microfluidic Paper-Based Analytical Device) To Measure Total Ammonia in Saliva Using Secang Wood Extract (*Caesalpinia Sappan L.*)

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ABSTRACT

This study aims to develop a method for analyzing total ammonia levels in saliva-based on Gas Diffusion Paper-based Microfluidic Analysis (GD-µPAD). The total amount of ammonia in saliva can be an indicator of the oral microbiome status potentially correlates with gastric cancer problems, periodontal disease or to assess caries risk. The developed GD-µPAD contained 6 unit of detections, where each unit consisting of three rounded stack layers: sample layer (paper layer impregnated with sodium hydroxide solution), hydrophobic PTFE membrane layer for gas separation, and detection layer (paper layer impregnated with *Caesalpinia sappan L* extract). The six units were aligned on a transparent laminated film bag with hot lamination. The analysis process involved converting ammonium to ammonia gas in the sample layer, which then diffuses the ammonia gas through the gas permeable PTFE membrane to the detection layer, resulting in a color change in the natural acid-base indicator of *Caesalpinia sappan L* extract from yellow to purplish red due to changes in pH in the presence of ammonia. The colors formed on the detection layer were processed using Image J software to determine the RGB intensity. Operational and chemical conditions were optimized to achieve sensitivity and to test the selectivity and validity of the method. Optimum conditions were achieved under reaction time of 5 minutes, concentration of NaOH of 1 M, and concentration of the extract of 1 % w/v. The GD-µPAD method provided good linearity at the total ammonia concentration of 0-40 mg/L (R^2 = 0.9951) with LOD and LOQ values of 3.38 mg/L and 5.63 mg/L. The development of the GD-µPAD method for the determination of ammonia levels in saliva was successfully applied to saliva samples. Determining the total ammonia in saliva using the GD-µPAD which was developed to be a very simple and affordable method that operates without the need for laboratory equipment.

Keywords: Ammonia, GD-µPAD, *Caesalpinia sappan*, Saliva.

Molecular Docking Analysis of the Constituent in the Fruits of *Morinda citrifolia* using PI3K/mTOR Receptor of Liver Cancer

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ABSTRACT

One of the responsible pathways for liver cancer is by PI3K/AKT/mTOR. Analysis of natural inhibitors for these pathways is the main interest of this research. The use of the medical plants as traditional medicine is being popular in communities, but the scientific efficacy is questionable. Here, we analyze the constituents of *Morinda citrifolia* (Noni) fruits extract which may be responsible for the inhibitor in PI3K/AKT/mTOR pathways in liver cancer. Dried *M. citrifolia* fruits were extracted three times with absolute methanol. The methanol extract obtained is 32.97% based on the dry weight of Noni fruit simplicia. The methanol extract is then partitioned with ethyl acetate (fraction A, 10.19%) followed by an n-butanol fraction (Fraction B, 32.25%) and the rest is designated as water fraction (fraction C, 57.57%). Fraction A then purified using silica gel column and eluted successively with a stepwise solvent (CH_3Cl-MeOH; 100%:0 to 0:100%) gave 9 sub-fractions. Among them, sub-fraction A3 was the prospective have only one spot on TLC. Analytical HPLC showed the single peak detected on 365 nm. Analysis using LC-MS/MS Qtof identified the constituent in A3 as scopoletin (32.98%) followed by minor compound gancidin W (7.12%). Molecular docking results showed that these ligands interact with the receptor inside the binding site of the target, and the interactions were similar with the co-crystallized ligand, with Val 882, the key amino acid in PI3K/mTOR receptor. However, the binding affinity of scopoletin was -6.56 Kcal/mol lower than gancidin W (-6.17 Kcal/mol). Scopoletin has four hydrogen bond interactions with different amino acid residues (Tyr 867, Asp 964, Glu 880, Val 882) compared to gancidin W with one hydrogen bond (Val 882). By this result, scopoletin is considered to have a higher possibility to inhibit liver cancer by invplved in PI3K/AKT/mTOR pathways. Further research is proposed for its anticancer activities using in vivo methods.

Keywords: anticancer, *Morinda citrifolia*, PI3K/AKT/mTOR, scopoletin, gancidin W.

A Green Synthesis of 9-(4-Bromophenyl)-3,4,5,6,7,9-Hexahydro-1*H*-Xanthene-1,8(2*H*)-Dione Using Lemon Juice Catalyst Assisted by Ultrasound and Its Antibacterial Activity

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ABSTRACT

The 9-(4-bromophenyl)-3,4,5,6,7,9-hexahydro-1*H*-xanthene-1,8(2*H*)-dione (Compound 1) was successfully synthesized using the green synthesis method. We used a green catalyst lemon juice and ultrasound-assisted method to reduce temperature, time, and hazardous waste reaction. Uncatalyst reaction produced the yield of compound 1 47.31 % when water used as the solvent. In the other hand, there was increase in yield when lemon juice was used as an acidic catalyst, and the yield changed to 59.14%. Meanwhile, another product was formed in significant amounts when we used these methods. The product was 2-(4-bromobenzylidene)cyclohexane-1,3-dione (Compound 2). These reaction results will be discussed further more in the talk. The antibacterial test show that compound 1 has no antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*.

Synthesis and Characterization of Complex Compounds from Cadmium(II) Chloride and Cobalt(II) Chloride with *N,N'*-Diethylthiourea

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ABSTRACT

Ionic complexes of cadmium(II) chloride and cobalt(II) chloride with *N,N'*-diethylthiourea (*detu*) ligands hves not been previously reported. Therefore, the synthesis was carried out to study the structure and characterization of the two ionic complex compounds. The cadmium(II)-*detu* ionic complex was synthesized using the direct reaction method with a ratio between Cd(II) salt and detu ligand of 1:2. Meanwhile, the cobalt(II)-*detu* ionic complex was synthesized with a ratio between Co(II) salt and *detu* ligand 2:4. The cadmium(II)-*detu* and cobalt(II)-*detu* ionic complexes have melting points of 105-108˚C and 122-125˚C, respectively. The electrical conductivity of the cadmium(II)-*detu* and cobalt(II)-*detu* complexes showed that the complexes were ionic complexes. The FTIR analysis showed the shifting of the C=S functional group to the smaller wave number which indicates the coordinating *detu* ligand to the cadmium(II) and cobalt(II) through the S atom. The indirect evidence from 1H-NMR showed CH_3 and CH_2 only slightly shifted between the free *detu* ligand and the Cd-*detu* and Co-*detu* complexes.

Keywords: Cadmium(II), Cobalt(II), *N,N'*-diethylthiourea, ionic complex, *detu*.

Comparison of Effectiveness and Efficiency of Fabrication Techniques and Carrier Oil in Curcumin Nanoemulsion Making Process

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ABSTRACT

Curcumin is one of the active substances that has been widely developed in the form of nanoemulsions due to its therapeutic properties. Despite the many advantages offered, the stability of nanoemulsions, which is greatly influenced by the nanoemulsion formulation and its manufacturing technique, are still being questioned. In order to explore the most effective and efficient technique, we are comparing high energy techniques (microfluidic and sonication) with low energy techniques (wet ball milling) in the curcumin nanoemulsions making process. In addition, the carrier oil also affects the efficiency of the encapsulation efficiency. In our experiment, soybean oil, olive oil and coconut oil are applied as carrier oil. Effectiveness will be measured based on particle size, polydispersity index and encapsulation efficiency. Particle size and polydispersity index were measured using a particle size analyzer instrument with dynamic light scattering technique while encapsulation efficiency was determined using a UV-vis spectrophotometer instrument. Efficiency will be determined based on the electrical power and time required in the process of nanoemulsions making. Our current results will be discussed further in the conference.
Keywords: wet-ball milling, nanoemulsion, curcumin, microfluidic, sonication.

Analysis of Water Quality at Karangantu Fishing Port Area Based on Pollution Index Method

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ABSTRACT.

Karangantu fishing port is a symbol of the rapid fishing industry in Serang, Banten. There are various activities in Karangantu fishing port area, such as: a place for landing of fisherman's boats, shipping of fish catches, and tourism object. These activities may impact the water quality around Karangantu fishing port area. This research aims to analyze the water quality and pollution index in Karangantu fishing port area based on index pollution method. The sample of water was carried out by purposive sampling method in three stations around Karangantu fishing port area, such as: fishing port, fishing market, and tourism object. Twelve parameters were analyzed: temperature, turbidity, transparency, TDS, TSS, pH, DO, COD, nitrate, cadmium, lead, and total coliforms. The result of water quality analysis was compared by Class III water classification based on the Government Regulation No. 82/2001, and water quality status was determined by pollution index based on the minister of environment decree No. 115/2003. The result indicates that tourism object around Karangantu fishing port area is in category of polluted, with PIj score is 6.35, fishing port and fishing market are in the categories of moderately polluted, with PIj scores are 4.99 and 3.90. These conditions show that various activities in the Karangantu fishing port area may have impact to the water quality. This research can provide the information and recommendation about the water quality status in Karangantu fishing port area. The worse pollution can be prevented by raising the public awareness about the importance of clean water, and provision of waste management facilities, also good waste management system was needed. Good management of water resources is needed to maintain the marine biota, keep the clean environment and public health, also provide clean water for people near Karangantu fishing port area.

Keywords: water quality, water pollution, Karangantu fishing port.

Individual Curcuminoids: Antioxidant Activities and Its Separation from Yellow Turmeric (Curcuma longa Linn)

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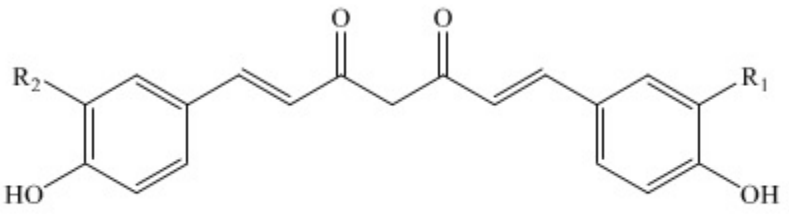
ABSTRACT

The history of curcuminoids research has been established for remarkably long time. Curcuminoids with a basic structure of 1,7-diphenylheptane consist of three types of compounds, namely curcumin (1), demethoxycurcumin (2), and bisdemethoxycurcumin (3). These three curcuminoid compounds are mixed and bring their physicochemical and biological properties in synergy. Yellow turmeric is one of the main sources for curcuminoids from natural products. In obtaining each compound (individual curcuminoid), it requires to be separated. This research aims to separate each of these curcuminoids and test their antioxidant activity. Separation of individual curcuminoids was performed by column chromatography and preparative TLC. Determination of the structure of each curcumin was carried out based on its physical properties and spectral analysis. All the individual curcuminoid compounds are yellow solids, but differ in their yellow color intensity, melting point, and antioxidant activity. The melting points of curcumin (1, yellow) demethoxycurcumin (2, brownish yellow), and bisdemethoxycurcumin (3, orange yellow) were 91-940C, 80-830C, and 182-1830C, respectively. Antioxidant activity properties and EC-50 values were curcuminoid isolate (55.05 ppm) ≈ bisdemethoxycurcumin (55.14 ppm) > demethoxycurcumin (99.25 ppm) > curcumin (103.75 ppm).



(**1**, $R_1 = R_2 = OCH_3$), (**2**, $R_1 = OCH_3$, $R_2 = H$), and (**3**, $R_1 = R_2 = H$)
Curcuminoid structure

Keywords: yellow turmeric, curcuminoid, curcumin, demethoxycurcumin, bisdemethoxycurcumin, antioxidant.

Effect of Activated Zeolite on Oil Yield in Double Scale Pyrolysis with Various Types of Plastic Waste

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ABSTRACT

Plastic is a basic need for humans, but it has also caused big problems for the environment because of its nature that is difficult to degrade. The pyrolysis process can convert plastic waste into fuel to replace petroleum. The type of plastic and the catalyst affect the plastic pyrolysis process. The purpose of this study was to determine the effect of the type of plastic and the addition of a zeolite catalyst on the oil yield from the pyrolysis of plastic waste. The stages of the research carried out were natural zeolite activation, pyrolysis reactor settings, pyrolysis of plastic waste types (PE, LDPE, HDPE). Characterization of the results include viscosity, refractive index, specific gravity, acid number and identification of the results carried out by IR and GC-MS. The results showed that the natural zeolite used had a mordenite phase and activated natural zeolite had a higher Si/Al ratio than the inactivated one. The addition of a zeolite catalyst has an effect on the yield produced. The yields of oil from plastic waste pyrolysis with zeolite catalyst for PE, LDPE and HDPE plastics were about 75.9; 76.9 and 83.4% w/w, respectively. The results of the FTIR and GC-MS analysis showed that the compounds that make up the pyrolysis oil were thought to be from the alkanes, cycloalkanes, alkenes, carboxylic acids with aromatic rings, and ketones. The results of the GC-MS test showed that the uncatalyzed pyrolysis product consisted of compounds with a long range of C_5-C_{11} carbon atoms. Meanwhile, the length range of carbon atoms of pyrolysis products with active zeolite catalyst ranges of C_6-C_{24}.

Keywords: natural zeolite catalyst, bio-oil, plastic, pyrolysis, reactor.

Mini Electrode Based on Chitosan-Activated Carbon Membrane for Detection Paracetamol in Herbal Medicine

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ABSTRACT

A tube type mini electrode has been made to detect paracetamol levels in herbal medicine, the electrode is made of a glass tube with a diameter of 0.7 cm, a length of 3 cm. As the membrane is a mixture of chitosan, activated carbon from rice husk, and cetyl trimethyl ammonium (CTA)-paracetamol. The internal solution is a standard solution of 0.01 M paracetamol in a solution of phosphoric acid pH 2. The average sensitivity of the paracetamol sensor is (22.60 ± 0.01) mV/decade in a linear concentration range of 10^{-6} – $5x10^{-3}$ M, with an average recovery of (90.6 ± 0.1)%. Paracetamol sensor electrodes can be applied to samples of herbal medicine on the market, with an average error of (8.0 ± 0.1)%.

Keywords: Paracetamol; herbal; chitosan; activated carbon, mini electrode.

The Removal of Methylene Blue Solutions Using Zinc Oxide Nanoparticles Prepared by Polyol Method

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ABSTRACT

The removal of methylene blue solutions was carried out with photocatalytic reaction using zinc oxide nanoparticles. Zinc oxide nanoparticles were synthesized by polyol method and characterized by XRD, SEM, TEM, and UV-DRS. The characterization results showed that zinc oxide nanoparticles have a hexagonal crystal structure, nanotube and nanospherical particles shape, particle size around 40-100 nm, particle aggregation formed, and the band gap energy (Eg) is 3.2 eV. Zinc oxide nanoparticles were tested for their photocatalytic activity for the removal of methylene blue at solution concentration of 20 $mg.L^{-1}$ under UV-LED irradiation. The removal of methylene blue solutions using zinc oxide nanoparticles showed the rates 0,07 $mg.L^{-1}.minutes^{-1}$. The biggest methylene blue concentration removal by zinc oxide nanoparticles was 98,00% with a time of 50 minutes under UV-LED irradiation.

Identification of Ammonia as A Biomarker of Chronic Kidney Disease by Gas Sensor Array

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ABSTRACT

Ammonia gas was known as a biomarker compound that can be found in the urine of patients with chronic kidney disease. The disease detection methods that have been used take a lot of time and not cost effective. Chromatographic method was very accurate, but the investment and operation of this method was relatively expensive and time consuming. Therefore, research to detects ammonia using gas sensor array in two types of testing: qualitatively and quantitatively, was carried out. The gas sensor array used were MQ-3, MQ-4, MQ-6, and MQ-8 sensors. In the qualitative test, the research was carried out by injecting 100 µL of ammonia, acetone, ethanol, and acetic acid in a chamber with gas sensor array with 10 replications. Clustering analysis such as PCA and K-Means Clustering, shows that gas sensor array can distinguish ammonia from the other test compounds. The quantitative analysis was done by injecting ammonia in four different ratios with distilled water, there are 25%, 50%, 75%, and 100% as much as 100 µL with 5 replications. PCA, Agglomerative Clustering, and Decision Tree Classifier show that the sensor array can detect the ammonia based on their ratio quite well.

Modification of A Screen Printed Carbon Electrode With Cerium and Optimization of Electrochemical Biosensor Experimental Conditions For Mitochondrial DNA Detection *Sus scrofa*

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ABSTRACT

Due to Indonesia's abundance of rare earth elements, they can be used in a variety of high-tech applications, one of them is cerium sensors. In this study, an electrochemical biosensor was developed to detect mitochondrial DNA's *Sus scrofa* using a Screen Printed Carbon Electrode-Cerium (SPCE-Ce). Scanning Electron Microscopy (SEM) and Cyclic Voltammetry (CV) have been used to characterize the surface of the SPCE electrode before and after cerium modification. The pork nucleotide sequence design as a DNA probe was determined using the NCBI blast and T-Coffee tools. The cerium surface and the phosphate backbone of DNA interact electrostatically to immobilize DNA probes on SPCE-Ce. The probe-target DNA hybridization process was characterized using voltammetry differentiation pulse (DPV). Optimization of experimental conditions such as probe DNA concentration, immobilization time, and hybridization time. The SEM images of SPCE and SPCE-Ce surfaces showed morphological differences, with the cerium-coated carbon surface being smoother and straighter. The redox current peak of the ferricyanide electroactive species increased in the cyclic voltammogram of SPCE-Ce. The probe DNA sequence is 5'-TATIATACCAATCACTAIC-3', and it has 100% homology with pig DNA and 0% with chicken and beef DNA. The voltammogram of DPV results showed a guanine oxidation peak at 1.22 V potential during probe-target DNA hybridization. The optimum experimental conditions were 30.0 g/mL probe DNA concentration, 20 minute immobilization time, and 20 minute hybridization time. For the target DNA concentration range of 5 to 30 g/mL, the linear equation of target concentration against current produces I = 0.0303 [DNA target] + 3.947. The sensitivity, LoD, LoQ, and precision values were calculated to be 0.0303 g/mL, 1.44 g/mL, 4.81 g/mL, and 98.99%, respectively.

Keywords: *Sus scrofa*, SPCE-Cerium, Electrochemical biosensor, DPV.

Synthesis of ZnO NPs with Green Chemistry Principles Using Mangosteen Peels Extract (*Gracinia mangostana* L.) as Capping Agent and Its Characterization as Antibacterial

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ABSTRACT

One of the nanoparticles that is currently being developed because of its usefulness for life is ZnO. ZnO nanoparticles (ZnO NPs) are widely used in various fields, one of which is in the health sector as an antibacterial. In this study, ZnO NPs were synthesized using the principles of Green Chemistry which are environmentally friendly and economical by utilizing secondary metabolite compounds in the inner peel (pericarp) of the mangosteen fruit and its characteristics, as well as its application testing as an antibacterial against acne-causing bacteria Propionibacterium acnes. This study used variations in the material used, namely the dried and wet inner peels of the mangosteen fruit to determine the effect of drying the mangosteen peel on the synthesized ZnO NPs in terms of mass produced, crystal size, particle size, and antibacterial effectiveness. The stages of this research were (1) extraction of wet and dried mangosteen peels using maceration method and using water solvent (2) phytochemical test of the solution extracted from wet and dried mangosteen peel (3) synthesis of ZnO NPs with $ZnSO_4.7H_2O$ precursor (4) characterization of ZnO NPs were conducted using XRD, SEM, and antibacterial test against Propionibacterium acnes using agar diffusion method. After doing the research, the results of XRD and SEM characterization were analyzed using Origin and Match3 applications for XRD and ImageJ for SEM. Analysis of antibacterial effectiveness was carried out by measuring the diameter of the clear zone contained in the agar medium. The results showed that ZnO NPs had been successfully synthesized by this method. Wet and dried mangosteen peel extract gave different mass of ZnO NPs, crystal size, particle size, and effectiveness of ZnO NPs as antibacterial. The average mass of ZnO NPs synthesized using a solution of wet mangosteen peels extract (1.011 g) < dried mangosteen peel (1.074 g). The average crystal size of ZnO NPs synthesized using a solution of dried mangosteen peels extract (17.48 nm) > wet mangosteen peels extract (15.23 nm) while the particle size of ZnO NPs synthesized using a solution of dried mangosteen peels extract (80.728 nm) < wet mangosteen peels extract (81.666 nm). This causes the effectiveness or inhibition of ZnO NPs synthesized using dried mangosteen peels extract (6.075 mm) against Propionibacterium acnes bacteria > wet mangosteen peels extract (5.555 mm).

Keywords: green synthesis, mangosteen, ZnO nanoparticles, antibacterial.

Study of the ABW-Structured $LiZnPO_4$ Crystallization Using X-Ray Diffraction and CrystalGrower Simulation

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ABSTRACT

LiZnPO4 having an ABW framework structure is one of many nanoporous materials which possess important applications. Its synthesis, characterizations, and applications were reported previously, but not its crystal growth. The study of crystal growth is crucial to get information on how crystals grow and how small ions and molecules of solvent and solutes interact during the hydrothermal process. With this knowledge, one can control the crystal habits, such as crystal size, morphology, and defects. In this study, we observed the crystallization of $LiZnPO_4$ (ABW) using X-ray diffraction, to produce its growth curve, combined with scanning electron microscopy (SEM). The data were then compared with the growth simulation employing CrystalGrower (CG) program. The results showed that there were differences in the crystallization curve of the studied material with that of general zeolite's. Primary nucleation of the $LiZnPO_4$ (ABW) occurred during its stirring process before the hydrothermal reaction at 70 C. The crystals continued to grow in high supersaturation condition until approximately 15 minutes of heating. After 60 minutes of the hydrothermal reaction, the synthesis condition has reached equilibrium. SEM analysis depicted bar-like crystal morphology with prism ends. The crystal morphology and growth profile from the laboratory observation agreed well with the CG simulation, in which a rough crystal surface was seen when supersaturation was high followed by surface growing into a smooth one when equilibrium was reached.

Keywords: ABW, crystallization, $LiZnPO_4$.

Development of Phosphate Measurement Method With Passive Sampling Technique Using Polymeric Inclusion Membrane (PIM) Aliquat 336 Chloride/1-Dekanol As Passive Sampler

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ABSTRACT

The passive sampling technique allows separation, target ion collection, and measurement of the average phosphate flux simultaneously. The passive sampler used for the measurement of phosphate ions can use PIM as a diffusion layer. In this study, PIM was made using PVC as a base polymer, Aliquat 336-chloride as a carrier, and 1-decanol as a plasticizer. The concentration of the three components of PIM were varied. A standard solution of 1.2 mg/L phosphate was used as the bulk phase and 0.1 M NaCl was used as the internal phase in the passive sampler. Passive sampling was conducted by immersing the passive sampler in the bulk phase for a certain time. The concentration of phosphate ion in the internal phase was determined spectrophotometrically at a wavelength of 690 nm. The results showed that PIM with a composition of 70:20:10 (%w/w) could be used as a diffusion layer for a passive sampler in measuring phosphate.

Hydroxyapatite: A Review of Synthesis, Structure, and Application as Heterogeneous Catalyst in Chalcones Derivatives Synthesis

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ABSTRACT

Chalcone derivatives are one of the most important classes of flavonoids which medicinal chemists constantly interested in developing their structures. Chalcones are natural compounds considered to have high potential as the main scaffolding for designing and developing new drugs. Claisen-Schmidt condensation has becomes a useful method to synthesize chalcones from arylaldehydes and acetophenones, but this reaction have frequently promoted by using homogenous catalysts. The separation between catalysts and products from synthesis process is one of the most important aspects to gain more pure products. Hydroxyapatites has solid inorganic surface that will support the arylaldehydes and acetophenones as the reagent to generate Claisen-Schmidt condensation to produce chalcones derivatives. This overview documents the strengths and weaknesses of chalcones derivatives synthetic routes using hydroxyapatite as an inorganic support and as a heterogeneous catalyst.

Keywords: hydroxyapatite, catalyst, chalcones.

Acquisition of Silica Compound by Sol Gel Method from Geothermal Solid Waste of Geothermal Power Plants

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ABSTRACT

Research has been investigated on the influence of stirring time on the sol-gel method on the characteristics of silica compounds obtained from geothermal solid waste of geothermal power plants. The purpose of this study is to recover silica compounds processed from geothermal solid waste samples. The methods used in this study cover three stages. The first stage is the homogenization of solid waste sample size in the size range of 0.200 to 0.354 mm. The second step is leaching using 25% sulfuric acid until the sample is dried. The third stage is the formation of silica compounds using the sol-gel method. The variation applied to this study was the stirring time with the sol-gel method for 20, 25, 30 minutes. The results obtained from the study were the yield of products with stirring variations at 25, 25, and 30 minutes in a row was 79.92; 47,07; and 47.08% of the sample after the leaching process. Characterization with FTIR indicates that the resulting product has a characteristic bond as Si-O-Si on all results with a variation in stirring time.

Keywords: geothermal waste, silica, sol-gel, FTIR.

Synthesis and Characterization of $ZnxMn_{2-X}O_4$ (x = 0.05; 0.10; 0.15 and 0.25)

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ABSTRACT

$ZnxMn_{2-X}O_4$ were synthesized by hydrothermal method using $Mn(CH_3COO)_2$, $ZnCl_2$, and KOH as precursors at synthesis temperature of 120 ºC for 8 hr. The synthesis was carried out with a mol variation of $ZnCl_2$ 0.05; 0.10; 0.15; and 0.25. The obtained powders were characterized by SEM-EDX, FTIR and XRD techniques. FTIR analysis shows the typical wavenumber $ZnMn_2O_4$ in the range 400-650 cm-1. The chemical composition was confirmed by EDX analysis and confirmed the presence of Mn, Zn and O in the sample, The results indicate that the hydrothermal synthesis method with a variation of x = 0.25 is the best synthesis parameter to produce ZnMn2O4 with purity 98,35%.

A Mini-Review on PCR Application for Microbial Impurities in Toyyiban Verification

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ABSTRACT

The term halalan-toyyiban is interchangeable, however, the two terms carry two different meanings. The former implies compliance with fundamental Syariah parameters, while the latter is a term to invoke enhanced features that make something good, pure, and wholesome. Polymerase Chain Reaction (PCR) is a powerful technique to identify various sources of food, contaminant, microbial contamination, and adulteration. In this paper, we review the application of PCR in the verification of food quality focusing on microbial safety. *Salmonella*, *Campylobacter*, and *Enterohemorrhagic* Escherichia coli (EHE *coli*) are among the most common foodborne pathogens whose DNAs can be investigated using PCR method. The determinations include the separation and analysis of certain DNA indicators for the impurities. Specitivity and sensitivity are two important parameters for microbial detection by PCR Technique

Keywords: halal and toyyib food, polymerase chain reaction (PCR), microbial contaminants.

A Mini-Review on PCR Inhibition in Halal Verification

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ABSTRACT

The issue of food adulteration and contamination in meat-based food products greatly concerns Muslim consumers. Halal verification is important, and the polymerase chain reaction (PCR) is a powerful technique for halal forensic. This method relies on the DNA polymerase activity, to polymerize nucleic acid using a DNA template. One of the important aspects of working with enzymes is the possible inhibition process from the environment. This paper is a mini-review about inhibition of PCR by natural spices that are present as in various traditional ingredients such as ginger, garlic, onion, candle-nuts, and pangium nuts. The polyphenolic and other antioxidative components can inhibit the main enzyme of PCR method. The threshold concentration of specific components from natural spices in traditional dishes are needed to avoid the negative false result in halal verification using PCR method.

Keywords: halal food, polymerase chain reaction, traditional spice, polyphenolic components.

Antioxidant Activity and Toxicity Test of Column Chromatography Steroids Isolates from Chloroform Fraction of *Hydrilla verticillata*

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ABSTRACT

Hydrilla verticillata contain some secondary metabolites, such as steroids and triterpenoids. The purpose of this study was to determine antioxidant activity and the toxicity levels of steroids isolates from chloroform fraction of *Hydrilla verticillata*. *Hydrilla verticillata* biomass was dried and then powdered. *Hydrilla verticillata* powder extracted by maceration methods using ethanol solvent. The crude ethanol extracts were hydrolyzed using 2 N of HCl and partitioned using chloroform. The steroid compounds were separated by Column Chromatography. Antioxidant activities of Column Chromatography steroid isolates were determined by the DPPH method, and the toxicity levels were determined by the BSLT method. The result showed that extraction through maceration using ethanol produced 2.52 % yield, whereas the percent yield of the partition using chloroform was 18.48 %. Separation by column chromatography resulted four steroids isolates B1, B2, B2G1, and G1R1. The steroids isolates of chloroform fraction of *Hydrilla verticillata* have antioxidant activity and toxicity properties. The EC50 value of B1, B2, B2G1, and G1R1 isolate were 5375, 179.40, 65.97, and 6.55 ppm. The LC50 value of B1, B2, B2G1, and G1R1 isolate were 5.99, 3.86, 4.37, and 6.86 ppm, respectively.

Use Of Humic Acid To Reduce Chromium(VI) Contaminants In Industrial Waste

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ABSTRACT

Humic acid is a constituent macromolecule of Humic Substances and mostly found in peat, coal, soil, and compost. Humic acid is known to be able to bind heavy metal ions in the soil and reduce these metals, especially to hexavalent chromium ions. Humic acid which is sold in the public is thought to be able to adsorb hexavalent chromium in water. Hexavalent chromium is one of the pollutants found in waters and soil, most of which come from the tanning and alloy industry. This experiment aims to determine the adsorption ability of commercial humic acids (labelled as AHK 1, 2, 3 and 4) on hexavalent chromium ion in laboratory scale. All humic acids were also analyzed by FT-IR for identification of functional groups and potensiometry for total acidity, carboxylic and phenol content. The order of adsorption ability is AHK 3 (>9.9) > AHK 4 (9.85) > AHK 1 (3.0) > AHK 2 (5.7) in ppm Cr(VI)/g AH. The ability of humic acid to adsorb hexavalent chromium was obtained from the presence of hydroxyl, carboxyl, and phenolic groups from the FT-IR results. The adsorption ability of the humic acid is do not positively corelate with the acidity, total carboxylic and phenolic content in it. The amount of humic acid and trace expected to take effect in the adsorption of Cr(VI).

Keywords: Adsorption, Hexavalent Chromium, Humic Acid.

PIM Preparation And Characterization With DBP Plasticizer As Passive Sampler For Phosphate Measurement

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ABSTRACT

A passive sampler for phosphate measurement could perform the separation and collection of target ions simultaneously at the sampling location as well as time-weighted average concentration measurements. The composition of the PIM determined the character of the passive sampler for measuring phosphate. The aim of this research was to make PIM with various carrier compositions and to characterize the performance of PIM as a passive sampler for phosphate measurement. PIM was made by mixing PVC as the base polymer, carrier Aliquat 336-Cl, and the plasticizer Dibutyl phthalate (DBP) in tetrahydrofuran (THF) solvent. The PVC concentration varied by 50%, 60%, 65%, 70%, and 80% w/w. The concentration of DBP plasticizer was kept constant at 10% while the carrier Aliquat 336-Cl was varied by 40%, 30%, 25%, 20%, and 10% w/w. The passive sampler was made from a 5 mL vial filled with 1 M NaCl solution as the inner solution and closed with PIM. Then, the passive sampler was immersed in the feed phase containing Phosphate solution with variations of 0.0; 0.3; 0.6; 0.9; and 1.2 mg/L with the PIM moiety leading to the feed phase solution. The feed phase was bubbling for 24 hours and then running a passive sampler with variations of 0, 3, 8, 24, 36, and 48 hours. The concentration of phosphate ions in the inner solution in the passive sampler was determined by the visible spectrophotometric method at 690 nm. The results showed that PIM with a composition of 70:20:10% could be used as a passive sampler to measure phosphate.

Keywords: phosphate, PIM, Passive Sampler, CTWA, and Uv-Vis.

Keratinase Characterization of Protease Producing Halophilic Bacteria using BK-1H Isolate from Bledug Kuwu Mud Crater, Central Java

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ABSTRACT

Keratinase is an alternative material used in the dehairing process of leather tanning industry to minimise production of hazardous waste. In the preservation process, leather soaked in high salt content solution, thus high salt tolerant keratinase are needed in this industry. By using halophilic bacteria isolated from the Bledug Kuwu mud crater, the BK-1H isolate is expected to have keratinase activity that can be used in the dehairing process of leather tanning. Isolate BK-1H used in this research refer to previous research that shown the high proteolitic index. The isolate needed to be identified for their ability to produce enzymes. The research stage include : (1) Gram staining and observation of bacterial colony morphology, (2) characterization of proteases by determining the optimum pH and temperature of the enzyme, and knowing the effect of metal addition on enzyme activity, (3) the variation effect of pH, time, and humidity to enzymes activity , (4) the ability of bacteria to degrade chicken feathers, (5) the ability of enzymes to degrade chicken feathers, and (6) genotypic identification of isolates using 16S rRNA gene sequencing. BK-1H was identified as a rod-shaped Gram negative bacteria. Protease produced by BK-1H showed a maximum activity of 4,083 U/mL at 46oC. The highest activity value for pH optimum is 1.308 (±0.243) U/mL, at pH 7. The addition of metal ions Zn2+, Ca^{2+}, Co^{2+}, and Mg^{2+} decrease enzymes their activity so that further testing is needed for other metal ions. The effect of variations pH at the time of enzyme production showed the highest yield at pH 10 with the optimum time of enzyme production within 2 days. The results of the sequencing showed the relations between BK-1H to *Bacillus swezeyi* with an identity percentage of 98.51%.

Keywords: Bledug Kuwu, halophilic, isolate BK-1H, keratinase, leather tanning.

Consortium of *Salinivibrio proteolyticus* and *Bacillus sp.* MD24 in Keratinase Fermentation

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ABSTRACT

Keratin in chicken feathers has potential as a raw material for wood adhesives because it has functional groups from amino acid side chains that are able to cross-link with lignin in wood. The solid structure of keratin in chicken feathers needs to be converted into a soluble structure through a degradation step in order to be applied as a wood adhesive. Chemical degradation of keratin in chicken feathers cannot control the results of hydrolysis which causes keratin to be degraded into amino acids and produces hazardous chemical waste. Enzymatic degradation is an environmentally friendly alternative. Previous research reported that *Bacillus sp*. MD24 and 2 microbial isolates from Pasuruan salt pond water, namely TG3 and TG6 isolates were able to produce keratinase. Keratinase from each microbe is thought to have the ability to degrade by cutting at different specific keratin sites. Thus, the microbial consortium may be able to increase the concentration of soluble keratin hydrolyzate with more diverse molecular weights. This research was conducted with an experimental laboratory design. The steps carried out in this study include: (1) Confirming the ability of TG3 and TG6 isolates to produce keratinase; (2) Identification of TG3 and TG6 isolate species using genomic methods; (3) Optimization of the humidity of the fermentation medium for TG3 and TG6 isolates; (4) Trial of microbial consortium isolates TG3 and TG6 with *Bacillus sp*. MD24 in keratinase fermentation. The environmental conditions of keratinase fermentation were carried out at 37°C and pH 8 using the Solid-State Fermentation method. TG3 and TG6 isolates have been tested for their ability to produce keratinase seen from their ability to degrade keratin in chicken feathers as much as 11.20% and 14.50% for 2 days of incubation, respectively. Species identification of isolates TG3 and TG6 showed that they were closely related to *Salinivibrio proteolyticus* with a similarity percentage of 99.13% and 99.14%, respectively. The optimization of the humidity of the fermentation medium showed that on the third day of incubation, both showed the highest optimum activity at variations in the ratio of chicken feather weight (g): volume of salt solution pH 8 (mL) 1:3. In this study, the microbial consortium of Bacillus sp MD24

with isolates TG3 and TG6 was not able to significantly increase the degradation ability of chicken feathers and the protein content of keratin hydrolyzate.

This is possibly because the characteristics of the optimum pH and temperature of the enzymes produced by each microbe are different, so that in the microbial consortium it is necessary to select 2 isolates of microbes that have almost the same optimum characteristics of enzymes.

Keywords: keratin, keratinase, microbial consortium, Solid-State Fermentation.

Citrate Modified Sugarcane Bagasse Adsorption Capacity on Heavy Metal Cadmium

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ABSTRACT

Cadmium is included in the 5 metals that have a high level of toxicity. Reduction of cadmium metal content can be done by adsorption process using adsorbent. Bagasse can be used as an adsorbent because it contains lignocellulose and has gaps or pores. The purpose of this study was to determine the characteristics of the adsorbent of citric acid modified bagasse with delignification treatment and its effectiveness on the absorption of cadmium(II). This research method has three stages: (1) the manufacture of bagasse as an adsorbent with a variety of treatments, (2) characterization of adsorbents include moisture content, ash content, surface area, FTIR, SEM, (3) adsorption of cadmium(II) using bagasse adsorbent and measurement of cadmium(II) ion concentration after adsorption process with AAS. This research succeeded in making an adsorbent without treatment (A), a modified citric acid adsorbent (B) and a modified citric acid adsorbent with a delignification pretreatment (C). The results obtained are the ash content and water content of the three adsorbents according to the adsorbent prerequisites. The surface area of adsorbent B has the highest value, namely144,972 m2/g, this happens because of the influence of citric acid. While adsorbent C has a smaller surface area due to NaOH has a concentration that is too high, causing the structure to dissolve in the bagasse and covering the pores. The results of the FTIR test showed that adsorbents B and C had hydroxyl and ester functional groups. The surface structure seen using SEM shows that adsorbent C has an uneven surface and has many gaps. Adsorbent C has the highest adsorption capacity for cadmium(II) ion, which is 6.88 mg./g.

Keywords : Adsorbent, Bagasse, Cadmium, Citric acid, Delignification.

Characterization of Microcrystalline Cellulose Derived from Pinewood Waste (*Pinus merkusii*) Hydrolyzed with Hydrochloric Acid

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ABSTRACT

The hydrolysis process on cellulose biomaterials is an important process to obtain micro and nano-sized cellulose. Cellulose obtained from the isolation of pinewood waste by acid treated has a characteristic bright white color and tends to be hydrolyzed with inorganic acid such as hydrochloric acid (HCl) with varying concentration (10 and 30%). Cellulose obtained is in the form of microcrystalline cellulose. Characterization with FTIR, XRD, and SEM resulted in different absorption peaks and intensity on cellulose and cellulose hydrolyzed with 10% and 30 % of HCl. It can be seen that no absorption was found at the wavenumber of 1600 cm-1 which is the typical C=C group absorption of lignin in HCl hydrolyzed cellulose which indicate during the hydrolysis process the lignin was successfully removed. The crystallinity index of hydrolyzed cellulose with HCl 10 and 30% were 56.11%, and 58.11% with crystallite size about 2.79 nm and 3.71 nm respectively. The morphological surface from SEM analysis results were long fibers aggregates with an average particle size of 10% HCl hydrolyzed cellulose and 30% hydrolyzed cellulose of 25 µm, and 5 µm which are increasingly distributed.

Cellulose Hydrogel Coated Fabric as Superoleophobic Membrane for Oily Wastewater Treatment

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ABSTRACT.

Oily wastewater is a major problem especially in developing countries. Current conventional treatments require intensive energy, large space and potentially releasing a huge amount of methane gas. Membrane treatment is one of the most promising method to separate liquid-liquid mixture or emulsion. Here, we report a surface wettability-based membrane to separate oil-water mixture. The membrane made from all biodegradable materials consist of cellulose and citric acid coated in cotton fabric. Citric acid cross link with cellulose producing better physical attachment. Cellulose produces a hydrogel like coating layer. The membrane shows superoleophobic properties by its high underwater oil contact angle. Our separation test shows membrane capable to separate oil-water mixture in continuous system. This findings are potential for organic based membrane development for oily wastewater separation.

Keywords: superoleophobic, cellulose, oil-water separation, cellulose hydrogel.

Microstructural Parameters Analysis of rGO-TiO_2 Composite From Coconut Shells

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ABSTRACT

The rGO-based composite materials with metal oxide nanoparticles such as TiO_2 have shown potential applications. This study aims to analyze the microstructural parameters of the rGO-TiO_2 composite from coconut shells. The reduced graphene oxide was exposure by microwave radiation during the reduction process for 40 minutes. The crystal structure of the sample was analyzed using rietica based on XRD results. The particle size was determined by SEM using Image-J software and the crystal size has been determined using the XRD technique using the Scherrer equation. The result shows that the particle size of the sample is about 220 nm. From the calculation results, the crystal size of the sample is 20 nm.

Keywords: Crystal structure, rGO-TiO_2 composite, particle size, rietica, image-J.

Molten Salt Synthesis of $SrBi_4Ti_4O_{15}$ for Methylene Blue Degradation

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ABSTRACT

The four-layered Aurivillius $SrBi_4Ti_4O_{15}$ compound has been reported to be potentially used as a photocatalyst material. In this research, a photocatalytic test of $SrBi_4Ti_4O_{15}$ was carried out in degrading methylene blue. SrBi4Ti4O15 was prepared by the molten salt method using NaCl-KCl salt. The diffractogram of the sample showed that the $SrBi_4Ti_4O_{15}$ was successfully obtained but found the impurities of $Bi_4Ti_3O_{12}$. The Micrograph scanning electron microscopy (SEM) showed that the shape of $SrBi_4Ti_4O_{15}$ particles is plate-like with a lot of agglomeration. The Kubelka-Munk calculation from the spectrum of ultraviolet-visible diffuse reflectance spectroscopy (UV-Vis DRS) showed that $SrBi_4Ti_4O_{15}$ has a bandgap energy of 3.14 eV (394,85 nm). The results of the photocatalytic test showed that $SrBi_4Ti_4O_{15}$ degraded methylene blue to 47.8% in 120 minutes and have a reaction rate constant (k) of 0.00576 minutes-1 based on a pseudo-first-order model.

Keywords: Aurivillius, $SrBi_4Ti_4O_{15}$, photocatalyst material, degradation, methylene blue.

Synthesis and Characterization of Reduced Graphene Oxide (*r*GO) Using Chemical Exfoliation Method Assisted by Microwave Radiation

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ABSTRACT

Graphene is an allotropic *2D* material of carbon that has several superior and attractive properties. One of the derivatives of graphene is reduced graphene oxide (*r*GO). In this research, *r*GO was synthesized using the chemical exfoliation method. At the stage of the oxidation process using the modified Hummer method. The reducing agent used in this study was L-ascorbic acid and with the help of microwave radiation. The resulting *r*GO samples were then characterized using X-ray diffraction technique, infra red spectroscopy, and LCR Meter. The diffactogram sample was found a peak of 2θ = 25.32° and low-intensity peak at 2θ = 43.10° which is typical peak of *r*GO materials. The IR spectra showed absorption peaks at 1238 cm-1 (the epoxide bond), 1535 cm-1 (the C=C aromatic), 1641 cm-1 (C=O (carbonyl) bond), and 3745 cm^{-1} (the hydroxyl bond) which related to *r*GO structure. The average value of the electrical conductivity of the *r*GO sample is $5.474x10^{-5}$ S/cm.

Keywords: Graphene, *r*GO, Modified Hummer Method, Chemical Exfoliation.

Hand Sanitizer Production Using Bioethanol from Sugarcane Bagasse Fermentation Throught Thermal Hydrolysis Process

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ABSTRACT

The COVID-19 pandemic is not over yet. One way to avoid the spread of COVID-19 is to maintain personal hygiene, especially on body parts that come into contact with objects, namely hands. Maintaining hand hygiene is an important thing to do to reduce the spread of the virus. Hand sanitizer containing ethanol can be used as an alternative to cleaning hands. Bioethanol, which is ethanol obtained from fermentation, can be used as a substitute for ethanol which is the main ingredient in hand sanitizers. As a tropical country, Indonesia has the potential as one of the high sugarcane-producing countries. In 2018, the area of sugarcane plantations recorded in the Indonesian Sugarcane Statistics Data reached 415,660 ha, so it can be estimated that the bagasse produced reached 41.566 million tons. This abundant bagasse certainly creates an innovation opportunity for its utilization. Bagasse containing lignocellulosic substrate has the potential to be processed into bioethanol because it has high sugar content. The purpose of this research is to produce hand sanitizer product by utilizing bagasse waste into bioethanol with an environmentally friendly process. This study used a thermal hydrolysis method at 121°C with a pressure of 15 psi for 1.5 hours to convert lignocellulose in bagasse into glucose. The resulting glucose is then fermented with tape yeast so that it becomes bioethanol which is used as a raw material for making hand sanitizers. The process of making hand sanitizers follows official guidelines from WHO. The results showed that hand sanitizer was produced with bioethanol as raw material from sugarcane bagasse.

Keywords: hand sanitizer, sugarcane bagasse, bioethanol, thermal hydrolysis, fermentation.

Phytochemical Screening, LC-MS/MS, and Antibacterial Evaluation from The Extract of Leaf *Pinus merkusii* Jung Et De Vriese

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ABSTRACT

Brawijaya University forest occupies an area of about 514 hectares, and 80% of the area is planted with pine (*Pinus merkusii* Jungh Et De Vriese). This paper reports the determination of the chemical composition of pine tree leaves. The method involves phytochemical screening including flavonoids, phenolics, saponins, steroids, terpenoids, and alkaloids and liquid chromatography mass spectrometry to determine the content of compounds present in this pine leaf extract. In addition, an evaluation of the antibacterial extract was also reported. It was found that variations in secondary metabolites were detected in each extract prepared from different parts of the plant, and their potential as an antibacterial agent was also large. The chemical composition was also confirmed from mass spectrum analysis. While the antibacterial activity shows important findings for future development.

Keywords: *Pinus merkusii*, phytochemistry, secondary-metabolite, antibacterial.

Bisindole Alkaloid Caulerpin from the Halimeda Cylindracea Decaisne; Biosynthetic Significance and Cytotoxic Activity

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ABSTRACT

Bisindole alkaloid compounds from the Halimeda genera are only two compounds were reported to date. In the present study, bisindole alkaloid caulerpin (1) have been isolated for the the Halimeda cylindracea Decaisne. The biosynthesis significance of 1 suggested by way of biotransformation indole-3-acetic acid to indole-3-carboxaldehyde via of tryptophan from shikimate pathway. This compound have many biology activity reported. The biology activity evaluation showed the crude extract from H. cylindracea Decaisne was active in the brine shrimp (A. salina Leach) assay with LC50 value 134.90 µg/mL, while compounds 1 with LC50 value 80.50 µg/mL.

Keywords: Alkaloid, Caulerpin, Halimeda.

Oxidation-Hydroxylation of Pine Rosin Acid

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ABSTRACT

Pine rosin acid or *Gondorukem* is a solid resin obtained from pine sap. It is yielded as residue from a high temperature distillation process. In industry, rosin acid is widely used and modified as raw material in paint, ink, adhesive, resin, thermoplastic, and thermosetting polymer. Modification process generally is undergone to generate rosin acid with specific properties and for certain purposes. This paper report, oxidation-hydroxylation reaction of pine rosin acid under mild process. The method involves a stirring of the rosin with oxidating agent under low temperature in basic condition. Product is isolated prior to neutralized process in 86% yield, and then determined by means of spectroscopy (UV-VIS, FTIR, LC - MS/MS). This method put the way for a green strategy for modification of pine rosin acid.

Review of reports on traditional medicinal plants in West Kalimantan in the last 10 years

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ABSTRACT

Traditional medicine based on medicinal plants in West Borneo presents a strong relationship belonging to natural remedies, health, and folk healing practice recognized by Dayak Tribes. The aim of current study is to carry out an ethnobotanical review on medicinal plants used in traditional medicine in West Borneo Province including information on local names, plant species, families, used parts, preparation method as well as medical use. The method used by collecting earlier published data in journals, texbooks, and webistes from 2011 to 2021. The present review reported that 532 species belonging to 94 families have been used in indigenous custom. Zingiberaceae has the highest number of plant species (30), followed by Euphorbiaceae (27), Rubiaceae (25), Poaceae (24), Fabaceae (21), and other families (less than 20). The leaves, roots, stems, whole, rhizomes, fruits, seeds, tubers and shoots were the most useful plant parts in natural preparation with a percentage of 49.2%, 19.4%, 8.4%, 6.5%, 6.3%, 5.0%, 2.5%, 1.6%, and 1.1% respectively as reported in the present review work. The most used preparation method which used in Borneo Barat natives was decoction and plasteration. The inventoried plant species are frequently used for the treatment of various illnesses and to ensure the medication safety of local people. This abundant data shows that Wes Borneo Province has many great potential values of medicinal plants. Hence, Preservation
and proper management including medicinal plants for this area is very necessary.

Keywords: Ethno-Medicinal plants, West Borneo, Dayak Tribes.

Microwave-Assisted Catalytic Conversion of Biomass into 5-Hydroxymethylfurfural (5-HMF) and Levulinic Acid using Hierarchical Mn_3O_4/ZSM-5 Catalyst

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ABSTRACT

Conversion of cellulose from lignocellulosic biomass of rice husks and model compounds of cellobiose and glucose to 5-hydroxymethylfurfural (5-HMF) and levulinic acid (LA) using a microwave was carried out with variations of time and energy. Microwaves have vibrations and rotational motion that can produce uniform heat in a very short time that can be used to accelerate the rate of conversion reactions. In addition, the conventional conversion process is also carried out as a comparison. The hierarchical Mn_3O_4/ZSM-5 catalyst was prepared using a double template method and has a combination of microporous and mesoporous material properties. The conversion products in the form of 5-HMF and LA were analyzed using HPLC, 1H-NMR, and 13C-NMR instruments. The delignified cellulose conversion reaction using a 600-watt microwave for 180 seconds showed a percent conversion that was not much different (37.27%) from the reaction using the conventional method for 4 hours (36.75%). The highest percent yield for LA was produced by a 600-watt microwave for 180 seconds, for cellulose with delignification 4.33%, cellobiose 6.12%, and glucose 9.57%. Meanwhile, for the percent yield of 5-HMF, the delignified cellulose was 0.07%, cellobiose was 0.3%, and glucose was 0.67%. Conversion using the microwave method also provides higher product purity than conventional methods.

Keywords: hierarchical ZSM-5, 5-hydroxymethylfurfural (HMF), levulinic acid, lignocellulose conversion, microwave assisted reaction.

Detection of Tuberculosis using Gold Nanoparticles modified by ssDNA IS6110

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ABSTRACT

Tuberculosis which is caused by Mycobacterium tuberculosis, is an infectious and deadly disease that has occurred to 8,5% of Indonesia's population. To treat the disease, a development in a method of TB detection that is fast, accurate, and efficient has been seen as the solution to reduce the spread of the disease and handling the patients could be done since the early stages. This research aims to a development of the detection technique of TB by colorimetric with a high sensitivity, fast, and low cost effective. Gold nanoparticles were used as an agent for surface plasmon resonance (SPR) and is modified by ssDNA from the genome IS6110, as an exclusive insertion element from M. tuberculosis. Gold nanoparticles were prepared using the Turkevich method and is functionalized with ssDNA IS6110 by modifying the DNA sequence with thiol. Results of this research shows that gold nanoparticles have been successfully synthesized with a spherical shape, size of 14,3 ± 2 nm, and a SPR peak of 520 nm. Gold nanoparticles modified with ssDNA has a high stability against NaCl as the aggregator. The detection of tuberculosis has successfully been accomplished by colorimetric detection with the interaction of ssDNA with the complementary sequence. The sample that has tuberculosis DNA had a shift in wavelength from 523 nm to 589 nm.

Fabrication of NiO Nanoporous as Electrocatalyst Hydrogen Gas Evolution Reaction

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ABSTRACT

Hydrogen gas is one of the sustainable energy sources of the future because hydrogen is a carrier of high-quality energy that can be made from a variety of primary energy sources. NiO nanoporous synthesis is synthesized with various silica hard templates positioned on graphene oxide (GO)/carbon foam (CF) as electrocatalysts in hydrogen gas evolution reactions. In general, this study aims to investigate the performance of NiO nanoporous fabricated by using three types of silica-based hard templates namely, SBA-15, KCC-1, and MCM-41 and NiO without using silica hard templates. BET analysis shows the surface area of NiO nanoporous (MCM-41) has the largest surface area compared to other NiO nanopores. Analysis of TEM results showed that NiO nanoporous use hard silica templates to form nanoporous, whereas NiO without silica templates was formed polyhedral. Graphene oxide has been successfully synthesized as evidenced by characterization using FTIR and Raman. Meanwhile, the evolution reaction of hydrogen gas is done using 4 working electrodes, namely in carbon foam undetectable hydrogen gas, while in GO/Carbon Foam, NiO(KCC-1)/GO/Carbon Foam, and NiO(MCM-41)/GO/Carbon Foam detected hydrogen gas of 0.002 mole.

Metabolomic Profiling of Ethyl Acetate Extract of Sponge *Halichondriidae* sp. from Kangean Islands and Their In Silico Activity as Coronavirus Drugs

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ABSTRACT

The Corona Virus Disease-2019 (COVID-19) pandemic has been an important challenge in medicine and pharmacy worldwide since December 2019. Limited information on drugs that can be used to treat COVID-19 patients has led to an ongoing search to find a cure for the disease. In this study, we extracted the marine sponge *Halichondriidae* sp. from the Kangean Islands using ethyl acetate as a solvent to obtain secondary metabolites used as models for COVID- 19 drugs. The results of the UV-Vis and Infrared spectrophotometer measurements of the extract showed the presence of unsaturated bonds in the compounds that make up the extract, both aliphatic and aromatic, and the presence of functional groups amines, alcohols, amides, carbonyls, and halides. The results of the metabolomic profiling analysis of the LC- ESI-MS/MS data showed the presence of compounds including 4-(1,3-Dibenzyl-2-imidazolidinyl)-N,N-dimethylaniline as the main compound, 4-{7-[2-Hydroxy-2-(4-nitrophenyl)ethyl]-3-methyl-2,6-dioxo-1,2,3,6,7,9-hexahydro-8H-purine- 8-ylidene}morpholin-4-ium, erucamide, nepafenac, 1-benzofuran-2-carbonitrile, 1,3-dibenzyl-2-(6-methyl-2- pyridinyl)hexahydropyrimidine, N,N,N-Tributyl-1-butanaminium-2-hydroxypropanoate, (±)-anabasine, benzyl urea, tert- Butyl isopropylcarbamate, 3-(4-Hexylcyclohexyl)-5-undecyl-1,2,4-oxadiazole and 2-[(2E)-2-octadecen-1-yl]succinic acid. Molecular docking analysis of COVID-19 receptors, namely 7NEG, 7L0N, and 6WZQ, showed that obtained the lowest binding energy from the interaction between 4-{7-[2-Hydroxy-2-(4-nitrophenyl)ethyl]-3-methyl-2,6-dioxo- 1,2,3,6,7,9-hexahydro-8H-purin-8-ylidene}morpholin-4-ium and 7L0N receptors at a binding energy of -6.277±0.04726 kcal/mol which showed hydrogen bonding interactions, a hydrophobic bond formed from two π-alkyl interactions, hydrogen-carbon interaction and Van der Waals interactions.

Keywords: Marine Sponge, *Halichondriidae*, Molecular Docking, Corona Virus Disease-2019 (COVID-19).

The Inhibitory Power of The Watermelon Mesocarp-Endocarp Mixture to The Pancreatic Lipase and Its Organoleptic Properties

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ABSTRACT

Obesity is a health problem whose prevalence increases along with the level of human welfare. Currently, obesity is prevented by inhibiting the activity of the pancreatic lipase enzyme involved in fat metabolism using orlistat. However, long-term use of orlistat can cause side effects.Watermelon mesocarp has inhibitory activity against pancreatic lipase enzyme which allows it to be used as an anti-obesity herb. However, its organoleptic properties are not favored by consumers. The aims of this research are to investigate (1) the effect of watermelon endocarp on the watermelon mesocarp inhibitory power in inhibiting pancreatic lipase and (2) the composition of the watermelon mesocarp-endocarp mixture whose organoleptic properties is acceptable. This research was carried out in three stages, (1) preparation of watermelon mesocarp and endocarp, (2) optimization of watermelon mesocarp-endocarp mixture as pancreatic lipase inhibitor, and (3) organoleptic test of watermelon mesocarp and endocarp mixture. The results showed that the endocarp increased mesocarp inhibitory power against pancreatic lipase with the optimum endocarp-mesocarp mass ratio of 2:1. The endocarp-mesocarp mass ratio of 2:1 also has the best organoleptic properties compared with the other compositions. The average scores for taste, aroma, and color were 5 (neutral), 7 (like), and 7 (like) respectively.

Keywords: watermelon mesocarp, watermelon endocarp, pancreatic lipase, anti-obesity.

Frequency Response of the Polystyrene Films Coated on the Quartz Crystal Microbalance to the Chloroform Vapors

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ABSTRACT

Polystyrene (PS) is widely used in sensors. It has high sensitivity, particularly to aromatic compounds, room temperature operation, has a relatively large surface area, allows more analytes to interact with the film, and enhances the sensor's stability. PS film was deposited on one side of Quartz Crystal Microbalance (QCM) using the spin coating. PS was dissolved in organic solvent toluene with various concentrations to produce the film of varying thickness. The concentration of the solution was determined by calculating the mass of PS to the volume of toluene. PS solution concentrations were 7%, 9%, and 11%. After deposition, the film was annealed at 100, 150, and 200 ºC for one hour. The Thickness of PS films was calculated using the Sauerbrey equation. According to the Sauerbrey equation, the measured frequency shift is proportional to the film thickness. The coated QCM sensor detected chloroform concentrations of 5ppm, 10ppm, and 15ppm at room temperature. The repeatability of PS film as a gas sensor was investigated over several measurement cycles, each cycle lasting for 30 minutes. The sensor was flushed for 500s before being tested for the next cycle to release the chloroform molecules that interacted with PS film. However, some molecules remain in the PS film, as indicated by the sensor's frequency response, which differs from its initial condition. QCM sensor coated by PS film has good sensitivity towards chloroform because it distinguishes different concentrations of chloroform. The frequency shift is proportional to the chloroform concentration.

Van Deemter Equation Versus Separation Impedance for Chromatographic Efficiency Evaluation of Poly-(Lauryl Methacrylate-co-Ethylene Dimethacrylate) Monolithic Column through Separation of Alkylbenzenes

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ABSTRACT

Organic polymer-based monolith is a single pieces continuous porous material mainly employed as a reversedphase column in high-performance liquid chromatography. We have been successfully synthesized poly-(laurylmethacrylate-co-ethylene dimethacrylate) monolith by in-situ co-polymerization inside a microbore silicosteel column (1.0 mm i.d x 100 mm), and the performance of this monolith was evaluated for separation of homologous series of alkylbenzenes. To obtain excellent chromatographic efficiency, the effect of mobile phase types, mobile phase composition, and linear velocity toward the separation of alkylbenzene compounds were investigated. Then, the efficiency was accessed by evaluating the retention time, resolution, capacity factor, and selectivity factor of resulted chromatograms. The highest efficiency with baseline-resolved was obtained by isocratic separation of alkyl benzene using acetonitrile-water (45/55, w/w) as mobile phase at room temperature and twice normal flow rate of 100 µL/min (≈ 2 mm/s) within 20 min with the number of the theoretical plate of 2812 plates/100mm column length. In this work, the Van Deemter equation is compared to the separation impedance for assessment most suitable method for evaluating the efficiency of a monolith column.

Keywords: monolith, microbore, alkylbenzene, separation impedance, Van Deemter.

Pressure Induced Structural Phase Transitions and Electronic Properties of Wide Band Gap Charge Transfer Insulator Mercurous Chloride: A First-Principle DFT Study

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ABSTRACT

The underlying physics behind the pressure induced structural phase transitions and the electronic properties of technologically significant Mercurous Chloride (Hg_2Cl_2) have been explored at room temperature from the ab-initio DFT study. The phonon dispersion relations and phonon density of states have been critically explored for the tetragonal and orthorhombic phases of the compound to understand the phonon modes associated with the structural phase transitions. Detail calculations on the pressure driven structural phase transitions and electronic properties at room temperature reveal the wide band gap insulating nature of Hg_2Cl_2 compound for its tetragonal and orthorhombic phases as obtained from GGA-HSE level of theory. The Mulliken bond population, electronic charge density distribution and Bader charges analyses have been calculated to understand the covalent and ionic interactions between Hg and Cl atoms for the tetragonal phase of Hg_2Cl_2 compound. The Natural Bond Orbital analyses have been performed to gain deeper insights on the charge transfer interactions between Hg and Cl atoms for the tetragonal phase of Hg_2Cl_2.

Antidiabetic and Antioxidant Activity of Jambon [Syzygium microcymum (Koord. & Valeton) Amshoff] Leaves

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ABSTRACT

Jambon has been used traditionally by the indigenous people of Indonesia to treat diabetes. This study aimed to evaluate Jambon leaves as antidiabetic and antioxidant agents. Dried leaves were macerated with methanol in which crude extract obtained was dissolved in 10% methanol followed by sub-sequential fractionation using hexane, dichloromethane, and ethyl acetate. The antidiabetic activity is evaluated through its ability in inhibiting the α-amylase enzyme. The highest activity sample was used to determine the type of inhibition through the reaction kinetics assay. Meanwhile, antioxidant activity is based on the ability of the sample to reduce DPPH, superoxide, and hydroxyl radicals. The result showed methanol extract to possess the highest α-amylase inhibitory activity with the non-competitive inhibition type and was comparable to acarbose standard drug, with values of 93.35±1.93% and 94.37±1.70%, respectively. The highest DPPH and superoxide reducing activity was shown by methanol extract, while the highest hydroxyl reduction was shown by an aqueous fraction with values of 12.28±0.28 µg/mL, 26.33±1.08%, and 32.13±1.48%, respectively. As crude extract, Jambon leaves extract indicated a potential source for antioxidant agent with the activity that is not as high as vitamin C which has DPPH, superoxide, and hydroxyl reducing activity 4.33±0.05 µg/mL, 79.92±2.58%, and 38.05±0.50%, respectively.

Keywords: α-amylase inhibitor, IC50, Michaelis-Menten equation.

On the Occupancy of Hydrophobic Guest Molecules inside EDI Zeolitic Ice

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ABSTRACT

The abundance of ice morphologies in the presence of hydrophobic molecules provides an opportunity to explore this material for its potential as a fuel gas storage. The ability of water molecules to form tetrahedral coordination through hydrogen bonds enables them to mimic the rich crystalline structures of zeolite. Particularly, the EDI structure of zeolite is analogous to the naturally occurring ice VI structure. In this work, the occupancy of hydrophobic guest molecules inside EDI zeolitic ice is investigated using van der Waals-Platteuw (vdWP) theory by integrating the Helmholtz energy of single-molecule inside the ice cavities. Additionally, a hybrid grand-canonical isobaric Monte Carlo simulation is performed to investigate the mechanical stability of the ice. The simulation shows that indeed the EDI zeolitic ice is stable in the presence of hydrophobic guest molecules. The results on occupancy from both methods are generally in agreement, which suggests that the mechanism of hydrophobic guest molecules inclusion is simply a competition between the Helmholtz energy of occupancy and the chemical potential of guest species.

Keywords: EDI zeolitic ice, van der Waals-Platteuw theory, Helmholtz energi, Monte Carlo simulation

Ultrasonication Assisted Esterification of Coffee Pulp Using Sulfuric Acid as Catalyst and Their Antioxidant Activities

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ABSTRACT

Indonesia is the 4th largest coffee producing country in the world. In the process of processing coffee cherries into coffee beans, the skin of the coffee cherries becomes the largest waste from this process, reaching 40%-45%. However, the use of coffee pulp waste is still limited as fertilizer and animal feed. Therefore, there is a need for research to explore the potential of coffee pulp waste which is abundant. Coffee pulp waste contains anthocyanins, flavonols, flavan-3-ol compounds, hydroxynamic acid, and caffeine. In addition, coffee pulp also contains ferulic acid, caffeic acid, gallic acid, and p-coumaric acid. Coffee pulp extract has antioxidant activity but its activity tends to be weak. Therefore, it is necessary to modify the chemical reaction of the active secondary metabolite compounds present in the coffee pulp waste extract to increase antioxidant activity. One of the chemical reactions that can be carried out is the esterification reaction. The purpose of this study was to determine the percentage yield of coffee pulp extraction with ethyl acetate solvent, to carry out the esterification reaction of coffee skin extract with acetic acid using the ultrasonic assisted ultrasonication method in several variations (w/v) namely 1:1, 1:2, 1:3, and 1:4 to determine the total phenolic compounds and antioxidant activity in coffee skin extract and esterified compounds. The results of coffee pulp extraction with ethyl acetate produced a dark green solid with an average yield of 0.85%. The result of total phenolic analysis showed that coffee peel extract had the highest total phenol, which was 28.6 mg/g. Meanwhile, the esterification treatment of various variations of acetic acid did not increase the antioxidant activity of the coffee skin extract. The results of esterification with a variation of 1:1 showed the highest antioxidant activity of 316.7 mg/L compared to other variations.

Keywords: Coffee pulp waste, ultrasonic assisted esterification, phenolic compound, antioxidants.

Performance Evaluation of PET/CA/SiO_2 (Scaling Waste from Geothermal) Nanofiltration Membrane for Batik Industry Wastewater Treatment

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ABSTRACT

Pollution of the aquatic environment is one of the problems in Indonesia. One source of water pollution is the batik industry wastewater. The high value of COD and the content of heavy metals and dyes in the batik industry wastewater has the potential to cause a decrease in water quality. Especially in a residential area adjacent to the location of batik production. So that, need to be handled effectively and efficiently to overcome pollution this aquatic environment. One of the technologies that can be used in wastewater treatment is membrane technology. Therefore, this research focuses on the fabrication of PET/CA/SiO_2 nanofiltration membrane for batik industry wastewater treatment and to study the effect of cellulose acetate (CA) and silica addition in performance evaluation of permeation and separation. The PET/CA/SiO_2 nanofiltration membrane was prepared using phase inversion induced by immersion precipitation and membrane casting would be prepared by glass plate method. Polyethylene terephthalate (PET) was obtained from plastic bottle waste. Meanwhile, silica was obtained from the purification of scaling waste from geothermal. The process of characterization membrane process includes surface morphology (SEM), functional group (FTIR), tensile strength, and water contact angle. From the result, it was found that the addition of SiO_2 and CA successfully improve the hydrophilicity and tensile strength of the membrane. Also, PET/CA/SiO_2 membrane successfully reduce COD, BOD, and TSS in the batik industry wastewater treatment through rejection parameters as well as the filtration performance of the membrane.

Keywords: Nanofiltration Membrane, Batik Wastewater, Polyethylene Terephthalate.

Application of *Caesalpinnia sappan* L, *Cudrania javanensis* and *Indigofera tinctoria* natural dyes on Lurik woven product

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ABSTRACT

The *lurik* woven industry is hampered by the pandemic of Covid-19. However , this moment actually opens the challenge to innovate . The innovations developed is applying the new kind of product prepared by natural dyes. The use of natural dyes in striated weaving needs to be developed to increase the competitiveness of Indonesian local products. The problem is that natural coloring products have a limited range of colors. In this study, the striated yarn was dyed with 3 primary colors: red, yellow and blue. The sources of these natural dyes are sappana (*Caesalpinnia sappan* L), *tegeran* (*Cudrania javanensis*) and indigo (*Indigofera tinctoria*). The three primary colors produce 9 derived colors which enriched the variant of *lurik* woven colors.

Keywords: *Caesalpinnia sappan* L, *Cudrania javanensis*, *Indigofera tinctoria*, *lurik*, natural dye.

A Quality Improvement of Low Rank Coal and Biomass by Pyrolysis

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ABSTRACT

A low rank coal has not been optimally used; an alternative to increase the value is conducted by combustion without oxygen called pyrolysis. On other hand, palm kernel shell (PKS) as a solid waste biomass is by-products of the palm oil industry; it can cause environmental problems if not managed properly. In fact, the waste is abundant and even has not been widely used; hence, it could be also an ideal feedstock for pyrolysis process. This research compares the products distribution resulted from pyrolysis of coal and biomass, and also characterizes the products of liquid (tar) and solid (char). The coal was crushed and sifted to a size of 0.3-1 mm, while PKS was cleaned and sifted to a size of 0.4-2 mm and dried at 105 ºC for 24 h. A total of 200 grams for each material was put into the reactor and heated at temperature of 400 ºC for 1 hour with 1.5 L/min nitrogen gas flow rate. The results showed that the pyrolysis of coal produced more char, while the pyrolysis of PKS produced more gas. The greater tar yield was obtained for the pyrolysis process using PKS. The largest tar compounds identified by GC-MS for both materials were phenol and acetic acid; 3-methyl-phenol and methanol were also found in coal and PKS, respectively. The calorific value of char increased about 5.19% for coal and 41.12% for PKS after pyrolysis. The physical properties were also improved, especially moisture content that is significantly reduced. Thus, the application of pyrolysis in utilizing coal and PKS could enhance the value-added of both materials as well as a contribution to the alternative energy.

Keywords: pyrolysis, low rank coal, palm kernel shell, value-added, alternative energy.

Mechanical Properties and Biodegradability of Modified Skin with Nanoparticle Prepared by Peperomia pellucida

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ABSTRACT

Peperomia pellucida is one of the plants that has secondary metabolite compounds which can be used as a reducing agent in synthesizing silver nanoparticles. This objectives of the research were to study modification effect of pickled goat skin using silver nanoparticles which prepared with *Peperomia pellucida* extract on mechanical properties and the biodegradability. The silver nanoparticles were synthesized from silver nitrate solution and *Peperomia pellucida* extract by microwave, extraction, and ultrasound methods, and also were characterized by using an Ultra Violet-Visible spectrophotometer and a Particle Size Analyzer. Mechanical properties of skin were determined by tensile strength test and the biodegradability of skin was determined by biodegradation test. The silver nanoparticles synthesized by microwave method showed the absorbance peak of UV-Vis at 420 nm, ultrasound at 450 nm, and extraction at 445 nm. The average size of the silver nanoparticles synthesized by microwave method was 179.7 nm, ultrasound was 88.2 nm, and extraction was 63.3 nm. Skin after modification with silver nanoparticle by ultrasound method has the greatest biodegradability, while skin modified with silver nanoparticle by microwave method has the highest tensile strength with average for about 24.075 MPa.

Keywords: *Peperomia pellucida* extract, silver nanoparticles, pickled goat skin, tensile strength, and biodegradation.

Study of the Application of Ionic Liquid Catalyst for Aldazine Synthesis

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ABSTRACT

Isatin and its derivatives are heterocyclic compounds that have good biological and pharmacological activities. This study aims to develop an efficient procedure for the synthesis of isatin aldazine using a protic ionic liquid 1-methylimidazolium hydrogen sulfate [MIM][HSO_4] as a green catalyst. In this study, the ionic liquid catalyst [MIM][HSO4] was synthesized by a simple neutralization reaction of 1-methylimidazole with protic acid and characterized by FTIR. The characterization results showed that the [MIM][HSO4] catalyst was successfully formed. Furthermore, [MIM][HSO_4] catalyst was applied to synthesize isatin aldazine derivative by reacting isatin with hydrazine hydrate and aromatic aldehyde benzaldehyde under heating conditions in ethanol. The synthesis is carried out in a two-step catalyzed reaction. Based on the optimization results, the amount of catalyst with the optimum reaction conditions was 10% mol. The success of the formations of isatin aldazine was identified and characterized using thin-layer chromatography (TLC) and LC-MS. The characterization results showed that the isatin aldazine product was successfully synthesized. The catalyst has shown a good yield of product, shorter reaction profiles, simplicity of its use, easy preparation of the catalyst, and environmentally benign process.

Rotational Speed Effect of the Planetary Ball Milling on the Particle Size and Crystal Structure of $CaMnO_3$ as a Thermoelectric Material

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ABSTRACT

$CaMnO_3$ (Calcium Manganese Oxide) is a ceramic material from oxide that promises as N-type thermoelectric. The $CaMnO_3$ was $CaMnO_3$ was synthesized using the solid-state reaction method by mixing the $CaCO_3$ and MnO_2 powder as raw materials then milling in the planetary ball mill. The rotational speed variations of the planetary ball mill were 148 rpm, 170 rpm, 192 rpm, and 212 rpm. The purpose of this research is to study the effect of rotational speed on the crystal structure and particle size of $CaMnO_3$, characterized by X-Ray Diffractions (XRD) and measured by Particle Size Analyzer (PSA). The X-ray diffraction pattern showed that $CaMnO_3$ crystals had formed at the diffraction angle of 33.8971, which indicated an Orthorhombic crystal system. On the other hand, the new phase peaks is found at the diffraction angle of 23.8145 indicating the presence of the Dicalcium manganate (Ca_2MnO_4) as a secondary phase. The intensity peak of $CaMnO_3$ increase with the increasing of the rotational speed followed by the increasing of the particle size and influencing the reducing of the Dicalcium manganate phase. The relationship between the crystal structure and particle size will be discussed further in this study.

Keywords: $CaMnO_3$, ball mill, rotational speed, thermoelectric.

Synthesis of MnO_2/Biochar Nanocomposite Using Sonochemical Method for Adsorption of Pb(II)

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ABSTRACT

Coconut shells, one of the abundant organic wastes from agriculture and plantation systems, can be converted into Biochar and used as high-efficiency materials for certain applications. In this work, we prepared Biochar from coconut shells by the fast pyrolysis method at 700 oC for 3 h, which is further activated by KOH at a ratio of 0.75:1 (w/w). The composite MnO_2/biochar was synthesized by the sonochemical-assisted co-precipitation method at various pHs (3, 5, 7, 9, and 11), temperatures (60 and 80^{o}C), and times (1, 2, and 3 h) using the fixed composition of MnO_2 and Biochar (1:1, w/w). The composite was applied as an adsorbent for Pb(II) removal from aqueous solutions. The isothermal adsorption was studied by the Langmuir and Freundlich model. Such results indicated that the MnO_2/biochar nanocomposite has good potential for environmental purposes as it can remove Pb(II) up to 90.52% under optimum conditions.

Keywords: biochar, manganese dioxide, nanocomposite, sonochemistry, adsorption.

Morphological and Mechanical Study of Gelatin/Hydroxyapatite Composite based Scaffolds for Bone Tissue Regeneration

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ABSTRACT

Gelatin-Hydroxyapatite (GHA) composite has been synthesized as a scaffold in bone tissue engineering. The purpose of this study was to find the optimal composition of the GHA scaffold composite which has the best mechanical properties. The independent variable in this study was the composition of HAp. Hydroxyapatite was synthesized by precipitation method from $Ca(OH)_2$ and $(NH_4)_2HPO_4$ as raw materials. Scaffold from GHA Composite was made by freeze-drying technique with freezing time for 8 hours at -80º C and drying with lyophilizer. The results were characterized using XRD, optical microscopy and tested for compressive strength. The results of the XRD showed that there was no change in a compound or the formation of new bonds on the GHA scaffold when it became a composite which was indicated by the absence of new peaks. It is also known that the peaks decrease in intensity as the amount of polymer in the composite increases. The highest degree of crystallinity was found in the 1:3 GHA sample because it had the highest concentration of HAp. The results of observations with an optical microscope showed that the most homogeneous pore surface morphology was GHA 1:2 with an average pore size of 225.12 ± 16.57 µm. From the results of the compressive strength test, the best value for the 1:2 GHA scaffold was 18.1 ± 0.61 MPa. The values obtained by this scaffold are following the minimum requirements for canceled scaffold so that it can be used as a scaffold candidate in bone tissue engineering.

Keywords: Composite scaffolds, Hydroxyapatite, Gelatin, Compressive strength.

Curcumin Nanoemulsion Formulation with Phase Inversion Temperature (PIT) Method

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ABSTRACT

Curcumin is a compound that can be used as an antiprotozoal, anti-inflammatory, antibacterial, and antioxidant, nevertheles, curcumin low solubility in water hamper curcumin metabolism in the body. A method to overcome this problem is by applying nanoemulsion, in which solubilized curcumin in oil phase, is carried by the water phase, thus increasing curcumin dispersion in water. One of curcumin nanoemulsion making method in this reasearch is Phase Inversion Temperature (PIT). PIT uses low energy in which emulsion is stirred and heated up to 90°C for 30 minutes followed with a cooling step in icebath for 30 minutes. This research was carried out with 2 variations, variations in the amount of Tween 80 as a surfactant and variations in the addition of co-surfactant Lecithin. The results of the study indicate a change in particle size, Polydiversity Index (PDI) and curcumin encapsulation to the variations used. The increasing concentration of tween 80 reduces particle size from 103,5 nm to 28,9 nm, an increase in PDI from 0.1305 to 0,2275 and a decrease in curcumin encapsulation from 70,73% to 32,03%. In the variation of the addition of co-surfactant Lecithin, there was an increase in particle size from 16,8 nm to 683,4 nm, an increase in PDI value from 0,1165 to 0,304, and an increase in the amount of curcumin encapsulation from 38,82% to 50,55%. This proves that the addition of lecithin increases the stability of the nanoemulsion with a smaller particle size (16,8 nm) and the PDI value close to 0,1 (0,1165) in the ratio between Lecithin and Tween 80 1: 5. Nanoemulsion produced was stable up to 30 days of storage in room temperature.

Keywords: Curcumin, Nanoemulsion, PIT Method.

Effect of Ethanolic Root Extract of *Ruellia tuberosa* L On Diabetic Rat Type I Based On Serum Glutamic Pyruvic Transminase (SGPT) Activity And Liver Hispathology

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ABSTRACT

Diabetes mellitus (DM) is a chronic metabolic disease characterized by hyperglycemia resulting from deficiency of insulin. Deficiency of insulin can be induced by streptozotocin that will raise free radicals and cause liver cell damage leading to increase activity of SGPT in the blood. The root of Ruellia tuberosa contains a flavonoid and phytosterols that might be used for treatment of DM type 1. The purpose of this research was to determine the changes of liver histopathology and SGPT activity in animal testing of DM type 1 which received ethanolic root extract of *R. tuberosa*. This research used the rat (*Rattus norvegicus*) male aged about 2 months, which were divided into 5 groups: (K1) the negative control group, (K2) the positive control group DM, (P1) groups of DM rats and therapy with ethanolic root extract of *R. tuberosa* at doses of 250 mg/kg BW, (P2) 375 mg/kg BW, (P3) 500 mg/kg BW. Streptozotocin was intraperitonial injection to rats with a dose of 20 mg/kg body weight for 5 days. Therapy was carried out using a sonde stomach for 21 days. Activities of SGPT were measured by spectrophotometric method and liver histopathology were observed using Hematoxylin Eosin staining. The SGPT data were analyzed by ANOVA and followed by Tukey test, while liver histopthology were analyzed in a descriptive. The results showed that therapy ethanolic root extract of *R. tuberosa* was able to decrease SGPT activity significantly and improved the liver histopathology by reducing lipid and cell degeneration, and size of sinusoidal returned to normal. In conclusion, ethanolic root extract of *R. tuberose* with dose of 250 mg/kg BW was a the best dose that could improve the image of the liver histopathology and decrease SGPT activity in rat model DM type 1 induced by streptozotocin.

Keywords: Diabetes Mellitus, Liver Histopathology, *Ruellia tuberosa* root, SGPT.

Microalgae Growth Kinetic Study with Logistic and Monod Models

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ABSTRACT

Microalgae is one of the important raw materials for the development of alternative energy. Peat water is a potential medium for microalgae due to rich in nutrients. In this study, microalgae cultivation was carried out using peat water and the addition of 1 g/l $NaNO_3$; 1.25 g/l and 1.5 g/l. Microalgae biomass produced from the cultivation process can be used as alternative energy for bioethanol or biodiesel production. Kinetics Logistics model and Monod model were used to predict the growth of microalgae in the cultivation process. The results showed that the cultivation process with addition of 1.5 g/l $NaNO_3$ produced the highest microalgae of 5.59 g. The kinetic parameters of the Logistics model are the maximum growth rate of 1.3268 d^{-1} and the carrying capacity of 1305600 cells/ml. Meanwhile, the kinetic parameters of the Monod model are the maximum growth rate (μmax) of 0.7807 d^{-1} and the substrate saturation constant (Ks) of 1.6211 mg/ml. The results also showed that microalgae cultivation could neutralize the pH of peat water from 4.4 to 6.9.

Keywords: Peat water, *Chlorella* sp., growth kinetics, microalgae, sodium nitrate.

Effect of Chromium Addition for Stabilizing the Crystal Structure of Iron in Liquid Bismuth

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ABSTRACT

The use of liquid metals such as molten lead and liquid bismuth in the design of liquid metal-cooled nuclear reactors is currently a very interesting research topic. This type of reactor is very promising to be developed in the future because of the various advantages it has when compared to thermal reactors. However, it has long been known that molten metal as a reactor coolant has a very corrosive effect on the steel used in the reactor. Various efforts should be taken to prevent corrosion such as finding good alloy steel and or developing corrosion inhibition methods. In this study, molecular dynamics simulations were carried out using the LAMMPS program to find the right FeCr steel composition that is resistant to liquid bismuth corrosion. To find the right FeCr composition, the iron diffusion coefficient will be calculated which describes how much corrosion occurs

Keywords: Liquid metal corrosion, molecular dynamics, metal alloy.

Biodegradability of Cellulose Composites Deposited by Nanoparticle

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ABSTRACT

This objectives of the research were to determine the formation of silver nanoparticles, the effect of adding glycerol and chitosan on biodegradability of bacterial cellulose from sweet potato waste water deposited by silver nanoparticles, the effect of biodegradation time to biodegradatibility of bacterial cellulose deposited silver nanoparticles. The research was started by making nata of liquid waste of sweet potatoes which is fermented by *Acetobacter xylinum* during 7 days. Bacterial cellulose-chitosan and bacterial cellulose-glycerol-chitosan were prepared before the drying process by immersed in chitosan solution. Preparation of silver nanoparticles was carried out by chemical reduction method from solution of $AgNO_3$ with trisodium citrate and gelatin and than was characterized by using a UV - Vis spectrophotometer. Biodegradability of bacterial cellulose and its composite was studied by mass loss and rate of mass loss. The cellulose was characterized by FTIR-ATR to determine the functional groups and XRD to determine crystallinity. The results showed that the silver nanoparticles have been successfully synthesized indicated by absorption at 418.80 nm, the addition of glycerol and chitosan decreased biodegradability of bacterial cellulose, the biodegradation time caused increasing mass loss and decreasing the rate of mass loss, and the highest nanosilver doped bacterial cellulose had -OH and C-O functional group and than the higher crystallinity than before biodegradation.

Keywords: biodegradability, cellulose composite, crystallinity, and silver nanoparticles.

Characterization of Styrene and Methyl Methacrylate Polymer/Cu_2O Synthesized by Nanoemulsion Polymerization

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ABSTRACT

Biofouling phenomenon defined as the accumulation of micro and macroorganisms on surfaces immersed in the sea. This research aimed to synthesize and characterize antifouling based on copolymer of styrene and methyl methacrylate with varying the Cu_2O content as biocide via nanoemulsion polymerization. Identification using FTIR showed that the polymerization has been successfully done in the absence of the C = C absorption peak at wave number 1600 – 1680 cm^{-1}. The particle size of resulting polymer particles with the incorporation of 5%, 10% and 15% of Cu_2O were around 100-200 nm. Morphology of styrene-methyl methacrylate copolymer/Cu_2O nanoparticles exhibited core-shell particles and Cu_2O were encapsulated in the core of the particles.

Properties of Bacterial Cellulose/Polyvinyl Composite Membrane for Polymer Electrolyte Li ion Battery

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ABSTRACT

High ionic conductivity and more porous have extraordinary significance to solid polymer electrolyte in Li ion battery application. In this study, bacterial cellulose (bc) based polymer was modified by polyvinyl pyrrolidone (pvp) and polyvinyl acetate (pva) to get composite solid polymer electrolyte. Blending the polymer host is one more approach to work on the morpholohy pore and electrochemical properties of polymer electrolytes. The slurry of bc is rich in fibers that contribute to forming the pore template of the solid electrolyte membrane. Polyvinyl work to make more pore and also increases the polymer segmental ion lithium mobility. Pore morphology of bc pva composite membrane homogeneously distributed by SEM observations. The presence of many pores makes the tensile strength of the bc pva membrane lower, for use in solid electrolytes it does not affect battery performance. The presence of pores that contribute a lot to the absorption of electrolytes. Enhancement of the conductivity upon addition of salt is correlated to the enhancement of more pore of polymer electrolyte. The conductivity of bc pva composite 8.45 x 10^{-7} Scm^{-1} higher than pvp at room temperature. In the future, pva can be relied on to be a mixed material for solid electrolyte membranes based on cellulose.

Keywords: Bacterial Cellulose, polyvinyl pyrrolidone, polyvinyl acetate, Solid polymer electrolyte.

Different Approach of Preparation Ag-modified Cryptomelane type-Manganese Oxide by Sol-gel Method for Methylene Blue Dye Removal

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ABSTRACT

Cryptomelane is a hollow type manganese oxide mineral that has a tunnel structure of 2 x 2. Cryptomelane can be used as an adsorbent and catalyst for the degradation of organic compound wastes. The purpose of this study was to synthesis of cryptomelane by the the sol-gel method using $KMnO_4$ and $C_6H_8O_7$ precursors with $AgNO_3$ as a dopant source (1, 5 and 10 %w/t). The different doping approach is carried out. The synthesized Ag-cryptomelane was characterized using X-ray Diffraction (XRD), Brunauer, Emmet and Teller (BET), and Energy Dispersive X-Ray Spectroscopy (EDX). The characterization results showed other phases formed besides cryptomelane, namely Ag, AgO and Ag_2O. The synthesized Ag-cryptomelane catalyst was then applied for the degradation of methylene blue using H_2O_2 as an oxidant.

Keywords: cryptomelane, methylene blue, sol-gel.

Microwave-assisted Synthesis and Antibacterial Bioactivity of 4-Methyl-2-Quinolone Derivatives

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ABSTRACT

2-Quinolones are heterocyclic compounds which possess interesting biologic activities ranging from antiviral, anticonvulsant, to antibacterial. In this study, derivatives of 4-methyl-2-quinolone were synthesized using microwave irradiation from *o-, m-, p-aminoaniline* (phenylenediamine), and *m-hydroxyaniline* (m-aminophenol) with ethyl acetoacetate in the presence of AlCl3 as a catalyst. Antibacterial activity of 4-methyl-2-quinolone derivatives were evaluated against *E. coli* and S. aureus using the disc diffusion method. 7-amino-4-methyl-2-quinolone (43,42%) and 7-hydroxy-4-methyl-2-quinolone (26,36%) were obtain from m-aminoaniline dan m-hydroxyaniline precursor, respectively, under conditions of 800 W microwave irradiation without solvent for 5 minutes, mole ratio of aniline:ethyl acetoacetate 1:1 (mole/mole), and 10% (w/w) catalyst. Synthesis from o- and p-aminoaniline produce a mixed compound. Products were identified by TLC and melting point apparatus, followed by further characterization using FTIR, UV-Vis, NMR, and LC-MS. The results of the antibacterial test showed that the four synthesized compounds had moderate antibacterial activity against *E. coli* and inactive against *S. aureus* in the range of 62.5-1000 ppm.

Cellullosa Hydrolysis Process of Red Dragon Fruit Pell (Hylocereos Costaricensis) As Candidate For Biothanol Production

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ABSTRACT

Red dragon fruit peel can be used as a source of energy (bioethanol) because it contained carbohydrates like cellulose. The process of making bioethanol is carried out through three steps: delignification, hydrolysis, and fermentation. The results of red dragon fruit peel delignification were analyzed quantitatively by FTIR, and the analysis showed that the results of delignification were cellulose. Cellulose was converted into glucose using the hydrolysis method with sulfuric acid and continued with bioethanol production by fermentation using Saccharomyces cerevisiae. The parameter used in this study was the concentration of sulfuric acid used during the hydrolysis process (0.5- 2.0 M) to produce the optimum glucose concentration. The quantitative test of glucose results showed that a mixture containing 2.0 M sulfuric acid produced the highest glucose value (0.05 g/mL). The 3300 cm^{-1} peak in the FTIR spectrum shows an OH group that predicts the formation of ethanol from the fermentation process. This research was aimed at obtaining alternative energy sources to overcome the scarcity of energy.

Keywords: Bioethanol, cellulose, fermentation, hydrolysis.

Microwave-assisted Synthesis of 4-Methyl Coumarins via Knoevenagel Condensation and Its Antibacterial Activities

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ABSTRACT

Bacterial infections have become a significant public health issue globally. Therefore, the need for new antibacterial agents continues to emerge to prevent the spread of bacteria. Coumarins and their derivatives are known to have a wide range of biological activities, including antibacterial. In this study, 4-methyl coumarin derivatives afforded, including 3-acetyl-4-methyl coumarin (1), ethyl-4-methyl-coumarin-3-carboxylate (2), and 3-cyano-4-methyl coumarin (3) through the Knoevenagel condensation reaction catalyzed by NaOH using the MAOS method. Compound 1 (43.54%) was formed under solvent-free conditions by reacting 2-hydroxy acetophenone and ethyl acetoacetate (1:1, mol/mol) with 30% mol NaOH catalyst at 80oC for 7 minutes. Modification of reaction time and temperature of optimum condition shows the formation of compounds 2 (28.00%) and 3 (51.56%). The use of malononitrile as active methylene induces compound 3 in the form of a mixture with various heterocyclic derivatives as a by-product. The synthesized compounds were identified using TLC and melting point tests and characterized using FTIR, UV-Vis, NMR, and LC-MS. Evaluation of antibacterial activity by disc diffusion method shows that compounds 1, 2, 3, and mixtures 3 showed weak inhibitory activity against E. coli bacteria. Meanwhile, only mixtures compound 3 showed weak inhibitory activity against S. aureus bacteria.

Keywords: Active Methylene, Antibacterial, Coumarin, Knoevenagel Condensation

Molecular Docking and Site-Directed Mutagenesis of Endo-β-1,4-D-Xilanase of *Bacillus* sp. From Soil Termite Abdomen to Improve Enzyme Effectiveness

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ABSTRACT

Endo-β-1,4-D-xylanase is the main enzyme that plays a role in xylan hydrolysis by breaking the β-1,4-D-glycosidic bonds in the xylan backbone and breaking it down into Xylooligosaccharides (XOS) and a little xylose. In this study, the gene encoding endo-β-1,4-D-xylanase from *Bacillus* sp. in termites' abdomen that had been cloned in the pET-30a(+) vector was enhanced its effectiveness through molecular docking and site-directed mutagenesis. Based on molecular docking analysis using xylopentaose as a ligand, 34 amino acid residues located on the catalytic site were mutated into aspartic acid, glutamic acid, arginine, histidine, and lysine, respectively. The results showed that the replacement of asparagine at position 63 to aspartate resulted in the lowest free energy. The results of site-directed mutagenesis of Asn63 to Asp63 showed an increase in relative specific activity of 33.14% compared to the wild type. The catalytic effectiveness (K_{cat}/K_M) increased 1.6 times compared to the wild type while the KM value decreased. This mutation also affects the enzyme properties, namely a decrease in the optimum pH of the N63D mutant to 4.5 compared to the wild type which has an optimum pH of 5.5. The N63D mutant enzyme maintained activity of more than 40% for 2 hours at 40-50 °C, and maintained activity of more than 60% at pH 4 for 2 hours. This concludes that goal-oriented manipulation through homology modeling, molecular docking, and site-directed mutagenesis is effective for enhancing xylanase activity and investigating the correlation between structure and function.

Keywords: xylan; xylanase; homology modelling; molecular docking; site-directed mutagenesis.

Identification of Microplastic in Mahakam River Samarinda as Raw Water of Water Treatment Plant

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ABSTRACT

The water from Mahakam River in Samarinda needs to fulfill the quality requirements because it is the main supply in the region. The microplastics in the water may negatively affect people in case they are not removed from the water. This study aimed to determine the abundance and type of microplastic in water from the Mahakam River, Samarinda City at a depth of 0.5 m based on size, specifically ≥500μm; 500μm> x ≥250μm, and 250μm > x ≥180μm. Samples were collected at Teluk Lerong Intake using grab and composite methods. The water sample was processed by filtering with 180μm nylon, eliminating organic substances using H_2O_2, density separator, second filtration with various nylon filters, and microscopic observation. Definitively, microplastic refers to various solid materials of the appropriate size, persist after undergoing the above process, and are microscopic. The results showed microplastic in all test samples with the highest abundance in size range of 250μm> x ≥180μm by 12.7 particles/500 mL sample. The size range of 500μm> x ≥250μm had an abundance value of 8 particles/500 mL and ≥500μm of 4.7 particles/500 mL. The predominant type was fiber, though the fragment and film microplastic were also found.

Biosorption of Co(II) and Ni(II) by Trichoderma viride Immobilized in Ca-Alginate

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ABSTRACT

Cobalt and Nickel are the heavy metals that is found in water and it comes from the wastes of petroleum, paint, glass, electroplating and ceramics industries. High concentrations of cobalt and nickel can cause environmental damage, such as paralysis, diarrhea, low blood pressure, lung irritation and bone defects. There are several methods to remove heavy metals in environment such as bioremediation, ion exchange, chemical precipitation nanoparticles, and also biosorption using microorganism. Biosorption is a method that can be used to reduce the concentration of some heavy metals in water using microorganisms. The research is focused on the determination of optimum conditions of pH, contact time, steering speed, and the number of adsorbents on biosorption of Co(II) and Ni(II) using Trichoderma viride that immobilized in Ca-Alginate. The analytical method used for determining Co(II) concentration is visible light spectrophotometry using Nitroso-R salt reagent, while the Ni(II) was determined using dimethylglyoxime. The results shows that optimum biosorption of Co(II) occurred at pH 4, with a contact time of 4 hours, stirring speed of 100 rpm, the highest adsorption percent of Co(II) reached 55.37% and adsorption capacity of Co(II) is 0,1496 mg/g adsorbent, while the optimum biosorption of Ni(II) were obtained at pH 4.5, with 4 hours contact time, at 100 rpm, the highest adsorption percent of Ni(II) reached 87.28% and the adsorption capacity of Ni(II) is 0,32 mg/g adsorbent.

Keywords: Biosorption, Heavy metals, Ca-alginate, Nickel, Cobalt, Immobilized, *Trichoderma viride.*

Separation Compound Chemical From cacao Vinegar in Different Temperature Based Eco Friendly

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ABSTRACT

Potential Cocoa and derivative products (Cocoa powder, cocoa liquor and wafer) consist compound of polyphenols and different potential levels of antioxidants. the greater content of polyphenols provides benefits to cosmetic and food functional. The potential of cocoa shell waste. The results of processing cocoa produce cocoa waste. with the use of pyrolysis process is able to overcome the accumulation of plantation waste. The results of this combustion produce cacao vinegar into distillates, Tar and charcoal. In this research the pyrolysis temperature was 114-514°C. Yield liquid smoke from cocoa shell Bulukumba with temperature pyrolysis 114 C as 11,19%, 214 C as 33,58%, 314 C as 22,14%, 414 C as 24,38% and 514 C as 8,70%,, The decomposition process of the analysis of raw materials for cacao Shell Bulukumba District revealed that lignin content was 42,28%, α cellulose was 44,55%, and the hemicellulose content was 10,02% and Analysis GC MS cacao Shell fruit in Enrekang district acetic acid 18.39%, phenol 2,43%, hepthyl octanoate 2,40% dodecanol 1,65% and carbamac acid 1,76%. The monitoring of cacao shell with pyrolysis process can reduce for environmental pollution

Keywords: Cocoa Shell, Pyrolysis, cacao waste, GC MS And Bio chemical.

Kappa Number and Viscosity in Oxygen Delignification of Kraft-Pulp Eucalyptus Pellita in Comparison with Prediction Data

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ABSTRACT

The quality of pulp after delignification process is measured by the lignin content (Kappa Number) and viscosity (pulp strength). In this study, Eucalyptus Pellita was treated in Kraft process followed with oxygen delignification. The resulting pulp was then analyzed in term of Kappa number and viscosity. The aim of this work was to develop kinetic empirical model of oxygen delignification reaction and compare the Kappa number and viscosity obtained from experimental data with those from kinetic model. The experimental data was collected by varying the operating conditions of oxygen pressures, temperatures, alkali concentrations and heating times. The Kappa number decreased with the increasing of alkali concentration, oxygen pressure, temperature, and heating time, as well as for the viscosity. The value of both Kappa number and viscosity obtained from kinetic model were close enough to that obtained from experiment. Therefore, the kinetic model could be used to predict the optimum condition in oxygen delignification of kraft-pulped.

Keywords: Kappa Number, Viscosity, Oxygen Delignification, Pulp, Eucalyptus Pellita.

Thermal Studies and Emission Spectrum of Pyrotechnic Based on Aluminum-Charcoal Fuel and Arabic Gum

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ABSTRACT

Calorific energy and emission spectrum produced by Al-Charcoal-Arabic Gum composition in percentages of 17/68/15, 22/63/15, and 27/58/15 wt. % were studied using a calorimeter, differential thermal analysis (DTA), and spectrometer test. DTA profiles from all these compositions showed similar exothermic and endothermic peaks that were presented at temperatures around 100, 300, 500, and 685 ^{o}C. Metal fuel in this composition did not react with Arabic gum and charcoal. Furthermore, a composition with the lowest charcoal percentage obtained the lowest calorific value (4006.20 calorie/g) and light orange, where the opposite of this composition generated an emission spectrum of orange color that was darker. The enhancement of charcoal existence in this sample can increase the density of each composition that affected calories from themselves.

Keywords: aluminum, charcoal, calories, emission spectrum.

Biofuel Production From *Reutealis Trisperma* oil pyrolysis with dolomit catalyst as a renewable energy sources

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ABSTRACT

In this study, the pyrolysis of *Reutealis trisperma* oil was first time carried out using a home-made batch reactor to determine the parameters and effect of the dolomite catalyst on the final pyrolysis product. The effect of temperature pyrolysis on product yields was investigated in the range 400-500 °C. In this study, no variation of catalyst concentration was carried out. The loading of catalyst used is 10%. The highest liquid yield of thermal and catalytic pyrolysis is 70% (450 °C) and 77% (450°C) respectively. The liquid product was characterized by GC-MS, and FTIR, whereas the solid was subjected to FTIR, XRD and SEM-EDX. The fuel properties of pyrolytic oil confirmed that the oil was viscosity 8.02 c.St, density 0.85 gcm^{-3}, pH 4.13, water content 0.31%, pour point -12 °C, and flash point 73 °C and calorific value 41.06 MJ/ kg. These results indicate that *Reutealis trisperma* oil has the potential to be used as a renewable fuel source.

Keywords: Biofuel, *Reutealis trisperma*, dolomite, pyrolysis.

Hydrolysis of Industrial Pepper Waste (*Piper nigrum* L.) Using Inorganic and Organic Acids For Formation of Rod and Sphere Nanocrystalline Cellulose

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ABSTRACT

Conversion of lignocellulosic material from agricultural waste to biopolymer is actively developed to enhance its added value as renewable source. In this study, industrial processing waste from pepper (*Piper nigrum* L.) was transformed into cellulose nanocrystals with defined rod and sphere-shape morphology using acid hydrolysis. The hydrolysis was performed using inorganic acids (sulfuric, hydrochloric, phosphoric) and organic acids (oxalic, citric, acetic) at different sonication times. The use of different type of acids and the variation of sonication times have significant effect towards the physicochemical characteristics, self-assembled structure, morphology, crystallinity, particle size, zeta potential and thermal stability of isolated nanocellulose. Hydrolysis using inorganic acid transformed cellulose from pepper waste to spherical NCC with narrow particle size distribution. Fully dissociated H^+ in inorganic acid dissociated hydrogen bonds, dissolved the amorphous cellulose fragments and disintegrated larger crystalline cellulose into monocrystals. Meanwhile hydrolysis of cellulose in organic acids produced rod NCC with high thermal stability and crystallinity.

Keywords: Pepper waste, hydrolysis, inorganic acid, organic acid, nanocellulose.

The Role of Micro and Mesoporosity of Aluminosilicate Catalyst for Solvent-Free Deoxygenation of Oleic Acid

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ABSTRACT

Bio-hydrocarbon liquid fuels, classified as the second-generation biofuels can be produced by oxygen removal of fatty acid/vegetable oil via deoxygenation reaction. Porous aluminosilicates were the ideal candidates due to the synergistic effects between porosity and acidity to control the distribution of hydrocarbons. The difference of organic template during the synthesis process influence the structure, porosity and catalytic activity of aluminosilicate. ZSM-5 framework was rapidly formed when using TPAOH preventing the formation of mesostructure in the second crystallization processes. In the absence of SDA, the aluminosilicate was characterized as mesoporous Al-MCM-41. Meanwhile, ZSM-5 with hierarchical structures was obtained when using silicalite as the organic template. The NiO impregnation enhance the Lewis acidity due to the proton exchange in aluminosilicate framework. Al-MCM-41 gives the highest catalytic activity compared with mesoporous ZSM-5. The use of oleic acid as a feedstock will increase the conversion up to 80,29%, 37.65% of liquid yield products with hydrocarbon selectivity of 88,57%. The reaction time influence the catalytic activity of deoxygenation reaction i.e conversion, yield and distribution of liquid products.

Keywords: Bio-hydrocarbon, biofuels, aluminosilicate, deoxygenation, template.

Variation of Surfactant Concentration P123:Gelatin on the Synthesis and Characterization of Mesoporous Nanosilica

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ABSTRACT

Mesoporous silica has a large pore structure (4.6-30 nm), thick pore walls, thermally and mechanically stable, uniform size, and regular structure, in the manufacture of these materials a template is needed as a structural guide. Mesoporous nanosilica has been successfully synthesized in this study using co-template P123 and gelatin with concentration variations of 1:0; 1:0,2; 1:0.5; 1:1 with the sol-gel method at 100℃ for 24 hours. Mesoporous nanosilica material was characterized using XRD Low Angle, XRD Wide Angle, FTIR, SEM, TEM, and DTA/TGA. The results showed that low angle X-ray diffraction data showed that three peaks were formed which indicated the formation of regular pores, the wide angle XRD formed an amorf phase which was indicated by a widening board peak at 2θ around 23.56°. The IR spectra show the characteristics of the mesoporous nanosilica material, which Si-O-Si vibrational mode with wave numbers 1100 and 950 cm^{-1}. The SEM results show that the morphology formed is rod chain, with increasing gelatin, aggregates are formed. The TEM results show the visualization of the hexagonal arrangement which is characteristic of the parallel mesopores of the p6mm space group.

Keywords. nanosilica, gelatin, natural hybrid template, Pluronic P123, Sol-Gel.

Effect of Active Zeolite in the Pyrolysis of PP and LPDE Types of Plastic Waste

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ABSTRACT

Plastic is a basic need for humans, but it has also caused big problems for the environment. The pyrolysis process can convert plastic waste into fuel to replace petroleum. The type of plastic and the catalyst affect the plastic pyrolysis process. The purpose of this study was to determine the effect of the type of plastic and the addition of a zeolite catalyst on the oil yield from the pyrolysis of plastic waste. The stages of the research carried out were natural zeolite activation, pyrolysis reactor settings, pyrolysis of plastic waste types PP and LDPE. Characterization of the results includes viscosity, refractive index, specific gravity, acid number, and identification of the results carried out by IR and GC-MS. The results showed that the natural zeolite used had a mordenite phase and activated natural zeolite had a higher Si/Al ratio than the inactivated one. The addition of a zeolite catalyst has an effect on the yield produced. The yields of oil from plastic waste pyrolysis with zeolite catalyst for PE or LDPE plastics were about 75.9; 76.9 and 83.4% w/w, respectively. The results of the FTIR and GC-MS analysis showed that the compounds that make up the pyrolysis oil were thought to be from the alkanes, cycloalkanes, alkenes, carboxylic acids with aromatic rings, and ketones. The results of the GC-MS test showed that the uncatalyzed pyrolysis product consists of compounds with a long-range of C_5 -C_{11} carbon atoms. Meanwhile, the length range of carbon atoms of pyrolysis products with active zeolite catalyst ranges of C_6 -C_{24}.

Keywords. zeolite, catalyst, plastic, pyrolysis, reactor.

Synthesis of ZnO NPs with Green Chemistry Principles Using Mangosteen Pericarps Extract (*Garcinia mangostana* L.) As Capping Agent and Its Characterization as Antibacterial

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ABSTRACT

One of the nanoparticles that are currently being developed because of their usefulness for life is ZnO. ZnO nanoparticles (ZnO NPs) are widely used in various fields, one of which is in the health sector as an antibacterial. In this study, ZnO NPs were synthesized using Green Chemistry Principles which are environmentally friendly and economical, by utilizing secondary metabolite compounds in the inner skin (pericarp) of mangosteen and its characterisation, as well as its application as an antibacterial against acne-causing bacteria Propionibacterium acnes. This study used variations of dried and wet pericarps to determine the effect of drying the mangosteen pericarps on the characters of ZnO NPs in terms of mass-produced, crystal size, particle size, and antibacterial effectiveness. The stages of this research were (1) extraction of wet and dried mangosteen pericarps (2) phytochemical test of the extracts (3) synthesis of ZnO NPs (4) characterization of ZnO NPs were conducted using XRD, SEM, and antibacterial test against Propionibacterium acnes. After doing the research, the results of XRD and SEM characterization were analyzed using Origin and Match3 applications for XRD and ImageJ for SEM. Analysis of antibacterial effectiveness was carried out by measuring the diameter of the clear zone contained in the agar medium. The results showed that ZnO NPs had been successfully synthesized by this method. Wet and dried mangosteen pericarps extract gave different mass of ZnO NPs (1.011 g from wet and 1.074 g from dried), the crystallite size (15.23 nm and 17.48 nm), and particles size (81.666 nm and 80.728 nm). This causes the effectiveness of inhibition of ZnO NPs synthesized using dried mangosteen pericarps extract against Propionibacterium acnes bacteria > wet mangosteen pericarps extract.

Keywords: *Garcinia mangostana* L., ZnO nanoparticles, Green Chemistry, Propionibacterium Acnes.

Synthesis of CaO From Dolomit Madura Using Rara Saponin as A Base Catalyst For Transesterification Reaction of Waste Coocing Oil (WCO)

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ABSTRACT

Dolomite from Madura has been extracted for its CaO using Rara saponins from lerak fruit. The results showed that the CaO obtained had a high purity with a Ca component of 88% from the original condition of 62%. The results of XRD and FTIR analysis showed that the main component was the CaO phase and no MgO phase was found. Hydrothermal treatment in the preparation process affects the crystal size of CaO, namely 55. The results of crystal size analysis obtained CaO crystals with sizes of 55.72 and 44.03 nm respectively in CaO without hydrothermal and CaO with hydrothermal. The catalytic activity test showed that the CaO obtained by the hydrothermal process, in higher biodiesel yields of 88.78%.

Keywords: Dolomite, rara saponin, transesterification, WCO.

Synthesis of TiO_2 Nano With Hydrotermal Method Dooped Fe For Diazinon Pesticide Defradation

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ABSTRACT

Use of diazinon pesticide is very wide in the agricultural sector, so it takes efforts to handle waste if the concentration and amount is greater in the environment. This is because diazinon is very dangerous for humans and vertebrates. In this study, photodegradation of diazinon with TiO_2 was synthesized into nano form and doped with Fe so that the energy band gap shifted to the visible region. Fe / TiO_2-nano synthesis product has a band gap energy in the visible region and can actively degrade diazinon 25 ppm of 91% by mass of Fe / TiO_2 nano by 50 mg at pH 7 with a time of 180 minutes.

Keywords: Photocatalyst, photodegradation, diazinon, Fe/TiO_2-nano.

Nanocellulose content as reinforcing agent in composite film and influence on mechanical properties

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ABSTRACT

Nanocellulose from corn cobs has been successfully prepared and used as a reinforcing agent on alginate/nanocellulose composite films. Nanocellulose was prepared by acid hydrolysis. In here, different content of nanocellulose in the composite film was studied to observe the water absorption and mechanical properties. As the results show that increasing the content of nanocellulose in the composite decrease water absorbance. Meanwhile, the tensile test results showed that increasing nanocellulose increased its tensile strength up to nanocellulose content of 5%, increasing nanocellulose content further decreased its tensile strength. The same pattern occurs in the value of Young's modulus where nanocellulose content of 5% has the highest value. While the elongation results showed the highest value at NC content of 4%. Hence nanocellulose in composite films has provided improved mechanical properties of composite films.

Keywords: composite, reinforcing agent, mechanical properties, modulus Young, tensile strength.

Hydrolysis Of White Shrimp Shell (Penaues Vannamei) Protein by Chicken Intestine Enzymes

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ABSTRACT

The shell of white shrimp (Litopenaeus vannamei) contains several valuable organic materials such as chitin, protein, fat, minerals, and some pigments. Chitin is a chemical as a raw material for producing chitosan which is very widely used. Chitin isolation from white shrimp shells is carried out through several stages, namely deproteination, demineralization and depigmentation stages. Shrimp shell deproteination in preparing chitin can be done chemically or enzymatically which is believed to be an environmentally friendly deproteinase process. This article describes the process of deproteinizing white shrimp shells to produce chitin enzymatically using protease enzymes found in chicken intestines. Protein will be hydrolyzed by enzymes from the chicken intestine so that it can be separated from its shell which contains chitin. The effect of incubation time and comparison of the composition of chicken intestines and shrimp shells on the deproteinization process of white shrimp shells has been studied. A mixture of white shrimp skin and chicken intestine with a weight ratio of 1/ 0; 2/ 1; and 1/2 were incubated for 48 hours at pH 1.5. The ability of chicken intestine proteases to hydrolyze white vaname shrimp shell protein was determined by measuring the total nitrogen of shrimp shells during the hydrolysis process. The results showed that the hydrolysis process occurred optimally at the ratio of the mixture of shrimp shells and chicken intestines 1/2 for 48 hours with a total nitrogen content value of 5.27%, equivalent to the nitrogen content in chitin which is widely reported.

Keywords: white shrimp shells, proteases, chicken intestines.

Study of Enzyme Endo-1,4-β-Endoxilanase Kinetics In The Hydrolysis of Xilan Skin Cassava Substrate

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ABSTRACT

Xylan is a polymer with Xylosa monomers. Xylan sources can come from agricultural waste, one of which is cassava skin. Cassava skin contains hemicellulose which has the main component in the form of xylan. Xylan structures vary based on the origin of the xylan source. Endoxilanase enzyme is the enzyme that is most involved in breaking the glycosidic bonds and producing short chain xylooligomers. This enzyme catalyzes the hydrolysis reaction of xylan to xylooligosaccharide. Characteristic parameters of the enzyme are pH, temperature, KM, Vmax, and Kcat. Previous studies reported that endo-β-1,4-D-xylanase enzymes derived from microorganisms in abdominal termites can hydrolyze xylan. The product from hydrolysis Xylan is xylogosaccharide. The purpose of this study was to determine Vmax and KM endo-β-1,4-D-xylanase enzymes on xylan substrates derived from cassava peel at optimum hydrolysis conditions. Materials and Methods: This study uses 2 kinetic parameters, the values of KM and Vmax. The kinetics parameters studied for the xylan substrate were carried out by varying the substrate concentration with the incubation time. The incubation time used to incubate cassava skin xylan substrate from 0 hours to 20 hours with a 4 hour range, while the incubation time used to incubate cassava pulp xylan substrate was 0 hours to 16 hours with a range of 4 hours. Results: The results obtained from this study were in the form of Vmax value of 0.053 mg⁄(ml.hour) and KM obtained from the hydrolysis process between endo-β-1,4-D-xylanase enzyme and xylan substrate from cassava peels of 〖4 , 77 × 10〗 ^ (- 3) mg⁄ml. Vmax and KM values obtained from the hydrolysis process between endo-β-1,4-D-xylanase enzyme and xylan substrate from cassava pulp were 5,82 mg⁄(ml.hour) and 〖4,07x10〗 ^ (- 3) mg⁄ml. Conclusion: The results obtained from the two substrates explain that the endo-β-1,4-D-xylanase enzyme is specific to both substrates but the enzyme with cassava pulp substrate has a shorter time to convert the substrate into a product because of the Vmax value on the pulp substrate cassava is higher than cassava peel substrate.

Nano Materials and Applications: Physics of Thin Films and Applications

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ABSTRACT

In recent years materials for nanotechnology had considerable interest in worldwide researchers due its interesting functional properties and applications in areas of energy, water, health care, and sensors. Research is being carried out worldwide to find alternative novel materials, improved the performance by various materials synthesis processes, surface modification, and fabrication technology. In my talk, I will discuss various studies on thin and bulk metal oxides, nitrides, fluorides and graphene/metal oxide composite electrode materials related to energy storage and conversion and sensors and other applications. Nanomaterials synthesis, characterization techniques, fundamentals, interface studies and applications related to energy storage and converison. Various preparation methods (Molten salt, Graphenothermal/carbothermal, coprecipitation, Hydrothermal, Combustion, Ball -milling, solgel and Nitridation, fluorination), Solid electrolytes sintering techniques by powder metallurgy techniques, and thin films fabrication and surface coating techniques. Prepared materials were characterized by Rietveld refinement X-ray diffraction, Neutron diffraction, Rutherford backscattering spectrometry (RBS), Nuclear reaction (NRA), AES, X-ray absorption/photoelectron spectroscopy (XAS/XPS), SEM, TEM, Raman/IR, density and BET surface area methods. Electrode fabrication and various electroanalytical studies like cyclic voltammetry, galvanostatic cycling, and electrochemical impedance spectroscopy, GITT, PITT techniques for Li,Na,K -ion batteries, and in situ and exsitu studies, reaction mechanisms, and voltage hysteresis and present challenges will be discussed. Finally, i will discuss briefly materials recovery techniques and few other interests related to Supercapacitors, Organic cathodes, Solar cells, metal-air batteries, Electrocatalysis, photocatalysis, health care and Magnetic materials and future directions.

Keywords: Nanomaterials ; Thin films; applications; Synthesis; characterization and applications.

Identification And Modification Of The Catalityc Side Endo-β-1,4-D-Xilanase Origin Of *Bacillus* sp Abdominal Terms In Silico

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ABSTRACT

Endo-β-1,4-D-xylanase (EC.3.2.1.8) is an enzyme that hydrolyzes xylan and produces xylooligosaccharides, xylobiose and xylose. These products are widely applied in food, paper and textile industries. Endo-β-1,4-D-xylanase used in this work is Endo-β-1,4-D-Xilanase from Bacillus Sp Abdominal Termite. This enzyme does not yet have a protein sequence and three-dimensional structure. Therefore this research was conducted in silico with three-dimensional structural obtained using SWISS-MODEL. Identification and modification of catalytic residues were performed with AutodockVina which resulting in the form of free energy and the location/area interaction between substrate and enzyme. Identification of lowest free energy of -8.1 kcal/mol was found where interactions between ligands and enzymes occurred in the amino acids Thr3, Tyr5, Asn20, Tyr69, Pro116. Modification of catalytic site with lowest free energy of -9.2 kcal/mol was obtained when the polar amino acid of the R group N35 (Asparagine) was changed to Aspartic Acid.

Synthesis of Cellulose Acetate from Corn Cobs as Membrane Material with Variations in Amount of Acetic Anhydride

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ABSTRACT

Corn cobs contain 38.8% cellulose which can be used as a source of cellulose from natural ingredients. This study aims to determine the effect of the ratio of cellulose : acetic anhydride on the characteristics of cellulose acetate and to determine the characteristics of the cellulose acetate membrane. The results obtained indicate that the synthesis of cellulose acetate produces types of cellulose diacetate and triacetate. Cellulose acetate that can be used as a membrane material is produced from a ratio of 1:5 with an acetyl content of 43.32% and a degree of substitution of 2.8. The product is soluble in acetone. Synthetic cellulose acetate membranes are more brittle than commercial cellulose acetate membranes. The synthetic cellulose acetate membrane produced a density value of 0.671 g/cm^3 and a swelling degree of 316%. The FTIR test of synthetic cellulose acetate membranes produced the same functional group uptakes as commercial cellulose acetate membranes.

Keywords: Corn cobs, cellulose, cellulose acetate, acetylation, synthetic membrane.

Sequential Injection Analysis (SIA) ForThe Determination of Sulfide Ion Using Visible Spectrophotometric Detection

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ABSTRACT

Measurement of sulfide level as a result of industrial wastewater is imperative for natural aquatic environments. The present study is aimed to develop a sulfide measurement method by sequential injection analysis with visible spectrophotometric detection for sulfide monitoring in tofu liquid wastes. The laboratory-made SI system consists of a syringe pump, 6-port selection valve, visible spectrophotometer detector, and holding coil. This system was controlled by a computer using LabView 8TM application program. The detection was based on the reaction of sulfide with two reagents, N.N dimethyl-1,4-phenylenediammoniumdichloride and $FeCl_3$ in the medium of 1,2 M HCl, forming the dye methylene blue. The absorbance was recorded at 664 nm. Under the optimized condition consist of the order of sample and reagent injection, the stopped-time in holding coil, and the volume of reagents, the analytical curve was constructed for a concentration range between 0.25-2.0 mg/L sulfide. This result in the linear range with a correlation coefficient of 0.996, sensitivity of 0.377 absorbance/ppm, and detection limit of 0.0056 ppm. The proposed method was successfully applied to the determination of sulfide in tofu liquid waste samples with satisfying results.

Keywords: Sequential injection, sulfide ion, Labview, visible spectrophotometer.

Voltammetric Deposition of Cobalt On Carbon Electrode For Phosphate Potentiometric Sensor

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ABSTRACT

The availability of phosphate sensors is very necessary in assessing the quality of agricultural soil. This study was aimed to develop a phosphate potentiometric sensor. Electrodeposition of cobalt (Co) on carbon electrodes was carried out by cyclic and linear sweep voltammetry using electrolyte solutions of $CoCl_2.6H_2O$ and NH_4Cl. Co-C electrodes resulting from electrodeposition were characterized using scanning electron microscopy (SEM), their performance was determined as a potentiometric sensor and the remaining electrodeposition solution was measured using a UV-Vis spectrophotometer. The measurement of the remaining deposition solution showed that the mass of Co deposited on the carbon electrode was 0.0174 gram and 0.0055 gram for the cyclic voltammetry method and the linear sweep voltammetry method, respectively. Co-C electrodes as potentiometric sensors were used to measure standard solutions of 0.01 concentration of phosphate; 0.1; 1; 1; 100 ppm. The performance parameters of the Co-C potentiometric electrode designed by cyclic voltammetry, including correlation coefficient, detection limit, slope, and reproducibility were 0.9931; 2.3 ppm; 25.34; 1.71%. Meanwhile, for the electrodes designed using linear sweep voltammetry, the same performance parameter values were obtained respectively 0.9998; 1.3 ppm; 28.74; 1.463%. The performance of the phosphate sensor designed by linear sweep voltammetry shows better performance than cyclic voltammetry.

Fractionation of Goat Hepatic Uricase Using Ammonium Sulphate with Variations in Concentration and Precipitation Time

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ABSTRACT

Goat liver is a source of uricase that can be used in uricolytic therapy. This study aims to determine the optimum precipitation time of the enzyme activity in fractionation of goat hepatic uricase using ammonium sulphate as precipitation agent. Goat liver is extracted to obtain uricase crude extract. The crude extract obtained was fractionated using ammonium sulphate 0-20% and 20-40% with variations in precipitation time of 12, 16, 20, and 24 hours and the uricase activity was determined using visible spectrophotometer. The optimum precipitation time in ammonium sulphate fractionation process 0-20% and 20-40% was 16 hours with the uricase activity obtained respectively were 0.02014 U / mg and 0.00183 U / mg. The activity obtained showed that the fractionation of goat hepatic uricase was effective when using ammonium sulphate 0-20% with precipitation time of 16 hours.

Keywords: Ammonium sulphate fractionation, enzyme activity, goat liver, uricase, visible spectrophotometer.

Compsite of Zeolite and Arrowroot Starch-G-Poly(Acrylic Acid-Co-Acrilamide) Hydrogel As Matrix of Controlled Release Phosphate Fertilizers

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ABSTRACT

One of the methods to increase agricultural yields is by intensification through fertilization. The most widely used fertilizers as primary nutrient source are chemical fertilizers from simple chemical compounds that are easily and readily soluble in water. The conventional fertilization process is done by spreading fertilizer on the soil, the fertilizer will dissolve in moisture in the soil and can be absorbed by plants. However, from the fertilizer moisture sollubilized in the soil, not all of it can be absorbed readily by plants, so that the dissolved phosphate in the soil that is not absorbed by plants can cause environmental pollution. To overcome this environmental problem, this paper describes the release of phosphate fertilizer to be controlled using a hydrogel composite matrix. The hydrogel composite matrix was synthesized from arrowroot starch-g-poly(acrylic acid-co-acrylamide)/zeolite through a graft polymerization process with the addition of fertilizers at various concentrations. The hydrogel composite showed a shift in the infrared (IR) spectrum which indicated that the acrylic acid and acrylamide monomers had been grafted onto the arrowroot starch chain. Zeolites and fertilizers interact with the hydrogel matrix during polymerization. The water absorption of the hydrogel composite decreased when the zeolite mineral concentration in the composite was increased. The water absorption capacity of the hydrogel composite and and phosphate release were increased in the buffer solution from pH 5 to pH 9. The amount of phosphate released in all buffer solutions increased when the concentration of fertilizer added in the composite matrix was increased.

Keywords: arrowroot starch, composite, phosphate.

Cationic and Anionic Dye Removal Using Modified Silica Gel with Ethanolamine

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ABSTRACT

Different types of dyes (anionic and cationic) in the water effluents cause difficulty in removal. This study aims to find the novel material organo-silica that can remove both cationic (methylene blue) and anionic dye (indigo carmine) in the single systems adsorption. The modified silica gel with ethanolamine (SG-EA) is prepared by wetness impregnation under reflux using H2SO4 as a catalyst. FTIR and surface area analyzer identify the results. The adsorption was evaluated in the aqueous batch system in various pH systems, adsorbate concentration, contact time, and mass of adsorbent. In SG-EA, new peaks representing -NH2 and -CH sp3 functional groups and decreasing the -OH peak of silica gel indicate ethanolamine successfully modified on the silica surface. However, the surface area of SG-EA decreases from 436.675 m2/g to 142.992 m2/g compared to silica gel. The SG-EA adsorption processes achieve the optimum at pH 9 and pH 11 for methylene blue and indigo carmine, respectively. The adsorption capacity for methylene blue and indigo carmine is consecutively 61.350 mg/g and 42.918 mg/g following the Langmuir isotherm adsorption model. The adsorption rates follow pseudo-second-order models which are 1.50 x 10-2 g/mg.min and 7.38 x 10-3 g/mg.min for methylene blue and indigo carmine. Moreover, a small amount of adsorbent (0.75 g) can remove methylene blue and indigo carmine around 99%. The adsorbent SG-EA was a potential adsorbent to remove both cationic and anionic dyes.

Keywords: dye removal, anionic and cationic dyes, adsorption process, modified silica gel, ethanolamine.

Catalytic Hydrogenolysis of Glycerol to 1,3-propanediol Using Mo/SiO_2 and Hydrogen Transfer Reaction

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ABSTRACT

The glycerol conversion using hydrogenolysis reaction find the challenge due to the regioisomer product that is 1,2-PDO and 1,3-PDO. Low-cost catalyst base on Mo/SiO_2 was introduced to substitute noble metal catalyst. The catalyst Mo/SiO_2 was prepared using impregnation method with concentrations of molybdenum 5, 10, 15% and calcination temperature 110, 300, and 500°C. The catalysts were characterized using FTIR, XRD powder, and FTIR-Pyridine. The catalytic testing for hydrogenation reaction was evaluated using molecular hydrogen donor from formic acid. High concentration of molybdenum tends to form aggregated that transformed to crystalline MoO3. The rising crystalline phase in the catalyst influence to present both Brønsted and Lewis acid site. The glycerol conversion showed the constant results around 42.5%. Meanwhile, the selectivity to 1,3-PDO was quite low and dependent on Brønsted acid site.

Keywords: Hydrogenolysis reaction, Glycerol, 1,3-propanediol, Mo/SiO_2.

Synthesis of Silver Nanoparticles Using Kepok Banana Peel Extract (*Musa Paradisiaca Linn*) Modified Chitosan as an Alternative Ingredients of Non-Alcoholic Hand Sanitizer

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ABSTRACT

The emergence of new pathogens, bacteria, and even now the Covid-19 pandemic caused by a virus has posed new challenges to aspects of public health around the world. Currently, the supportive and preventive strategy to overcome this is through hand hygiene, one of which is using a hand sanitizer. Most effective hand sanitizer products are hand sanitizers that contain alcohol. However, the continuous or excessive use of hand sanitizers that contain alcohol poses several challenges and concerns. Therefore, it is necessary to develop non-alcoholic active ingredients as safe antibacterial and antiviral agents. The application of silver (Ag) in the form of nanoparticles is very broad and has been widely studied because it has antibacterial, antifungal and antiviral properties. Thus, the use of silver nanoparticles as an active ingredient for making hand sanitizers is a useful and interesting innovation to develop. The purpose of this study was to determine the effectiveness of a non-alcohol-based hand sanitizer made by formulating silver nanoparticles with chitosan. In this study, silver nanoparticles were synthesized through a biosynthetic technique using kepok banana peel extract as a bio-reductant and capping agent. Hand sanitizer is formulated using chitosan modified silver nanoparticles. The results of the study show that hand sanitizer preparations containing silver nanoparticles have an antibacterial effect that is almost the same as commercial hand sanitizers. Meanwhile, the surface modification was able to increase antibacterial activity which indicated a synergistic effect between the two to overcome pathogenic bacteria. Thus, non-alcohol-based hand sanitizers are effective as antibacterial and antiviral and comply with other standards.

Keywords: Hand-Sanitizer, Non-Alcohol, Silver Nanoparticle.

PARALLEL SESSION SCHEDULE

PARALLEL SESSION SCHEDULE

Parallel Session Day 1, October 12nd 2021 Room 1

Room 1 (Natural Product Chemistry)			
Time	**Author**	**ID Number**	**Title**
12.30 - 13.00	**Invited Speaker Anna Safitri, Ph.D.**	-	Bioprospecting of Anti-diabetic Activity of Root Extracts of Ruellia tuberosa L
13.00 - 13.15	Yuka Fadana, Nur Ikhtiarini, Masruri Masruri and Moh. Farid Rahman	72	Phytochemical screening, LC-MS/MS, and antibacterial evaluation from the extract of Pinus merkusii Jung Et De Vriese
13.15 - 13.30	Iwan Dini, Nunuk H. Soekamto, Firdaus Firdaus, Unang Supratman and Jalifa Latip	75	Bisindole Alkaloid Caulerpin from the Halimeda Cylindracea Decaisne; Biosynthetic Significance and Cytotoxic Activity
13.30 - 13.45	Widia Edy Kuncoro, Masruri Masruri, Nur Ikhtiarini and Siti Mariyah Ulfa	76	Oxidation-hydroxylation of Pine Rosin Acid
13.45 - 14.00	Dodi Iskandar, Widodo Widodo, Warsito Warsito and Masruri Masruri	77	Review of reports on traditional medicinal plants in West Kalimantan in the last 10 years
14.00 - 14.15	Moh Farid Rahman, Siti Mariyah Ulfa, Faizal Muhammad Zubair and Masruri Masruri	81	Metabolomic Profiling of Ethyl Acetate Extracts of Sponges Halichondriidae sp from Kangean Islands and Their In-silico Activity as Coronavirus Drugs
14.15 - 14.30	Anak Agung Istri Ratnadewi, Yeni Kartikasari, Ari Satia Nugraha and Tri Agus Siswoyo	86	Antidiabetic and Antioxidant Activity of Jambon [Syzygium microcymum (Koord. & Valeton) Amshoff] Leaves
14.30 - 14.45	Anna Roosdiana, Anna Safitri, Dyah Ayu Oktavianie A.P and Intan Kirana	98	Effect of ethanolic root extract of Ruellia tuberosa L on diabetic rat type I based on serum glutamic pyruvic transminase (SGPT) activity and liver hispathology
14.45 - 15.00	Fitri Gustika Nurchanifah, Dyah Utami Cahyaning Rahayu, Dita Arifa Nurani, Yuni K Krisnandi, Iman Abdullah, Bambang Heru Susanto and	30	The Effect of Various Stirring Speed in the Synthesis of Oleic Imidazoline as an Introduction to Pre-Scale Up Synthesis

	Agnesya Putri Gustianthyfarid		
15.00 - 15.30	**Break**		
15.30 - 15.45	Regina Ainunnisa Hakim, Dyah Utami Cahyaning Rahayu and Andhina Rizkya Satriani	31	Flavonoid Content Screening and Antioxidant Activity of Indonesian Cinnamon Extract (Cinnamomum burmannii)
15.45 - 16.00	Rini Retnosari, Nadia Erlina Mayangsari, Siti Marfu'Ah, Sutrisno Sutrisno and Ihsan Budi Rachman	38	A Green Synthesis of 9-(4-Bromophenyl)-3,4,5,6,7,9-Hexahydro-1H-Xanthene-1,8(2H)-Dione Using Lemon Juice Catalyst Assisted by Ultrasound and Its Antibacterial Activity
16.00 - 16.15	Zubaidah Ningsih and Lestari Maria	40	Comparison of Effectiveness and Efficiency of Fabrication Techniques and Carrier Oil in Curcumin Nanoemulsion Making Process
16.15 - 16.30	Sutrisno Sutrisno, Daratu Eviana Kusuma Putri, Eli Hendrik Sanjaya and Husni Wahyu Wijaya	42	Individual Curcuminoids: Antioxidant activities and Its Separation from Yellow Turmeric (Curcuma longa Linn)
16.30 - 16.45	Astri Anjani, Dyah Utami Cahyaning Rahayu and Endang Saepudin	105	Microwave-assisted Synthesis and Antibacterial Bioactivity of 4-Methyl-2-Quinolone Derivatives
16.45 - 17.00	Alfa Wezy Anugrah Purba, Dyah Utami Cahyaning Rahayu and Sri Handayani	107	Microwave-assisted Synthesis of 4-Methyl Coumarins via Knoevenagel Condensation and Its Antibacterial Activities

Day 1, October 12nd 2021 Room 2

Room 2 (Chemical Instrumentation & Sensor)			
Time	**Author**	**ID Number**	**Title**
12.30 - 13.00	**Invited Speaker Zulfikar, Ph.D.**	-	**Development Array Sensor for Detecting Robusta Coffee Aroma**
13.00 - 13.15	Akhmad Sabarudin, Aulia Ayuning Tyas, Bagas Dwi Pamungkas, I Gede Bhaskara Adi Pratama, Ulfa Andayani and Setyawan Purnomo Sakti	8	Determination of Cystatin C Using Paper-based Analytical Devices for Early Detection of Renal Failure
13.15 - 13.30	Kikie Trivia Amalia, Nurrahmah Nurrahmah, Ulfa Andayani, Setyawan Purnomo Sakti and Akhmad Sabarudin	9	Colorimetric Determination of Albumin to Creatinine Ratio Using Paper-based Analytical Devices for Rapid Detection of Kidney Disfunction
13.30 - 13.45	Sintia Puji Astutik, Rurini Retnowati, Hermin Sulistyarti, Suratmo, Vina Khurnia Wati and Nikmatus Zahro Wahidah	26	The Potency of Natural Dyes from Kesumba Seeds Extract (Bixa orellana L.) for Identification of Animal Fats by UV-vis Spectrophotometry
13.45 - 14.00	Lani Artana Putri, Puspita Mufidah Sari, Hermin Sulistyarti, Akhmad Sabarudin and Erwin Sulistyo	28	Determination of Ammonia in Pond Water by Gas-Diffusion Flow Injection Analysis (GD-FIA)-Spectrophotometry using Minnieroot Flower (Ruellia tuberosa) as Natural Reagent
14.00 - 14.15	Hermin Sulistyarti, Dwi Yulianti Ariska, Rurini Retnowati, Akhmad Sabarudin, Puspita Mufidah Sari and Muhammad Deni Anugerah	29	Biosynthesis Silver Nanoparticle Using Extract of Tomato (Solanum lycopersicum) for The Development of Spectrophotometric Mercury Detection
14.15 - 14.30	Boyfannie Ivan Putra, Muhammad Nurul Masyhudi, Hermin Sulistyarti, Akhmad Sabarudin and Puspita Mufidah Sari	36	Development of the GD-μPAD (Gas Diffusion Microfluidic Paper-Based Analytical Device) To Measure Total Ammonia in Saliva Using Secang Wood Extract (Caesalpinia Sappan L.)
14.30 - 14.45	Ani Mulyasuryani, Rachmat Triandi, and Zainul Abidin	45	Mini Electrode Based on Chitosan-Activated Carbon Membrane for Detection Paracetamol in Herbal Medicine

14.45 - 15.00	Maulida Fajriyah, Yeni Wahyuni Hartati, Shabarni Gaffar, Anni Anggraeni and Yusuf Rohmatulloh	48	Modification of a Screen-Printed Carbon Electrode with Cerium and Optimization of Electrochemical Biosensor Experimental Conditions for Mitochondrial DNA Detection Sus scrofa
15.00 - 15.30	**Break**		
15.30 - 15.45	Gabriel D. Devian, Yatim L. Ni'Mah and Suprapto Suprapto	47	Identification of Ammonia as A Biomarker of Chronic Kidney Disease by Gas Sensor Array
15.45 - 16.00	Suharti Suharti, Soenar Soekopitojo, Surjani Wonorahardjo and Rahmi Masita	55	A Mini-Review on PCR Application for Microbial Impurities in Toyyiban Verification
16.00 - 16.15	Suharti Suharti, Soenar Soekopitojo, Surjani Wonorahardjo and Rahmi Masita	56	A Mini-Review on PCR Inhibition in Halal Verification
16.15 - 16.30	A. Ghanaim Fasya, Dewi Sinta Megawati, Vivi Septya Wati, Vinna Siti Hardianti Fauzi and Hasan Ali Mahbubi	57	Antioxidant Activity and Toxicity Test of Column Chromatography Steroids Isolates from Chloroform Fraction of Hydrilla verticillata
16.30 - 16.45	Muhammad Arief Nuryadin, Barlah Rumhayati and Adam Wiryawan	59	PIM Preparation and Characterization with DBP Plasticizer as Passive Sampler for Phosphate Measurement
16.45 - 17.00	Akhmad Sabarudin and Ayu Rahayu Anggraeni	84	Van Deemter Equation Versus Separation Impedance for Chromatographic Efficiency Evaluation of Poly-(Lauryl Methacrylate-co-Ethylene Dimethacrylate) Monolithic Column through Separation of Alkylbenzenes

Day 1, October 12nd 2021 Room 3

Room 3 (Environmental & Material Chemistry)			
Time	**Author**	**ID Number**	**Title**
12.30 - 13.00	**Invited Speaker Dr. Irma Puspita Kusumaningrum**	-	**Development of Cross-Linked Carboxymethyl Kappa Carrageenan Coated Nanomagnetite as Copper Ion(II) Adsorbent**
13.00 - 13.15	Lilik Zulaihah, Mohammad Rachman Waluyo and Alina Cynthia Dewi	4	Experimental Study of Polyurethane Foam Absorption of Transportation Exhaust Gas Pollutants in Pondok Labu City South Jakarta
13.15 - 13.30	Soerjani Widyastuti, Nur Yusrina, Mohammad Misbah Khunur and Yuniar Ponco Prananto	16	Preliminary Study of On-site Aqueous Chemical Laboratory Waste Treatment Based on Lean Manufacturing Concept
13.30 - 13.45	Layta Dinira	23	Extraction Efficiency of Recent Macrocyclic Ligand for the Separation of Heavy Metal Ions by Liquid-Liquid Extraction: A Review
13.45 - 14.00	Chairul Irawan, Abubakar Tuhuloula, Iryanti Fatyasari Nata, Dini Aprilla and Indah Purnamasari	27	Synthesis of The Modified Surface Functional Group of Activated Carbon from The Coffee Ground and Its Application for Removal of Nitrate from The Tofu Industry Processing Wastewater
14.00 - 14.15	Roza Ruspita and Atika Aulia	41	Analysis of Water Quality at Karangantu Fishing Port Area Based on Pollution Index Method
14.15 - 14.30	Angela Novelia, Anisun Zakiyah and Yuly Kusumawati	46	The Removal of Methylene Blue Solutions Using Zinc Oxide Nanoparticles Prepared by Polyol Method
14.30 - 14.45	Yusron Maulana and Yudhi Utomo	58	Use of Humic Acid to Reduce Chromium(VI) Contaminants in Industrial Waste
14.45 - 15.00	Abdillah Al Farraby and Yudhi Utomo	62	Citrate Modified Sugarcane Bagasse Adsorption Capacity on Heavy Metal Cadmium
15.00 - 15.30	**Break**		
15.30 - 15.45	Muhammad Lathif Al-Abror, Erna Hastuti and Anton Prasetyo	66	Molten Salt Synthesis of SrBi4Ti4O15 for Methylene Blue Degradation

15.45 - 16.00	Intan Permatasari Abriyanto, Raga Bimantoro, Sari Yuliani, Silvia Ariyani M., Vania Archardiva Kusuma and Tutuk Djoko Kusworo	89	Performance Evaluation of PET/CA/SiO2 (Scaling Waste from Geothermal) Nanofiltration Membrane for Batik Industry Wastewater Treatment
16.00 - 16.15	Kun Budiasih, Eli Rohaeti and Tony Wijaya	90	Application of Caesalpinnia sappan L, Cudrania javanensis and Indigofera tinctoria natural dyes on Lurik woven product
16.15 - 16.30	Siti Siregar, Peggy Clarita, Yuliana Yuliana, Putri Ayudianingsih, Nurhayati Nurhayati and Amir Awaluddin	104	Different Approach of Preparation Ag-modified Cryptomelane type-Manganese Oxide by Sol-gel Method for Methylene Blue Dye Removal
16.30 - 16.45	Ika Meicahayanti, Ratu Fortuna Prameswari Tantowi Putri and Dwi Ermawati Rahayu	109	Indentification of Microplastic in The Intake Area of Teluk Lerong Water Treatment Plant Samarinda
16.45 - 17.00	Ulfa Andayani	110	Biosorption of Co(II) and Ni(II) by Trichoderma viride Immobilized in Ca-Alginate

Day 1, October 12nd 2021 Room 4

Room 4 (Polymer Chemistry & Chemical Process)			
Time	**Author**	**ID Number**	**Title**
12.30 - 13.00	**Invited Speaker Nanang Masruchin, Ph.D.**	-	**Nanocellulose Production with Eco-Technology Concept and Its Applications**
13.00 - 13.15	Noverra Mardhatillah Nizardo and Dzul Fadli Alimin	35	Synthesis and Characterization of pH and Thermoserponsive Nanogels of Poly(N-vinylcaprolactam-co-N-methylolacrylamide) Using Emulsion Polymerization
13.15 - 13.30	Gading Bagus Mahardika, Ranandhiya Salsabila, Firman Kurniawansyah, Hikmatun Ni'Mah, Tantular Nurtono and Mahfud Mahfud	43	Synthesis of Alternative Hard Capsule from Carrageenan and Starch using Glycerol as Plasticizer
13.30 - 13.45	Barlah Rumhayati, Hanifah Nur Aini and Ani Mulyasuryani	51	Development of Phosphate Measurement Method with Passive Sampling Technique Using Polymeric Inclusion Membrane (PIM) Aliquat 336 Chloride/1-Dekanol as Passive Sampler
13.45 - 14.00	Fathia Rahmatul Aziah, Nur Ikhtiarini, Masruri Masruri, Arie Srihardyastutie and Moh Farid Rahman	63	Characterization of Microcrystalline Cellulose Derived from Pinewood Waste (Pinus merkusii) Hydrolyzed with Hydrochloric Acid
14.00 - 14.15	Abdul Halim, Lusi Ernawati, Maya Ismayati, Fahimah Martak, Toshiharu Enomae, Ibrahim Nata Imani and Brigita Cahya Wulandari	64	Cellulose Hydrogel Coated Fabric as Superoleophobic Membrane for Oily Wastewater Treatment
14.15 - 14.30	Moh Rifqi Nawafi, Masruroh and Dionysius J.D.H. Santjojo	96	Morphological and Mechanical Study of Gelatin/Hydroxyapatite Composite based Scaffolds for Bone Tissue Regeneration
14.30 - 14.45	Eli Rohaeti, Amalia S N Annisa, Isti Yunita and Suwardi Suwardi	101	Biodegradability of Cellulose Composites Deposited by Nanoparticle
14.45 - 15.00	Sri Fahmiati, Yenny Meliana and Ridha Marta Putri	102	Characterization of Styrene and Methyl Methacrylate Copolymer/Cu2O Synthesized by Nanoemulsion Polymerization.
15.00 - 15.30	**Break**		

15.30 - 15.45	Qolby Sabrina, Hilwa Kamilah, Christin Rina Ratri, Sitti Ahmiatri Saptari and Titik Lestariningsih	103	Properties of Bacterial Cellulose/Polyvinyl Composite Membrane for Polymer Electrolyte
15.45 - 16.00	Ika Oktavianawati, Mya Ulfa and Wuryanti Handayani	13	The Effect of Column Length and Duration of Water Distillation on The Profile of Essential Oil from Java Citronella (Cymbopogon winterianus) Leaves
16.00 - 16.15	Istiqomah Rahmawati, Boy Arief Fachri, Shima Nuril Pradipta, Nurtsulutsiyah, Nadhilah Shabrina, Diza Raudhatul Afwal and Muhammad Reza	14	Application of Response Surface Methodology in Optimizing Condition of Phenolic Compounds Extraction from Cocoa Pod Husk Waste (Theobroma cacao L.) using Ultrasonic Assisted Extraction (UAE) Method
16.15 - 16.30	Aulia Qisti, Daffa Rizal Dzulfaqaar Alauddin, Eka Nurkhayati, Tiara Novia Sanggraini, Thoriq Aziz and Daratu Eviana Kusuma Putri	71	Hand Sanitizer Production Using Bioethanol from Sugarcane Bagasse Fermentation Through Thermal Hydrolysis Process
16.30 - 16.45	Yayang Setyawan, Lukman Hakim and Zubaidah Ningsih A.S.	97	Curcumin Nanoemulsion Formulation with Phase Inversion Temperature (PIT) Method
16.45 - 17.00	Anak Agung Istri Ratnadewi, Indras Dwi Anggita, Rosa Safitri, Firda Marta Safitri and Boy Arief Fachri	106	Cellulose Hydrolysis Process of Red Dragon Fruit Pell (Hylocereus Costaricensis) as Candidate for Bioethanol Production

Day 2, October 13rd 2021 Room 1

Room 1 (Material Chemistry)			
Time	**Author**	**ID Number**	**Title**
08.15 - 08.30	Rizki Marcony Surya, Yoki Yulizar, Antonius Herry Cahyana and Dewangga Oky Bagus Apriandanu	3	The Leaves Extract Utilisation for Hematite Nanoparticles Fabrication
08.30 - 08.45	Sri Wardhani, Marda Ahsany, Rachmat Triandi Tjahjanto and Danar Purwonugroho	10	Effect of Sodium Tripolyphosphate Concentration on Precipitated Calcium Carbonate (PCC) Particle Size
08.45 - 09.00	Iryanti Fatyasari Nata, Doni Wicakso, Agus Mirwan, Chairul Irawan, Niken Astuti and Rizka An-Nisa	19	Synthesis of rice husk magnetic nanoparticle biocomposites: Evaluation on rice husk fiber concentration and Characterization
09.00 - 09.15	Fauziatul Fajaroh, Firdaus Assidiqi, Olvi Dyah Fernanda, Muhammad Rafli and Siti Marfu'Ah	49	Synthesis of ZnO NPs with Green Chemistry Principles Using Mangosteen Peels Extract (Gracinia mangostana l.) as Capping Agent and Its Characterization as Antibacterial
09.15 - 09.30	Alfitrah Bachtiar, Husni Wahyu Wijaya, I Wayan Dasna and Nani Farida	50	Analysis of the ABW-Structured Li-ZnPO4 Crystal Growth with X-Ray Diffraction and CrystalGrower Simulation
09.30 - 09.45	Ervin Cahyaningtiyas, Puspitasari, Utiya Hikmah, Erna Hastuti, Nur Aini and Anton Prasetyo	65	Crystal Structure Parameters Analysis of rGO-TiO2 Composite Using Debye-Scherrer and Rietveld Method
09.45 - 10.00	Novia Alfiyansyah Putri, Anton Prasetyo and Utiya Hikmah	67	Synthesis and Characterization of Reduced Graphene Oxide (rGO) Using Chemical Exfoliation Method Assisted by Microwave Radiation
10.00 - 10.30	**Break**		
10.30 - 10.45	Tyas Nurul Zafirah, Masruroh, Istiroyah, Adin Okta Triqadafi and Setyawan P. Sakti	83	Frequency Response of Polystyrene Films coated on Quartz Crystal Microbalance to chloroform vapors
10.45 - 11.00	Lukman Hakim, Siti Mariyah Ulfa and Hideki Tanaka	87	On the Occupancy of Hydrophobic Guest Molecules inside EDI Zeolitic Ice
11.00 - 11.15	Eli Rohaeti, Destyana S Elmina, Amalia S N Annisa, Kun S Budiasih and Nur Aeni Ariyanti	92	Mechanical Properties and Biodegradability of Modified Skin with Nanoparticle Prepared by Peperomia pellucida

11.15 - 11.30	Fahmi Al Aziz, Ananda Ilham M Fauzy, Setyawan P Sakti, Dionysius J. D. H Santjojo and Masruroh	94	Effect of Rotational Speed in Planetary Ball Milling on the Particle Size and Crystal Structure of CaMnO3 as a Thermoelectric Material
11.30 - 11.45	Widiya Nur Safitri, Maria Ulfa, Didik Prasetyoko and Wega Trisunaryanti	118	Variation of Surfactant Concentration P123:Gelatin on the Synthesis and Characterization of Mesoporous Nanosilica
11.45 - 12.00	Holilah Holilah, Didik Prasetyoko and Ratna Ediati	116	Hydrolysis of industrial pepper waste (Piper nigrum L.) using inorganic and organic acids for formation of rod and sphere nanocrystalline cellulose
12.00 - 12.15	Fauziatul Fajaroh, Firdaus Assidiqi, Siti Marfu'Ah, Adilah Aliyatulmuna and Muhammad Rafli	121	Synthesis of ZnO NPs with Green Chemistry Principles Using Mangosteen Pericarps Extract (Garcinia mangostana l.) As Capping Agent and Its Characterization as Antibacterial

Day 2, October 13rd 2021 Room 2

Room 2 (Catalys & Catalysis)			
Time	**Author**	**ID Number**	**Title**
08.15 - 08.30	Nihayatur Rohmah and Irmina Murwani	2	Catalyst Selectivity of Mg1-xFexF2 In The Reaction Synthesis of Vitamin E
08.30 - 08.45	Muhammad Roy Asrori, Aman Santoso, Sumari Sumari and Yana Fajar Prakasa	20	A review: Synthesis of Amphiphilic Material and Its Potential in Catalysis System of Biodiesel Synthesis
08.45 - 09.00	Damiana Nofita Birhi, Adzkia Qisthi Ismail, Elvina Dhiaul Iftitah and Warsito	21	One-Pot Catalytic Oxidation for Transforming Eugenol to Vanillin Using ZnAl2O4 Catalyst
09.00 - 09.15	Yana Fajar Prakasa, Sumari Sumari, Aman Santoso and Muhammad Roy Asrori	22	ZSM-5-Based Catalyst: A Valuable Approach toward Biodiesel Production. A Review
09.15 - 09.30	Siti Nurul Afifah, Masruri Masruri, Arie Srihardyastutie and Moh. Farid Rahman	33	Directed study of pine's rosin reaction under non-precious metal catalyst
09.30 - 09.45	Sumari Sumari, Dwiky El Fizar Kustanto, Aman Santoso and Fauziatul Fajaroh	34	Catalyst of Ag-Zn/ZSM-5 for the Conversion of Glycerol to Ethanol
09.45 - 10.00	Aman Santoso, Sumari Sumari and Muhammad Roy Asrori	44	Effect of Activated Zeolite on Oil Yield in Double Scale Pyrolysis with Various Types of Plastic Waste
10.00 - 10.30	**Break**		
10.30 - 10.45	Daratu Eviana Kusuma Putri	52	Hydroxyapatite: A review of synthesis, structure, and application as heterogeneous catalyst in chalcones derivatives synthesis
10.45 - 11.00	Mazizah Ridha Adianti Helmi, Yuni K. Krisnandi and Dyah Utami Cahyaning Rahayu	78	Microwave-Assisted Catalytic Conversion of Biomass into 5-Hydroxymethylfurfural (5-HMF) and Levulinic Acid using Hierarchical Mn3O4/ZSM-5 Catalyst
11.00 - 11.15	Rinny Jelita, Meilana Dharma Putra, Iryanti Fatyasari Nata, Chairul Irawan and Jefriadi	91	A Quality Improvement of Low Rank Coal and Biomass by Pyrolysis
11.15 - 11.30	Nurul Fikriazizah and Antonius Herry Cahyana	93	Study of the Application of Ionic Liquid Catalyst for Aldazine Synthesis
11.30 - 11.45	Yorinda Buyang, Didik Prasetyoko and Suprapto Suprapto	115	Biofuel Production From Reutealis Trisperma oil pyrolysis with dolomit catalyst as a renewable energy sources

11.45 - 12.00	Reva Edra Nugraha, Hari Purnomo, Didik Prasetyoko and Suprapto Suprapto	117	The Role of Micro and Mesoporosity of Aluminosilicate Catalyst for Solvent-Free Deoxygenation of Oleic Acid
12.00 - 12.15	Amman Santoso, Sumari, Muhammad Roy Asrori, Anugrah Ricky Wijaya, Rini Retnosari, Ihsan Budi Rachman, Amirotus Sholikhah	120	Effect of Active Zeolite in the Pyrolysis of PP and LPDE Types of Plastic Waste

Day 2, October 13rd 2021 Room 3

Room 3 (Inorganic and Material Chemistry)			
Time	**Author**	**ID Number**	**Title**
08.15 - 08.30	Putri Nuzilla Shafira, Anna Safitri and Yuniar Ponco Prananto	17	Synthesis of Anion-dependent Zinc(II)-Niacinamide Complexes by Layered Solution Method
08.30 - 08.45	Nadia Cikita Handayani, Anna Safitri and Yuniar Ponco Prananto	18	Synthesis of Anion-dependent Copper(II)-Niacinamide Complexes by Layered Solution Method
08.45 - 09.00	Reza Mega Wahyuni, Husni Wahyu Wijaya, Meyga Evi Ferama, I Wayan Dasna and Nani Farida	39	Synthesis and Characterization of Ionic Complex Compounds from Cadmium(II) Chloride with N,N'-Diethylthiourea
09.00 - 09.15	Maisulah Maisulah, Husni Wahyu Wijaya, Nani Farida and I Wayan Dasna	54	Synthesis and Characterization of ZnxMn2-XO4 (x = 0.05; 0.10; 0.15 and 0.25)Synthesis and Characterization of ZnxMn2-XO4 (x = 0.05; 0.10; 0.15 and 0.25)
09.15 - 09.30	Ahmadiansyah, Diah Mardiana and Akhmad Sabarudin	95	Synthesis of MnO2/Biochar Nanocomposite Using Sonochemical Method for Adsorption of Pb(II)
09.30 - 09.45	Lulu Aulia, Munawar Khalil and Ivandini Tribidasari Anggrainingrum	80	Fabrication of NiO Nanoporous as Electrocatalyst Hydrogen Gas Evolution Reaction
09.45 - 10.00	Mohammad Wijaya, Muhammad Wiharto, and Army Auliah	111	Separation Compound Chemical from Cacao Vinegar In Different Temperature Based Eco Friendly
10.00 - 10.30	Break		
10.30 - 10.45	Abdul Basyir	113	Thermal Phenomenon and Emission Spectrum Study of Pyrotechnic Based on Aluminum-Charcoal Fuel and Arabic Gum
10.45 - 11.00	Novita Andarini, Mohammad Qosim and Tanti Haryati	123	Synthesis of TiO_2 Nano with Hydrotermal Method Dooped Fe for Diazinon Pesticide Degradation
11.00 - 11.15	Busroni Busroni, Jumina, Sri Juari S., Dwi Siswanta, Chairil Anwar	5	One Step Synthetic Method Material of p-Tert.Butylcalix[4]arene Derivative via Direct Benzoylation: Mechanism Models
11.15 - 11.30	Busroni Busroni, Dwi Siswanta, Jumina, Sri Juari Santosa, Chairil Anwar	7	Preparation and Application of Calixarene Derivatives Bearing Benzoyl Groups For Removal Fe(III) Cations

11.30 - 11.45	Nuni Widiarti, Didik Prasetyoko and Yatim Lailun Ni'Mah	122	Synthesis of CaO from dolomit Madura using rara saponin as a base catalyst for transesterification reaction of Waste Coocing Oil (WCO)
11.45 - 12.00	Yudi Aris Sulistiyo, Landep Ayuningtias, Siti Aisah, Nur Abqoriah, Tanti Haryati, Novita Andarini, Suwardiyanto	128	Catalytic hydrogenolysis of glycerol to 1,3-propanediol using Mo/SiO2 and hydrogen transfer reaction
12.00 - 12.15	Yudi Aris Sulistiyo, Mutiara Alfiah, Amanda Dwi Widyatmiko Vahyani, Tanti Haryati, Suwardiyanto, I Nyoman Adi Winata, Novita Andarini	127	Cationic and Anionic Dye Removal Using Modified Silica Gel with Ethanolamine

Day 2, October 13rd 2021 Room 4

Room 4 (Biochemistry)			
Time	**Author**	**ID Number**	**Title**
08.15 - 08.30	Mega Nuraini, Subandi, Muntholib, Suharti and Eli Hendrik Sanjaya	15	Double Potential Powder Sugar Apple (Annona squamosa) and Watermelon Mesocarp (Citrullus lanatus) as inhibitory Lipase Pancreatic and Xanthine Oxidase
08.30 - 08.45	Evi Susanti, Dian Putri Novitasari and Suharti Suharti	25	Characterization of Crude Extract of Protease from Bacillus megaterium TR-10 as Efforts to Support Halal Collagen Production Process
08.45 - 09.00	Evi Susanti, Tri Ardyati, Suharjono Suharjono and Aulani'am Aulani'am	32	Characterization of Lignin Peroxidase from Phanerochaete chrysosphorium ITB isolate
09.00 - 09.15	Indah Permatasari, Nur Faridah and Suharti Suharti	60	Keratinase Characterization of Protease Producing Halophilic Bacteria using BK-1H Isolate from Bledug Kuwu Mud Crater, Central Java
09.15 - 09.30	Lina Maziyyatus Salamah, Nur Faridah, Andriyani Andriyani and Suharti Suharti	61	Consortium of Salinivibrio proteolyticus and Bacillus sp. MD24 in Keratinase Fermentation
09.30 - 09.45	Muhammad Izzan Ahsan Sitepu, Munawar Khalil and Andriansjah	79	Detection of Tuberculosis using Gold Nanoparticles modified by ssDNA IS6110
09.45 - 10.00	Muhammad Mahdum Rosyid, Subandi Subandi, Evi Susanti, Sumari Sumari and Muntholib Muntholib	82	THE INHIBITION POWER OF THE WATERMELON MESOCARP-ENDOCARP MIXTURE TO THE PANCREATIC LIPASE AND ITS ORGANOLEPTIC PROPERTIES
10.00 - 10.30	Break		
10.30 - 10.45	Padil Padil, Meilana Dharma Putra, Iryanti Fatyasari Nata, Doni Rahmat Wicakso, Zulfarina Zulfarina, Chairul Irawan and Sunarno Sunarno	99	Microalgae Growth Kinetic Study with Logistic and Monod Models
10.45 - 11.00	Achmad Sjaifullah, I Nyoman Adi Winata, Cici Desi Septiana	125	Hydrolysis of White Shrimp Shell (Penaues Vannamei) Protein by Chicken Intestine Enzymes
11.00 - 11.15	Wuryanti Handayani, Anak Agung Istri Ratnadewi, Agung Budi Santoso, Dewanti Oktaviana K		Study of Enzyme Endo-1,4-β-Endoxilanase Kinetics in the Hydrolysis of Xilan Skin Cassava Substrate

11.15 - 11.30	Wuryanti Handayani, Esti Utarti, Muhamad Kiki Afindia Joenata, Anak Agung Istri Ratnadewi		Fractionation of Goat Hepatic Uricase Using Ammonium Sulphate with Variations in Concentration and Precipitation Time
11.30 - 11.45	Dwi Indarti, Bambang Piluharto, Anyberta Dwi Listyanti		Synthesis of Cellulose Acetate from Corn Cobs as Membrane Material with Variations in Amount of Acetic Anhydride
11.45 - 12.00	Bambang Piluharto, Rina Silviah, Dwi Indarti, Busroni	124	Nanocellulose Content as Reinforcing Agent in Composite Film and Influence on Mechanical Properties
12.00 - 12.15	I Nyoman Adi Winata, Achmad Sjaifullah, Zulfa ilmi	126	Composite of Zeolite and Arrowroot Starch-G-Poly(Acrylic Acid-Co-Acrilamide) Hydrogel as Matrix of Controlled Release Phosphate Fertilizers

Day 2, October 13rd 2021 Room 5

Room 5 (Computational Chemistry & Miscellaneous)			
Time	**Author**	**ID Number**	**Title**
08.15 - 08.30	M.V. Reddy		Nano Materials and applications: Physics of Thin films & applications
08.30 - 08.45	Yanuar Setiadi, Muhamad Basit Febrian and Badra Sanditya Rattyananda	24	Computational Analysis on The Development of New Technetium-99m-labeled Pentapeptide for Cancer Molecular Imaging Targeting Integrin α5β1
08.45 - 09.00	Siti Mariyah Ulfa, Andrian Sucahyo and Nishizawa Mikio	37	Molecular Docking Analysis of the Constituent in the Fruits of Morinda citrifolia using PI3K/mTOR Receptor of Liver Cancer
09.00 - 09.15	Swarup Ghosh and Joydeep Chowdhury	85	Pressure Induced Structural Phase Transitions and Electronic Properties of Wide Band Gap Charge Transfer Insulator Mercurous Chloride: A First-Principle DFT Study
09.15 - 09.30	Nuril Fadila, Artoto Arkundato, Ratna Dewi Syarifah, Mohammad Ali Shafii and Lutfi Rohman	100	Effect of Chromium Addition for Stabilizing the Crystal Structure of Iron in Liquid Bismuth
09.30 - 09.45	Anak Agung Istri Ratnadewi, Safitri Eka and Laily Nafis	108	Molecular Docking and Site-Directed Mutagenesis of Endo-β-1,4-D-Xilanase of Bacillus sp. From Soil Termite Abdomen to Improve Enzyme Effectiveness
09.45 - 10.00	Metika Mega Agata, Selvi Amelia Virda, Aria Darmawan, Hikmatun Ni'mah, Achmad Roesyadi, and Firman Kurniawansyah	112	Kappa Number and Viscosity in Oxygen Delignification of Kraft-Pulp Eucalyptus Pellita in Comparison with Prediction Data
10.00 - 10.30	Break		
10.30 - 10.45	Sudarko, Laili Nafis, Anak Agung Istri Ratnadewi		Identification and Modification of The Catalytic Side Endo-β-1,4-D-Xilanase Origin of Bacillus sp Abdominal Terms In-Silico
10.45 - 11.00	Tri Mulyono, Asnawati, Ainul Avida		Sequential Injection Analysis (SIA) for the Determination of Sulfide Ion Using Visible Spectrophotometric Detection
11.00 - 11.15	Umi Sahrun Ni'mah, Siswoyo, dan Yudi Aris Sulistiyo		Voltammetric deposition of cobalt on carbon electrode for phosphate potentiometric sensor
11.15 - 11.30	Baiq Emalia Pebriatin, Vita Valiana, Siti Sainidah, Ika Oktavia Wulandari, Akhmad Sabarudin, Dewi Ratih Tirto Sari		Synthesis of Silver Nanoparticles Using Kepok Banana Peel Extract (Musa Paradisiaca Linn) Modified Chitosan as an Alternative Ingredients of Non-Alcoholic Hand Sanitizer

11.30 - 11.45			