ABSTRACT BOOK
The 2nd International Conference on Chemistry and Material Science
On behalf of the International Conference on Chemistry and Material Science (IC2MS) 2019 committee, I welcome all of the participants in Malang.

Chemistry is the fundamental of all aspects in this universe. Development in this field has offered various range of technology which is proven to be crucial in our life. Similarly, material science, as one of the extended development of chemistry, has played a major role in life. Innovation, improvement and integration of these fields continues providing contribution to human race in form of knowledge and technology.

IC2MS is a biannual scientific conference that provides a unique platform for scientists, researchers, and professionals across multiple disciplines to share their research advancements and critical ideas to address the development in chemistry and material sciences. By communicating the advancement of knowledge and technology in these fields, new innovation and improvement of the existing technology are facilitated. Furthermore, the expansion of theoretical chemistry will also possible as the result of brainstorming among the participants. By promoting collaboration across disciplines, we will further extend the opportunity to discover an innovation, gain better understanding and enhance the advancement of science body.

I would like to express my gratitude to everyone who have supported this conference. I hope that the conference will facilitate a fruitful discussion, connect participants and further facilitate collaboration and integration.

With best regards,

Yuniar Ponco Prananto, PhD
Conference Chairperson
Brawijaya University
## GENERAL SCHEDULE FOR IC2MS 2019

### DAY 1 – 2 NOVEMBER 2019

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ABSTRACTS

KEYNOTE AND INVITED SPEAKERS
Synthesis and evaluation of curcumin analogs as antioxidant, anti-inflammatory and immunosuppressive agents

Ibrahim Jantan

School of Pharmacy, Faculty of Health and Medical Sciences, Taylor’s University, Lakeside campus, 47500 Subang Jaya, Selangor, Malaysia profih@gmail.com

ABSTRACT

Curcumin, a hydrophobic polyphenol mainly isolated from the rhizomes of Curcuma longa, is a multi-targeting agent exhibiting broad spectrum of activities including anti-oxidant, anti-inflammatory and immunosuppressive activities. Curcumin has been reported to be involved in the treatment of various chronic inflammatory diseases through the inhibition of important enzymes involved in arachidonic acid metabolism pathway along with the inducible nitric oxide synthase (iNOS) and pro inflammatory cytokines, regulating the process of inflammation. Owing to its anti-inflammatory activity curcumin has been shown to be efficacious against numerous inflammatory diseases, including pancreatitis, arthritis, inflammatory bowel disease, colitis, gastritis, allergy, autoimmune diseases and cardiovascular problems. Although safe at higher doses, curcumin still has the problem of poor bioavailability and solubility. Poor absorption, over active metabolism and rapid excretion from the body are among the major reasons limiting the therapeutic use of curcumin. A number of strategies including formulation of curcumin with adjuvant like piperine, curcumin-based drug delivery system, and structural modification of curcumin have been adopted to overcome these problems. Among all, the strategy of structural modification has been reported to reach a limited success culminating in analogs with better stability and rapid absorption. A series of novel structurally modified and more stable curcumin analogs have been synthesized by using Claisen-Schmidt condensation reaction, between a ketone and aldehyde in the presence of a polar solvent. The synthesized compounds have been evaluated for their antioxidant, anti-inflammatory and immunosuppressive activities. Structure–activity relationship (SAR) studies have been carried out to gain insight into their antioxidant, anti-inflammatory and immunosuppressive activities. SAR studies revealed that methoxy, phenoxy and carbon–carbon double bonds are responsible for antioxidant, anti-inflammatory and immunosuppressive activities while α,β-unsaturated carbonyl group along with electron withdrawing substituents, position of substituents and symmetry of structure is directed as obligatory for reactivity. Some curcumin analogs have potential to be developed into effective anti-oxidant, anti-inflammatory and immunosuppressive agents.
Microfluidic Paper-based Analytical Devices (μPADs) and Their Application to Analytical and Bioanalytical Chemistry

Akhmad Sabarudin

Department of Chemistry, Faculty of Science, Brawijaya University, Indonesia
Research Center for Advanced System and Material Technology, Brawijaya University, Indonesia

Email: sabaripn@ub.ac.id

ABSTRACT

Microfluidic Paper-based Analytical Devices (μPADs) are a simple analytical platform that satisfies a combination of low cost, portability, and easy-to-use. Basically, the μPADs consist of two components such as a paper and a liquid barrier. The hydrophilic area in the μPADs are used to load reagents and samples. The hydrophobic barrier is created by constructing a pattern using water insoluble material on a paper substrate to provide a leak-proof barrier of the liquid path in the hydrophilic area of the μPADs. In this experiment, the μPADs devices are prepared using a chromatographic paper and designed at an appropriate pattern prior to printing by employing a solid ink/wax printer (Xerox colorqube 8580 DN) to produce hydrophobic barriers and hydrophilic channels. This printing method requires heating to melt a wax and assist penetration of the wax through the paper pores; thereby creating hydrophobic barriers in the front and the back sides of the device. In general, there are two different designs for quantitative analysis in our experiments such as (1) distance-based and (2) colour image-based designs. In the first design, the detection of analyte concentrations is estimated by measuring the distance of a coloured reaction product which flows inside paper channels driven by capillary force towards the detection zone of the μPADs. In the second design, the quantitative detection of analytes is measured based on the change in colour intensity formed in the detection zone of a μPAD by employing ImageJ software to determine the RGB values. Various experimental parameters were optimized to achieve the best performance of the μPADs. The produced μPADs in these works are further applied to qualitative and quantitative analysis of lead (II), blood urea nitrogen, serum creatinine, vitamin C, benzoic acid, antioxidant, and other applications discussed later. There is no significantly different of the analytical results obtained by the μPADs in comparison to the standard methods. Overall, the results obtained in this study indicate that the μPADs devices are a reliable tool for high throughput and on-site determination of metallic and non-metallic analytes in various samples.

Keywords: μPADs, microfluidic, paper, wax printing, quantitative analysis.
Driving forces for poly(N-vinylcaprolactam) collapse upon heating

Kenji Mochizuki
(Shinshu University, Japan)

ABSTRACT

Upon heating, thermo-sensitive aqueous polymers undergo the coil-to-globule transition, where drastic chemical and structural transformations occur that are of great interests for academia and applications. Although it is widely believed that the disruption of the clathrate-like hydration shell drives this polymer collapse, no decisive evidence has yet been provided. Here, we demonstrate, using all-atom molecular dynamics simulations, that poly(N-vinylcaprolactam) in water has a less ordered hydration structure than the bulk liquid and undergoes the coil-to-globule transition without remarkable hydration shell depletion or qualitative transformation. Furthermore, our free energy analyses show that water strongly pushes the "hydrophobic" caprolactam groups apart rather than bringing them together. We find that the reduction of this water-mediated repulsion, arising from the excluded volume effect, drives the polymer collapse upon heating.
Coordination Chemistry with a Twist - Chiral Cages and Network Solids

David R. Turner

School of Chemistry, Monash University, Clayton, VIC 3800, Australia

ABSTRACT

The prevalence of chirality in natural systems means that the synthesis, purification and detection of chiral molecules are important areas of research. To achieve these goals it is important that materials are developed that have a high degree of selectivity towards the desired substrates.

Recent work in our group has focused on the design and synthesis of chiral coordination compounds, both discrete cage-like species and porous extended networks (coordination polymers). Studies involving several families of diimide ligands, containing amino acid terminal groups, give insights to the geometric and steric influences on the structure and activity of the resulting complexes.

The structures of coordination polymers containing naphthalene- or perylene-diimide ligands are highly dependent on the amino acid that is used. A robust metalomacrocyclic synthon has been identified and its applications, and limitations, from both crystal engineering and supramolecular perspectives have been explored. A subset of these materials separate racemic analytes in a liquid-chromatographic application.

The use of copper-acetate paddlewheels as structural components has led to discrete helical cages. Handedness can be controlled by the ligands used and can be templated in systems containing achiral analogues. A family of lantern-type $\text{M}_4\text{L}_4$ species allow alteration of the size and nature of the cage, and far larger octahedral $\text{M}_{12}\text{L}_{12}$ cages show enantioselective guest sorption.

Hydrothermal Synthesis of Titanium Dioxide Nanotube Using Methylamine for Photodegradation of Congo Red

Cheng Yee Leong¹, Pei Wen Koh¹, Ye Shen Lo¹, Siew Ling Lee¹,²*

¹Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81300 Johor Bahru, Malaysia
²Centre for Sustainable Nanomaterials, Ibn Sina Institute for Scientific and Industrial Research, Universiti Teknologi Malaysia, 81300 Johor Bahru, Malaysia. silee@ibnusina.utm.my

ABSTRACT

Titanium dioxide (TiO₂) nanotube photocatalyst is highly desired for the photodegradation of dye in waste water treatment. A series of titanium dioxide nanotube photocatalysts were successfully synthesized by using methylamine as N-ligand via hydrothermal treatment at different hydrothermal temperatures and hydrothermal durations. The effect of these two parameters on the photocatalytic activity of synthesized materials were investigated. TEM micrographs and XRD analysis depicted methylamine assisted the transformation of anatase TiO₂ nanoparticles to nanotube via the exfoliation of TiO₂ crystallite into layered sheet and promoted the curling of layered sheet, forming nanotube. Hydrothermal temperature up to 180°C was able to fully transform the morphology of anatase TiO₂ nanoparticles into nanotube. The reaction duration was further modified by keeping the temperature constant at 180°C. Fluorescence analysis showed that 24 h hydrothermal duration gave the slowest electron-hole recombination rate. DR-UV-Vis analysis indicated that the synthesized samples were active under UV region. The photocatalytic performance of the synthesized materials was tested in the photodegradation of congo red under UV irradiation. The results suggested that among the materials synthesized, TiO₂ nanotube synthesized at 180°C, under 24 h hydrothermal duration appeared to be the most superior photocatalyst which gave the highest photocatalytic activity of 77%. Possible mechanism of the TiO₂ nanotube formation with methylamine as N-ligand is presented.

Keywords: Titanium dioxide, nanotube, methylamine, photocatalyst, hydrothermal
Strategies to Target Mycolic Acid Biosynthesis in Mycobacteria

Dr. Hendra Gunosewoyo

1Curtin University, School of Pharmacy and Biomedical Sciences, Perth, WA, Australia

Abstract

Small-molecule targeting of the unique cell wall of Mycobacterium tuberculosis (M.tb) has generally been successful in the antitubercular drug discovery field. The waxy, highly hydrophobic cell wall of Mycobacteria is mainly composed of the long chain mycolic acids, interconnected to the arabinogalactan and peptidoglycans. Recently our group has been working on the two key proteins in the mycolic acid biosynthesis pathway, namely the mycobacterial membrane protein large 3 (MmpL3) and polyketide synthase (Pks13). In collaboration with Johns Hopkins Center for Tuberculosis and East China Normal University, we identified indoleamides and coumestans as small molecule scaffolds for inhibiting the two protein targets. I will present key results, updates and future directions of this work.
Metabolomics approach for standardization of *Andrographis paniculata* raw material and extracts

M Rafi$^{1,2,3,*}$, UD Syafitri$^{2,4}$, R Heryanto$^{1,2,3}$, E. Rohaeti$^{1,2}$, Z. Ari$^{6}$, DA Septaningsih$^{3}$, A Rohman$^{5}$, MB Amran$^{6}$, B Prajogo$^{7}$

$^1$Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Pertanian Bogor, Bogor

$^2$Pusat Studi Biofarmaka Tropika, Institut Pertanian Bogor, Bogor

$^3$Advance Research Laboratoty (AR-Lab), Institut Pertanian Bogor, Bogor

$^4$Departemen Statistika, Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Pertanian Bogor, Bogor

$^5$Fakultas Farmasi, Universitas Gadjah Mada, Yogyakarta

$^6$Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Teknologi Bandung, Bandung

$^7$Fakultas Farmasi, Universitas Airlangga, Surabaya

*Corresponding author: mra@apps.ipb.ac.id

ABSTRACT

Guarantee in the consistency of quality, safety, and efficacy of herbal medicines from the raw materials to its finished products is essential because medicinal plants have high variability in the content of bioactive components. Environmental growth, harvesting time, postharvest processes, genetics is some factor which significantly affects the composition and concentration of bioactive compounds in medicinal plants. Evaluation of the quality of herbal medicinal raw materials generally by measuring the concentration of one or a group of chemical components that have certain pharmacological activities in their constituent medicinal plants. This approach cannot provide a comprehensive and complete picture, so the quality control of medicinal plants must use a metabolomics approach. This approach will obtain information on all or classes of chemical components that can be detected for the evaluation of raw materials because there is the possibility of the work of a medicinal plant to be synergistic. In this study, we used metabolomics approach for standardization of sambiloto (*Andrographis paniculata*). *Sambiloto* was chosen for the proposed sample because it is a plant that is widely used in antidiabetic and one of the medicinal plants included in the scientification of *jampu* (Traditional Indonesian medicines). By using a metabolomics approach, we have characterized and classified sambiloto based on harvest time, plant parts, solvent extraction, and geographical origin.
Modification of Metal-Organic Frameworks (MOFs) as a Novel Material for Hydrogen Storage and CO$_2$ Capture

Witri Wahyu Lestari, Hadi Suwarno, Atmanto Heru Wibowo, Yuni K. Krisnandi, Irwinsyah, Marisa Adreane, Lila Yunita, Dwi Ni'maturrahmah, Larasati, Shanti Astuti, Fitriana J. Teteki

Chemistry Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University
Jl. Ir. Sutami No. 36A, Keningan-Jebres, Surakarta, 57126
Email: witri@mipa.uns.ac.id

Abstract

As a class of hybrid porous crystalline materials consisting of organic linker and metal ion or metal cluster, MOF is recently becoming very attractive material to be explored. The occupancy of multi- various and tunable porosity, unsaturated metal center and the addition of metal nano-particle via post synthesis modification make MOFs potentially to be used as novel material in the application of hydrogen storage and CO$_2$ capture. Herein, it will be presented the synthesis strategy of MOFs based on HKUST-1, MOF-5, MIL-100(Fe), and Zr-BTC and its modification with natural zeolite, organic polymer, and metal impregnation to enhance their structural characteristics and performance in hydrogen storage and CO$_2$ capture.

References:


Marine Geochemical Explorations of Sediment Using Pindexes and Pb Isotope Ratios

Anugrah Ricky Wijaya*, Shigeru Ohde ²

¹Dept. of Chemistry, Universitas Negeri Malang (UM), Malang
²Dept. of Marine Chemistry, University of The Ryukyus, Okinawa

*Corresponding email: anugrah.ricky.fmipa@um.ac.id

ABSTRACT

Three important things controls of the geochemical explorations are the highly accurate and precision method, routine assessment, and identify the source of anthropogenic and natural sources. Especially for sediment chemistry, we modified BCR/Tessier microwave to release rapid method and then investigate the residence of metal contents in the geochemical fractions of sediment. All of the raw data of geochemical fractions were analyzed by ICP-MS and then assessed by Priority index (Pindex) as summations of normalized Pollution Index (PLI), Risk Index (RI), and simplify Geoaccumulation Index (SIgeo). To identify the sources of heavy metals, especially of Pb, we applied to the ratio isotope 208Pb/206Pb vs 207Pb/206Pb with Pb growth curved associated with Pb references using the single-stage Cumming and Richard model to map anthropogenic and natural sources of Pb.
ABSTRACTS

ORAL SESSION
Mesoporous Silica Nanocomposite Functionalized 2-(2-Oxoindolin-3-Ylidene)-1,3-Diphenylpropane-1,3-Dione for Fluorescent Chemosensor Of Al$^{3+}$ Ions

Hendrik O. Lintang¹, Tantiana Indriani¹, Muhammad Riza Ghulam Fahmi¹, Yehezkiel Steven Kurniawan², Leny Yuliati¹,²

¹Department of Chemistry, Faculty of Science and Technology, Universitas Ma Chung, Malang, Indonesia
²Ma Chung Research Center for Photosynthetic Pigments (MRCPP), Universitas Ma Chung, Malang, Indonesia

*Corresponding email: hendriklintang@machung.ac.id

ABSTRACT

Nowadays, optical chemosensors for detection of metal ions based on organic functionalized mesoporous silica materials have attracted attentions due to their high sensitivity and selectivity. On the other hand, a particular attention is given to isatin derivatives, which are known as effective chelating agents for binding metal ions. It has been reported that isatin derivatives functionalized SBA-15 were the selective chemosensors against Fe$^{3+}$ and Hg$^{2+}$ metal ions. In this work, a novel organic-inorganic hybrid material was designed by impregnating 2-(2-oxoindolin-3-ylidene)-1,3-diphenylpropane-1,3-dione compound onto the surface of SBA-15. The successful immobilization was clarified by Fourier transformed infrared spectroscopy. The fluorescent spectrum of the hybrid nanomaterial gave a strong emission peak at 404 nm when excited at 354 nm. The sensing capability of the hybrid material was evaluated for monovalent (Na$^{+}$ and K$^{+}$), divalent (Cu$^{2+}$ and Hg$^{2+}$), and trivalent (Al$^{3+}$ and Fe$^{3+}$) metal ions. It was found that the hybrid nanomaterial selectively detects Al$^{3+}$ ions by giving hyperchromic phenomenon. From the fluorescent titration experiment, the limit of detection value was found to be 12 µM while limit of quantitation was found to be 41 µM. These finding show that the hybrid nanomaterial serves as a promising platform for the detection and quantification of Al$^{3+}$ ions.
Highly Sensitive Fluorescent Chemosensors of Fe$^{3+}$ Ions using Mesoporous Silica/Isatin-Schiff Base Nanocomposites

Krisfian Tata Aneka Priyangga, Muhammad Riza Ghulam Fahmi, Matheus Randy Prabowo, Yehezkiel Steven Kurniawan, Leny Yuliati, and Hendrik O. Lintang

Ma Chung Research Center for Photosynthetic Pigments (MRCPP), Universitas Ma Chung, Jl. Villa Puncak Tidar N-01, Malang 65151, Indonesia

Department of Chemistry, Faculty of Science and Technology, Universitas Ma Chung, Jl. Villa Puncak Tidar N-01, Malang 65151, Indonesia

Corresponding email: hendrik.lintang@machung.ac.id

ABSTRACT

Keywords: chemosensor, SBA-NH, detection, fluorescent, Fe$^{3+}$. The development of highly sensitive detection of iron metal ions (Fe$^{3+}$) has particularly received significant attention using fluorescent chemosensors based on the organic compounds. Hundreds of host compounds have been designed and prepared; however, they were slightly soluble in water. As a result, their applications for monitoring of the aquatic environment are limited. In our previous work, it was found that impregnation of isatin derivative (NH) on the SBA-15 as nanocomposite SBA-NH gave fluorescent detection of Fe$^{3+}$ metal ions using the solid method with the detection limit (LoD) and quantification limit (LoQ) as 1.49 and 6.32 mM, which is not sensitive enough. In the present work, the dispersion method was employed to increase the Fe$^{3+}$ sensing sensitivity. The chemosensor SBA-NH was added to the Fe$^{3+}$ solution in distilled water and the sensing sensitivity was evaluated using spectrofluorometer. It was found that SBA-NH showed high sensitivity to detect Fe$^{3+}$ metal ions through a significant quenching of its emission peak at 527 nm. The sensing capability of chemosensor SBA-NH was found to give LoD and LoQ as 19.6 and 65.5 µM, respectively. By using this method, the LoD and LoQ values were much lower around 75 and 95 times compared to our previous work, indicating more efficient interaction between the chemosensors and the metal ions. These findings would be the useful approach for sensitivity enhancement strategy in the detection of metal ions using organic-inorganic hybrid nanomaterials. Acknowledgements: This research was supported by Ministry of Research, Technology and Higher Education, The Republic of Indonesia through World Class Research (WCR) Grant 2019 with agreement Number 041/SP2H/LT/MULTI/L7/2019 date March 26th 2019.
A Synthesis Of Polyethylene Glycol (PEG) Coated Magnetite Fe₃O₄ Nanoparticles And Their Characteristic For Enhancement Of Biosensor

Ganesha Antarnusa

Dept. Physics Education, Universitas Sultan Ageng Tirtayasa

*Corresponding email: ganesha.antarnusa@untirta.ac.id

ABSTRACT

Polyethylene glycol (PEG) coated magnetite Fe₃O₄ nanoparticles has been successfully synthesized by using chemical co-precipitation method with variation concentrations. The magnetite Fe₃O₄ nanoparticles used as a bimolecular labels (nano-tags) exhibiting a soft magnetic behavior with Ms of 77.16 emu/g and Hc of 49 Oe respectively and polyethylene glycol (PEG) as a stabilizer and dispersant. XRD patterns and transmission electron microscopy (TEM) images showed that Fe₃O₄ was well crystallized and it grew in their inverse spinel structure with an average size of around 10 nm. Fourier transform infrared spectroscopy (FT-IR) results suggest that PEG indicated with Fe₃O₄ via its carbonyl groups. Result of Vibrating Sample Magnetometer (VSM) shows that Fe₃O₄ have exhibited good magnetic response and easily attracted to a magnet placed beside with superparamagnetic behavior. Such Fe₃O₄ nanoparticles with favorable size and tunable magnetic properties are promising biosensor applications.

The Carbazole Compounds Endowed with Phosphonic Anchoring Group for Sensitizer in Dye-Sensitized Solar Cells

Yuly Kusumawati*, Bhakti S. Pamungkas

Chemistry Department Institut Teknologi Sepuluh Nopember
Campus ITS Sukolilo, Kepuitih, Sukolilo, Surabaya, East Java 60111

*Corresponding email: y_kusumawati@chem.its.ac.id

ABSTRACT

The sensitizer dye contacts onto the TiO₂ surface through an anchoring group in a Dye-Sensitized Solar Cells (DSSC). The thermal stability of the anchoring group and TiO₂ binding contact is important to be considered in order to obtain the cell stability. Phosphonic acid is an anchoring group that has a good binding-contact thermal stability with TiO₂ surface. In this research we investigated through the computational study the electronic properties of carbazole derivative compounds endowed with the phosphonic anchoring-groups (CP). A series of 10 CP derivatives was studied which has a different functional donor group. The electronic properties were investigated using the TD-DFT method with the CAM-B3LYP basis set. The substitution of carboxyl group with the phosphonic one resulted the absorption spectrum to the blue shift (5-70 nm) which gave a less beneficial effect to the DSSC performance. The addition of donor functional group aniline into the CP (aniline-CP) could shift back the absorption spectrum to the red-shift. While the addition of donor functional pyrrole into the CP (pyrrole-CP) increase significantly the oscillator strength that can induce the increase in light harvesting efficiency. The DSSC parameter also has been calculated including the electron injection driving force $\triangle G_{\text{inject}} (-0.84872 \text{ eV})$ and $\text{eVOC} (2.763 \text{ V})$. 
Synthesis and Molecular Docking Study of 6-Chloropyrazine-2-carboxylic acid Derivatives

Nur Pasca Aijijiyah, M. Riza Ghulam Fahmi, Mardi Santoso

1Dept. of Chemistry, Institut Teknologi Sepuluh Nopember, Surabaya
2Universitas Ma Chung, Malang
*Corresponding email: tsv09@chem.its.ac.id

ABSTRACT

One of the most lethal and frequent infectious diseases worldwide is tuberculosis. Multi and extensively tuberculosis drug-resistant constitutes a serious problem and emphasizes the need for novel anti-tubercular agents. Accordingly, various pyrazine-2-carboxamides were synthesized and evaluated as potential anti-tuberculosis agents. The synthesis involved reaction of pyrazinoic acid with thionyl chloride to yield acyl chloride which on treatment with various anilines gave various pyrazine-2-carboxamides. Based on structure-activity relationships extracted from previously published, this paper reported synthesis and molecular docking study of 6-chloropyrazine-2-carboxamides. Synthesis involved reaction of 6-chloropyrazinoic acid with 2,4,6-trichlorobenzoyl chloride instead of thionyl chloride which listed under the Chemical Weapons Convention as it may use for the production of chemical weapons. Structure identification of 6-chloropyrazine-2-carboxamides was carried out by 1H-NMR, 13C-NMR, FTIR, and high-resolution mass spectroscopy. It is predicted that 6-chloro-N-octylpyrazine-2-carboxamide has better bioactivity against Mycobacterium tuberculosis, based on molecular docking study.

Synthesis and Molecular Docking Study of Pyrazine-2-carboxylic acid Derivatives

Muhammad Zulqurnain, M. Riza Ghulam Fahmi, Arif Fadlan, Mardi Santoso

1Dept. of Chemistry, Institut Teknologi Sepuluh Nopember, Surabaya
2Universitas Ma Chung, Malang
*Corresponding email: tsv09@chem.its.ac.id

ABSTRACT

The pyrazine-2-carboxylic acid derivatives (3a-c) with aromatic, cyclic, and aliphatic side chain were synthesized in good yields. The structures of derivatives were confirmed by spectroscopic methods (FTIR, NMR, HRMS). The molecular docking was performed to determine the possible binding interaction between 3a-c with Mycobacterium tuberculosis Inha protein. The derivative 3c showed the lowest rerank score (-86.4047 kcal mol\(^{-1}\)) and it might correspond to the lowest experimental IC\(_{50}\) value.
Modification of Metal-Organic Frameworks (MOFs) as a Novel Material for Hydrogen Storage and CO₂ Capture

Witri Wahyu Lestari, Hadi Suwarno, Atmanto Heru Wibowo, Yuni K. Krisnandi, Irwinsyah, Marisa Adreane, Lila Yunita, Dwi Ni'maturrahmah, Larasati, Shanti Astuti, Fitriana J. Teteki

Chemistry Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University
Jl. Ir. Sutami No. 36A, Kentingan-Jebres, Surakarta, 57126
Email: witri@mipa.uns.ac.id

ABSTRACT

As a class of hybrid porous crystalline materials consisting of organic linker and metal ion or metal cluster, MOF is recently becoming very attractive material to be explored. The occupancy of multi-variables and tunable porosity, unsaturated metal center and the addition of metal nano-particle via post synthesis modification make MOFs potentially to be used as novel material in the application of hydrogen storage and CO₂ capture. Herein, it will be presented the synthesis strategy of MOFs based on HKUST-1, MOF-5, MIL-100(Fe), and Zr-BTC and its modification with natural zeolite, organic polymer, and metal impregnation to enhance their structural characteristics and performance in hydrogen storage and CO₂ capture.
The Separation of CO$_2$ from CH$_4$ for Biogas Upgradation Process Using ZIF-8/Polysulfone and ZIF-8/Pebax-based Mixed Matrix Membranes

Putu Doddy Sutrisna$^1$, Emma Savitri$^1$

$^1$Dept. of Chemical Engineering, University of Surabaya (UBAYA), Surabaya, Indonesia

*Corresponding email: pudod@staff.ubaya.ac.id

ABSTRACT

Biogas is one type of renewable energy that has been explored widely in Indonesia to substitute unrenewable energy. The applicability of biogas can be improved by the upgradation of biogas to biomethane with higher content of methane. Carbon dioxide (CO$_2$) gas contained in biogas can decrease the calorific value as well as generate greenhouse gas. Hence, the separation of CO$_2$ from methane (CH$_4$) occurs as a crucial step to improve the utilization of biogas. The separation of CH$_4$/CO$_2$ mixture can be conducted using polymeric membrane that needs no chemical, hence considered as environmentally friendly technique. However, the utilization of polymeric membrane in gas separation processes is hampered by the trade-off between gas throughput and selectivity. To solve this problem, the incorporation of inorganic particle, such as ZIF-8 particles, into polymer matrix to improve the gas separation performance of the membrane has been conducted recently. ZIF-8 has pore size between the sizes of CO$_2$ and CH$_4$, hence suitable to separate such gases. In this research, ZIF-8 has been incorporated into copolymer Pebax by simple blending and solvent evaporation techniques in flat sheet configuration. The pure gas permeation tests showed an increase in gas permeability (120 Barrer compared to 90 Barrer) after the inclusion of ZIF particles with a slight decrease in CO$_2$/CH$_4$ selectivity. Further analysis also confirmed that ZIF particles in Pebax dispersed more uniform compared to inside other polymer, such as Polysulfone and Cellulose Acetate. At FTIR wave number of 800 cm$^{-1}$ – 1,100 cm$^{-1}$, it has been found that ZIF particles formed chemical bonding with C-O-C ring of polymer that could potentially improve the mechanical and plasticization resistance of the membranes. XRD analysis also indicated an increase in degree of crystallinity of MMMs after the incorporation of particles. Keywords: Biogas, biomethane, ZIF-8/Pebax, mixed matrix membranes, CO$_2$/CH$_4$ gas
Utilization of Activated Mendong Charcoal (Frimbistylis Umbellaris) as Adsorbent Of Hydrogen Sulfide (H$_2$S) And Nitrogen Dioxide (NO$_2$) Gas: Preliminary Assessment

Sulistyo Saputro, Lina Mahadiani, Inung Widhyastuti, Rizka F. Hanifa

Dept. of Chemistry Education, Universitas Sebelas Maret, Surakarta

Corresponding email: rizkafauziahanif@student.uns.ac.id

ABSTRACT

In recent years, emissions of hydrogen sulfide (H$_2$S) and nitrogen dioxide (NO$_2$) have been highlighted where their presence began to feel. Several H$_2$S and NO$_2$ methods, including chemical adsorption by activated carbon have been proposed. In this study, activated carbon was prepared from Mendong plant (frimbistylis umbellaris), which was functionalized with zinc chloride (ZnCl$_2$) with a variance concentration of 2.5; 5; 7.5; and 10 % w/v to determine the efficiency of H$_2$S adsorption. This research was conducted by laboratory experimental methods. Mendong stem charcoal was obtained from the process of using a modification tool. Activation was done by maceration using ZnCl$_2$ activator (w/v) for 24 hours. Determination of H$_2$S gas using the blue methylene’s methods for 1 hour showed the highest effectiveness at a concentration of 2.5 % ZnCl$_2$ w/v by 80%. The adsorption of NO$_2$ gas was conducted for 1 hour by using Griess Saltzman’s method. With an activator of 2.5% ZnCl$_2$ the largest concentration of NO$_2$ gas absorbed when the HNO$_3$ concentration was 1.5 M (0.057 µg/mL) with the percentage of NO$_2$ efficiency adsorbed at 28%. The adsorption of H$_2$S and NO$_2$ was analyzed using UV-Vis spectrophotometry. Keyword: mendong, adsorbent, gas, H$_2$S, NO$_2$.

Effect of Sonication Frequency in Synthesis of Silica Aerogel-Activated Carbon Nanocomposite

Siti Muthomimah, Widi Rahayu, Nazriati, Adilah Aliyatulmuna

Chemistry, University of Malang, Malang

Corresponding email: nazriati.fmipa@um.ac.id

ABSTRACT

The silica adsorption capacity can be enhanced by composing it with activated carbon. Sonication is one of the techniques in mixing, reaction processes, and fission materials with the aid of high energy at ultrasonic wavelengths. The study aims to know the effect of sonication frequency in the synthesis nanocomposite silica aerogel-activated carbon by sol-gel method with modifying agent TMCS (trimethylchlorosilane) and HMDS (hexamethyldisilazane). Synthesized nanocomposites were characterized functional groups analysis by the FTIR (Fourier Transform Infrared Spectrophotometry) method, morphological analysis by SEM (Scanning Electron Microscopy) method and surface area analysis by the BET (Brunauer-Emmet-Teller) method. The results of FTIR the nanocomposite shows a group of Si - OH, Si - O - Si, C - H, C = O, C – O, the peaks around of 2665.62 cm$^{-1}$, 1090 cm$^{-1}$, 2814 cm$^{-1}$, 2814 cm$^{-1}$, 1622.13 cm$^{-1}$, 3209.5 cm$^{-1}$. Results of SEM Nanocomposite synthesis with 42 kHz frequency sonication has a smaller particle size than 35 kHz frequency. Surface area analysis (BET) obtained 674,897 m$^2$ / g at frequency of 42 kHz and 486,909 m$^2$ / g synthesis at frequency of 35 kHz.
Ibuprofen Adsorption Study by Langmuir, Freundlich, Temkin and Dubinin-Radushkevich Models using Nano Zinc Oxide from Mild Hydrothermal Condition

Maria Ulfa¹, Yuli Iswanti¹
¹Dept. of Chemistry Education, Sebelas Maret University, Surakarta

Corresponding email: ulfa.maria2015@gmail.com

ABSTRACT

Ibuprofen at the aquatic area as inflammatory drug residue is dangerous for enviromental sustainability. The removal of ibuprofen at aquatic area is carried out on nano zinc oxide (NZO) as an adsorbent. The NZO adsorbent was synthesized by gelatin self assembly as green method and characterized by FT-IR and XRD techniques. The residual ibuprofen model was prepared by dissolution of ibuprofen in water-hexana at ratio 10:0; 1:9; 5:5, 9:1 and 0:10. The optimized batch experimental parameters were 100 ppm for 55 min at room temperature. Adsorption data investigated by Langmuir, Freundlich, Temkin and Dubinin-Radushkevich models. Result show that, Dubinin-Radushkevich model is the best model for describing the adsorption mechanism between ibuprofen as adsorbate and zinc oxide as an adsorbent. The adsorption capacity of 9:1 is highest on that ibuprofen adsorption indicated that the composition of both solvent is favorable for ibuprofen dissolution due polar-non polar interaction which is reaching 92% removal of ibuprofen. In the future, zinc oxide as adsorbent may be used for the removal of ibuprofen from any aquatic core area body due to the economic and enviromental reason.

Keywords : adsorption, Langmuir, Freundlich, Temkin, Dubinin-Radushkevich, zinc oxide, solvent

Adsorption Kinetic and Slow-Release Behavior of Curcumin on Mil-100 (Fe) and Mesoporous Silica Nanoparticles (Msns)

Witri Wahyu Lestari¹ and Nuhaa Faaizatunnisa¹
¹Chemistry Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Jl. Ir. Sutami No 36A, Kentingan, Jebres, Surakarta, 57126, Indonesia

Corresponding email: witri@mipa.uns.ac.id

ABSTRACT

Curcumin is a polyphenolic compound with a variety of interesting benefits to be used as a health product, however the hydrophobicity of curcumin cause poor bioavailability in the adsorption in the plasma, tissue, water solubility, and metabolism. Curcumin encapsulation into a matrix and slow-release process can be an alternative solutions to this problem. In this preliminary study, adsorption kinetic of curcumin into matrix materials, in this case Metal Organic Framework (MOFs) type of Materials of The Lavosier Institute (MIL-100(Fe)) and Nanoparticles mesporous silica (MSN) was investigated. The loading/adsorption was carried in ethanol: distilled water = 1: 5 for 5 hours with various concentrations of curcumin 5, 10, 20, and 30 ppm. The kinetic study can be explained by the Langmuir and Freundlich Adsorption Isotherm model. Meanwhile, the curcumin release test at pH 5.8 and 7.4 were observed with a UV-VIS spectrophotometer. Kinetic study using Langmuir Isotherm Adsorption model for MOF and MSN shows the reaction rates occurred in 3rd and 2nd order, respectively. The loading capacity of Kur@MIL-100 (Fe) is higher than Kur@SiO, reached up to 97.94%. The pH response to curcumin release was sensitive to MOF material and not sensitive to MSN. Both materials show the ability in slow-release of drug, therefore both matrices can be used as a hydrophobic drug delivery system.of pH-based controlled drugs.

Keywords: MIL-100(Fe), MSN, curcumin, slow-release, responsive pH.
The Effect of Rhodamine B on The Properties of Fluorescent Nanoparticles Derived from Geothermal Silica

Yovilianda Maulitiva Untoro¹, Diaz Ayu Widyasari², S.N Aisyiyah Jenie*¹

¹Research Centre for Chemistry, Indonesian Institute of Sciences, Kawasan Puspiptek, Building 452, Serpong, Tangerang Selatan, Banten 15314 Indonesia
²Department of Chemistry, Faculty of Sains and Technology, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Jl. Ir. H. Juanda No.96 Cemp Putih Ciputat, Kota Tangerang Selatan, Banten 14512 Indonesia

*Corresponding email: snajenie@gmail.com

ABSTRACT

Rhodamin B can use as a fluorophore to produce a fluorescent silica nanoparticle. Geothermal sludge as a source to produce silica. The purpose of the research is to synthesize fluorescent silica nanoparticle (FSNP) modified by rhodamine B and cetyl trimethyl ammonium bromide (CTAB) using sol-gel method. FSNP were derived from geothermal waste by adding NaOH at 90°C as a precursor of sodium silicate, added rhodamine B as a dye with variations of 0.2 g, 0.1 g, 0.05 g, 0.025 g, 0.0125 g, 0.00625 g, 0.003125 g, added CTAB for good active role and HCl 2N with aging for 18 hours. Characterization of FSNP included X-ray diffraction (XRD) to identify the crystallographic phases of the sample and surface area analyzer (SAA) to determine the surface area of materials. The best FSNP determination was performed by adding 0.05 g of rhodamine B. The results showed that the optimum FSNP was in its amorph phase with the specific surface area was 190.22 m²/g.

The Effect of Aging Time and Crystallization Time on The Synthesis and Characterization of Zeolite-Y Based on Malang Quartzite Silica

Sukrawati Arni¹, Sumari Sumari*¹, Aman Santoso¹

¹ Chemistry, University Of Malang

*Corresponding email: sumari.fmipa@um.ac.id

ABSTRACT

The purpose of this study is to determine the effect of aging time and crystallization time on the characteristics of zeolite Y. The raw material of silica used was obtained from silica extraction of Malang quartzite by leaching and sol-gel methods. The extracted silica was analyzed using XRF and XRD. Synthesis zeolite-Y was carried out using a hydrothermal method by mixing NaOH, Al(OH)₃, SiO₂, and H₂O according to the mole ratio of the elements in zeolite-Y. The aging process was carried out at the various time of 12, 24, 48 hours and the crystallization process was carried out at the various time of 6, 9, 12 hours at a temperature of 150°C. The synthesized zeolite-Y was analyzed using XRF, XRD, FTIR, and SEM. The results showed that quartzite silica could be extracted by leaching and sol-gel methods with the yield of 99.1 wt%. The optimum conditions of synthesis zeolite-Y was obtained at the aging time of 12 hours and the crystallization time of 12 hours.
Modification of Gunungkidul Natural Zeolite Using Alkaline and Application in The Corrosion Rate Reduction of Steel Plates in Acid Media

Mohammad Abdul Khafid1, Aditya Pandu Wicaksono2, Firstyananda Wahyu Andita3, Asifa Ihya Nurdina3

1 Department of Environmental Engineering, Faculty of Mineral Technology, UPN “Veteran” Yogyakarta
2 Department of Chemical Engineering, Faculty of Industrial Engineering, UPN “Veteran” Yogyakarta

Corresponding email: abdulkhafid925@gmail.com

ABSTRACT

The use of metals in the industry plays a very important role, where nearly 90% of industrial equipment comes from metallic materials. Corrosion is an electrochemical process between metals with its environment that can damage metal quality. Gunungkidul natural zeolite can be modified into a mixture of alkyd paint as a coating material to reduce the corrosion rate of steel plates are quite effective. In this research zeolite in the activation utilizing NaOH with a concentration of 1 N for 120 minutes. Zeolite characterization process uses X-Ray diffraction to determine the crystalline phase of zeolite and adsorption of nitrogen analysis to determine the extent of its surface with Brunauer-Emmet-Teller (BET) modeling. The process of lining the steel plates is done by dyeing on a mixture of alkyd-zeolite paints and inserted into an H2SO4 medium with a concentration volume of 100 ml for 20 days. The results of this study showed that the corrosion rate of steel plate is 1.254 mm/day (not coated), 0.090 mm/day (coating of alkyd paint) and 0.001 mm/day (coating of alkyd paint-zeolite). Using zeolite activated as a mixture of alkyd paint is more effective in lowering the corrosion rate of mild steel plates and environmentally friendly. Keywords: modification, natural zeolite, coating, acid media.

Preparation and Dissolution Rate of Piroxicam on Mesoporous Silica Nanoparticles as Controlled Drug Delivery

Hariyati Purwaningsih1, Bagus Purnawira1, Helmi Son Haji1, Vania Mitha Pratiwi1, Diah Susanti1, Agung Purniawan1

1Dept. of Material Engineering, Faculty of Industrial Technology, Institute Technology of Sepuluh Nopember (ITS) Surabaya

Corresponding email: hariyati@mat-eng.its.ac.id

ABSTRACT

This study aims to analyse the ability of mesoporous silica in increasing the dissolution rate of piroxicam. This study was included 2 steps: (1) silica mesoporous synthesis from rice husk ash followed by CTAB surfactant templated; (2) encapsulation process of piroxicam into mesoporous silica. Mesoporous silica formed by added CTAB surfactant as porous-templated with various concentration 1, 1.25, 1.5, 1.75 and 2%. Transmission electron microscope proved that silica had hexagonal pores structure correspond to MCM-41 structure. Increasing CTAB surfactant concentration was correlating with increasing piroxicam encapsulation in silica mesoporous. Silica with 1.5%CTAB-templated has highest encapsulation capacity up to 44.66% and showed dissolution rate 11.04 mg / l, 9.62 mg / l, 9.62 mg / l, 12.0 mg / l, and 13.20 mg / l and 13.6 mg / l at 5, 10, 15, 30, 45, 60 minutes respectively.
**Synthesis and Characterization of Ni-Mordenite Based on Quartz Sand by Wet Impregnation Method**

Sumari (1), Mochammad Irfan Abror(1), Ida Bagus Suryadharma(1), Aman Santoso(1), Anugrah Ricky Wijaya(1)

(1)Departement of Chemistry, Universitas Negeri Malang, Jalan Semarang 5 Malang, 65145, Indonesia

*Corresponding email: sumari.fmipa@um.ac.id*

**ABSTRACT**

Abstract. The purpose of this study was to synthesize and characterize Ni-mordenite based on quartz sand by wet impregnation method. Silica as one of raw material in synthesis of mordenite was extracted through a combination of leaching, alkaline extraction, and acid precipitation methods. Extraction results were analyzed using X-Ray Fluorescence and X-Ray Diffraction. Zeolite of mordenite was synthesized by hydrothermal method at 180 °C for 120 hours and Ni-mordenite was synthesized by the wet impregnation method using a nickel (II) salt solution. The synthesis results were characterized using XRF, XRD, IR, and SEM. The result showed that result of silica extraction from quartz sand is silica with a purity of 98 wt%. Zeolite H-modernite was successfully synthesized with a ratio of silica alumina (SiO2/Al2O3) of 5.17. A solution of 4.7 wt% nickel(II) was impregnated on mordenite zeolite and 3.35 wt% nickel(II) succeeded. The impregnation of nickel(II) ions in mordenite zeolites does not change the crystallinity and morphology of the synthesized zeolite mordenite Keywords: extraction of silika, ni-zeolite mordenite, quartz sand, wet impregnation.

**Colorization of Grafted Kaoline by Thermal Substitution Reaction**

Tutik Setianingsih1, Danar Purwonugroho1, Siti Mutrofin1, Darjito1, Yoandra Nadya Yoniansyah1, Tengku Nurul Rohma1

1 Department of Chemistry, Faculty of Science, Brawijaya University, Malang

*Corresponding email: tutiksetia@ub.ac.id*

**ABSTRACT**

Kaoline is a phyllosilicate mineral due to its layered structure. Layers of kaoline are built by SiO4 and AlO6 which can be substituted by cations and result in changing of color. The layers can be also delaminated (separated each other) by grafting reaction. In this research, we grafted the kaoline layer using propanol and colorized it by calcination of each kaoline – FeCl3 and kaoline – CrCl3.6H2O mixture. The purpose of this research is to study the effect of kaoline grafting on the colorization of kaoline. Those effects were detected by comparing the color of calcined activated kaoline and the calcined mixture of each kaoline – FeCl3 and kaoline – CrCl3.6H2O. Kaoline was activated with an H2SO4 solution (0.1M). The calcination was conducted at 1100 °C for 5 hrs. The grafting process was performed by immersing the activated kaoline for 24 hrs and stirring for 1 h. Characterization by SEM shows the thinner layered morphology of the grafted kaoline than the activated kaoline. Observation of color shows that the colorized grafted kaoline had a lighting color than the ungrafted one. FTIR spectra of the colorized grafted kaoline had weaker bands related to vibration of Si-O-Al and M-O than the ungrafted ones, indicating a lower concentration due to delamination. Moreover, the colorized grafted kaoline caused a shift of band that corresponds to Si-O-Al, indicating substitution reaction. Keywords: kaoline, grafting, colorization, calcination, substitution.
The Effect of Polyethylene Glycol (PEG) on The Performance of Desalination Using Natural Zeolite-PVA Hybrid Membrane

Anwar Ma’ruf¹, M. Agus Salim Al Fatoni², Agus Mulyadi Purnawanto³, Linatul Chulqi¹

¹Chemical Engineering Department, Universitas Muhammadiyah Purwokerto
²Civil Engineering Department, Universitas Muhammadiyah Purwokerto
³Agrotechnology Department, Universitas Muhammadiyah Purwokerto

Jl. Raya Dukuh Waluh Kembaran, Purwokerto, Indonesia 53182

*Corresponding email: anwarump@yahoo.com

ABSTRACT

The seawater desalination process currently uses membrane technology because of relatively lower investment and energy requirements. The process of seawater desalination using membrane process technology can be done in 3 methods, namely reverse osmosis (RO), distillation membrane (membrane distillation / MD) and pervaporation process (PV). This study will examine the performance of hybrid membrane developed from natural zeolite-TiO₂ with polyvinyl alcohol (PVA) in addition with polyethylene glycol (PEG) for desalination of seawater. The addition of PEG to the PVA polymer solution (dope) will increase the membrane resistance (Rm) and seawater rejection. The higher rejection is achieved of 93.77% at the addition of 6% PEG. Fouling resistance (Rf) isn’t effected by PEG concentration. The fouling resistance has a good linearity and stability at the addition of 6% PEG

Synthesis Copolymer of Chitosan with Acrylamide as an Adsorbent for Treatment of Heavy Metal Waste

Desnelli¹, Eliza¹, Ady Mara¹, Ady Rachmat¹

¹Chemistry Department, Sriwijaya University, Palembang.

*Corresponding email: desneli2010@gmail.com

ABSTRACT

The aim of this research is chemical modification of chitosan to improve and enhance the ability of as an adsorbent. Chitosan is a natural polymer produced from chitin deacetylation. The best performance of chitosan as an adsorbent in acidic solutions. Chemical modification carried out the chitosan copolymerization with acrylamide. Copolymer synthesis using by microwave oven with the weight ratio chitosan and acrylamide is 1: 4. The characterization of chitosan copolymerization with acrylamide (chitosan-g-acrylamide copolymer) were using by FTIR spectroscopy and Scanning Electron Microscope (SEM). The analysis of the functional group by FTIR spectroscopy show that the copolymer has been successfully synthesized, the C-N absorption peak at wave number 1415.75 cm⁻¹. The surface analysis with SEM shows that the morphology of the copolymer surface is more homogeneous compared to chitosan. Keywords: chitosan; acrylamide copolymer; copolymerization, adsorbent
Characterization of Adsorbent Based on Soybean (Glycine Max L. Merr) Biomass and Adsorption Ability of Cu(II) Cation in Temperature Variations

Hanumi Oktiyani Rusdi, Yudhi Utomo, Layyin Nadiya Rosyida, Surjani Wonohardjo

1 Dept. of Chemistry, Universitas Negeri Malang

*Corresponding email: yudhi.utomo.fmipa@um.ac.id

ABSTRACT

Cellulose has become very popular to produce materials for various applications, because of its abundance, physical and chemical properties which are advantageous, therefore there is always a development effort through new processing technologies, cellulose and cellulose functionalization methods. This research was conducted to study soybean biomass-based on cellulose adsorbents to determine the effect of temperature on the ability of adsorption on Cu(II) cation. The characterization of adsorbents using SEM and FT-IR test and surface area test and the results of the study showed that the soybean biomass adsorbent at a temperature variation of 25, 30, 40, 50, and 60 °C was carried out resulting in higher percentage of Cu (II) adsorption.

Reduction of Cadmium concentration by Oscillatoria Microalgae in a Culture Medium

Hermansyah, Hentiana, Doni Setiawan, Risfidian Mohadi, Hilda Zulkifli, and Getari Kasmiarti

1Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Sriwijaya, Jalan Raya Palembang Prabumulih KM32, Inderalaya, South Sumatera, Indonesia 30662
2Biology Department, Faculty of Mathematics and Natural Sciences, Universitas Sriwijaya, Jalan Raya Palembang Prabumulih KM32, Inderalaya, South Sumatera, Indonesia 30662
3Graduate school of Sriwijaya University, Jalan Padang Selasa no.254, Bukit Besar, Palembang, Indonesia 30139

*Corresponding email: hermansyah@unsri.ac.id

ABSTRACT

Microalgae has functional group such as carboxylate (-COOH) and hidroxyl (-OH) which play a role as adsorbent of heavy metal. Reduction of heavy metal cadmium concentration by Oscillatoria microalgae in a culture medium has been carried out. This study aimed to study potency of Oscillatoria microalgae as biological adsorbent agent of heavy metal Cadmium in the laboratorium condition using BG-11 media. We conducted 4 treatments culture media with 6 repetitions consisting of P0 = 100 mL medium + 10,000 individual Oscillatoria; P1 = 1 mg/L Cd(II) + 100 mL medium + 10,000 individual Oscillatoria; P2 = 3 mg/L Cd(II) + 100 mL medium + 10,000 individual Oscillatoria; and P3 = 5 mg/L Cd(II) + 100 mL medium + 10,000 individual Oscillatoria. Based upon data resulted that abundance of Oscillatoria in culture medium BG-11 increase in growth on exponential phase day 4 to day 7 day which is 1208-1599 ind/L. In the presence of 1 mg/L Cd(II) and 10,000 individual Oscillatoria in 100 mL medium resulted decrease of 0.7595 m/L Cd concentration, higher concentration of Cd was lower reduction of Cd concentration. Keywords: Oscillatoria, adsorbent, cadmium, microalgae, BG-11 medium
Preparation and Characterization Composite of Activated Carbon Palm Shell as Adsorbent of Cr(III) Ion

Intan Lestari1, Diah Riski Gusti2, Yonanda Ramadhanthy3, Dela Tamara Putri4

1 Dept of Chemistry Faculty of Science and Technology Universitas Jambi

ABSTRACT

Activated carbon prepared from palm shells (Elaeis guinensis Jack) was composite with magnetite Fe3O4 and used as Cr(III) metal ion adsorbent. Activated carbon-magnetite Fe3O4 composite was characterized by SEM, VSM, XRD, and FTIR. SEM image shows that Fe3O4 deposited on the surface of activated carbon. The degree of magnetization of Fe3O4 with VSM obtained 20.99 emu/g. The pattern of XRD diffractogram shows that diffraction peak at 2θ which was 6.5495°; 30.1146°; 35.3581°; 43.0631°; 57.1369°; 62.5918°. The spectra of FTIR show that functional groups exist in composites such as carboxyl, carbonyl, and hydroxyl groups. Adsorption of Cr(III) ion occurs at pH 5, 30 minutes contact time and a maximum concentration of 200 mg/L Cr(III) with a maximum adsorption capacity was 5.4 mg/g. Key Word: Adsorption, activated carbon, magnetite Fe3O4, composite, Cr(III).

Removal Of Cr (VI) Using Biochitin From White Shrimp (Litopenaeus Vannamei) Modified with Dithizone

Barlah Rumhayati1, Lutfiyatul Mukhlisah2, Sasangka Prasetyawan1

1 Department of Chemistry Faculty of Mathematics And Natural Sciences Brawijaya University Indonesia 65145

2 Postgraduate of Chemistry Departement, Brawijaya University, Indonesia 65145

ABSTRACT

Abstract: Biocitin modified with dithizone is chitin produced from the fermentation of white shrimp shells using Lactobacillus plantarum followed by using Bacillus thuriengenesis. Biochitin was then modified by adding 0.03 grams of dithizone to 2 grams of adsorbent in toluene solvent followed by reflux for 4 hours at 700C. The purpose of this study was to determine the optimum conditions of Cr (VI) removal using dithizone modified biochitin (DiCh). Determination of the optimum removal conditions was carried out by means of 25 mL of Cr (VI) solution of 50 mg / L mixed with DiCh adsorbents (0.1; 0.2; 0.3; 0.4 and 0.5 gram) with contact time (0, 2, 4, 6 and 8 hours). Furthermore, the adsorption of electroplating wastes with known concentrations was also carried out (0.92; 9.38; 92.39; 986.42 and 13215.94 mg / L). The results of this study indicate that the optimum removal conditions of Cr (VI) using DiCh adsorbents were 0.4 grams with a contact time of 4 hours and the optimum concentration of 986.42 mg / L which had an adsorption percentage of Cr (VI) removal was 83.45 ± 0.78 %.
Removal of Chromium Hexavalent using Bentonite from Lampung with Modification using Acid Activation and ZnO Composite

Addy Rachmat¹, Nico Erlangga², Widia Purwaningrum¹, Muhammad Said¹

¹Dept. of Chemistry, Sriwijaya University, Palembang, South Sumatera

Corresponding email: addy_rachmat@unsri.ac.id

ABSTRACT

Bentonite from Lampung was successfully modified through acid activation and ZnO composite via sol-gel method. The prepared material characterization was evaluated through various techniques i.e. X-ray Diffractometer and Gas Sorption Analysis. Chromium hexavalent removal was conducted in batch mode in variety of time. Result shows that acid activation was able to make Bentonite structure opened and increase in surface area. XRD data indicate (003) plane at 2-theta 17deg decreased due to octahedral layer diminished along with formation of three dimensional silicate layers. The ZnO-impregnated Bentonite shows similar XRD pattern to acid activated Bentonite, which means no structural changes occurred. The pristine Bentonite has 6.46 m²/g surface area which was increased after being treated with acid to 47.8 m²/g. Upon impregnation with ZnO, Bentonite surface area was decreased to 11.5 m²/g due to surface blocked by ZnO particles. Adsorption-desorption isotherm of Bentonite before and after ZnO impregnation has similar hysteresis type of H3. The volume adsorbed at STP however shows markedly decreased as indicate by lower pore volume of ZnO-Bentonite. Adsorption test of Bentonite before and after ZnO impregnation against Cr(VI) shows slight different. The acid activation Bentonite was able to remove 46.6% after 120 minutes of adsorption whereas ZnO-Bentonite able to remove 48.7% Cr(VI) at 30 minutes adsorption process.

Solvent Effect at Ibuprofen Adsorption Using Zinc Oxide Plate Rod-Like from Gelatin

Maria Ulfa¹, Muh Ari Purnama Ali²

¹Dept. of Chemistry Education, Sebelas Maret University, Surakarta

Corresponding email: ulfa.maria2015@gmail.com

ABSTRACT

The ubiquitous occurrence of several pharmaceuticals in discharging sewage effluents has led to considerable deterioration of life and quality of receiving water bodies. Ibuprofen as nonsteroidal anti-inflammatory drugs represent a diverse class of drugs and are among the most commonly used analgesics for the management of pain and/or inflammation associated with rheumatoid arthritis and osteoarthritis, muscle stiffness, and pain, dental pain, migraine, and headache. The present work investigated the effect of different solvent for ibuprofen dissolution during adsorption of Ibuprofen onto plate, rod-like of zinc oxide from its hexana, methanol, ethanol solutions and water as co-solvent. The plate, rod-like of zinc oxide was synthesized using block copolymer and gelatin as a template and zinc sulphate as zinc precursor then were characterized by X-ray diffraction, Scanning electron microscopy and FTIR to analyze the structure and morphology. The impact of various solvent on percentage removal (%) of Ibuprofen was determined by batch adsorption experiments. The data obtained were subjected to isotherm and kinetic analysis in order to describe the distribution of ibuprofen between the liquid and solid phases in the batch studies. The results obtained best fitted the Langmuir isotherm model with the adsorption capacity close to 110 mg/g at room temperature with initial concentration 100 ppm. Sum up, for large scale removal ibuprofen treatment for aquatic body, plate, rod-like zinc oxide may be an adsorbent in future. Keywords: adsorption, plate rod-like of zinc oxide, metanol, hexana, etanol, solvent, capacity.
Metabolomics Approach for Standardization of Andrographis Paniculata Raw Material and Extracts

M Rafi1,2,3*, UD Syafitri2,4, R Heryanto1,2,3, E. Rohaeti1,2, Z. Arif1, DA Septaningsih1, A Rohman5, MB Amran6, B Prajogo7

1Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Pertanian Bogor, Bogor
2Pusat Studi Biofarmaka Tropika, Institut Pertanian Bogor, Bogor
3Advance Research Laboratoty (AR-Lab), Institut Pertanian Bogor, Bogor
4Departemen Statistika, Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Pertanian Bogor, Bogor
5Fakultas Farmasi, Universitas Gadjah Mada, Yogyakarta
6Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Institut Teknologi Bandung, Bandung
7Fakultas Farmasi, Universitas Airlangga, Surabaya

*Corresponding author: mra@apps.ipb.ac.id

ABSTRACT

Guarantee in the consistency of quality, safety, and efficacy of herbal medicines from the raw materials to its finished products is essential because medicinal plants have high variability in the content of bioactive components. Environmental growth, harvesting time, postharvest processes, genetics is some factor which significantly affects the composition and concentration of bioactive compounds in medicinal plants. Evaluation of the quality of herbal medicinal raw materials generally by measuring the concentration of one or a group of chemical components that have certain pharmacological activities in their constituent medicinal plants. This approach cannot provide a comprehensive and complete picture, so the quality control of medicinal plants must use a metabolomics approach. This approach will obtain information on all or classes of chemical components that can be detected for the evaluation of raw materials because there is the possibility of the work of a medicinal plant to be synergistic. In this study, we used metabolomics approach for standardization of sambiloto (Andrographis paniculata). Sambiloto was chosen for the proposed sample because it is a plant that is widely used in antidiabetic and one of the medicinal plants included in the scientification of jamu (Traditional Indonesian medicines). By using a metabolomics approach, we have characterized and classified sambiloto based on harvest time, plant parts, solvent extraction, and geographical origin.
Quantitative Analysis of Multi-components by Single Marker of Curcuma xanthorrhiza

Badrunanto*, Mohamad Rafi, Wulan Tri Wahyuni

*Dept. of Chemistry, IPB University, Bogor
Corresponding email: badrunanto@gmail.com

ABSTRACT

A new simple and effective routine analytical method for quantification of curcuminoids in Curcuma xanthorrhiza was established by high-performance liquid chromatography. This method based on chromatographic fingerprint combined with a quantitative analysis of multi-components by single marker (QAMS). Curcumin was selected as an internal marker for the determination of two other similar compounds, i.e. bisdemethoxycurcumin and demethoxycurcumin by using Relative Coefficient Factor (RCF). This chromatographic method has good linearity for each component (R > 0.9998) and the recoveries of extraction methods were within 100.23-103.95%. The precision of the method was good at inter-day and intra-day analysis (RSD < 4.0%). The stability of RCFs were good under various chromatographic conditions with RSD < 1%, thus the quantification of curcuminoids can be determined based on RCF. The ratio of retention time was used to locate each compound. The quantification of curcuminoids between QAMS and external standard method (ESM) proved the consistency and similarity of the two method (RSD < 2%). This study demonstrated that QAMS can be used as a routine method for quality control of curcuminoids in Curcuma xanthorrhiza as well as ESM. This method successfully proved accurate, stable, more effective and more simple than the external standard method. Key words: C xanthorrhiza, Curcuminoids, ESM, QAMS, RCF.

Synthesis of ZnO-Ag Nanocomposite Using Microwave Method with Clove oil

A’yunil Hisbiyah*, Khoirun Nisyak, Yulianto Ade Prasetya, Elvina Dhiaul Iftitah, Arie Srihardyastutie

*STIKES Rumah Sakit Anwar Medika, Sidoarjo
Corresponding email: yuihisbi@gmail.com

ABSTRACT

ZnO and Ag nanoparticle have known their antibacterial activity especially their use in medical materials. In this study, ZnO-Ag Nanocomposite was synthesized by microwave method with variation of reaction time using clove oil as their bioreductor. ZnO-Ag was prepared from Zn(II) acetate as a source of ZnO and AgNO3 as a source of Ag. The crystallinity structure, average particle size, morphology, and composition of ZnO-Ag were characterized by X-Ray Diffraction, Scanning Electron Microscope, and Energy Dispersive X-ray Spectroscopy. X-ray diffraction pattern indicates that the reaction time of 30 minutes has optimal synthesis results. The nanocomposite obtained consists of 43.2 % Ag nanoparticle, 17.5 % hexagonal Zincite, 14.6% Zinc Oxide, 14.5% wulfingite (deuterated), and 10.2% Zn(OH)2 with an average particle size of 28.29 nm according to Scherrer’s equation. The result of the scanning electron microscope showed that ZnO has an elongated shape and Ag has a round shape. Keywords: Clove oil, silver, zinc oxide, variations of reaction time, microwave method.
**Synthesis ZnO-Ag with Clove Oil through Sonication Method**

Khoirun Nisyak¹, A’yunil Hisbiyah¹, Yulianto Ade Prasetya¹, Elvina Dhiaul Iftitah³, and Arie Srihardyastutie²

¹ Dept. of Medical Laboratory Technology, STIKES Rumah Sakit Anwar Medika, Sidoarjo
² Dept. of Chemistry Department, Brawijaya University, Malang
³ Corresponding email: nisachemist@gmail.com

**ABSTRACT**

Synthesis ZnO-Ag nanocomposite has been successfully carried out by sonication method using clove oil as a reducing agent. The ZnO-Ag synthesis process was carried out by one pot synthesis method using an ultrasonicator and time variation carried out to determine the effect of time on crystallographic characteristics and the average particle size. The variation of synthesis time is 30, 60, 90, 120, 240, and 300 minutes. Crystallographic analysis was performed using an X-Ray Diffractometer (XRD) and the average particle size was calculated using the Debye – Scherrer equation. The best results of the particle size were morphologically analyzed by Scanning Electron Microscope – Energy Dispersive X-Ray Spectroscopy (SEM-EDX). Based on research that has been done, the best time for synthesis of ZnO-Ag with clove oil through sonication method is 30 minutes, the resulting particle size is 24.98 nm with the composition of Ag 26.1% (cubic), ZnO 33.5% (hexagonal), Zn(OH)₂ 32.5% (orthorhombic), and Ag 7.9% (hexagonal). Keyword: ZnO-Ag, Clove oil, Sonication, nanocomposite, and particle size.

**Green Microwave-assisted Synthesis of ZnO-Ag Nanocomposite using Clove Oil (Syzygium aromaticum L.) and Its Bioactivity against Staphylococcus aureus**

Rizki Wahyu Aji Wibowo¹, Elvina Dhiaul Iftitah³, Masruroh²

¹ Dept. of Chemistry, Brawijaya University, Malang
² Dept. of Physics, Brawijaya University, Malang
³ Corresponding email: vin_iftitah@ub.ac.id

**ABSTRACT**

The green microwave-assisted synthesis of zinc oxide-silver (ZnO-Ag) nanocomposite using clove (Syzygium aromaticum L.) plant extract which roled as a natural bioreduction and a stabilising agent has been investigated. Different variables (solvents and irradiation times) are reported in this paper. The characterization of the samples was carried out using XRD, FT-IR, and SEM-EDS also Gram-positive microbe, Staphylococcus aureus used to confirm its bioactivity. The result of XRD analysis showed that the nanocomposite ZnO-Ag product best was according to acetone and 30 minutes time reaction which clearly exhibited the presence of ZnO-Ag crystal also smallest size, where ZnO (9 – 16 nm) and Ag (10 – 12 nm). FT-IR spectrum indicates the absorption at specific wavenumber. The analysis of SEM-EDS show agglomeration and its arranged elements consist of Zn(46.89%), O(29.72%), and Ag(23.39%). The sample’s inhibition zone was 13.3 mm against S. aureus.
Qualitative Analysis of *Coleus Arthropurpureus* Ethyl Acetate Fraction and Antibacterial Activity on *Staphylococcus aureus*

Afidatul Muadifah¹, Ayu Kumala Sari¹, Choirul Huda¹, Indra Lasmana Tarigan²,³*

¹ Dept. of Pharmacy, STIKes Karya Putra Bangsa, Tulungagung
² Dept. of Health analyst, STIKes Karya Putra Bangsa, Tulungagung
³ Dept. of Chemistry, Universitas Jambi

*Corresponding email: indratarigan@unja.ac.id*

**ABSTRACT**

Staphylococcus aureus is a pathogenic microbe that is causing various diseases in humans and animals. Infectious diseases caused by *Staphylococcus aureus* in Asia reached 70% in 2007, while in Indonesia reached 23.5%. The plant provided several bioactive compounds that might function as an antibacterial which inhibit both bacterial growth and damaging the cell system and protein synthesis. *Coleus arthropurpureus* knew that contains alkaloids and tannins, that supposed to be antibacterial compound. Tannins have antibacterial activity, in general, the mechanism is to damage the bacterial cell membrane and induce the formation of complex compound bonds to enzymes or microbial substrates. The aim of this study to qualitatively and quantitatively analyze the bioactive compounds that contained in *Coleus arthropurpureus* which have an antimicrobial function using high-performance liquid chromatography (HPLC) in the reverse phase C-18 column and screening of antibacterial activity was carried out by disc-diffusion method. The results of both qualitative and quantitative analysis by HPLC was obtained the presence of tannin bioactive compounds (1.48 ppm at a retention time of 2,806 minutes) and alkaloids (1.11 ppm at a retention time of 7,015). Moreover, we verified the diameter of inhibition of growth zone against *Staphylococcus aureus* at a concentration of 15% extract were 12.80 mm. It was found that the highest percentage of bioactive compound in *Coleus arthropurpureus* is tanin, and that is might an antibacterial agent.

Physicochemical Properties and Antibacterial Activity of Castor Oil and Its Derivatives

Muh. Iqbal Fitranda¹, Sutrisno⁶, Siti Marfu’ah¹

¹ Dept. of Chemistry, State University of Malang, Malang

*Corresponding email: sutrisno.kimia@um.ac.id*

**ABSTRACT**

Castor oil is vegetable oil sourced from castor seeds (*Ricinus communis* Linn). The main content of fatty acids in castor oil are ricinoleic acid (84%), linoleic acid (7%), oleic acid (6%), and palmitic acid (1%). The fatty acids in castor oil are different from other oils, especially ricinoleic acid. Research on the antibacterial activity of castor oil and ricinoleic fatty acid has been carried out but for the K-soap and fatty acids methyl esters of castor oil have not been conducted. This research aims to produce castor oil derivatives, namely K-soap, free fatty acids (FFAs) and fatty acids methyl esters of (FAMEs) and evaluate their antibacterial activity. The results of the study included (1) K-soap (solid, white, melting point 168–175 °C), (2) free fatty acids (liquid, yellow, density 0.98 g.mL⁻¹, refraction index 1.46, viscosity 693.22 cSt, boiling point 210 °C, and the value of acids, saponification, and esters are 145.88, 294.52, 148.64), (3) fatty acids methyl esters (liquid, yellow, density 0.98 g.mL⁻¹, refraction index 1.46, viscosity 27.31 cSt, boiling point 170 °C, and the value of acids, saponification and esters are 0.33, 392.7, 392.37). Antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* will be reported in this paper.
Emulsifier and Antimicrobial Activity Against Propionibacterium acnes and Staphylococcus epidermidis of Oxidized Fatty Acid Esters from Hydrolyzed Castor Oil

Atika Nabilah 1, Sri Handayani 1, Siswati Setiasih 1, Dyah Utami C. R 1, Sumi Hudiyono PWS 1

1 Dept. of Chemistry, Universitas Indonesia, Depok

*Corresponding email: sumi.hudiyono@sci.ui.ac.id

ABSTRACT

The purpose of this study was to synthesize esters from oxidized fatty acids produced by castor oil hydrolysis as emulsifiers and antimicrobial compounds. Castor oil was hydrolyzed using KOH to produce fatty acids. The hydrolyzed fatty acids were then oxidized using KMnO₄ and the success of the oxidation was proven by determined the iodine number. Esterification was carried out with varied alcohols, namely methanol, ethanol, isopropanol, and 1-butanol using ZnCl₂ as catalyst and the mole ratio between fatty acids and alcohol was 1:2. Conversion percentage of esterification was determined using titrimetric method and the product was characterized using FTIR. From the hydrolysis of castor oil, 84% of fatty acids were produced. Decreasing iodine number from 43.38 mg/g to 13.11 mg/g and increasing intensity of the -OH group absorption in the FTIR spectrum showed the success of fatty acids oxidation. FTIR spectrums of the ester products showed the absorption of a typical C=O ester group at 1750-1735 cm⁻¹ and C-O-C at 1300-1000 cm⁻¹. The emulsifier test showed that the ester products have emulsifier ability and the emulsions were stable up to 24 hours with a water-in-oil (w/o) emulsion type. The best ability as an emulsifier was demonstrated by methyl ester. The results of antimicrobial assay against Propionibacterium acnes and Staphylococcus epidermidis showed that all ester products could inhibit the growth of both bacteria. The largest inhibition zone was obtained from isopropyl ester for P. acnes by 16 mm and butyl ester for S. epidermidis by 17 mm. Keywords: castor oil, oxidized fatty acid esters, emulsifier, antimicrobial agent
Characterisation of Biocrude Oil Produced from Slow Pyrolysis of Macaranga motleyana: Effect of Sample Size

RR Dirgarini Julia Nurlianti Subagyono, Rika Puspitasari, Ari Susandy Sanjaya, Wiwin Suwinarti

1 Chemistry Department, Faculty of Mathematics and Natural Sciences, Mulawarman University
2 Chemical Engineering Department, Faculty of Engineering, Mulawarman University
3 Forestry Department, Faculty of Forestry, Mulawarman University

*Corresponding email: dirgarini@fmipa.unmul.ac.id

ABSTRACT

The characterization of biocrude oil produced by slow pyrolysis of fast growing wood Macaranga motleyana wood has been carried out. Slow pyrolysis was carried out in a fixed bed pyrolysis reactor at 500 °C for 1 hour with a variety of wood sample size. The decrease of sample size from 20 to 40 mesh resulted in an increase in the percent yields of liquid product, which were 28.5 wt.% and 36.1 wt.%, respectively. Characterisation of the biocrude oil showed that the pH of the biocrude oil was 2, the density of biocrude oil was 1.132 g / mL, while the viscosity value of the biocrude oil was 53.6 cSt. Analyses of the biocrude oil using a Gas Chromatography-Mass Spectrometry (GC-MS) revealed that the biocrude oil derived from Macaranga motleyana wood contained phenol and its derivatives, such as eugenol and compounds resulted from thermal degradation of cellulose or hemicellulose. The decrease of sample size resulted in biocrude oil containing more chemical compounds.

Synthesis of Carbon Nano Material Composite from Patchouli Biomass by Pyrolysis Method Combination

Tutik Setianingsih, Siti Mutrofin, Suratmo, Bambang Ismuyanto, Andreas Novan Endaryana, Vahlevi Permatasari, Dhimas Yudistira

1 Department of Chemistry, Faculty of Science, Brawijaya University, Malang
2 Department of Chemical Engineering, Faculty of Engineering, Brawijaya University, Malang

*Corresponding email: tutiksetia@ub.ac.id

ABSTRACT

Carbon nanomaterial is potential for many applications due to its unique physicochemical properties. This material was synthesized from patchouli biomass with pyrolysis method combination, i.e reflux - microwave and hydrothermal-microwave toward surface functional groups, crystal structure, and surface morphology. A mixture of ZnCl₂ activator and the biomass was pyrolysed by reflux and hydrothermal method at each 200°C for 5 hrs. Then, pyrolyzed again in a microwave at 800W for 40 minutes. The products were characterized by FTIR spectrophotometry, XRD, dispersion test, and SEM. Results of the research show that the hydrothermal – microwave method resulted in a darker product than the reflux – microwave one. FTIR spectra show weaker bands connected to C=C and C-O groups for the carbon produced by hydrothermal – microwave than reflux – microwave. XRD diffractograms show similar pattern with CNT but with a shift of peaks to lower 2θ position. SEM images confirm that the hydrothermal – microwave method produced a smaller particle of carbon than reflux – microwave. The dispersion test shows both products formed colloid and suspension system in a water solvent. Keywords: carbon nanomaterial, biomass, physicochemical, pyrolysis method.
The Effects of Biochar and Biochar-Fe Nano-Particles Amendment on Stabilisation of Dissolved Organic Carbon In The Soils Impacted by Tropical Forest Transformation

Ngatidjo1, Diah Riski Gusti1, Damris Muhammad1

1 Department of Chemistry, Faculty of Science and Technology, Universitas Jambi, Indonesia

Corresponding email: damris@unja.ac.id

ABSTRACT

The application of biochar for environmental purposes is receiving widespread interest in the last two decades. However, its application for stabilization of dissolved organic carbon (DOC) in the soils impacted by tropical forest transformation systems is limited. Biochar was synthesized from two agricultural wastes (paddy straw and coffee husk) and pyrolyzed at three temperatures (400, 500 and 600°C). Biochar-Fe nanoparticles were synthesized from FeCl3 and FeCl2 precursors with the sol-gel method. Soil samples were collected from smallholders of palm oil plantations as the most impacted by the tropical forest transformation in Jambi Province, Indonesia. Short-term soil incubations were used to study the effects of relevant biochar amendment on DOC stabilization in and CO2 emission from the soils. In addition, the effects of litter addition to the soils on CO2 emission and DOC production were also studied with separate incubation experiments. Approximately individual 750 g of soil-biochar, soil-biochar-Fe nanoparticles, and soil-biochar-litter mixtures were added into 1000-ml incubation bottles and sealed with aluminum. The gas produced during the course of incubations of (soil-biochar, soil-biochar-Fe nanoparticles, and soil-biochar-litter) at the bottle empty headspace was collected in an absorbing solution of 1 M NaOH. A small fraction of the solid was also collected from the bottle during the course of 8-week incubation periods. Carbon dioxide concentrations in the absorbing solution were determined with acid-base titration and water-extractable DOC from the solids (soil-biochar, soil-biochar-Fe nanoparticles, and soil-biochar-litter) was analyzed with UV-VIS spectrometer. Surface morphology, the composition of functional groups and surface area of biochar and biochar-Fe nanoparticles were studied with Scanning Electron Microscope-Energy Dispersive X-Ray Analyzer (SEM-ADX) and Fourier Transform Infrared (FTIR) Spectroscopy. Biochar-Fe nanoparticle effects on DOC stabilization in the soil of the palm oil plantation were significantly different from control but not significant from biochar only addition. Soil-biochar mixture treatments with litter resulted in higher DOC production in the solids and CO2 emission which is attributed to the priming effect of litter addition. However, this is also followed by the improvement of DOC stabilized in the solids.

Keywords: biochar, nanoparticle, pyrolysis, dissolved organic carbon.
Lime and Lemon Juice as Green Catalyst of 1,8-dioxo-hydroxanthene Derivatives Synthesis from Vanillin Under Free Solvent

Rini Retnosari1, Sutrisno1, Meyga Evi Ferama Sari1, Ihsan Budi Rachman1, Dedek Sukarianingsih1, Yaya Rukayadi2

1 Department of Chemistry, Faculty of Mathematics and Natural Sciences, State University of Malang
2 Institute of Bioscience, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

*Corresponding email: rini.retnosari.fmipa@um.ac.id

ABSTRACT

1,8-dioxo-hydroxanthene derivatives (compound 1a) has been successfully synthesized from vanillin (4-hydroxy-3-methoxybenzaldehyde) and dimedone using lime and lemon juice as green catalyst under free solvent. Both lime juice and lemon juice contain rich citric acid that can be used as an acidic catalyst for the synthesis of 1,8-dioxo-hydroxanthene via Knoevenagel condensation. Beside that vanillin can be isolated from Vanilla planifolia Andrews fruits and it is usually used as a flavor. This work used materials from natural resources that are environmentally safe, low toxicity, inexpensive, and readily available. Lime and lemon juice also can be used as reaction media to avoid organic solvent. The product is easily separated from reaction media by filtration and recrystallization from ethanol. The purity of the product and its molecular mass is determined by GC-MS. Then, the structure of the product is determined based on spectroscopic data. Keyword: 1,8-dioxo-hydroxanthene, vanillin, lime juice, lemon juice, green catalyst.
Synthesis of Chitosan from Snail Shells (Pila ampulaceae) and its Potential as a Coating Agent for Preservation of Podang Mango

Riska Surya Ningrum¹, Dewi Sondari¹, Aisyah Hadi Ramadani², Reny Rosalina³, Desy Yustiyani⁴

¹Research Center for Biomaterials, Indonesian Institute of Sciences, Jl Raya Bogor km 46 Cibinong, Bogor, West Java 16911, Indonesia.
²Generasi Biologi Indonesia Foundation, Jl. Swadaya Barat 4, Gresik, Jawa Timur, Indonesia
³Graduate student of Biomedical Sciences Program, Khon Kaen University Thailand
⁴Student of Undergraduate Pharmacy Study Program, Faculty of Pharmacy, Institut Ilmu Kesehatan Bhakti Wiyata, Kediri, Indonesia

*Corresponding email: riska_suryaningrum17@yahoo.com

ABSTRACT

Podang mango is an endemic fruit of Kediri Regency which has a relatively short post-harvest shelf life. Physiological factors and pathogenic fungal contamination accelerate decay. Coating is a way to extend the shelf life and maintain fruit quality during storage. In this research, chitosan was synthesized from shell of P.ampulaceae using demineralization, deproteination, and deacetylation methods. The chitosan that was obtained was tested for its antifungal activity against F.oxysporum using the disk diffusion method with variations in concentration 0.5%, 1%, 1.5%, and 2%. The effect of coating with active ingredients on fruit quality was analyzed experimentally using three treatments which were negative control, chitosan, and chitosan-gelatin with 3 replications. The parameters measured were color, texture, aroma, water content, vitamin C, and weight loss. Chitosan which was successfully synthesized has deacetylation degree 53.86 on characterization using FTIR. The antifungal assay gave result that chitosan 2% was the most effective in inhibiting the growth of F.oxysporum. The effect of coating by adding chitosan to the composition of the coating agent could extended the shelf life until 14 days of storage and maintaining the quality of podang mango. Chitosan-gelatin coating showed the best treatment in reducing weight loss (8.97%), maintaining aroma (sweet fragrance), texture (soft), water content (84%), and vitamin C (0.182%). Chitosan combined with gelatin as a coating agent becomes the most optimal preservation material and is recommended for application on Podang mangoes.
Patch Film Based On HPMC And Chitosan Containing Peppermint Essential Oil (Mentha piperita)

Miksusanti1, Herlina2, Fitrie A.N3, Anggraini H.T1, Tarmizi Taher1

1Chemistry Department FMIPA Sriwijaya University
2Pharmacy Department FMIPA Sriwijaya University

*Corresponding email: miksusanti@unsri.ac.id

ABSTRACT

This study is aimed to incorporate peppermint essential oil (Mentha piperita) into patch. Patches were incorporated peppermint essential oil (Mentha piperita) were tested for their ability to inhibit the activity of bacteria Staphylococcus aureus and were analyzed for physical properties. Patches were prepared in several formulas i.e. the addition of essential oils with volume ratio 0 µL/mL (F I), 32 µL/mL (F II), 48 µL/mL (F III), 64 µL/mL (F IV), and 80 µL/mL (F V) of the total polymer volume (L). The patch obtained was tested for antibacterial activity and physical properties. The results showed that the five patches had variety of weight, thickness and folding endurance comply with the standard, as well as good swelling index. Formula V contained 80 µL/mL of peppermint essential oil was chosen as the best formula because it could inhibited Staphylococcus aureus in the active category with inhibitory zone values of 14.37 ± 0.92 mm. Antibacterial compounds within peppermint essential oils detected by GC-MS were l-Menthone, Isomenthone, p-Menthan-1-ol, Menthol, D-limonene, Isopulegol, Isomenthol acetate, Pulegone, Isocaryophyllene, dan α-caryophyllene. The result of this work verify that peppermint essential oils incorporation into patch shows antibacterial activity and good physical properties. Keywords : Peppermint essential oils (Mentha piperita), Patch, Staphylococcus aureus, HPMC and chitosan.

Corrosion Inhibitor Spray of Acacia Bark Extract For Sulfuric Acid Corrosion and Sodium Chloride on Mild Steel

Diah Riski Gusti1, Intan Lestari1, Faizar Farid1, Putri Anggraini1, Rismatua Oktafiani1

1 Chemistry Department, Faculty of Science and Technology, Jambi University, Jambi

*Corresponding email: diahgusti07@yahoo.co.id

ABSTRACT

Corrosion inhibition of acacia bark extract (ABE) has been carried out to inhibit corrosion-sulfuric acid and corrosion-sodium chloride on mild steel. Phytochemical tests on acacia bark extract contain tannins and flavonoids. This research uses a weight-loss method. ABE solutions in spray bottles sprayed on mild steel can reduce corrosion rates compared to those not sprayed. The corrosion inhibition efficiency by ABE spray to corrosion-sodium chloride is greater than corrosion-sulfuric acid. ABE spray is a good inhibitor. Keywords: spray, inhibitor, acacia bark, extract, mild
2-(4-Hydroxyphenyl-2-oxoethyl-2-phenylacetate (pHP-PA) Derivatives and their Photochemical Application

Al Anshori, J.*, Ladányi, V., Heger, D., Rubina, M., Givens, R.S., Klan, P.

*Dept. of Chemistry, FMIPA, Universitas Padjadjaran, Bandung, Indonesia
1Dept. of Chemistry, Faculty of Science, Masaryk University, Brno, Czech Republic
2Dept. of Chemistry, Faculty of Pharmaceutical Chemistry. The University of Kansas, United States of America

*Corresponding email: jamaludin.al.anshori@unpad.ac.id

ABSTRACT

The pHP-PA derivatives were successfully synthesized in 2–5 steps with 26–71% overall chemical yields. The disappearance quantum yields of pHP-PA derivatives under various conditions and bearing various substituents were found to affect strongly their acidity constants. The pHP-PA derivatives (7b–e and 11) are suggested as model compounds for further comprehensive studies of the mechanism of LG release from the triplet state of these derivatives. In addition, the pHP-PA 3a derivative is suggested to serve as an actinometer in the irradiation wavelength range of 254–313 nm. Our result suggest that the pHP-PA 3a derivative may serve as a good candidate for actinometry thanks to its relatively simple photochemistry, and because the course of the reaction can easily be analyzed by UV/Vis spectrophotometry, 1H-NMR or HPLC, and also because the reaction is free of photoproduct interferences. Moreover, the quantum yield of its neutral (protonated) form is independent of the excitation wavelength and the presence of oxygen.

Synthesis of ZnO/rGO/TiO₂ Composites and its Photocatalytic Performance for Rhodamine-B Degradation

Haniffudin Nurdiansah*, Rena Eka Firlyana*, Diah Susanti*, Hariyati Purwaningsih*

*Department of Materials Engineering, Faculty of Industrial Technology, Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia

*Corresponding email: haniffudin@mat-eng.its.ac.id

ABSTRACT

Today the growth of the textile industry in Indonesia is increasing. One example of dangerous textile waste is Rhodamine B. Therefore we need a method to treat Rhodamine B waste. One method that can be used is photocatalyst. ZnO and TiO₂ semiconductors are known as good photocatalyst materials because they have small bandgap energy. In addition, reduced graphene oxide (rGO) has potential due to its good conductivity and large surface area. This study aims to synthesize ZnO/rGO/TiO₂ composites. From the XRD results of composite, the peaks corresponding to the XRD pattern of ZnO, TiO₂, and rGO were obtained. From the results of SEM testing obtained in the form of sheets (rGO), agglomerates (TiO₂), and hexagonal nanorod (ZnO). This is furthermore confirmed by the results of EDX testing which shows wt% of C: O: Ti: Zn equal to 2: 21: 13: 63. From the FTIR results, C-O peaks at 998 cm⁻¹, Ti-O-Ti at 506 cm⁻¹ and Zn-O at 497 cm⁻¹ were obtained. From the photocatalytic test, the value of degradation of Rhodamine-B by the composite obtained 94.72% at the time of 5 hours under UV light irradiation. Keyword: Rhodamine-B; Waste; ZnO/rGO/TiO₂; Photocatalyst; Degradation
Hydrothermal Synthesis of Titanium Dioxide Nanotube Using Methylamine for Photodegradation of Congo Red

Cheng Yee Leong¹, Pei Wen Koh¹, Ye Shen Lo¹, Siew Ling Lee¹,²*

¹Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81300 Johor Bahru, Malaysia
²Centre for Sustainable Nanomaterials, Ibnu Sina Institute for Scientific and Industrial Research, Universiti Teknologi Malaysia, 81300 Johor Bahru, Malaysia. sillee@ibnusina.utm.my

ABSTRACT

Titanium dioxide (TiO₂) nanotube photocatalyst is highly desired for the photodegradation of dye in waste water treatment. A series of titanium dioxide nanotube photocatalysts were successfully synthesized by using methylamine as N-ligand via hydrothermal treatment at different hydrothermal temperatures and hydrothermal durations. The effect of these two parameters on the photocatalytic activity of synthesized materials were investigated. TEM micrographs and XRD analysis depicted methylamine assisted the transformation of anatase TiO₂ nanoparticles to nanotube via the exfoliation of TiO₂ crystallite into layered sheet and promoted the curling of layered sheet, forming nanotube. Hydrothermal temperature up to 180°C was able to fully transform the morphology of anatase TiO₂ nanoparticles into nanotube. The reaction duration was further modified by keeping the temperature constant at 180°C. Fluorescence analysis showed that 24 h hydrothermal duration gave the slowest electron-hole recombination rate. DR-UV-Vis analysis indicated that the synthesized samples were active under UV region. The photocatalytic performance of the synthesized materials was tested in the photodegradation of congo red under UV irradiation. The results suggested that among the materials synthesized, TiO₂ nanotube synthesized at 180°C, under 24 h hydrothermal duration appeared to be the most superior photocatalyst which gave the highest photocatalytic activity of 77%. Possible mechanism of the TiO₂ nanotube formation with methylamine as N-ligand is presented.

Rahmat Gunawan$^*$, Erwin$^2$, RR Dirgarini JNS$^1$

$^1$Lab. of Physical Chemistry, Dept. of Chemistry, Mulawarman University
$^2$Lab. of Organic Chemistry, Dept. of Chemistry, Mulawarman University
*Corresponding email: rahmat.gunawan@yahoo.co.id

ABSTRACT

Electron transfer studies on the interaction of molecular systems cyanidin-TiO$_2$-graphene and curcumin-TiO$_2$-graphene have been carried out. The method used in all calculations uses the Density Functional Theory method. The calculation of the HOMO-LUMO difference from the cyanidin and curcumin molecules is 8.03 eV and 7.65 eV, respectively. The best distance calculation between cyanidin and curcumin molecules on the TiO$_2$-graphene surface is 4.4 Å and 4.6 Å, respectively. While the PDOS calculation obtained the price of band gap from the TiO$_2$-graphite system was 2.03 eV while in the cyanidin and curcumin system the TiO$_2$-graphite system was 3.51 eV and 3.75 eV, respectively. The electron transfer shown by the value of the isosurface shows the transfer of electrons from the p and d sub orbitals from the TiO$_2$-graphene surface to the s and p sub orbitals on the cyanidin and curcumin molecules of +0.746 e / Å and +0.875 e / Å, respectively. These results indicate that the interaction of the curcumin molecule in the TiO$_2$-graphe system is stronger than the cyanidin molecule.

Structure Transformation of TiO$_2$ Rutile into Anatase by Solid State Reaction

Khusnul Khotimah$^1$, Tanti Haryati$^1$, Novita Andarini$^1$, Yudi Aris Sulistio$^1$, Suwardiyanto$^*$

$^1$ Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java
*Corresponding email: antokfmipa@unej.ac.id

ABSTRACT

TiO$_2$ anatase has the highest photocatalytic activity among the other TiO$_2$ and it is obtained by the sol-gel technique. This method involves expensive titanium precursors hence it needs an alternative. The solid-state reaction can be employed to obtain TiO$_2$ anatase from the TiO$_2$ rutile. A mixture of Na$_2$CO$_3$ and TiO$_2$ rutile at various ratios was reacted at 800 C results in sodium titanate. Sodium removal was conducted by acid leaching and ion exchange to give amorphous TiO$_2$. TiO$_2$ anatase from acid leaching is more crystalline than TiO$_2$ obtained by ion exchange whereas more Na$_2$CO$_3$ in synthesis sodium titanate results in smaller TiO$_2$ anatase particle size through ion exchange. Keywords: Structural transformation, solid-state synthesis, rutile, anatase
The Structural and Optical Band Gap Energy Evaluation of TiO2-Fe2O3 Composite

Rendy Muhamad Iqbal¹, Dyah Ayu Pramoda Wardani¹, Luqman Hakim¹, Akhmad Damsyk¹, Hamzah Fansuri²

¹Department of Chemistry, Faculty of Mathematic and Natural Science, Universitas Palangka Raya, Kampus UPR Tunjung Nyaho, Palangka Raya 73111, Indonesia
²Department of Physics, Faculty of Mathematic and Natural Science, Universitas Palangka Raya, Kampus UPR Tunjung Nyaho, Palangka Raya 73111, Indonesia
³Department of Chemistry, Faculty of Science, Institut Teknologi Sepuluh Nopember, Kampus ITS Sukolilo, Surabaya 60111, Indonesia

*Corresponding email: iqbal.rm@mipa.upr.ac.id

ABSTRACT

Solar cells are one of the promising alternative energy in the 2000s, this is due to the absence of emissions or waste generated by this energy source (clean energy). One type of solar cell is the Dye Sensitizer Solar Cell (DSSC). One important device that generates electricity in DSSC is photoanode, the most widely used TiO2 material as photoanodes in the current era, but the energy gap of the TiO2 band is quite large at 3.2 eV. This study aims to reduce the energy gap of TiO2 band by forming composites with Fe2O3. Solids of TiO2 and Fe2O3 are dispersed with various compositions into methanol and stirred until homogeneous, then methanol is evaporated to obtain a mixture of solids, then the solids are calcined to form composites. These composites were characterized by XRD and UV-Vis Diffuse Reflectants Spectrophotometer. The results of XRD characterization showed that the peaks on the composite diffractogram had similarities with the peaks belonging to TiO2 and Fe2O3. In addition, the greater the composition of Fe2O3 in composites, the peak intensity increases while the peak intensity of TiO2 decreases. The results of the characterization with UV-Vis Diffuse Reflectants spectrophotometer showed that there was a change in band gap energy, the lowest band gap energy was 2.67 eV for TiO2-Fe2O3 with a ratio of 1:4. In addition, the refractive index value calculated by Ravindra relation shows that the lowest value is 2.0752 and the highest is 2.4286, the value is reversed with the band gap energy which if the band gap energy increases the refractive index decreases. Another parameter is the high frequency dielectric constant has the opposite pattern of increasing band gap energy, while for the static dielectric constant the opposite.
Inexpensive Solar Cell Using TiO$_2$/Coffee Composite As Photon Absorbing Material

Dui Yanto Rahman$^1$, Fisca Dian Utami$^1$, Nadya Amalia$^1$, Rita Sulistyowati$^1$, Mikrajuddin Abdullah$^1$

$^1$Department of Physics, Bandung Institute of Technology, Bandung, West Java, Indonesia

*Corresponding email: duiyantorahmanmsi@gmail.com

ABSTRACT

Solar cell using TiO$_2$/coffee composite as photon absorbing material has been successfully fabricated. A suspension of TiO$_2$/coffee was poured on the fluorine tin oxide substrate which was heated on the hotplate with a temperature of 100°C. The content of coffee was varied from 10, 20, 30, 40 to 50% compared to the mass of TiO$_2$. PVA-LiOH polymer electrolyte was employed to function as a hole transport medium. The highest efficiency of 0.76% was achieved with 40% of the coffee fraction. This solar cell is promising to be developed in the future due to the easy method and cheap materials used. Keywords: TiO$_2$, coffee, photon, polymer electrolyte, efficiency.

Carbon-coated single-phase Ti4O7 nanoparticles as electrocatalyst support

Christina Wahyu K$^1$, Aditya F. Arif[1,2,], Osi Arutanti$^3$, Takashi Ogi$^1$

$^1$Department of Chemical Engineering, Graduate School of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi-hiroshima 739-8527, Hiroshima, Japan

$^2$Department of New Investment, PT Rekayasa Industri, Jalan kalibata Timur I no 36, Jakarta 12740, Indonesia

$^3$Research Center for Chemistry, Indonesian Institute of Sciences, Kawasan Puspitek, Serpong, Tangerang 15314, Indonesia

*Department of Engineering, Chemical Engineering, Brawijaya University, Jalan Mayjen Haryono 167, Malang, Jawa Timur 65145, Indonesia

*Corresponding email: aditya_farhan@rekayasa.co.id

ABSTRACT

The unique structure of Magnéli phases TiO$_x$ renders them effective for the electrochemical applications. This work demonstrates a synthesis of carbon-coated Magnéli phases TiO$_x$ (TiO$_x$@C) nanoparticles from 3-aminophenol and rutile titania (TiO$_2$) nanoparticles as a support for platinum (Pt) electrocatalyst. 3-aminophenol was polymerized and carbonized on the surface of TiO$_2$ nanoparticles respectively in a microwave hydrothermal reactor and a tubular furnace. Reduction of the carbon-coated TiO$_2$ (TiO$_2$@C) into TiO$_x$@C was performed in hydrogen atmosphere at 800-1050 °C. The carbon coating effectively prevented TiO$_2$ nanoparticles from sintering, resulted in TiO$_x$@C sizes from 50 to 100 nm. Single-phase Ti$_4$O$_7$ core, which has the highest theoretical electrical conductivity among the Magnéli phases, was obtained from reduction of TiO$_2$@C at 1000 °C. For 10 min C/TiO$_2$-supported Pt exhibited an electrochemical surface area of 46 m$^2$ mgPt$^{-1}$ at 15% Pt loading, slightly higher than that reported for commercial TKK electrocatalyst with 20% Pt loading (44.13 m$^2$ mgPt$^{-1}$).
**Synthesis, Characterisation, and Photocatalytic Activity of Bismuth oxide Prepared by Solution Combustion Method**

Fikrian Kasalji*, Didik Setiyo Widodo, Hendri Widhyandari, Yayuk Astuti

1Chemistry Department, Faculty of Science and Mathematics, Diponegoro University, 50275, Semarang, (Central Java) Indonesia
2Physics Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, 57126, Surakarta, (Central Java) Indonesia

*Corresponding email: fikrian.kasalji96@gmail.com

**ABSTRACT**

Bismuth oxide is a semiconductor metal oxide potential as a photocatalyst due to its wide band gap. This metal oxide can be synthesized by solution combustion method. The solution combustion method is chosen since efficient in time and energy, simple and easily controlled particle size. There are 2 important components in this method namely fuel and oxidant. One factor influencing this method is the ratio of fuel-oxidant. The purpose of this study is to synthesize bismuth oxide with variations of fuel-oxidant ratio ($\phi > 1$, $\phi = 1$, and $\phi < 1$), determine the characteristics and photocatalytic activity of obtained products to degrade dyes molecules. The fuel and oxidant applied in this research were glycine and bismuth nitrate pentahydrate, respectively. Firstly, bismuth nitrate pentahydrate was dissolved in nitric acid and added glycine (the amount of the chemicals depending on the ratio applied). The solution had been heated at 300 °C for 8 hours and then calcined at 700 °C for 4 hours. The obtained products were yellow powder indicating bismuth oxide was formed. This result was strengthened by FTIR spectra which showed the presence of Bi-O-Bi and Bi-O functional groups. Furthermore, diffractogram indicated a mixture of $\alpha$-Bi$_2$O$_3$ and $\beta$-Bi$_2$O$_3$ contained in all products with morphology coral reefs-like. Even though the content of the crystal structure is the same, the particle size of the bismuth oxide ratio 1 is the smallest followed by a ratio of $\phi > 1$ and $\phi < 1$. The difference in the ratio of fuel oxidant also led to different band gap energy values that are 2.584, 2.581, and 2.625 for bismuth oxide $\phi > 1$, $\phi = 1$, and $\phi < 1$ respectively. Differences in characteristics among the products caused different photocatalytic activities. Bismuth oxide ratio 1 has better photocatalytic activity compared to the other two products in degrading remazol black B, methyl orange and rhodamine B dyes. Keywords : Bismuth Oxide, Solution Combustion, Glycine, Photocatalytic Activity, Photocatalyst

Trie Nanda Mulyana Purba*, Adi Darmawan¹, Yayuk Astuti¹

¹ Dept of Chemistry, Faculty of Science and Mathematics, Diponegoro University, Semarang

*Corresponding email: trienandamulyana@gmail.com

ABSTRACT

Bismuth oxide is a metal oxide semiconductor material that can be used as a photocatalyst owing to its wide bandgap energy of 2-3.96 eV. One of the methods used for bismuth oxide synthesis in solution combustion. The advantages of this method are easy, inexpensive, and better product homogeneity. It is known that the ratio of fuel/oxidant in material synthesis by this method affects the physicochemical properties of the obtained products such as crystal structure, morphology, and photocatalytic activity. Therefore, this study aims to examine the effect of the ratio of fuel-oxidant on bismuth oxide synthesis by this method on the physical and chemical properties of the products formed. The stages of this research include: synthesis of bismuth oxide with bismuth nitrate pentahydrate as oxidant and hydrazine as fuel with variations in the ratio of fuel-oxidant ($\phi$) <1, = 1 and > 1. At first, the oxidant was dissolved into nitric acid and then added hydrazine fuel, stirred until a solution was formed then heated at 300 °C for 8 hours. The obtained product was then calcined at 700 °C for 4 hours. The results showed that the products formed in the form of yellow powder indicating that bismuth oxide was formed. This is reinforced by the appearance of peaks at wave numbers around 840 and 1400 cm⁻¹ attributed to Bi-O and Bi-O-Bi functional groups. Furthermore, the diffractogram peaks indicated that the obtained products contained $\alpha$-Bi$_2$O$_3$ for products ratio <1 and > 1 while product ratio = 1 contained a mixture of $\alpha$-Bi$_2$O$_3$ and $\beta$-Bi$_2$O$_3$. SEM images described the morphology of the product in the form of gravel with particle sizes from smallest to largest is owned by bismuth oxide ratio > 1, = 1 and < 1 respectively. Meanwhile, the bandgap energy values were 2.76, 2.72 and 2.78 for bismuth oxide ratios <1, = 1 and > 1 respectively. The difference in characteristics caused the photocatalytic activity of the product ratio = 1 to be higher than other products as indicated by the degradation percentage and the degradation rate constant. Keywords: Bismuth oxide, solution combustion, fuel-oxidizer ratio, photocatalyst, photocatalytic activity, organic molecules dyes
Preparation of Bismuth Oxide Using Urea-Fueled Solution Combustion Method For Organic Dye Molecules Decolorisation

Rahma Demy Fitria Irbati\textsuperscript{1}, Yayuk Astuti\textsuperscript{1}, Amelli\textsuperscript{1}, Hendri Widiyandari\textsuperscript{2}

\textsuperscript{1}Dept. of Chemistry, Faculty of Science and Mathematics, Diponegoro University, Semarang
\textsuperscript{2}Dept. of Physics, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Surakarta

*Corresponding email: rahmademy25@gmail.com

ABSTRACT

Bismuth oxide (Bi$_2$O$_3$) is a wide band-gap material (2.389 eV), potential as a good semiconductor photocatalyst material. Bi$_2$O$_3$ can be synthesised by a solution combustion (SC) method with urea as a fuel and bismuth nitrate pentahydrate as an oxidant. This method has some advantages that are the result of the particle size can be controlled, the process is simple and the energy needed is more efficient. One of the factors influencing the synthesis material using this method is the fuel-oxidant ratio since it affect the physicochemical properties of obtained products. This study aims to synthesize bismuth oxide using the SC method with variations in the ratio of fuel-oxidant ($\phi$), namely $\phi > 1$, $\phi = 1$ and $\phi < 1$, determine the characteristics of obtained products and also their photocatalytic activity in decolorizing remazol black b (RBB) and methyl orange (MO) as pollutant models. The success of bismuth oxide formation was indicated by the presence of Bi-O-Bi and Bi-O functional groups in the FTIR spectra in the products. The characterization results showed that the three obtained products had dominant phases $\alpha$-Bi$_2$O$_3$ and $\beta$-Bi$_2$O$_3$ with bandgap energy values of each ratio were 2.56 eV, 2.57 eV, and 2.60 eV. Meanwhile, the morphology of all products showed irregular shape and coral reef-like with bismuth oxide ratio 1 has the smallest particle size. The different characteristics caused photocatalyst activity of all products on RBB and MO dyes decolorisation was different in which bismuth oxide ratio 1 gave better photocatalytic activity compared to others, as indicated by the decolorisation percentage and the decolorisation rate constant for each RBB and MO dyes were 70.34\% and 88.35\% and 66,238 x 10^{-5} \text{s}^{-1} and 6,6761 \times 10^{-5} \text{s}^{-1}, respectively. Keywords: bismuth oxide, solution combustion, photocatalytic activity, dyes molecules decolorisation
**Performance of Bismuth Oxide Prepared by Citric Acid-Fueled Solution Combustion Method For Degradation Of Organic Dye Molecules**

Dhina Anggraeni¹, Yayuk Astuti¹, Adi Darmawan¹, Hendri Widiyandari²

¹ Dept. of Chemistry, Faculty of Science and Mathematics, Diponegoro University, Semarang
² Dept. of Physics, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Surakarta

*Corresponding email: dhinaanggraeni72@gmail.com*

**ABSTRACT**

Bismuth oxide, a pale yellow material with a melting point of 825°C, is commonly used as a photocatalyst because it has a wide band gap value (2.3-3.6 eV). Bismuth oxide synthesis can be done by several methods including solution combustion. One factor that influences this method is the fuel-oxidant ratio which will affect properties such as surface area, morphology, crystal structure, and particle size of the obtained products. This study aims to synthesize bismuth oxide using a solution combustion method with variations in the ratio of citric acid (fuel)-bismuth nitrate pentahydrate (oxidant) (\(\phi\)), namely \(\phi = 0.8\), \(\phi = 1\), and \(\phi = 1.2\), determine the characteristics of obtained products using FTIR, XRD, SEM, and DRS-UV, and determine their photocatalytic activity to degrade dyes remazol black b (RBB) and methyl orange (MO).

Synthesis of bismuth oxide started by dissolving bismuth nitrate pentahydrate in nitric acid, then adding citric acid and then stirring. The mixture formed was heated for 8 hours at 300°C then calcined for 4 hours at 700°C. Furthermore, characterization and photocatalytic activity test were carried out. The obtained products were pale yellow powder indicating bismuth oxide has formed. This is confirmed by FTIR spectra showing peaks at wave numbers of around 840 cm⁻¹ attributed to Bi-O-Bi bonds and also peaks at wave numbers of around 1400 cm⁻¹ assigned as Bi-O bonds. In addition, diffractograms of the three products showed the presence of \(\alpha\)-Bi₂O₃; and \(\beta\)-Bi₂O₃ all ratio variations. However, the band-gap values and morphology for each product differ slightly. The band-gap value of bismuth oxide ratio 1 is 2.56 eV while the ratio of 0.8 and 1.2 has a band gap value of 2.59 eV. Moreover, particle size of bismuth oxide ratio 1 is smallest. These different characteristics led to the photocatalytic activity of the bismuth oxide ratio 1 photocatalytic activity is higher compared to others in degrading RBB and MO as indicated by the percent degradation and the degradation rate constant. Keywords: bismuth oxide, solution combustion, ratio fuel-oxidant, citric acid, photocatalytic activity, photocatalyst
Comparison of Absorption Efficiency of Synthetic Dyes by Dragon Fruit Peels and Modified Dragon Fruit Peels

Ihsan Budi Rachman*, Firaz Apriyanto1, dan Della Dwi Taufina1

*Chemistry Department Faculty of Science, Malang State University

*Corresponding email: ihsan.rachman.fmipa@um.ac.id

ABSTRACT

The development of an increasingly advanced industry, resulting in a lot of waste and pollutants produced. Wastes discharged into the environment are very dangerous and can cause various diseases. Therefore, special handling efforts are needed to minimize the impact of sewage pollutants on the environment. One of the wastes discharged into the environment is synthetic dyes for textiles and other synthetic dyes. Plants have main components of organic compounds with certain functional groups. The functional groups of these organic compounds are unique to each plant. The different functional groups attached to plants make it have different physical properties. The difference in physical properties in organic molecules can be used as an agent for absorbing synthetic dyes. One of them is the skin of dragon fruit, a tropical fruit that is produced in many seasons. Determination of the structure and morphology of fruit skin before and after dye absorption was carried out by infrared spectroscopy and SEM-EDX. The nature of the synthetic dyes which absorb UV light and are visible makes the basis for the analysis of the concentration of these dyes in waters by UV-Vis spectroscopy. The kinetics of skin uptake of the dye will be carried out with the Langmuir adsorption isotherm and the Freundlich model. The results of the adsorption constant and absorption efficiency are obtained, compared to other fruit peels.
Color Stability of Red Natural Pigment Extracted from Tomato and Red Watermelon

Leny Yuliati¹,²; Juliana², Renny Indrawati¹,²

¹ Ma Chung Research Center for Photosynthetic Pigments, Universitas Ma Chung, Villa Puncak Tidar N-01, Malang 65151, East Java, Indonesia
² Department of Chemistry, Faculty of Science and Technology, Universitas Ma Chung, Villa Puncak Tidar N-01, Malang 65151, East Java, Indonesia

*Corresponding email: leny.yuliati@machung.ac.id

ABSTRACT

Tomato and red watermelon are red colored-fruits with abundant lycopene pigment that is responsible for their red color. While these fruits are no doubt widely consumed directly as food source, their use as potential natural red color-pigment could not be ignored. One major issue for the latter application would be the pigment stability, which is strongly related to their color stability. In this work, the color stability of tomato and red watermelon extracts was evaluated by color measurement to obtain the lightness, redness, and yellowness values of the extracts. The pH of the extracts was tuned from 1 to 10 and the color measurement was conducted up to 7 days. Prior to the measurements, the fresh extracts were encapsulated by maltodextrin, freeze dried, and kept in the freezer. Based on the color measurement results, it was confirmed that the chroma values of the tomato extract were found to be higher than the red watermelon extract. Furthermore, the tomato and red watermelon extracts were more stable when the pH was in acid condition than the basic condition. Based on the color differences monitored for 7 days, pH of 2 resulted in the most positive linear correlation, but with a relatively small gradient for both tomato and red watermelon extracts. These results suggested that pH played an important role to maintain the color stability of the red natural pigment, which is lycopene, in tomato and red watermelon extracts. It was proposed that the basic condition would result in the degradation of the lycopene due to the breaking of the conjugation bonds. Keywords: chroma, color difference, color stability, tomato extract, watermelon extract

Natural Dyes Extraction Utilised for Coloring Process in Fashion Industries

Putu Doddy Sutrisna1, Hadiatni Rita Priyantini1, Prayogo Widyastoto Waluyo2, and I Made Ronyastra3

1 Department of Chemical Engineering, Faculty of Engineering, University of Surabaya (UBAYA), Indonesia
2 Department of Fashion Design and Lifestyle, Faculty of Creative Industry, University of Surabaya (UBAYA)
3 Department of Industrial Engineering, Faculty of Engineering, University of Surabaya (UBAYA), Indonesia

*Corresponding email: pudod@staff.ubaya.ac.id

ABSTRACT

Recently, small scale fashion industries are growing quite rapidly in Indonesia. This is due to the continuous encouragement and facilitation by the Government of Indonesia to improve workforce in creative industry. As fashion industries depend on the availability of dyes as one of their resource, it is very important to develop a new and sustainable supply of dyes for dyeing process in fashion industries. Hence, research on the extraction of dyes from sustainable and natural resources for fashion industries are considered very important and urgent. Dyes for fashion and textile are naturally occurred in plants or parts of plants. The extraction of dyes from these sources can be conducted by using simple mixing between solvent and the plants inside a soxhlet extractor or reflux apparatus. In this study, the extraction processes of natural dyes from three materials, i.e. sappanwood, mahogany, and mango leaf employing combination of maceration, soxhlet and reflux techniques were reported. The experiments were conducted to analyse the effects of extraction time, temperature, and solvent to materials ratios on the yield of dyes. Spectrophotometer UV-Vis and Gas Chromatography-Mass Spectrometry were mainly used to determine the concentration of dyes after each experiment. The experimental results showed that for all materials the optimum ratio of material and solvent was 1 : 6. In addition, the reflux followed by maceration could produce dyes that can be utilised for fabric coloring that suits the industrial needs.
Isolation and Optical Properties of Natural Pigments from Purple Mangosteen Peels

Yehezkiel Steven Kurniawan, M. Riza Ghulam Fahmi, and Leny Yuliati

1Ma Chung Research Center for Photosynthetic Pigments, Universitas Ma Chung, Villa Puncak Tidar N-01, Malang 65151, East Java, Indonesia
2Department of Chemistry, Faculty of Science and Technology, Universitas Ma Chung, Villa Puncak Tidar N-01, Malang 65151, East Java, Indonesia
*Corresponding email: leny.yuliati@machung.ac.id

ABSTRACT

Purple mangosteen (Garcinia mangostana) is one of the tropical fruits which is abundantly available in Indonesia. It has been known that purple mangosteen has several biological applications such as anticancer, antitubercular and antioxidant agents due to the existence of some natural pigments and secondary metabolites. Even though purple mangosteen contains isoflavone, xanthone, tannins, phenolic acids, and anthocyanins, so far, their peels were discarded and generated as organic waste. In this work, we isolated and studied the fluorescent properties of the natural pigments from the purple mangosteen peels, which could be applied for dye-sensitized and other photonic materials in the future. To isolate their natural pigments, the mangosteen peels were macerated separately using distilled water, ethanol and acetone as the solvents for 24 h. The extracts were filtrated and characterized using spectrophotometers of Fourier transform infrared (FTIR), ultraviolet-visible (UV-Vis), and spectrofluorometer. The FTIR spectra of the extracts showed the absorption peaks of O-H, C-H sp\(^3\), C=O, C=C, and C-O functional groups, while absorption peaks at 210-354 nm were observed in the UV-Vis spectra of the extracts due to the presence of flavonoid and/or phenolic acid compounds. The three-dimension fluorescence spectra showed that the excitation and emission peaks of the mangosteen peels extracted with water were found at 444 and 498 nm, respectively, while that extracted with ethanol gave no significant fluorescence peaks. On the other hand, the mangosteen peels extracted with acetone gave the strongest emission intensity at 472 and 502 nm due to the most intense color intensity. This study provided useful information about the optical properties of natural pigments extracted from purple mangosteen peels through a simple isolation technique.
Subcloning and Heterologous Expression Of Lk2 Lipase Gene in Pichia Pastoris GS115

Annisa Ananda, Akhmaloka 1,2
1 Biochemistry Research Group, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung, Indonesia
2 Department of Chemistry, Faculty of Sciences and Computer, Universitas Pertamina, Indonesia

Corresponding email: loka@chem.itb.ac.id

ABSTRACT

Lipases are one of hydrolase enzymes that widely used in many industrial fields as biocatalyst. A high production of lipases by using recombinant DNA technology is necessary to fulfil industrial demand. In the previous study, lk2 lipase gene isolated from compost has been cloned into pET-30a(+) vector and overexpressed in Escherichia coli BL21 (DE3) intracellularly. However, the lipase was formed inclusion bodies and need a lot of purification steps. This study aims to obtain soluble LK2 lipases by overexpressing lk2 lipase gene in Pichia pastoris GS115 under the control of AOX1 promoter and secreted into the medium. The lk2 lipase gene was obtained from pET30a(+) vector and inserted into pPICZ(alpha) A inducible yeast vector. Pichia pastoris GS115 cells are transformed with the recombinant plasmid called pPICZ(alpha)A-lk2 by electroporation. The culture for lk2 gene expression was grown in BMMY broth by adding 0,5% methanol every 24 hours for 5 days. Protein analysis of the culture supernatant showed the enzyme was ~35 kDa. The hydrolysis activity of the culture supernatant was measured using 4-nitrophenyl dodecanoate and the highest activity was 0.056 U/mg. This results indicated that Pichia pastoris expression system can produce soluble and active LK2 lipases. Keywords: lipase, heterologous expression, Pichia pastoris

Purification of Keratinase From Bacillus sp MD24 Using Ammonium Sulfate Fractionation

Umi Faridatuz Zuhriyah, Evi Susanti, Suharti Suharti 1,3
1 Dept. of Chemistry, Universitas Negeri Malang, Malang
3 Corresponding email: suharti.f mipa@um.ac.id

ABSTRACT

A keratin degrading bacterium, Bacillus sp MD24, was isolated from soil. The crude keratinase produced by the bacterium has been reported to dehair goat skin. However, the dehauling process takes 72 hours. In order to shorten the dehauling time it is necessary to improve the keratinase concentration. This can be done by optimizing keratinase production either finding the best fermentation media or optimizing fermentation condition. Another way to improve the concentration could be done by partially purifying it enzyme. Keratinase from Bacillus sp MD24 had been produced under submerge fermentation, however it produced relatively low amount of enzyme. Although an effort to increase enzyme production had been reported by solid state fermentation, the total enzyme production were not enough for industrial purposes. This work aimed to increase enzyme concentration by partial purification through enzyme precipitation using ammonium sulfate. The research was conducted in five stages (1) regeneration the bacterium, (2) production of keratinase, (3) purification of keratinase with ammonium sulfate fractionation, (4) determination of keratinase activity and protein concentration, and (5) SDS PAGE analysis. The crude extract keratinase has an activity of 185,53 U/mL. The highest activity keratinase produced at ammonium sulfate fractionation between 25-50% with spesific activity, purity level, and yield, 2679,69 U/mg, 64 times, and 23 %, respectively.
The Potency of *Ananas comosus* L. and *Aleurites moluccanus* L. Extracts as Xanthine Oxidase Inhibitor

Mieke Alvionita, Mimma Amalia, Subandi*, Evi Susanti, and Dian Nugraheni

Dept. of Chemistry, Faculty of Mathematics and Sciences, Universitas Negeri Malang, Malang

*Corresponding email: subandi.fmipa@um.ac.id

ABSTRACT

The exploration of gout treatment agent based on the natural product gain a high attention in recent years. Although some current drugs are effectively treat gout, the several unbeneﬁcial effects can not be avoided. Thus, the searching for new alternatives with less side effects are desired. These present work was aimed at investigating the potency of pineapple (*Ananas comosus* L.) and candlenut (*Aleurites moluccanus* L.) extract as an inhibitor of xanthine oxidase, an enzyme that responsible for gout disease. The stage of this work was divided into four stages, including (1) sample extraction using ethanol 70%, (2) phytochemical characterization, (3) puriﬁcation of the extract, and (4) inhibitory activity testing of extract using in vitro analysis. This work resulted that the yield of thick extract of pineapple and candlenut were 12.3% and 17.5% respectively. Some of various isolates obtained from thin layer chromatography (TLC) were tested their saponine content based on the foam produced. The greater foam formation were shown by the isolate 2 (I2) of pineapple extracts and isolate 1 (I1) of candlenut extracts. These two isolates also showed the signiﬁcant decrease of uric acid production compared to the other isolates and allopurinol. The percentage of inhibition activity of I2 of pineapple extract toward xanthine oxidase was 63.4%, whereas I1 of candlenut extract was 52.4%. Keywords: *Ananas comosus* L.; *Aleurites moluccanus* L.; Xanthine oxidase inhibitor

A Study of The Effect of T10609C & C10676G Mutations on Mitochondrial ND4L Gene to The Proton Translocation Process in Type 2 Diabetes Mellitus and Cataract Patients Using in Silico Method

Wanda Destiarani, Rahmainiar Mulyani, Muhammad Yusuf, Iman Permana Maksum

Dept. of Chemistry, Universitas Padjadjaran, Sumedang

*Corresponding email: iman.permana@unpad.ac.id

ABSTRACT

The mutation rate of mtDNA is 17 times higher than nuclear DNA. These mutations can cause mitochondrial disease which prevalence of sufferers 1:10.000. For the ﬁrst time, the T10609C mutation was found in T2DM patients while C10676G in cataract patients, both mutations were in ND4L gene of mtDNA that encodes ND4L protein. In previous studies, ND4L protein (subunit of complex I) shown to play a role in proton translocation process. The purpose of this study was to determine the effect of both mutations using in silico method. Mutations mapping shows changes in amino acids, which are M47T from T10609C and C69W from C10676G. MD simulations carried out on native and mutants of ND4L-ND6 subunits for 100ns. The native model shows proton translocation pathway similar to those of complex I from other organisms. But, in M47T and C69W models of mutant, the pathway is interrupted by hydrogen bond between Glu34 and Tyr157 which limits water molecules to pass. It shows that the T10609C and C10676G mutations interfere proton translocation process in mitochondrial complex I. Keywords: Cataract, diabetes mellitus, mitochondrial complex I, T10609C, and C10676G.
The Preventive Effect of Ethanolic Extract of Rome Beauty Apple Peel (Malus Sylvestrys Mill) Towards Protease Activity and Jejunal Histopathology of Rat (Rattus Norvegicus) Exposed to Plumbum Acetate

Anna Roosdiana¹, Analis Wisnu Wardhana², Tarsisius Handaru Cahyo Putro²

¹Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Brawijaya, Malang, Indonesia
²Faculty of Veterinary Medicine, University of Brawijaya, Malang, Indonesia

*Corresponding email: aroos@ub.ac.id

ABSTRACT

Abstract. The exposure of plumbum to body can be through inhalation, digestion and adsorption. Plumbum intoxication can lead to jejunal damages and increase protease activity due to reactive oxygen species (ROS) production. Apple peel extract contains flavonoids that can scavenge ROS. This research aimed to investigate the effect of ethanolic extract of Rome Beauty apple peel to protease activity and jejunal histological feature of Rat exposed to plumbum acetate. This research used 20 rats, those were divided into 5 treatment groups, which were negative control group (healthy rat), positive control group which exposed to Pb acetate 10 mg/rat/day for 14 days, and preventive therapy group which administrated the apple peels extract with 28 mg / 200 g BW, 56 mg / 200g BW, 112mg / 200g BW doses for 21 days and also Pb acetate with 10mg/rat/day for 14 days on day 15th until 28th. Jejunal histological features was stained using HE stain which then observed using a microscope and protease activity measured using by the spectrophotometric method. The data of protease activity was statistically analyzed using ANOVA, followed by Tukey test (? = 5%). The results showed that the administration of ethanolic extract of Rome Beauty apple peels at best dosage of 112 mg / 200 g BW can reduce protease activity and improve jejunal histopathology. The conclusion of this study is that apple peels extract of Rome Beauty can be used to prevent the increase of protease activity and the damage of Rat jejuna exposed to plumbum acetate.
Isolation and Characterization of Uricase from Chicken Liver

Wuryanti Handayani1, Nasrul Amaliyatun Naja1, Agung Budi Santoso1, Anak Agung Istri Ratnadewi1,2

1 Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java
2 Graduate School of Biotechnology and PUI-BioTIn, University of Jember, East Java

*Corresponding email: istri_dewi.fmipa@unej.ac.id

ABSTRACT

Uricase enzyme is an enzyme used to degrade uric acid into a product in the form of allantoin. Uricase enzyme is extracted from broiler chicken liver and kampong chicken liver. This research was conducted to determine the activity of the uricase enzyme in chicken liver. The value of uricase activity is obtained by measuring the concentration of uric acid as a substrate using a spectrophotometric method with a wavelength of 291.2 nm. Uricase enzymes are purified using ammonium sulfate fractionation (0-60% saturation) and dialysis. The uricase molecular weight was determined from SDS PAGE electrophoresis using a protein marker of known molecular weight. The results showed that supernatants had the highest value of uricase activity compared to pellets. Optimization of ammonium sulphate fractionation in broiler chicken liver optimum at 20-40% saturation which is 2,091 x 10^-8 U / mg and optimum kampong chicken liver at 40-60% saturation is 2,498 x 10^-8 U / mg. Then purification is continued with the production of the uricase enzyme. The value of uricase activity in broiler chicken liver using ammonium sulphate (0-40% saturation) is 4,037 x 10^-6 U / mg and kampong chicken liver with ammonium sulphate (0-60% saturation) is 1,600 x 10^-5 U / mg. The dialysate in broiler chicken liver has uricase activity value of 6,669 x 10^-6 U / mg and uricase activity in kampong chicken liver is 1,754 x 10^-5 U / mg. The uricase enzyme molecular weight is estimated to be between 30-50 kDa by the SDS PAGE profile. The results of this study indicate that the activity of uricase enzymes is present in the liver of broiler chickens and kampong chicken liver.

Keywords: Broiler chicken liver, kampong chicken liver, uricase enzymes, uric acid, purification, and characterization.
The Potency of Polyalthia Longifolia Leaves from Indonesia and Philippines as an Inflammatory Bowel Disease (IBD) Therapy: Study on Rattus Norvegicus Models Induced by Indometachin.

Aulanni’am†, Tri Zulfi Anita †, Dayshine Nahari †, Ikke Alma Aluka ‡, Erica Imarinda Agustine ‡, Tiara Novita ‡, Dyah Kinasih Wuragil ‡, Wibi Riawan ‡, Ma Asuncion G. Beltrand ∗

† Department of Chemistry, Faculty of Sciences, Brawijaya University, Malang, Indonesia
‡ Faculty of Veterinary Medicine, Brawijaya University, Malang, Indonesia
∗ College of Veterinary Medicine, Tarlac Agricultural University, Camiling Tarlac, Philippines.

∗Corresponding email: aulani@ub.ac.id

ABSTRACT

Herbal plants have potential to be used as therapy materials. Polyalthia longifolia is widely grown in both in Indonesia and the Philippines, but it has not been widely used in society as a therapeutic. Several studies have reported that Polyalthia loongifolia leaves extract has anti-inflammatory activity. This study aimed to determine the potential of Polyalthia longifolia leaves extract as IBD therapy in Indometachin-induced rats. Four groups of rats were used, as (1) control, (2) IBD with 10 mg/kgBW of sulfasalazine therapy, (3) IBD with 300 mg/kgBW of Indonesia Polyalthia leaves extract therapy and (4) IBD with 300 mg/kgBW of Philippines Polyalthia leaves extract therapy. Histopathological appearance of gastric, duodenum, jejunum and colon were analyzed, as well as protein profile and pro-inflammatory cytokines expressions. The results showed that Polyalthia longifolia therapy both from 2 countries origin have potency as anti-inflammatory agents compare to commecial available drugs. This works proposed the use of Polialthia longifolia leaves as IBD therapy.
A Molecular Docking Study of Dehydroevodiamine as an Inhibitor of Epstein-Barr Virus Protease

Rosi Nur Azizah1, Suharti2*, Yahmin3
1Dept. of Chemistry, State University of Malang, Malang
2Dept. of Chemistry, State University of Malang, Malang
3Dept. of Chemistry, State University of Malang, Malang
*Corresponding email: suharti.fmipa@um.ac.id

ABSTRACT
Epstein-Barr Virus (EBV) is a type of gamma-herpes virus which causes kissing disease. The virus induces cancer and causes latent infection. EBV protease is one of the constituent capsid proteins that play an important role in assembling virions on nucleus and spreading them. Therefore, this enzyme potentially became one of inhibition target which have impact on the termination EBV life cycle. During this time, drugs to inhibit this enzyme had not been studied. This study aimed to examine dehydroevodiamine as a potential inhibitor EBV protease by molecular docking method. The docking was done through both blind and specific docking techniques and the K_i values were calculated using docking approach when RMSD is 0 Å. Molecule visualization was done using PyMol and dehydroevodiamine profile identification was done on Ro5. The results showed that dehydroevodiamine has binding affinity of -9.8 kcal/mol and -7.3 kcal/mol; predicted K_i (STP) of 1,426729x10^-8 and 1,431479x10^-6 for blind and specific docking, respectively. No one dehydroevodiamine profiles violated Ro5. These values indicated the potential of dehydroevodiamine as an oral drug candidate for kissing disease. This finding opens possibility to do further work on wet-lab levels.

Enzymatic Degradation of Shrimp Using Chicken Intestine Protease

Achmad Sjaifullah*
1 Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java
*Corresponding email: sjaiful.fmipa@unej.ac.id

ABSTRACT
The chicken intestine is a waste that is produced in large quantities from chicken processing. Currently, the chicken intestine is generally processed as a mixture of animal feed, although there is some community that uses chicken intestine as food. From the high protein and fat content, the chicken intestine has the potential to be processed to produce nutritious food. In addition to the main components of protein and fat, chicken intestines contain various protease enzymes. In this paper, the protease enzyme present in chicken intestinal tissue is used to degrade proteins in whole shrimp and chicken intestines themselves, so that fat in chicken intestinal tissue can be separated from the protein hydrolysate produced during the hydrolysis. The purpose of this research is to study the amount of fat that can be separated from chicken intestinal hydrolysate and shrimp hydrolysate during proteolytic degradation by chicken intestinal protease enzymes and to investigate the effect of incubation time and the amount of chicken intestine composition to the protein degradation in shrimp by measuring dissolved nitrogen during proteolytic hydrolysis. The study was conducted by incubating a mixture of whole shrimp and chicken intestine in the ratio of 1/0, 2/1 and 1/2 for 48 hours at a pH of 1.5. The ability of chicken intestinal protease in hydrolyzing shrimp protein and chicken intestinal protein is determined by measuring dissolved nitrogen during the hydrolysis process. The results showed that the greater the composition of the chicken intestines used, the better the hydrolysis process which indicated by increasing levels of dissolved nitrogen and increasing fat could be separated from the protein hydrolysate. This research also promises a mixture of shrimp and chicken intestine hydrolysate as a functional food such as flavoring enhancement with reduced fat content.
The Effect of Rice Bran on Triglyceride Levels and Histopatologic Aorta in Rat (Rattus norvegicus) of High Cholesterol Dietary Model

Chanif Mahdi1, Putri Citrawati2*, Viski Fitri Hendrawan2

1 Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Brawijaya
2 Fakultas Kedokteran Hewan, Universitas Brawijaya
*Corresponding email: chanifmahdi@gmail.com

ABSTRACT

Cholesterol is a steroid compound found in animals and humans. Total cholesterol normal levels in rat is 10-54 mg/dL and triglyceride 26-145 mg/dL. Rice bran has a crude fiber content and antioxidants that can be used to resolve these conditions. This study aims to determine the effect of rice bran as therapy in the rat (Rattus norvegicus) high-cholesterol dietary model towards triglyceride levels and histopathologic of the aorta. Rat (Rattus norvegicus) is divided into 5 groups with 4 repetitions. Group A as a negative control, group B was fed high cholesterol, group C rat high-cholesterol diet model with rice bran therapy of 16%/rat/day, D group of rat high-cholesterol diet model with rice bran therapy of 38%/rat/day, and group E rat diet high cholesterol model with rice bran therapy of 57%/rat/day. Rice bran therapy performed for 21 days. Triglyceride levels were calculated by the GPO-PAP method and aortic histopathologic features were observed by HE staining (Hematoxylin-Eosin). The effect of rice bran on blood triglyceride levels was analyzed by one way Anova (Analysis of Variance) with ?=5% and aortic histopathologic analysis was qualitatively descriptive. The results showed that rice bran therapy could significantly reduce triglyceride levels (p <0,01) with a dose of 57%/rat/day to decrease triglyceride levels. Rice bran therapy is also repaired aortic tissue histopathology of rat high cholesterol diet model. Keywords: Cholesterol, Triglyceride, Rice Bran, Rattus norvegicus, and Aorta
Effects of Growth Medium on Extracellular Secretion of Human Epidermal Growth Factor in *Escherichia coli* by Co-expression with *Bacillus cereus* Phospholipase C

Firdausi Permata Ummu Latifah¹, Annisa Indriyanis, Riyona Desvy Pratii, Sriwidodo¹, Iman Permana Maksum²*

¹Department of Chemistry, Faculty of Mathematics and Natural Sciences, Padjadjaran University, Bandung, Indonesia
²Research Center of Biotechnology, Indonesian Institute of Science (LIPI), Bogor, Indonesia
³Department of Pharmacy and Pharmaceutical Technology, Faculty of Pharmacy, Padjadjaran University, Bandung, Indonesia

*Corresponding email: iman.permana@unpad.ac.id

ABSTRACT

Human Epidermal Growth Factor (hEGF) is a small, mitotic growth polypeptide that promotes the proliferation of various cells and is widely applied in clinical practices, especially in therapeutic uses of wound healing. Since it has a lot of benefits, production of recombinant hEGF (rhEGF) in a large scale is needed. Some methods have been used in this protein production, one of them was the production of rhEGF using extracellular secretion in *Escherichia coli*. Previous research have been done using co-expression method with phospholipase C from *Bacillus cereus* to increase the amount of rhEGF. Phospolipase C *B. cereus* has been used in several protein expression and was proved that it can increase the secretion of recombinant protein through hydrolytic mechanism of cell membrane. In addition, growth condition is one of some major factors which can affect the yields of produced protein. Different compositions of bacterial growth medium often lead to different result. This paper studies how rich-nutrient Terrific Broth (TB) medium and Luria Bertani (LB) medium produced different rhEGF results when it was co-expressed with phospholipase C *B. cereus*. rhEGF was characterized using SDS-PAGE and confirmed by western blot using anti-mouse EGF, and its concentration was measured using ELISA. rhEGF were successfully characterized after co-expression in TB medium and the concentration was 503.48 \(\mu\text{g/mL}\). rhEGF was better produced in TB medium rather than in LB medium since TB medium has richer composition. Keywords: co-expression, hEGF recombinant, extracellular secretion, phospholipase C *Bacillus cereus*, luria bertani, terrific broth
Determination Kinetic Parameters of Endo-beta-1,4-D-Xylanase from Abdominal Termites with Xylan Oat and Birchwood

Anak Agung Istri Ratna Dewi¹, Linda Faiqotul Himmah¹, Tri Mulyono¹, Wuryanti Handayani¹, Sudarko¹

¹ Departement of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java

*Corresponding email: istry_dewi.fmipa@unej.ac.id

ABSTRACT

Parameters kinetic (KM, V_max, and k_cat) of endo-beta-1,4-D-xylanase under optimum conditions with oat spelt xylan and birchwood substrate have been investigated in this study. Hydrolysis of endo-beta-1,4-D-xylanase using a variation of substrate concentration (b/v) ranging from 0.2 to 1.2%. Variation of incubation time is up to 20 hours with 4 hours interval at the optimum temperature of the enzyme, 40°C. The results obtained from this study were the KM of endo-beta-1,4-D-xylanase for oat spelt xylan and birchwood were 4.10 mg/mL and 0.681 mg/mL, respectively. V_max values, and k_cat for xylan oat substrate of 0.28 mg/mL.hour and 1.7 x 10^-3 s^-1. While V_max and k_cat for birchwood substrate that is 0.117 mg/U/hour and 7 x 10^-4 s^-1. From the results of this study, we found that endo-beta-1,4-D-xylanase can hydrolyze substrates that have differences solubility. Keywords: endo-1,4-?-D-xylanase, parameters kinetics, oat spelt xylan, birchwood.

Molecular Docking Study of Dehydroevodiamine as an Inhibitor Epstein-Barr Virus Protease

Rosi Nur Azizah¹, Suharti²*, Yahmin³

¹Dept. of Chemistry, State University of Malang, Malang
²Dept. of Chemistry, State University of Malang, Malang
³Dept. of Chemistry, State University of Malang, Malang

*Corresponding email: suharti.fmipa@um.ac.id

ABSTRACT

Epstein-Barr Virus (EBV) is a type of gamma-herpes virus which cause kissing disease. The virus induces cancer and causes latent infection. EBV protease is one of the constituent capsid proteins that play an important role in assembling virions on nucleus and spreading them. Therefore, this enzyme potentially became one of inhibition target which have impact on the termination EBV life cycle. During this time, drugs to inhibit this enzyme had not been studied. This study aimed to examine dehydroevodiamine as a potential inhibitor EBV protease by molecular docking method. The docking was done through both blind and specific docking techniques and the K_i values were calculated using docking approach when RMSD is 0 Å. Molecule visualization was done using PyMol and dehydroevodiamine profile identification was done on Ro5. The results showed that dehydroevodiamine has binding affinity of -9.8 kcal/mol and -7.3 kcal/mol; predicted K_i (STP) of 1,426729x10^-8 and 1,431479x10^-6 for blind and specific docking, respectively. No one dehydroevodiamine profiles violated Ro5. These values indicated the potential of dehydroevodiamine as an oral drug candidate for kissing disease. This finding opens possibility to do further work on wet-lab-levels.
Molecular Docking Study of Novel 5-O-Benzoylpinostrobin Derivatives to Estrogen-Alpha: Agonist or Antagonist?

Mohammad Rizki Fadhil Pratama, Hadi Poerwono, Siswandono

1Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Universitas Airlangga, Dr Ir Soekarno Street, Surabaya, East Java 60115, Indonesia
2Department of Pharmacy, Faculty of Health Sciences, Universitas Muhammadiyah Palangkaraya, RTA Milono Street, Palangka Raya, Central Kalimantan 73111, Indonesia

Corresponding email: profsis@ff.unair.ac.id

ABSTRACT

The leading cause of breast cancer is a mutation in the receptor protein that plays a vital role in the regulation of cell proliferation in breast tissue, one of which is estrogen-alpha (ERα). As a hormonal protein, ERα interacts with both agonist and antagonist ligands. Meanwhile, pinostrobin is a flavanone that is known to have anti-breast cancer activity. Previous research has found that 5-O-benzoylpinostrobin derivatives are predicted to be potential as anti-breast cancer. This study aims to predict the potential of 5-O-benzoylpinostrobin derivatives as antagonists of ERα. Molecular docking was carried out using Autodock Vina 1.1.2 with 1QKU and 3ERT for receptors that bind to agonist (estradiol) and antagonists (4-hydroxytamoxifen) ligands, respectively. The parameters observed consisted of free energy of binding (ΔG) and amino acid interactions. The docking results show that all test ligands have lower ΔG to receptors with reference antagonist than agonist ligands. The most significant difference in the value of ΔG antagonist-agonist is shown by 5-O-benzoylpinostrobin, where the ligand also shows high similarities in amino acid residues and types of interactions compared to the reference ligand at 90.91% and 54.55%, respectively. The results concluded that 5-O-benzoylpinostrobin derivatives are predicted to be used as ERα antagonist.
Some studies concerning the analysis of total phenolics, total flavonoids and the radical scavenging of DPPH (\(\cdot \cdot \cdot \)-diphenyl\(\cdot \cdot \cdot \)-picrylhydrazyl) of secondary metabolite compounds using UV-Vis showed interferences by the compounds contained in the extracted sample that absorbs in the visible area. Therefore to provide a good and accurate method, research on the comparison of spectrophotometric and TLC (Thin Layer Chromatography)-Densitometry methods in the analysis of total phenolics and total flavonoids and DPPH radical scavenging activity is necessary. In this study, we determined total phenolics, total flavonoids and DPPH radical scavenging activity of parsley (Petroselinum crispum). A dry extract of parsley was prepared by maceration method in 96% ethanol solvent, followed by evaporation and freeze-drying. The total phenolic content using the Folin-Ciocalteu reagent; total flavonoids using a complex compound formation with AlCl\(_3\); antioxidant activity using DPPH radicals based on the spectrophotometric method were consecutively 324.63 ± 0.007 mg GAE/g; 131.60 ± 0.02 mg RE/g; IC\(_{50}\) 3249.
Acetylacetone as a Potential Chemosensor for Rapid Detection of Cu(II) Ions in Aqueous Media

Antonius Agung Nugroho1, Yehezkiel Steven Kurniawan1, Leny Yuliati1,2

1 Ma Chung Research Center for Photosynthetic Pigments, Universitas Ma Chung, Villa Puncak Tidar N-01, Malang 65151, East Java, Indonesia
2 Department of Chemistry, Faculty of Science and Technology, Universitas Ma Chung, Villa Puncak Tidar N-01, Malang 65151, East Java, Indonesia

Corresponding email: leny.yuliati@machung.ac.id

ABSTRACT

Copper can be found in various materials widely used in our daily life. In the environment, copper is commonly found as metal ion in the form of Cu(II). Unfortunately, an excessive amount of Cu(II) can cause several health problems such as anemia, irritation, and liver dysfunction. Therefore, monitoring Cu(II) ions is one of the most critical issues in wastewater treatment. Even though diketone-derived compounds have been reported for their ability to make a stable metal complex with Cu(II) ions, the application of diketone-derived compounds as Cu(II) chemosensor agent has not been addressed yet. In this present work, acetylacetone (penta-2,4-dione) was used as the chemosensor to detect Cu(II) ions in the aqueous media. Ultraviolet (UV)-visible spectra showed that the blue colored-Cu(II) solution gave absorption at 811 nm, while the acetylacetone only gave absorption at UV region of 272 nm. Interestingly, the blue Cu(II) solution immediately turned to green solution after the addition of Cu(II) solution into the ligand solution, and a new peak was appeared at 748 nm due to formation of Cu(II)-acetylacetone complex. This large shifting suggested the potential application of the acetylacetone as a colorimetric sensor of Cu(II), which gives benefit in the rapid detection. The limit of detection (LOD) and limit of quantification (LOQ) were found to be 0.15 and 0.51 mM, respectively. Furthermore, the presence of other metal ions, such as Na(I), K(I), Mg(II), Mn(II), Ni(II), Al(III), Au(III) and La(III) could be neglected since they gave low extents of interferences up to less than 10%. These results showed that the acetylacetone could be used as a potential chemosensor for Cu (II) detection in the aquatic environment. Keywords: Acetylacetone, Chemosensor, Cu(II) Ions, Rapid Detection

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Development of Pre-concentration Method of Nickel(II), Chromium(II), Cobalt(II) and Copper(II) Ions in Water Samples Using Carboxymethyl Kappa Carrageenan (CMKC) Coated Nanomagnetite

Irma Kartika Kusumaningrum, Nuridhia Nisa Purnama, Anugrah Ricky Wijaya, Yudhi Utomo, Munzil Arief, Rohima Nostia, Lutfiyah Findiani, Hassan Daupor

1 Department of Chemistry, State University of Malang, Indonesia
2 Department of Chemistry, Yala Rajabath University, Thailand

*Corresponding email: irma.kartika.fmipa@um.ac.id

ABSTRACT

Flame Atomic Adsorption Spectrophotometry (FAAS) is one of the instruments that is often used to determine metal ion concentration. FAAS is commonly owned by laboratories that carry out the determination of metal ion concentration, FAAS uses operational procedure for metal ion concentration determination is simple, the test results of metal ions concentration determination are accurate, but unfortunately the accuracy of metal ion determination test decreases if the concentration of metal ions is too low, whereas the threshold for metal ions in drinking water is very low. Preconcentration is a method for increasing the concentration of metal ions in a sample. Effective preconcentration method needs to be studied to improve the accuracy of the determination results concentration of metal ions in water at low concentrations, with FAAS. This research aims to determine the effectiveness of preconcentration of metal ions in water samples, using CMKC coated nanomagnetite. The research was conducted in four stages, (1) CMKC coated nanomagnetic synthesis, (2) Preconcentration of samples containing Ni(II), Cr(II), Co(II), Cu(II) ions using CMKC coated nanomagnetics, (3) Measurement of metal ion concentration with AAS Flame, (4) Determination of effectivity of preconcentration process and optimal preconcentration conditions. Based on the results of this research, CMKC coated nanomagnetics can be used to preconcentrated of metal ions Ni(II), Cr(II), Co(II), Cu(II) in water samples, by utilizing desorption adsorption mechanism. Desorption was done using 0.1N HNO₃ as a desorption solvent without variations in concentration and desorption time. Optimal preconcentration conditions for each metal ion are as follows: Ni(II) = pH 6, 60 minutes; Cr(II) = pH 7, 40 minutes; Co(II) = pH 6, 40 minutes; Cu(II) = pH 6, 40 minutes. Keywords: Preconcentration, metal ion, nanomagnetite, CMKC, FAAS.
Differentiation of Two Robusta Coffees Based on Gas Sensor Array Response Using Principal Component Analysis

S. Siswoyo1, K.I. Aulia1, B.A. Ramadhani1, Z. Zulfikar1, T. Mulyono1, A. Asnawati1

1 Department of Chemistry, Faculty of Mathematics and Natural Science, University of Jember, East Java

Corresponding email: siswoyo@unej.ac.id

ABSTRACT

City of Jember is known as main producer of Robusta coffee in East Java. It is believed that each type of Robusta coffee planted on different location has a distinct characteristic based on its aroma and taste. This research was aimed to evaluate the difference between two coffee types using a gas sensor array. Two coffee samples, Argopuro Robusta coffee, and Sidomulyo Robusta coffee were discriminated based on their aroma when the coffee was brewed in boiled mineral water at certain temperature. A variation on the coffee powder size (smooth <60 mesh, medium <45 mesh and rough 8-16 mesh) was also investigated. The coffee aroma was measured using five MQ gas sensors families (MQ-135, MQ-2, MQ-3, MQ-6 and MQ-7) which were arranged in a circular array in which the aroma enables to flow over the sensors. Experiment was carried out for two months and the sensor array measurement was established every two weeks with four repetitions of each measurement. The sensor array performance was derived from its repeatability and reproducibility. The results showed that the gas sensor array was capable to differentiate the two types of coffee based on the sensor response pattern. Application of the principal component analysis (PCA) of the sensor array response has shown that the Argopuro coffee and Sidomulyo coffee were clearly segregated based on the aroma arising from the brewed coffee. The sensor array performance was relatively good for two months of use based on repeatability and reproducibility tests. Keywords: aroma discrimination; robusta coffee; gas sensor array; principal component analysis; MQ sensor family.

Aroma Classification of Brewed Robusta Coffee from Various Jember Plantations Using Electronic Nose

Tri Mulyono1, Khonita Anjalsari R1, Nihlatur Rahma1, Pungky Vidya J1, Siswoyo1, Zulfikar1, and Asnawati1

1 Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java

Corresponding email: arekkramat@gmail.com

ABSTRACT

We present an electronic nose based on metal oxide sensors and applications for aroma analysis of coffee brewing with variations in temperature and various coffee plantations. Characterization of robusta coffee aroma can be used to classify coffee based on the location of the plantation. Electronic nose uses an array of sensors consisting of sensors MQ-135, MQ-2, MQ-3, MQ-6, and MQ-7 which are placed in a gas-capture chamber. This coffee steeping gas is pulled by a pump to the sensor chamber and the response is displayed in graphical form. Data is processed with Microsoft Excel and XLStat software. Signal patterns are displayed in the form of radar charts and PCAs. PCA analysis and radar charts show the results that the electronic nose is able to distinguish the aroma of Robusta coffee from Sidomulyo, Argopuro, Garahan and Panti plantations. The electronic nose can also classify Robusta coffee in all four gardens based on brewing temperatures of 75, 80, 85, 92, and 95 oC. The test performance of the sensor array on the electronic nose shows good compatibility marked with a value of RSD 20%. Keywords: Electronic nose; PCA, Robusta Coffee; Brewing temperature, Jember plantation.
Optical Emission Spectroscopy Study of the Electron Temperature and Density Dependence on the Pressure Chamber for the Deposition Carbon Produced by Argon Plasma Sputtering

Dwi Ratna Setya Pambudi, Mahardika Auditia Hanif, D. J. Djoko Herry Santjojo, Masdiana C. Padaga, Masruroh*

1Department of Physics, Brawijaya University, Malang, 65145, Indonesia
2Collaborative Research Group for Advanced System and Material Technology (ASMAT), Brawijaya University, Malang, Indonesia
3Faculty of Animal Husbandry, Brawijaya University, Malang 65145, Indonesia

*Corresponding email: ruroh@ub.ac.id

ABSTRACT

An investigation of the Optical Emission Spectroscopy (OES) to study effect of the pressure chamber to the chemical species, electron temperature ($T_e$) and density ($n_e$) was performed on RF 2 MHz plasma sputtering for carbon deposition. A carbon target and argon (Ar) gas were used to deposit carbon films. The carbon deposition was carried out at pressure chamber of 10, 15, and 20 Pa, and the RF voltage, flow rate, and substrate temperature was kept at 120 volts, 60 ml/min, 200°C. The emission spectrum of Ar plasma was monitored by OES in order to analyze the chemical species present in the plasma during the deposition process. The NIST database was used to determine the species in the plasma and to calculate the $T_e$ and $n_e$. The OES emission shows the peak intensity which indicating the Ar I (atomic) and Ar II (Ar+ ion). The electron temperature was calculated by using Boltzmann Plot while the electron density by using Stark Broadening. The results show both $T_e$ and $n_e$ decreased on increasing the pressure chamber. The emission line measurements with Boltzmann Plot resulted in the electron temperature dependence of pressure is approximately 0.48, 0.47, and 0.46 eV, respectively. Moreover, the calculation of electron density resulted in approximately $6.7 \times 10^{18}$, $6.2 \times 10^{18}$, and $4.4 \times 10^{18}$ cm$^{-3}$. Keywords: Carbon, plasma sputtering, OES, electron temperature, and electron density.
Preliminary Study of TiO2 Synthesis and Characterization of Ilmenite (FeTiO3) Bangka with Particle Distribution Method

Y I Supriyatna*, A N Nainggolan1, S Sumardi1, W Astuti1, L Indriyani2, HTBM Petrus3, A Prasetya3

1Research Unit for Mineral Technology, Indonesian Institute of Science, Tanjung Bintang, South Lampung – Indonesia
2Department of Material and Metallurgy, Kalimantan Institute of Technology, Karang Joang, Balikpapan, East Kalimantan – Indonesia
3Department of Chemical Engineering (Advanced Material and Sustainable Mineral Processing Research Group), Universitas Gadjah Mada, Jl. Grafika 2, Yogyakarta – Indonesia 55281

*Corresponding email: yayat_iman@yahoo.com

ABSTRACT

Food packaging technology more advanced nowadays, as evidenced by the increasing number of packages in foods that are able to decompose in nature or can be recycled, along with human awareness of their environment. Packaging is one of the important things in food packaging products that are useful for maintaining shelf life from the influence of the external environment. Therefore, one effort to maintain food freshness is by utilizing a thin layer of nano dioxide particles of titanium dioxide (TiO2) which can separate water molecules into hydrogen and electrons on the surface of the material. Besides being able to improve the physical properties of packaging, the use of nano TiO2 can suppress the growth of natural microorganisms such as bacteria, viruses and fungi. So that in the future the use of TiO2 can be applied to the field of food packaging after the material is combined with several polymeric materials. The purpose of this research is to conduct an initial experiment with the synthesis of TiO2 nanoparticles from Ilmenite (FeTiO3) originating from Bangka as a raw material for functional food packaging. This experiment began by sieving iron sand in 80, 100, 150, 200 and 325 mesh sieves. The analysis carried out at an early stage is to use X-Ray Fluorescence (XRF) to determine the element content contained and X-Ray Diffraction (XRD) to observe iron sand mineralization performed. Furthermore, to find out the surface morphology of the Ilmenite material, the Scanning Electron Microscope (SEM-EDS) test was also carried out.
The Effect of Sodium Sulfate and Sulfur Addition on Carbothermic Reduction of Indonesian Ilmenite Concentrate with Pulverized Biomass

Agung Setiawan*, Sri Harjanto
Department of Metallurgy and Materials Engineering, Universitas Indonesia, Depok
*Corresponding email: agung.setiawan72@ui.ac.id

ABSTRACT

The effect of sodium sulfate and sulfur addition on carbothermic reduction of Indonesian ilmenite concentrate was investigated with pulverized palm oil shell as a reductant. The ilmenite concentrate was mixed using a planetary ball mill to homogeneity and reduce particle size with additives and reductant. The addition dosage of additives was selected as 0%, 1.5%, 3%, and 4.5%, respectively. The mixture was reduced at 1200°C for 60 min under inert condition (nitrogen atmosphere). The phase transformation of reduced samples was examined by X-ray diffraction (XRD), and size of metallic iron was analyzed by optical microscopy (OM) and also field-emission scanning microscopy (FESEM). Furthermore, chemical composition was investigated by energy-dispersive x-ray spectroscopy (EDX), and the average iron particle size was measured by the free software ImageJ. The experimental results demonstrated that sodium sulfate is better at improving the aggregation and growth of metallic iron than sulfur. The average iron particle size increased by increasing the dosage of additives. The best results obtained in the reduced sample with the addition of 4.5% sodium sulfate showed that the largest size and grade of metallic iron were 73.78 square micrometer and 94.20%, respectively. The main phases of the reduced samples were Fe, TiO₂, Ti₃O₅, FeTi₂O₅, FeS, Fe₃O₄, FeO, MnS, Na₃AlS₃, and Na₃AlSi.

The Effect of SrO Impregnation on the Characteristics of Cobalt Ferrite (CoFe₂O₄) Nanoparticles Synthesised by Co-precipitation

Thutug Rahardiant Primadi¹, Aman Santoso¹, Yahmin¹, Sumari¹, Adilah Aliyatulmuna¹, Fauziatul Fajaroh*¹
¹Department of Chemistry, State University of Malang, East Java, Indonesia
*Corresponding email: fauziatul.fajaroh.fmipa@um.ac.id

ABSTRACT

Cobalt Ferrite (CoFe₂O₄) nanoparticles are magnetic materials that have greater hardness than Fe₃O₄. CoFe₂O₄ is widely applied in many fields, including as a heterogeneous catalyst in various chemical reactions such as photocatalysis, phenol degradation, and transesterification reactions. This is supported by the thermal stability and chemical stability possessed by CoFe₂O₄. Coating or impregnation of a non-magnetic material, on the surface of the ferrite, on one side will reduce its magnetism and possibly its surface area. But on the other hand, the positive impact of coating or impregnation is the increase in particle mono-dispersion. Weakening the magnetism of the particles will reduce the interaction of attraction between particles, so that the particles are getting more monodisper. This will optimize its potential as a heterogeneous catalyst. In this research impregnation of strontium oxide (SrO) will be carried out on the surface of CoFe₂O₄. After that, the properties are compared with CoFe₂O₄ before impregnated. CoFe₂O₄ synthesis was carried out through the coprecipitation method, followed by base impregnation with SrO. The results showed that the impregnation of SrO on CoFe₂O₄ increased the zeta potential of the particles which indicated the stability of the particles in the dispersion.
Synthesis and Characterisation of Mo/SiO₂ Catalysts

Landep Ayuningtias¹, Tanti Haryati¹, Novita Andarini¹, Yudi Aris Sulistio¹, Suwardiyanto*¹

¹ Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java

Corresponding email: antokfmipa@unej.ac.id

ABSTRACT

Conversion of glycerol as a side product of biodiesel production to a more valuable product such as 1,3 propanediol becomes important since the increase of biodiesel production leads to the lowering of raw glycerol price. Metal supported catalyst based on Pt, Ir, Rh, and Pd has been employed for this purpose. In order to replace these precious metals, molybdenum (Mo) has been studied in the form of Mo/SiO₂ using ammonium heptamolybdate (AHM) as a precursor. Dispersion of molybdenum over silica surface was observed through the molybdenum concentration (5, 10 and 15 % w) and temperature of calcination (110, 300 and 500 °C). Interaction and dispersion of molybdenum and silica were studied by means XRD and FTIR. Impregnation of molybdenum onto silica vibration of Mo-O-Si, terminal M=O and Mo-O-Mo and a shoulder of Si-O-Si asymmetric stretching. Impregnation also decreases the concentration silanol group of silica until 31.6 %. -MoO₃ has been detected at molybdenum concentration of 10 and 15 % upon calcination at 500 °C. Keywords: metal-supported catalyst, Mo/SiO₂, silica, dispersion.

Renewable Aromatic Compounds Distribution via Hydrocracking of Sunan Candlenut Oil (Reutealis trisperma (Blanco) Airy Shaw) with Co-Ni/HZSM-5 Catalyst

Lenny Marlinda¹, Rahmi¹, Muhammad Al-Muttaqi², Danawati Hari Prajitno¹, Achmad Roesyadi³

¹ Department of Chemistry, Faculty of Sains and Technology, University of Jambi
² Research Unit of Mineral Technology, Indonesian Institute of Sciences, South Lampung
³ Department of Chemical Engineering, Faculty of Industrial Technology, Sepuluh Nopember Institute of Technology, Surabaya

Corresponding email: marlindalenny@unja.ac.id

ABSTRACT

Hydrocracking is an attractive way to produce biofuel from non-vegetable oils. Various efforts have been made to improve hydrocracking process towards higher yield and quality of liquid biofuel and better energy efficiency. The aim of this research is to evaluate the potential of using high temperature to hydrocracking of sunan candlenut oil with Co-Ni/HZSM-5 as the catalyst for production of biofuels under different conditions. The effects of reaction temperature on product were investigated and the liquid products obtained were predicted. Hydrocracking of sunan candlenut oil at temperature of 300-400 oC, 2075 bar for 2 h was performed in the presence of catalysts under hydrogen initial pressure in pressured batch reactor. The GC-MS analysis indicated that biofuel using higher temperature (400 oC) with catalyst ratio of 1:1 was composed of 33,4% of n-paraffin, 1,94% of olefin, 5,57% of cycloparaffin, 1,03% of isoparaffin, 42,48% of aromatic and 4.59% of carboxylic acid. The composition of biofuel with catalyst ratio of 1:2 was composed of 32.13% of n-paraffin, 2.31% of olefin, 6.75% of cycloparaffin, 2.95% of isoparaffin, 44.46% of aromatic, 7.11% of carboxylic acid and 1.19% of oxygenated compounds. It was also observed that the higher temperatures removed the oxygenated compounds from the hydrocracking products. The aromatization reaction was dominant reaction in hydrocracking of Sunan candlenut oil with Co-Ni/HZSM-5 catalyst. This oil deserves to be recommended as a source of non-edible vegetable oils to produce biofuel range gasoline as an environmentally friendly transportation fuel.
Pillarization of Clay using Ti and Mn as the Support of Ni-Mo Catalysts for the Catalytic Upgrading Reaction of Bio-Crude Oil

Nino Rinaldi*1, Ahmad Rudy Setiawan2, Adid Adep Dwiatmoko1, Nurmaya Arofah2

1Research Center for Chemistry, Indonesian Institute of Sciences, Kawasan PUSPIPTEK, Serpong, Tangerang Selatan 15314 INDONESIA
2Dept. of Sciences and Technology, Syarif Hidayatullah State Islamic University Jakarta, Ciputat, Tangerang Selatan 15412 INDONESIA

*Corresponding email: nino.lipikimia@gmail.com

ABSTRACT

Pillarization Bio-crude oil was the liquid product from the biomass pyrolysis. Bio-crude oil has the potential to be upgraded into an equivalent liquid fossil fuel by the catalytic upgrading process, such as hydrodeoxygenation (HDO) reaction using Ni-Mo metal catalysts supported by pillared clay (PILC). Clay’s physical and chemical properties can be modified through the pillarization method using an oxide metal as the pillar. This study will prepare the pillared clays using Ti and Mn metals and will be used as the support of Ni-Mo catalyst, labeled as Ni-Mo/Ti-PILC and Ni-Mo/Mn-PILC. The prepared catalysts will be tested on the catalytic HDO reaction of bio-crude oil. Several characterization techniques were carried out, such as XRD, BET, FTIR, XRF, SEM, TPD to get information about the physicochemical properties of prepared catalysts. The Ni-Mo/Al2O3 commercial catalyst was also used as a comparison. It is observed that the pillarization of clay using metals of Ti and Mn could be successfully obtained, and the activity of Ni-Mo catalysts supported on the pillared clays have a high catalytic activity compare to the Ni-Mo commercial catalysts from the DOD value after the reaction.

Photocatalytic Materials of N-doped Carbon Nanodots from Blackstrap Molasses

Mentik Hulupi1, Muhamad Ariq Al Badar2, Ahya Sularasa1 and Haryadi*1

1 Department of Chemical Engineering, Politeknik Negeri Bandung, Indonesia

*Corresponding email: haryadi@polban.ac.id

ABSTRACT

The synthesis of N-doped carbon nanodots (N-doped CDs) has been successfully conducted by reaction of blackstrap molasses and urea as carbon and nitrogen sources consecutively. The chemical reaction was initiated by oxidation step using hydrogen peroxide and followed by Microwave-Assisted Extraction (MAE) method for 2 minutes’ irradiation. The properties of N-doped CDs under UV light 365 nm emit blue fluorescence and show absorption peak at wavelength of 220 nm. The presence of nitrogen within N-doped CDs has been recognized by N-H and C-N stretching vibrations at 1590 cm\(^{-1}\) and 1037 cm\(^{-1}\) respectively by means of FTIR. Typical morphology for tiny dots of N-doped CDs has uniformly particle size distribution as observed through HRTEM owning average particle size of 1.5 nm.
Zinc oxide (ZnO) is a metal oxide based semiconductor with a large band gap energy (3.30 eV), so that it is promising for degradation of organic contaminants. However, that large band gap energy indicates that ZnO is mostly active under UV light only. In the present study, ZnO material with oxygen defect was successfully synthesized using a hydrothermal method and interestingly, it was found to possess a remarkable photocatalytic activity under the visible light irradiation. The synthesized ZnO material was then characterized using X-ray diffraction (XRD), diffuse reflectance ultraviolet-visible (DR UV-vis), Fourier transform infra-red spectroscopy (FTIR), and spectrofluorometer. Both diffraction pattern and absorption spectrum showed the characteristic of ZnO. However, the maximum emission wavelength of the synthesized ZnO was observed at 558 nm, showing that the ZnO was formed with high concentration of oxygen vacancy. The excitation spectra showed that the prepared ZnO have absorption at the visible light region, which was more than 400 nm. The materials were evaluated for photocatalytic phenol degradation under ultraviolet and visible light. The synthesized ZnO showed ability to mineralize 93.6% phenol under UV light and 39.6% phenol under visible light, which was a remarkable performance. This study demonstrated that the existence of oxygen vacancy defects induced the photocatalytic activity of ZnO under visible light irradiation through electron trapping mechanism in the oxygen vacancy state. Keywords: oxygen vacancy, phenol degradation, photocatalysis, visible light, zinc oxide
Synthesis and Characterization of Copolymer Poly(Vinylidene Difluoride)/Graphene Nanofiber

Muhamad Nasir¹, Triannisa Rahmawati¹, Indriyati¹, Fitri Dara¹, Desak Gede Sri Andayani²

¹ Development Unit for Clean Technology, Indonesia Institute of Sciences (LIPI), Cisitu-Sangkuriang, Bandung 40135, Indonesia

Corresponding email: mnasir71@yahoo.com

ABSTRACT

The copolymer poly(vinylidene difluoride)/graphene (cPVDF/graphene) nanofibers were fabricated using the electrospinning method. The concentration of cPVDF was fixed at 24% (wt.%) with variation of graphene content 0.01-0.1% (wt.%) in N,N-dimethylacetamide (N,N-DMAC) solvents. Characterization was conducted to analyze the effect of graphene concentration and electrospinning parameter of cPVDF/graphene using SEM-EDS, FTIR, TG-DSC, XRD. From SEM-EDS measurement results, it is found that the concentration of graphene and variations in the parameters of the electrospinning device (voltage, distance from the needle to the collector, flow rate) affect the formation of nanofibers. Some of these influences include nanofiber diameter size, beads, and beta-crystal phase. Moreover, when the voltage is too high and too low, the nanofiber spinning process cannot be carried out. Meanwhile, the improper flow rate affects the formation of beads and the resulting in bigger diameter distribution. The FTIR and XRD spectra show that nanofiber is more dominated by the beta crystal phase than the alpha crystal phase. TG-DTG and DSC spectra show that graphene influences the thermal properties of nanofiber composites. Contact angle test results show that the hydrophobicity decreases when nanofiber is added to graphene. The results of this research can be used as an option in overcoming environmental problems. Keywords: beads, cPVDF, electrospinning, graphene, nanofiber.
Mechanical and Leaching Stability Characteristics of Geopolymer Synthesized from High-Magnesium Ferronickel Slag

Tjokorde Walmiki Samadhi¹, Winny Wulandari², Aprilina Purbasari²

¹Faculty of Industrial Technology, Institut Teknologi Bandung, Bandung
²Dept. of Chemical Engineering, Faculty of Engineering, Universitas Diponegoro, Semarang

*Corresponding email: twsamadhi@che.itb.ac.id

ABSTRACT

The recent push by the Indonesian government to increase the volume of domestic ferronickel processing implies that the volume of ferronickel slag as the primary form of solid waste also increases. Conversion of high-magnesium ferronickel slag (HMFNS) into geopolymer, a cementitious polymeric alcal aluminosilicate material, has been studied using HMFNS and coal fly ash (FA) produced by a smelter in the Northern Maluku province. The HMFNS is ground in a ball mill to a median particle size of roughly 0.5 mm. Geopolymer mortar specimens are prepared by activating HMFNS-FA blends using a mixture of sodium hydroxide and sodium silicate as the activator solution. The mass ratio of sodium silicate to sodium hydroxide in the activator is 3:1, while the HMFNS:FA mass ratio in the reacting mixture is varied from 1:1 to 2.75:1. The entire geopolymerization process is undertaken at ambient temperature. The highest mortar compressive strength obtained after 3 days is 14.2 MPa, which compares well with ASTM C150 standard minimum strength for almost all types of Portland cement mortars. Since the HMFNS and FA are classified as hazardous waste, leaching stability of the geopolymer mortar is important. TCLP test on a geopolymer mortar specimen indicates that the leaching mobility of all criteria TCLP metallic elements are well below the national regulatory threshold values. Altogether, these results suggest that the geopolymerization of HMFNS offers a viable solution for ferronickel processing waste re-utilization.
**A DFT Study on The Reaction Mechanism of Cyclization of 2-Hydroxy Chalcone Catalyzed by Methane Sulfonic Acid via Intramolecular Oxa-Michael Addition**

Suci Zulaikha Hildayani, Muhamad Abdulkadir Martoprawiro, Yana Maolana Syah

Dept. of Chemistry, ITB, Bandung

Corresponding email: hildazulaikha@gmail.com

**ABSTRACT**

Methane sulfonic acid (MSA) is an environmentally friendly catalyst that widely used in several organic syntheses. The recent study reported that use of MSA for chalcone-flavanone conversion shown very good result. Meanwhile, the reaction mechanism of chalcone-flavanone conversion catalyzed by Bronsted acid is proposed occur via intramolecular oxa-Michael addition. This study investigated the reaction mechanism of cyclization of 2-hidroxy chalcone to produce racemic 2R and 2S-flavanone using methane sulfonic acid as Bronsted acid catalyst via intramolecular oxa-Michael addition. The method that used is Density Functional Theory method with functional and basis sets of M06-2X/6-311+G(d,p). The optimized reactant, product, and intermediate structures have been successfully calculated as well as the transition states. Based on calculation result, the overall reaction is exothermic and cyclization step is concluded as the rate-determining step of the reaction with activation energy is 175.35 kcal/mol. There is no significant difference in reaction mechanism pathways of 2-hydroxy chalcone’s cyclization that leading to two possible products, 2R, and 2S-flavanon.

**Effect of Erbium (Er) on Al-5Zn-0.5Cu Alloy Sacrificial Anode**

Deni Ferdian, Taufik Andika, Yudha Pratesa

Dept. of Metallurgy and Materials Engineering
Universitas Indonesia

Corresponding email: deni@metal.ui.ac.id

**ABSTRACT**

Effect of addition 0.1wt%, 0.3wt% and 0.5wt % erbium rare earth on Al 5Zn-0.5Cu alloy was investigated using Differential Scanning Calorimetry (DSC) and Cyclic Polarization, complemented with Optical Microscope (OM). The presence of erbium formed precipitates on the grain boundary which made finer grain microstructure and enhance activation of corrosion. Breakdown potential tend to decrease as the increase of erbium content; the lowest breakdown potential on this study is Al-5Zn-0.5Cu-0.3Er (-0.89 V vs Ag/AgCl). Addition of erbium accelerate corrosion rate by making the alloy more anodic. Potential coupling of these alloy with steel structure was -0.78 V vs SCE, still safe to protect high strength steel material.
The Fabrication of Zn-Zr Alloy through Centrifugal Casting and Box Furnace Method for Implant Application

Achmad Fauzi Trinanda, Moh Waqyan Ghani Fahmi, Rizki Yuni Pratiwi, Sotya Astutiningsih, Ahmad Zakiyuddin*

Dept. of Metallurgy and Materials Engineering, Universitas Indonesia

*Corresponding email: ahmadzakiyuddin@ui.ac.id

ABSTRACT

Recently, zinc (Zn) is extensively observed as biomaterial or biodegradable implant for medical application. A biomaterial is any substance that has been engineered to interact with biological systems for a medical purpose. Zn is chosen because it has moderate degradation compared to Mg and Fe. Unfortunately, Zn has limitation on its mechanical properties that still low. The Alloying element is needed to improve the mechanical properties of Zn. Alloying element, such as zirconium (Zr) can improve the mechanical properties of Zn. In this study the addition of Zr with the composition variations of 0%, 0.5%, 1%, and 2%. Two kinds of alloying method used are centrifugal casting and box furnace with a temperature of 550°C. The aims of this study are to know the effect of each fabrication method to the mechanical properties and microstructures of Zn-Zr alloy that are resulted. The results show that the microstructure of the alloy from centrifugal casting is more homogenous than the box furnace method. The mechanical properties of centrifugal casting are also higher than the box furnace method. The hardness value obtained from centrifugal casting of 0, 0.5, 1 and 2% of Zr respectively are 35.162 HV, 41.988 HV, 42.324 HV, 57.112 HV.

The Effect of Zirconium Addition on Corrosion Behaviour of Zn-Zr Alloys as Biodegradable Orthopedic Implant Application

Rizki Yuni Pratiwi1, Achmad Fauzi Trinanda2, Moh Waqyan Ghani Fahmi3, Sotya Astutiningsih1, Ahmad Zakiyuddin*

Dept. of Metallurgy and Material Engineering, University of Indonesia, Depok

*Corresponding email: ahmadzakiyuddin@ui.ac.id

ABSTRACT

In this work, corrosion behaviour of zinc-based alloys with addition of 0,5%, 1%, and 2% of zirconium for biodegradable material as orthopedic implant were investigated. The potentiodynamic polarization method is carried out to determine the corrosion resistance and corrosion rate of each composition in order to observe the effect of zirconium addition in a Kokubo simulated body fluid solution. The result showed the addition of 0,5% and 1% of zirconium would decrease the corrosion rate of Zn-xZr alloys correspondingly to 0,079 mm/year and 0,116 mm/year whereas the 2% addition would increase the rate to 0,188 mm/year due to the formation of Zr-rich precipitates inside the alloys. The passivation zone on the polarization curve showed the formation of the protected thin layer on the surface of the alloys which caused the corrosion rate to decrease and the layer therefore confirmed the degradable ability of the Zn-xZr alloys. In general, the corrosion rates of Zn-xZr alloys were higher than Fe-based alloys and lower than Mg-based alloys. Moreover, the corrosion rates were much lower than the maximum rate of 0,4 mm/year for biodegradable implants so Zn-xZr alloys were suitable as biodegradable material implant for orthopedic application.
The Effect of Zr Addition on Microstructures and Hardness Properties of Zn-Zr Alloys for Biodegradable Orthopedic Implant Applications

Moh Waqyan Ghani Fahmi, Achmad Fauzi Trinanda, Rizki Yuni Pratiwi, Sotya Astutiningsih, Ahmad Zakiyuddin*

Dept. of Metallurgy and Materials Engineering, Universitas Indonesia, Depok

*Corresponding email: ahmadzakiyuddin@ui.ac.id

ABSTRACT

The development of Mg and Fe based biomaterials in the past decade has been extensively studied as biodegradable material for medical applications. The development of this material is limited in terms of its suitability for clinical applications. Zn-based alloys began to be an alternative to be studied as a substitute for Mg and Fe based biomaterials. Zn-based alloys have a moderate degradation rate but have low mechanical properties, so other elements need to be added to improve their mechanical properties. In this study the added element is zirconium (Zr) with a composition variation of 0.5%, 1%, and 2%. The alloying method used is casting with a temperature of 550°C. The results of the microstructure analysis, the addition of Zr to Zn alloys will form precipitates in the side the grain boundaries and more addition of Zr composition, the smaller grain size formed. The grain size from pure Zn until the addition of 2% Zr in sequence are 266.40µm, 20.16µm, 16.70µm, and 15.85µm. The XRD analysis, from addition of Zr will form the Zn phase and the intermetallic phase Zn22Zr. The hardness value obtained from pure Zn until 2% Zr in sequence are 35.162HV, 41.988HV, 42.324HV, 57.112HV.

The Influence of Hollow Cathode Geometry and N₂-H₂ Gas Mixture on the 2 MHz RF Plasma Species and Density

Josephine Maria Windajanti1, Abdurrouf1*, Dionysius J.D.H. Santjojo1, Mauludi Ariesto Pamungkas1

1. Dept. of Physics, Faculty of Science, Brawijaya University, Malang

*Corresponding email: abdurrouf@ub.ac.id

ABSTRACT

Hollow cathode discharges were produced by a combination of RF-DC plasma generation and hollow cathode effect. A high-density plasma could be formed inside the simple structure of the hollow tube using 2 MHz RF generator power of 100 W at a voltage of 100 to 150 V with DC bias of -600 V. The system was specially designed for the surface modification of titanium by nitriding process with N₂-H₂ plasma gas mixture at low temperature. This experiment was conducted at a different gas pressure range from 10 to 80 Pa with a gas flow rate of 100 mL/minute. Various geometry of the cylindrical and square hollow cathode with a length of between 6 - 12 cm were investigated to create anions and excited atoms due to electron collisions in the discharge. The trapped electrons and the emission of secondary electrons on the cathode surface will affect the intensity of the plasma produced inside the hollow tube. The influence of both pressure and hollow cathode geometry such as hollow gap, diameter, and hollow depth have been studied. The species inside of N₂-H₂ plasma were detected based on light emission by using optical emission spectroscopy (OES) to obtain effective plasma species for the nitriding process.
Swelling Effect Observation of The Copper Phthalocyanine Layer on
QCM and Its Effect on Surface Roughness and Morphology Changes

Rahmad Oktafiansyah, D.J. Djoko Herry Santjojo, Setyawan P Sakti, Muhammad Ghufron and Masruroh

1Dept. of Physics, Brawijaya University, Malang
2Collaborative Research Group for Advanced System and Material Technology (ASMAT), Brawijaya University, Malang

*Corresponding email: ruroh@ub.ac.id

ABSTRACT

Copper Phthalocyanine (CuPc) is one material often used for the active layer of gas sensors based on Quartz Crystal Microbalance (QCM). One criterion of good coating for gas detection is the existence of a swelling effect. Swelling effect on QCM active layer can shorten recovery time in gas sensor applications. The swelling effect is studied by observing changes in QCM frequency when the QCM surface is in contact with a solution. Upon diffusion of the solution molecules into the CuPc layer, a continuous decrease in the QCM frequency occurs. The CuPc layer was deposited by the vacuum evaporation method. The morphology and surface roughness of CuPc layers after contact with distilled water solutions, phosphate-buffered saline (PBS) and Tris-HCl were observed using scanning electron microscopy-energy dispersive x-ray (SEM-EDS) and topography measurement systems (TMS). The results of frequency measurements indicate a swelling effect as shown by the decrease of the frequency change value after the injection process of the solution on the surface of the CuPc layer. The most significant change in frequency occurs in PBS solutions. This change occurs as PBS has a higher molecular weight and ionic strength than distilled water and tris-HCl. TMS results show that the swelling of the CuPc layer results in changes in the microstructure layer. A decrease in the roughness of the CuPc layer is observed after contact with the buffer solution, due to the presence of buffer solution molecules that diffuse through the CuPc layer causing the configuration of CuPc molecules to become more tenuous.
Mechanical Properties of Alginate Based Biopolymers as Wound Dressing Material

Ane Nurjanah\(^1\), Rusnadi\(^1\), M. Bachri Amran\(^1\)

\(^1\)Dept. of Chemistry, Institut Teknologi Bandung

Corresponding email: 12001ane@gmail.com

ABSTRACT

The utilization of biopolymers has been widely accepted in many areas due to its eco-friendly. Especially in medical care, biopolymers are receiving great attention and are considered as a potential for wound healing. Wound dressing material is one of medical needs which is the demand continues to raise. One of the most widely used biopolymers for wound dressing is alginate. To improve alginate works as a wound dressing material, various alginate modifications with nanoparticles or synthetic polymers have been developed. Furthermore, the use of suitable methods to develop them is also of great concern. Nowadays Interpenetrating Polymer Network (IPN) has been widely used as a method which can facilitate the modification of the alginate. In this research will be modified alginate biopolymer with ZnO nanoparticles and synthetic polymer, poly (ethylene glycol) dimethacrylate (PEGDMA) as one of the candidate of wound dressing material. Alginate can go through swelling and its crystallinity is low so that it affects its mechanical properties. Interpenetration of ZnO nanoparticles into the alginate matrix is able to limit the volume of alginate polymer chains with ZnO surfaces as fillers so as to improve the mechanical properties and their antibacterial properties. in order to be more compatible, ZnO needs to be modified with PEGDMA that can crosslink with alginate to strengthen the bonding network of IPN materials. The requirement of IPN formation is the existence of two crosslinking networks, alginate already have crosslinking and other crosslinking networks obtained from synthetic polymers. This is the reason of utilization of IPN to obtain the functional material of alginate as one of the expected wound dressing material. Characterization of alginate-based wound dressing material was performed using FTIR, XRD and SEM. In addition, optimization tests of mechanical and antibacterial resistance properties were performed to meet detailed studies of the effect of ZnO nanoparticles and PEGDMA interpenetrated into alginate to the properties of the wound dressing material.
**Blending Polymer Cellulose Acetate/Polysulfone for Resistance of Protein Fouling**

Dwi Indarti*, Dana Iswara Putra, Bambang Piluharto

*Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java

*Corresponding email: indartidwi.fmipa@unej.ac.id

**ABSTRACT**

Blending polymer CA/PSf was prepared using N,N-dimethylacetamide (DMAc) as solvent and PEG400 as an additive in membrane fabrication. Membrane CA/PSf is made using the phase inversion method by immersion precipitation process. Membrane CA/PSf characterized by measuring the contact angle of the membrane to determine the membrane hydrophilicity. The performance of membrane is measured uses water flux and rejection of dextran 70 kDa and Bovine Serum Albumin (BSA) 67 kDa. The contact angle of the membrane CA/PSf which amounted to 50° until 63°, so it can be categorized as hydrophilic membranes because the value of the contact angle is lower than 90°. The resulting water flux membranes CA/PSF from 3.8708 L/m2.hour to 10.462 L/m2.hour. Dextran rejection generated which is equal from 40.24% to 89.53%, while the BSA rejection of membrane from 36.21% to 81.68%. Increasing the composition of PSf produces contact angle and water flux increased, but the rejection of dextran and BSA decreased. Resilience fouling membranes CA/PSf is measured by Relative water Flux Reduction (RFR) and Fouling Resistance. RFR membranes CA/PSF which amounted from 9.445% to 32.75%, while the membrane fouling resistant CA/PSF ranged from 0.6725 to 0.9055. RFR is higher when the amount of PSf increased and indicating that their membranes are prone to fouling, it also can be evidenced by the decreased value of resistance fouling when the composition of PSf increase. Keywords: Blending Polymer, flux, rejection, RFR and Resistance Fouling

**Characterization of Alginate-Chitosane Membrane as Potential Edible Film**

Nurul Ismillayli, Surya Hadi, Ni Komang Tri Dharmayani, Rochmad Kris Sanjaya, Dhony Hermanto

Dept. of Chemistry, Faculty of Mathematics and Natural Sciences, University of Mataram, Mataram

Dept. of Pharmacy, Faculty of Health Sciences, University of Kadiri, Kediri

*Corresponding email: dhony.hermanto@unram.ac.id

**ABSTRACT**

Alginate-chitosan based biopolymer for possible aplication as edible film coating has been studied. Alginate hydrosol and chitosan hydrosol with ratio of 1: 1 are mixed to form thin membrane and then dried. The obtained alginate-chitosan membrane was confirmed using FTIR spectrophotometers. Characterization of membrane include thickness, tensile strength, moisture content, resistance to pH change and antimicrobials properties were conducted. It shows that the interaction of alginate and chitosan in the membrane occurs through the electrostatic interaction of the carboxylic group of alginate and ammonium groups of chitosan. At the same thickness, the alginate-chitosan membrane tensile strength is higher and more resistant to pH changes than both native alginate and chitosan membranes. Furthermore, the alginate-chitosan membrane has good antimicrobial potential against gram-positive bacteria (Staphylococcus aureus) and gram-negative bacteria (Escherichia coli). It is expected that the alginate-chitosan membrane has the potential application for safe and efficient fruit coating. Keyword: alginate, chitosan, membrane, edible film.
Edible Coating Development of Durian Seeds Starch and Glucomannan with The Addition of Essential Oil as an Antimicrobial to Increase Shelf Life Tomato and Cauliflower

Andhika Suryo Prabowo 1, Lizda Johar Mawarani 1*

1 Engineering Physics, Institut Teknologi Sepuluh Nopember, Surabaya
*Corresponding email: lizda@ep.its.ac.id

ABSTRACT

Edible coatings can increase shelf life with minimizing water loss and maintaining the structural integrity of coated product contact. This study aims to determine the effect of the addition of edible coating has been made from durian seed starch and glucomannan with the addition of essential oils of eucalyptus oil and virgin coconut oil (VCO) with variations are 0%, 0.1%, 0.5%, 1% and 2% as antimicrobial to bacteria and fungi on tomatoes and cauliflower. The preparation was carried out by mixing durian seed starch and glucomannan with distilled water and glycerol. Essential oil was added with a predetermined variation and stirred for 20 minutes at 70 °C. The smallest degree of swelling is obtained in the 2% VCO sample of 457.52%. All samples found no fungal growth and bacterial contamination in oil-less samples amounted to 3.1 x 10^3 cfu / ml, therefore safe to consume according to BPOM no.16 of 2016. Organoleptic results showed all samples could be accepted by the all panelists except samples of VCO 2%, EO 1% and EO 2% were somewhat disliked. Edible coating application on tomatoes and cauliflower can increase shelf life.

The Effect of CMC, Agar, and Konjac on the Characteristics of Durian Seed Starch Edible Film

Muhammad Husain Haekal 1, Lizda Johar Mawarani 1*

1 Engineering Physics Department, Institut Teknologi Sepuluh Nopember, Surabaya
*Corresponding email: lizda@ep.its.ac.id

ABSTRACT

Edible film as synthetic plastic food wrap alternatives continuously developed. Durian seed starch is one of the materials used in edible film fabrication. This research studied on durian seed starch-based edible film with the addition of carboxymethyl cellulose (CMC), agar, and konjac with a mass fraction of 10%, 20%, 30%. The observed characteristics were swelling degree and tensile strength of the fabricated film. The edible film solution was made using the ratio of flour and additives, water, and glycerol of 1:20:0.3 (w/w), stirred for 20 minutes at 70 °C. The results showed that agar addition on edible film made the film could not be fabricated, konjac addition increases the swelling degree and the tensile strength, while CMC addition increases the swelling degree and decreases the tensile strength. Agar and CMC are not compatible to be the additive on the durian seed starch edible film. The most optimal results were with the addition of 30% of konjac with the tensile strength of 9.4 MPa and a swelling degree of 1073.81%.
Preparation of Curcumin Nanoemulsion in Soybean Oil – Tween 80 System by Wet Ball Milling Method

Zubaidah Ningsih A.S.¹, Maria Lucia A.D Lestari², Ellya Indahyanti¹, Shobbu Ibabas Sholihat¹

¹ Dept. of Chemistry, Brawijaya University, Malang
² Dept. of Pharmaceutics, Airlangga University, Surabaya

Corresponding email: zubaidah@ub.ac.id

ABSTRACT

Abstract: Curcumin nanoemulsion which has a particle size 20-200 nm, is one of the curcumin drug delivery system, that can increase curcumin solubility and bioavailability. The previous method of curcumin nanoemulsion formulation is modified thin-film hydration followed by sonication that has a long process and using organic solvent. This study aims to make curcumin nanoemulsion by wet ball milling method in soybean oil – Tween 80 system. Nanoemulsion is expected to have smallest particle size, high curcumin loading capacity and good stability during storage. Preparation of curcumin nanoemulsion by this methods is done by milling curcumin as drug, soybean oil as curcumin solvent, tween 80 as stabilizer, water as dispersed medium and milling beads as milling media on the vial with various milling time. Particle size and polydispersity index are monitored using Dynamic Light Scattering while nanoemulsion morphology is observed using digital imaging microscope. Results show that optimum milling times is 24 hour and the highest curcumin loading capacity is 300 mg which is stable during 60 days of storage. Particle size of the nanoemulsion is ranging from 127 – 338 nm. In addition, wet ball milling methods is relatively simple and easy to apply. Keywords: Curcumin Nanoemulsion, Dynamic Light Scattering, Wet Ball Milling.

Synthesis and Characterization of Chitosan Membrane as a Matrix in Drug Delivery of Curcumin

Budi Hastuti¹, Alfiah Assya’adha Djean, Saptono Hadi² and Ahmad Ainurofiq²

¹ Department of Chemistry Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret
² Department of Pharmacy, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret

Corresponding email: Budihastuti@staff.uns.ac.id

ABSTRACT

This study aims to find out how to synthesize the chitosan membrane contained curcumin and its characteristics. The chitosan membrane characterization was determined using FTIR for functional group analysis, XRD for crystallinity and SEM to shows the surface of morphology and cross-section in the chitosan membrane. Curcumin encapsulated into the chitosan membrane was performed use UV-Vis spectrophotometry at \lambda 426 nm. The results of this study indicate that the chitosan membrane synthesis obtained homogeneous clear yellow membrane sheets. Characterization of chitosan FTIR was obtained characteristic peaks on wave number 3425.58 cm\(^{-1}\) that showed OH groups and 1627.92 cm\(^{-1}\) which showed the presence of amine groups. While chitosan XRD results shows semi-crystalline which is shown by the results of the graph that has a high peak intensity with angles \(\theta\) on 4.1604 and 3.8711. Based on the SEM test shows that chitosan have a smooth and even surface morphology. The optimum time for encapsulation of curcumin into the chitosan membrane is 60 minutes with \% EE of 14%. Keywords: chitosan, membrane, curcumin, encapsulation
Synthesis and Characterization of Pectin membrane as a matrix for Curcumin sustained release

Budi Hastuti¹, Maulida Kurniawati¹, Saptono Hadi², Ahmad Ainurofiq²

¹Department of Chemistry Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta
²Department of Pharmacy, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Surakarta

Corresponding email: Budihastuti@staff.uns.ac.id

ABSTRACT

This study aims to synthesize pectin membranes, characterization of pectin membranes use FTIR, XRD, SEM, and to see the loading of curcumin in pectin membranes as drug delivery system by contact time variations. Pectin membrane synthesize by dissolved 0.5 gram of pectin powder in 25 ml of 2% acetic acid solution then stirred for 1 hour. The solution is molded in membrane mold then oven for 24 hours at 50°C. Pectin membranes were characterized by FTIR to determine functional groups, XRD test to determine crystallinity, and SEM test to determine the surface morphology. The loading of curcumin in pectin membrane are carried out by contacting the pectin membrane into 100 ppm curcumin at various times of 5 to 120 minutes. Determination of curcumin concentration contained in pectin membrane using UV-Vis at ? 426 nm. The results showed that the produced of pectin membrane was thin, pellucid, and homogeneous sheets. The results of FTIR characterization showed OH group at wave number 3448.72 cm⁻¹ and there was carbonyl group at wave number 1604.77 cm⁻¹. XRD characterization result showed that the pectin membrane was semi-crystalline. SEM characterization results showed smooth and flat surface morphology. The optimum contact time in loading curcumin processes in pectin membrane was 60 minutes with a loading percentage of 10%. Keywords: pectin, membrane, curcumin, sustained release
Essential Oil Extraction of Cananga Odorata Flowers Using Hydrodistillation and Steam-Water Distillation Processes

Ika Oktavianawati

Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java

Corresponding email: ika.fmipa@unej.ac.id

ABSTRACT

This paper discussed the effect of distillation processes in the extraction of Cananga essential oil from Cananga odorata. In this research, Cananga oils were extracted by steam-water distillation and hydrodistillation processes. The equipment used in this current research is a distillation home scale set-up plant which further will be applied to Cananga local farmer in Sukorambi region, Jember district. Therefore, the preliminary optimization process for this distillation equipment was required. The distillation batch (retort) contained 2 kg of Cananga flowers and 20 L of water. Based on the research result, the distillation equipment could run the hydrodistillation process for 2.5 hours, while in steam-water distillation set-up could only run for 2 hours. The volume of water in the distillation batch was a limiting factor in both processes. In general, the yield of essential oil increased along with the length of distillation time that have been applied. However, the result showed that essential oil from hydrodistillation for 1 hour had the best quality compared to other distillation conditions, in terms of its volatile compound contents. Oxygenated hydrocarbons content in Cananga oil from a 1-hour hydrodistillation process (56.5%) was highest compared to 2 and 3-hour hydrodistillation (35.48% and 22.36%, respectively), and even to essential oil from steam-water distillation process (43.25%). Generally, extra grade Cananga oil was markedly by the high content of esters, and linalool, but low in -caryophyllene content. These characteristics could be found in Cananga oil obtained from hydrodistillation process for 1 hour which contained major volatile compounds, i.e. geranyl acetate (16.58%), benzyl benzoate (13.38%), -caryophyllene (16.35%), germacrene D (15.3%), and farnesol (9.54%). However, linalool was only found in Cananga oil from steam-water distillation. Therefore the current distillation condition, hydrodistillation for 1 hour, would be applied in the distillation of Cananga oil at Jember local community. Keywords: Cananga, essential oil, hydrodistillation, steam-water distillation
**Effect of Sonication Time on Properties of Nanocellulose from Corn Cobs**

Farida Utami¹, Tri Mulyono¹, and Bambang Piluharto¹,²  

¹ Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Jember, East Java  
² Centre for Advanced of Science and Technology (CDAST), University of Jember  

*Corresponding email: bampito.fmipa@unej.ac.id*

**ABSTRACT**

Corn cobs are waste generated from maize after grain removed. The cellulose content in the corn cobs is a potential source to isolate to be nanocrytalline cellulose by acid hydrolysis method. This method usually was followed by sonication treatment to prevent particle aggregate. The aim of the research is to study the effect of sonication time on nanocellulose properties, including the structure of cellulose, particle size and surface charges. As a result, the functional group analysis by FTIR shows that there are not significantly for all various sonication time. Increasing of sonication time increase the surface charge of nanocellulose. Nanocellulose that obtained by the sonication treatment have lower in the particle size.  

**Keywords:** sonication, corn cobs, nanocellulose, charge, particle size

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**Annual Products Review of Samarium-153-EDTMP Radiopharmaceutical as a Palliative Agent for Morphine Substitute**

TS Humani¹, RD Hendarto², Hambali³, Y Tahyan⁴, Widyastuti⁵  

¹ Center for Radioisotope and Radiopharmaceutical Technology-National Nuclear Energy Agency of Indonesia  

*Corresponding email: humani@batan.go.id*

**ABSTRACT**

Samarium-153-Ethylene Diamine Tetra Methylene Phosponate (Samarium-153-EDTMP) radiopharmaceutical is an analgësic drug used for palliative therapy in advanced cancer patients and is routinely used in hospitals in Indonesia. It can be used as a morphine substitute for relieving pain. This product is produced by Center for Radioisotope and Radiopharmaceutical Technology-National Nuclear Energy Agency of Indonesia under GMP facilities. To guarantee the quality of the products in accordance with the GMP guidelines, it is necessary to carry out annual product quality review. This is to ensure that products are made consistently and follow the quality standards, in addition to identify deviations, as well as the possibility to improve product quality. The product quality review of the Samarium-153-EDTMP, 2018 production batch, showed that the products had a clear visual appearance, sterile and pyrogen-free, with radionuclide purity of 99.99 ± 0.00%, radiochemical purity of 99.76 ± 0.20%, concentration radioactive of 56.90 ± 5.52 mCi / mL, and pH of 7.61 ± 0.42. The specifications specified for the Samarium-EDTMP product are radionucleide purity, radiochemical purity, radioactive concentration and pH respectively are 99.80%; > 95%; 50 ± 20% mCi / mL; and 7.0-8.5. It can be concluded that the production of Samarium-153-EDTMP during 2018 has been carried out consistently with the results are meet with established specifications.  

**Keywords:** annual product quality review, radiopharmaceutical, Samarium-153-EDTMP, palliative therapy
**Sonication-Assisted Green Synthesis and Characterization of Copper Nanoparticle Using Piper Retrofractum Vahl Extract**

Suci Amaliyah 1, Dwika Putri Pangesti 1, Masruri 1, Akhmad Sabarudin 1*, Sutiman Bambang Sumitro 2

1 Dept. of Chemistry, Brawijaya University, Malang
2 Dept. of Biology, Brawijaya University, Malang

*Corresponding email: sabarjpn@ub.ac.id

**ABSTRACT**

Copper nanoparticle has attracted much attention due to its application in diverse fields. The application of copper nanoparticle depends on their physical and chemical properties. In this study, copper nanoparticles (CuNPs) were synthesized using Piper retrofractum Vahl fruit extract and copper sulfate as starting matters. Piper retrofractum Vahl extract was used as bioreductor as well as capping agent in CuNP formation. Reaction process was assisted by sonication. The influence of extract concentration, pH, temperature and time reaction on the size of CuNP was studied. The morphology and structure of synthesized CuNPs were characterized by UV-Vis, FT-IR, SEM-EDS and XRD. UV-Vis measurement showed the surface plasmon resonance peak at 204 nm. FTIR characteristic peaks of metal-oxygen (Cu-O) was confirmed in the range 538.10 - 559.32 cm\(^{-1}\) and Cu–O–H bonds lead to bending absorptions in the region 846.69 - 854.41 cm\(^{-1}\). SEM analysis showed that synthesized CuNPs are the spherical shape. The high presence of copper was confirmed by EDS. Crystallite size afforded in the range between 18.69 - 115.61 nm. The results proved that Piper retrofractum Vahl fruit extract can be applied for a greener synthesis of copper nanoparticle. Keyword: green synthesis, copper nanoparticle, sonication, characterization

**Synthesis and Characterization of Pyrazine-Contained Transporting Small Molecules**

Vety Sri Harlinda Ayudha 1, Mokhamat Ariefin 1, Ming-Chou Chen* 1

1 Dept. of Chemistry, National Central University, Taiwan

*Corresponding email: mcchen@ncu.edu.tw

**ABSTRACT**

Organic-inorganic perovskite solar cells (PSCs) have attracted wide attention in the optoelectronic science and technology. The high performance of performance PSCs usually have a sandwich structure consisting of perovskite layer between electron-transporting layer (ETL) and hole-transporting layer (HTL). The most effective organic HTL is spiro-OMeTAd, but these material require complicated multistep synthesis and expensive. In this study, pyrazine core is served as a central core and was end-capped with electron-donating group, such as triphenylamine (TPA). Via stille coupling, three new material, DNB, bDNB, and DNP were prepared. The optical properties of these three compound were characterized by UV-Vis and electrochemical properties (HOMO and LUMO) were characterized by DPV. A novel series of pyrazine-contained hole transporting layer (HTL) small molecule has been synthesized. Thermal properties were characterized by DSC, TGA, and melting point apparatus.
Synthesis and Characterization of Dibenzodithiophene (BDT)-Based Quinoidal Small Molecules for n-type Organic Thin-Film Transistors

Mokhamat Ariefin¹, Vety Sri Harlinda Ayudha¹, Ming-Chou Chen¹

¹Dept. of Chemistry, National Central University, Taiwan

*Corresponding email: mccchen@ncu.edu.tw

ABSTRACT

A novel series of benzodithiophene (BDT)-contained quinoidal small molecule with cyanomethylene end-capping group and various alkyl chain (hexyl, decyl, and tetradecyl) were synthesized as an n-type organic thin-film transistor (OTFT). Planar conjugation and rigid structure of BDT core make it attractive for achieving highly tuneable molecular energy level and optical bandgap as well as high mobility. The optical and electrochemical properties of BDTQ series were characterized by UV-Vis and DPV. The molecular structure of BDTQ-10 (benzodithiophene with decyl alkyl chain) were determined via single-crystal X-Ray diffraction, showed that BDTQ-10 has planar core structure and good molecular stacking.

Effect of Precursors Concentration and Annealed Substrate Temperature on the Crystal Structure, Electronic and Optical Properties of ZnO Thin Film

Yus Rama Denney¹,², Adhitya Trenggono³, and Danu Wijaya³

¹Department of Physics Education, Faculty of Teacher Training and Education, University of Sultan Ageng Tirtayasa, Jl. Ciware Raya No. 25, Cipare, Serang, Banten 42117, Indonesia

²Center of Excellence for Food Security (PUI-PT), University of Sultan Ageng Tirtayasa, Serang, Banten, 42435, Indonesia

³Department of Metallurgical Engineering, Faculty of Engineering, University of Sultan Ageng Tirtayasa, Jl. Jenderal Sudirman Km 3 Cilegon, Banten 42435, Indonesia

*Corresponding email: yusramadenny@untirta.ac.id

ABSTRACT

This study carried out on the effect of precursor concentration and annealed substrate temperature on the crystal structure, electronic and optical properties of ZnO thin film. An aqueous solution of Acid Nitrite was used as precursors and its concentration was varied from 0.1 M to 0.4 M. The ZnO thin film was deposited on the glass substrate by Spray Pyrolysis Deposition and annealed with different temperature from 300 oC to 600 oC. The crystal structure, electronic and optical properties were investigated by Scanning Electron Microscopy (SEM), X-ray diffraction (XRD) and UV-Spectrometer. XRD result showed that all thin films have amorphous hexagonal wurtzite crystalline. Particle sizes ranging from 21.83 to 43.67 nm were calculated through Debye-Scherer Method. It showed that concentration of the precursor had slightly impact to the particle size. Meanwhile, the increase in particle size with increasing annealed temperature is found to be gradual. The average transparent of all thin film was more than 80%. The band gap of the ZnO thin films were estimated by Tauc Plot Relation. It showed that the band gap values were increased with the increasing of precursor concentration due to Burstein-Moss Effect. In addition, the decrease in band gap values was found with increasing annealed temperature. Our results demonstrated that the varying precursor concentration and annealed substrate temperature can enhance the structure, electronic and the optical properties of ZnO thin films.
Antioxidant and Xanthine Oxidase Inhibitory Activities of Leaf Extract of Kecapi (Sandoricum koetjape)

Fajar Nur Hamzah¹, Subandi¹, Wawan Sujarwo² and Tjandrawati Mozef³

¹Dept of Chemistry, Faculty of Mathematics and Natural Sciences, State University of Malang, Malang
²The Bali Botanic Garden, Indonesian Institute of Sciences, Tabanan
³Research Centre for Chemistry, Indonesian Institute of Sciences, Serpong

*Corresponding email: Tjandrawm@gmail.com

ABSTRACT

Until now, the prevalence of gout in the world continues to increase. One of the gout medicines that are often used is allopurinol, which acts as inhibitor of xanthine oxidase, the enzyme that synthesizes uric acid. Xanthine oxidase belongs to the group of oxidoreductase enzyme, so usually it can also be inhibited by substances that have high antioxidant activity. On the other hand, the fruit of kecapi (Sandoricum koetjape) which has been widely used to make jelly and candy, also has a high antioxidant content, therefore kecapi leaves are also thought to have equivalent antioxidant activity. The purposes of this study are to determine the antioxidant and xanthine oxidase inhibitory activity of kecapi leaf extracted. This research was conducted in several steps: 1) preparation of kecapi leaf powder, 2) extraction by maceration using methanol solvent, 3) partitioning crude extract using n-hexane, butanol, ethyl acetate and water 4) phytochemical test, antioxidant assay using DPPH and xanthine oxidase inhibitory to correlate these activities with total phenolic contents (TPC) and total flavonoid compounds (TFC) and 5) identification of compounds in the crude extract with the highest inhibitory power. The results has shown that the crude extract of the kecapi leaf contained flavonoids, tannins, steroids, saponins and alkaloids. Highest antioxidant power, total phenol, total flavonoids and the inhibitory power against xanthine oxidase were found in the ethyl acetate fraction. The type of xanthine oxidase inhibition by ethyl acetate fraction is competitive inhibition, and based on spectroscopic analysis, one of the active compounds in the extract particularly is dehydrotumulosic acid. These results indicate that the kecapi leaves have potency as a source of anti-gout drug. Key words. Sandoricum koetjape, antioxidant, xanthin oxidase inhibitor, anti gout herbal
Effect of methyl substituent on the solubility of 1,4-benzoquinone derivatives in the octanol/water partition system

Siti Mariyah Ulfa*, Ade Cintyia Sally, and M. Farid Rahman

1 Chemistry Department, Faculty of Science, Brawijaya University, Malang, Indonesia
*Corresponding email: ulfa.ms@ub.ac.id

ABSTRACT

Quinone is ubiquitous natural compounds which have a fascinating chemical and biological properties. One of their derivatives is 2-isopropyl-5-methyl-1,4-benzoquinone (known as thymoquinone) which is the major constituent in Nigella sativa seed extract. There are many reports about the biological activity of thymoquinone, such as anti-inflammatory, antidiabetic, anticancer, and antioxidant. However, the hydrophobicity or lipophilicity of thymoquinone should be increased to induce its activity as drug constituent. Here, we report the synthesis of 2-(5-bromoamyl)-3,5-dimethyl-1,4-benzoquinone (1) and 2-(5-bromoamyl)-5-methyl-1,4-benzoquinone (2) from 1,4-benzoquinone. Compound 1 has two methyl groups attached in quinone, whereas compound 2 only has one methyl substituent. The synthesis of 1 and 2 is initiated by decarboxylation of bromohexanoic acid using AgNO3 as catalysts and followed by reflux with 2,6-dimethyl- or 2-methyl-1,4-benzoquinone for 2 hours at 90°C, respectively. The product is purified by column chromatography using SiO2 and then analyze by UV-Visible, FT-IR, and NMR. The yield of 1 and 2 is 13.75% and 4.04%, respectively. The low yield of compound 2 can be explained by the lack of one methyl group in quinone ring which suppressed the electron induction into the ring. Then, the solubility of 1 and 2 (expressed by logP value) is measured in octanol/water system by shake flask method. The logP of compound 1 is 2.99, compound 2 is 1.36, and thymoquinone is 2.37. It is showed that the logP value of compound 1 is higher than compound 2 and thymoquinone because of the influence of the methyl group in the quinone ring.
In Silico Analysis of Saponin Isolates from Mesocarp of Cucumber (Cucumis sativus L.) and Purple Eggplant (Solanum melongena L.) as Pancreatic Lipase Inhibitor

Mely Wijaya¹ and Subandi²

Department of Chemistry, State University of Malang

¹Corresponding email: subandi.fmipa@um.ac.id

ABSTRACT

ABSTRACT Currently Orlistat has been widely used as anti-obesity drug, with its activity as a pancreatic lipase inhibitor. While two saponin isolates, from cucumber mesocarp and purple eggplant, also proved to be active as pancreatic lipase inhibitors in vitro. Based on spectrophotometric analysis, the two saponin isolates are thought to be Silphioside F and Cesdiurins I-III. The purpose of this study is to confirm the ability of the two compounds as pancreatic lipase inhibitor through in silico analysis, relative to Orlistat. This study uses PyMol (Python Molecular Viewer), PyRx 0.8, and Discovery Studio software. As a ligand, has been used 3D structure of Silphioside F and Cesdiurins I-III, and the Orlistat as a comparative molecule. While as a receptor molecule, according to in vitro analysis, has been used 3D structure of porcine pancreatic lipase. The result of analysis has shown that the binding site of pancreatic lipase, relatively the same as Orlistat for Silphioside F molecule, but different for the Cesdiurins I-III molecule. The data indicate that in inhibiting pancreatic lipase, the two isolate compounds, using different mechanism. However, against pancreatic lipase, both molecules have greater binding affinities each, compared to Orlistat, that are -9.7 kcal/mol for Silphioside F and -9.5 kcal/mol for Cesdiurins I-III), while Orlistat is only -7.6 kcal/mol. The latest data are in line with the in vitro analysis, that both isolates have greater inhibition power than Orlistat. Keywords: pancreatic lipase inhibitor, cucumber saponin , solanum saponin, in silico analysis.
New Record: Chemical Investigation of Equisetum ramosissimum Desf. from Ijen Crater Nature Preserve

Andik Wijayanto¹, Suhadi¹, Murni Saptasari¹, Dyah Ayu Pitaloka¹, Fira Fitria Jihans¹, M. Hisyam Baidlowi², Mohd Zuwairi Bin Saiman³, Eko Sri Sulasmi¹

¹ Faculty of Mathematics and Natural Sciences, State University of Malang, East Java, Indonesia
² Al Hikmah Nursing Vocational High School, Poncokusumo, Malang, East Java, Indonesia
³ Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

*Corresponding email: andikwijayanto.fmipa@um.ac.id

ABSTRACT

It is important to carry out chemical exploration of pteridophyte in Ijen Crater Nature Preserve because, with extreme natural conditions, we expected to get potential species for medicine purpose and previously no one has investigated. Equisetum ramosissimum is one of the species found in the area. Analysis of chemical compounds with LCMS has been carried out. We found a total of 109 chemical compounds consisting of 106 chemical compounds from leaf and stem extracts and 101 chemical compounds from rhizome extract. Some chemical compounds found in both leaf and stem extracts and rhizome extracts with the top 5 concentrations are hirsutrin, chlorogenic acid, luteolin 7 glucoside, naringin and ponasterone A. Three chemical compounds found in rhizome extract but not found in leaf and stem extracts are xylose, procyanidin, and prodelphinidin C2. And 7 compounds found in stem and leaf extracts but not in rhizome extract, namely riboflavin, thiamin, daidzein, pyridoxine, niacin, succinic acid, and fumaric acid. We concluded that E. ramosissimum has potential as an anticancer, antioxidant, anti-inflammatory, and antidiabetic drug.
Profile Analysis of Fatty Acid And Antibacterial Potential of Oil Extracted from Tengkawang (Shorea sumatrana)

Yusnelti1, Rico Gewana Resdy Maulana2, Indra Lasmana Tarigan*1

1Department of Chemistry, Faculty of Science and Technology, Universitas Jambi
2Department of Industrial Chemistry, Faculty of Engineering, Universitas Sumatera Utara

*Corresponding email: indratarigan@unja.ac.id

ABSTRACT

Introduction: The Shorea sumatrana plant, from which Tengkawang oil is extracted, is endemic to Indonesia, especially in Kalimantan and Sumatera regions, which produces chemical diversity especially as natural drug. Objectives: To investigate both the profile analysis of fatty acid and antibacterial potential of Tengkawang oil. Materials and Method Used: The extract of Tengkawang oil was carried out using the soxhlet extraction method, normal hexane at 67 °C for 4 h. Moreover fractional distillation was conducted to separate the mixture from Tengkawang oil. The profile analysis of fatty acid was verified by GC-MS and the antibacterial activity was evaluated using disc-diffusion method. Results: The profile analysis of fatty acid of Tengkawang oil indicated the presence of palmitic acid (17.26%), stearic acid (60.68%), oleic acid (11.98%), oleic acid chloride (1.80%), stearic acid chloride (1.86%), glycidyl stearate (1.92%), diethyl phthalate (4%), and 2-monopalmitin (0.5%). On other hand, to determine the antibacterial activity, we verified diameter of inhibition of growth zone against Salmonella enteritidis, Escherichia coli, Staphylococcus aureus, and Bacillus cereus at a concentration of 12.5% the inhibition were 21mm, 8mm, 22mm and 19mm respectively. These were compared with standard tetracycline as positive control at the concentration 12.5% were 10mm, 23mm, 17mm, and 37mm. DMSO was assigned negative control. Conclusion: It was found that the highest percentage of fatty acid in Tengkawang oil is stearic acid, at 60.68%, and that Tengkawang oil is an antibacterial agent.
The Effect of Ultrasonic Wave and $K_2O/Al_2O_3$ Catalyst Concentration on Synthesis of Methyl Ester (Biodiesel) from Cpo Off Grade

Aman Santoso*, Anugrah Ricky Wijaya, Chandra Fetty P, Dedek Sukarianingsih, Sumari

* Chemistry Department, Faculty of Mathematics and Natural Sciences, State University of Malang, Indonesia

*Corresponding email: aman.santoso.fmipa@um.ac.id

ABSTRACT

Fatty acid methylesters can be made through transesterification of vegetable oils with homogeneous or heterogeneous catalysts. Ultrasonic waves and the catalyst concentrations affect the transesterification reaction. The purpose of this study was to determine the effect of ultrasonic waves on the transesterification of CPO off grade with the $K_2O/Al_2O_3$ catalyst. Stages of research consist of characterization of CPO off grade, activation and characterization of natural zeolite, preparation and characterization of $K_2O/Al_2O_3$ catalysts, oil esterification, CPO transesterification with $K_2O/Al_2O_3$ catalysts with ultrasonic waves. Characterization of transesterification including density, viscosity, refractive index, and acid number. The results showed that the use of ultrasonic waves reduce the reaction time from 120 minutes to 35 minutes. The highest yield was obtained at concentration of 30 wt% $K_2O/Al_2O_3$ catalyst with the yield of 88.06 wt%. The characteristics of the methyl ester including density, viscosity, refractive index, and acid number respectively are 0.891 g/mol; 7.86 cSt, 1.454, and 0.465 which is fullfill the SNI standard of biodiesel. Keywords: transesterification, biodiesel, CPO, $K_2O/Al_2O_3$, ultrasonic.
Characterization of Protease Soluble Collagen (PSC) From Milkfish Scales (Chanos chanos)

Nia Lutfiana, Suharti, Evi Susanti

Chemistry Department, Faculty of Mathematics and Natural Science
Universitas Negeri Malang, Indonesia

Corresponding email: evi.susanti.fmipa@um.ac.id

ABSTRACT

The aim of this study was to characterize protease collagen soluble (PSC) obtained from milkfish scales, extraction using protease from proteolytic bacteria HTcUM7.1 isolate. The characterization included spectrum of Fourier Transform Infra Red (FT-IR), SDS-PAGE, Field Emission Scanning Electron Microscopy (FESEM), denaturation temperature by differential scanning calorimetric (DSC) and solubility. This was indicated by the FTIR spectrum and SDS-PAGE that PSC from milky scales was type I of collagen. The resulting PSC has white color, fiber with a length of about 20-60 µm, denaturation temperature 193.92 °C, with maximum solubility at pH 1-3 and 1-3% NaCl.

Kinetics Study of Photocatalytic Activity of Bismuth Oxide Prepared By Different Methods on Methyl Orange Degradation

Yayuk Astuti, Arum Distia Wulansari, Indira Nastasya Ayna Saffa, Prisca Putri Elesta, Adi Darmawan, Abdul Haris, Didik S Widodo

Chemistry Department, Faculty of Science and Mathematics, Diponegoro University, 50275, Semarang, (Central Java) Indonesia

Corresponding email: yayuk.astuti@live.undip.ac.id

ABSTRACT

Methyl orange is one of the azo dyes often used in the textile industry. This compound is stable, carcinogenic, toxic, and difficult to biodegrade in nature so that if it is discharged into the water system it will damage the ecosystem in it. Therefore, it is necessary to degrade this dye molecules into simple compounds that are not harmful to the environment. One treatment that can be applied is photocatalysis. One of the photocatalysts that can be utilized is bismuth oxide because this material has a wide band energy gap (2-3.96 eV). Bismuth oxide can be synthesized by several methods and it should be born in mind that the synthesis procedures will affect the obtained product properties. In this paper, the kinetic study of photocatalytic performance of bismuth oxide prepared by different methods, namely precipitation, sol gel and solution combustion on degrading methyl orange compounds will be discussed. Some parameters such as degradation percentage, reaction order and degradation rate constants will be presented. Keywords: methyl orange degradation, bismuth oxide, photocatalysis, photocatalytic activity, band gap
Green Synthesis of ZnO Nanoparticles by Using Banana Peel Extract as Capping agent and Its Bacterial Activity

Siti Marfu’ah¹, Santias Megasani Rohma², Thutug Rahardiant Primadi³, Endang Ciptawati⁴, Sumari⁵, Adrian Nur⁶, Fauziatul Fajaroh⁷

¹ Dept. of Chemistry, Universitas Negeri Malang  
² Dept. of Chemistry, Universitas Negeri Malang  
³ Dept. of Chemistry, Universitas Negeri Malang  
⁴ Dept. of Chemistry, Universitas Negeri Malang  
⁵ Dept. of Chemistry, Universitas Negeri Malang  
⁶ Dept. of Chemical Engineering, UNS  
⁷ Dept. of Chemistry, Universitas Negeri Malang

*Corresponding email: fauziatul.fajaroh.fmipa@um.ac.id

ABSTRACT

One of the nanoparticles used in the medical world is ZnO nanoparticles. The purpose of this study is to synthesize ZnO nanoparticles using bananas peel extract as a capping agent. This research was conducted in four main steps, namely: extraction of three kind of bananas peel (red kapok, ambon, and tanduk), phytochemical test on the bananas peel extract, synthesis of ZnO nanoparticles using the extracts, characterization of ZnO nanoparticles by X-Ray Diffraction (XRD), and the test of the antibacterial activity of ZnO nanoparticles. Based on the phytochemical test it was proven that bananas peel extract contained secondary metabolite such as flavonoids, polyphenols, alkaloids, and saponins in various concentration. From the XRD it can be concluded that ZnO nanoparticles were successfully synthesized. Through the agar diffusion test, it can be showed that ZnO nanoparticles are a promising materials as antibacterial agents. This statement is based on evidence that the diameter of the clear zone produced ranges from 8 to 10 mm.
Isolation of A Phenolic Compound and Antioxidant Activity Test In Some Extracts Fraction of Broken-Bones Plant (Euphorbia tirucalli L.)

Meiske Sangi¹, Julius Pontoh¹, Farha Dapas²

¹ Department of Chemistry, Faculty of Science, Sam Ratulangi University, Manado, Indonesia.
² Department of Biology, Faculty of Science, Sam Ratulangi University, Manado, Indonesia.

*Corresponding email: meiskesangi@gmail.com

ABSTRACT

Euphorbia tirucalli L. or patah tulang (broken-bones) plant is one of the biological materials commonly used as a traditional medicine to treat external body part wounds. This research aims to isolate and identify phenolic compounds and antioxidants in broken-bones plants. The method used was the extraction and fractionation of plants with various types of solvents, determining the total phenolic content and testing the antioxidant activity with the DPPH method, analyzing and determining the structure of compounds for the most active fractions of total phenolic and antioxidants by UV-Vis, IR spectroscopy, ¹H-NMR and ¹³C-NMR. The highest phenolic total content was FA (117.968 µg / mL) followed by hexane fraction 103.920 µg / mL then ethyl acetate 60.270 µg / mL and finally ethanol extract 48.206 µg / mL. The antioxidant activity test using DPPH method (1,1-diphenyl-2-picryl hydridrasyl) obtained the highest hexane fraction extract content of IC50 17.030 µg / mL followed by IC50 water fraction extract 17.068 µg / mL and IC50 ethanol extract 24.443 µg / mL last extracted from ethyl fraction acetate IC50 52.883 µg / mL. The most active hexane extract was then separated/purified by chromatography to obtain pure extracts that were active as antioxidants. Isolation results obtained by pure extract of 6 mg and based on the analysis of spectrophotometer data UV-Vis, IR, ¹H-NMR and ¹³C-NMR, it can be concluded that the isolated compound from a broken-bones plant is one type of compound structure namely euphol triterpenoid type.
Anti-Inflammatory Test From Ethyl Acetate Fraction of Palm (Arenga Pinnata Merr.) Frond Midrib Grain Flours In Carrageenan-Induced White Male Wistar Rats Paw Edema

Meiske Sangi*, Julius Pontoh, Silvana Veronica

* Department of Chemistry, Faculty of Science, Sam Ratulangi University, Manado, Indonesia

Corresponding email: meiskesangi@gmail.com

ABSTRACT

Palm (Arenga pinnata) frond midrib grain flours are potential as a traditional medicine to eliminate itching and burns on the skin. Empirically, the benefits of medicinal plants for health have widely known however there is a lack of scientific publications regarding the potential of palm frond midrib grain flours as an anti-inflammatory. The purpose of this study was to test the anti-inflammatory activity of the ethyl acetate fraction in white male Wistar rats using carrageenan as induction of swelling in the soles of the rat’s right paw. Ethyl acetate fraction obtained from the fractionation in ethanol extract was tested by Thin Layer chromatography and continued by column chromatography. The isolation results obtained as much as 14 mg brownish-yellow anti-inflammatory test was carried out on 15 rats divided into 5 treatment groups, each group consisting of 3 animals. The results obtained were extracts of ethyl acetate fraction of palm frond midrib grain flours at a dosage of 20%, 25%, and 30% can inhibit edema on the soles of rat’s paw that have been induced by 5% carrageenan as much as 0.5 ml. The 25% dosage had the highest inhibitory power among other treatments at 79.55% in the fourth hour. Keywords: Palm midrib flour, anti-inflammatory.
Antifungal Activity from Co-Culture of a Local Fungus of Tropical Peat Swamp Soil, Penicillium sp. LBKURCC34 with Gram Negative and Gram Positive Bacteria

Yuana Nurulita, Yuharmen, Andy Dahliati, Yum Eryanti, Yuli Haryani, Supridianto, Khairulinas, & Titania Tjandrawati Nugroho

Chemistry Department, Faculty of Mathematics and Natural Sciences, University of Riau, Pekanbaru 28293

Corresponding email: ynurulita@lecturer.unri.ac.id

ABSTRACT

Microorganisms is important producer of novel bioactive natural products, particularly in the field of drug discovery. However, many microbial gene clusters may be silent under standard laboratory growth conditions. Thus more efficient methods to discover new potential natural compounds is needed. Co-culture methods is one of a powerful emerging tool for enhancing the chemical diversity of microorganism. This research used the local culture collection of Penicillium sp. LBKURCC34, the fungus isolated from peat soil of primary forest at Giam Siak Kecil Bukit Batu (GSKBB) - Biosphere Reserve in Riau Province, to produce secondary metabolites secreted to their growth media that was cultivated by two different Gram of bacterial pathogen, Escherichia coli and Staphylococcus aureus. The 14 days fermentation was carried out, then the media was extracted with ethyl acetate. The ethyl acetate crude extract was evaporated, then the concentrate dissolved in methanol. Antifungal, Candida albicans test was performed by the disc diffusion and dilution (MIC and MFC) methods. The crude extract of the co-culture with S. aureus could inhibit C. albican growth, while that extract of the cu-culture with E.coli could not do. The value of MFC of the potential extract was less than the positive control, Ketoconazole, unfortunately it only has potency as bacteriostatic extract. Lastly, this method could increase the potency of local fungus to produce candidate antifungal compound. Keywords : Penicilliun sp. LBKURCC34, Escherichia coli, Staphylococcus aureus, Co-culture fermentation, antifungal Candida albicans.
Inhibition of Cancer Cell Proliferation by Red Dragon Peel (Hylocereus polyrhizus) Extracts

Rudi Hendra1, Rohimatul Khodijah 1, Rizky Abdulah 2, Yuli Haryani 1

1 Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Riau, Pekanbaru, Indonesia
2 Faculty of Pharmacy, University of Padjadjaran, West Java, Indonesia

Corresponding email: rudi.hendra@lecturer.unri.ac.id

ABSTRACT

Dragon fruit (H. polyrhizus) is a plant from South America which is easily found in tropical countries. The fruit is one of popular in Indonesia due to its unique shape, colours, and it is consumed as a beverage. However, the thickness of the peel from the fruit can cause problem in waste management. Red dragon fruit (Hylocereus polyrhizus) is a species of plant that provides natural pigment which is betalain. Betalain is one of the pigments that gives a natural colour to flowers and fruits. Moreover, of betalain in red dragon fruit peel, there are bioactive compound such as polyphenol and flavanoid with antioxidant, antimicrobial, and cytotoxic activities. Therefore, in this study cytotoxicity and toxicity activities from pigment and non-pigment extracts from the peel was determined. The pigment was extracted by using maceration with ethanol HCl while non-pigment extraction was carried out by using methanol followed by partition with hexane, dichloromethane, and ethyl acetate, respectively. The toxicity assay was done by using Brine Shrimp Lethality Test (BSLT) method and cytotoxicity level was done by using MTT assay against breast cancer (MCF-7 cells) and human esophageal cancer (TE-8 cells). The results showed that all the extracts exhibited various toxicity levels where dichloromethane showed the highest toxic level with LC50 10.32 ppm followed by hexane, ethyl acetate, pigment, and methanol extracts with value of 23.53, 148.96, 164.05, and > 1000 ppm, respectively. Therefore, all the extracts were subjected to cancer cell line and the results showed the extracts exhibited various activity to inhibit both cancer cell lines. Furthermore, the active extracts will be subjected to purification and isolation for the bioactive compounds. Keywords: dragon fruits, toxicity, cytotoxicity, cancer

Synthesis Ti/W/Si composite as catalyst for photodegradation of rhodamine B

Prilianda Kusmiaty1, Karina Adhaina, Noor Hindryawati1, Soerja Koesnarpadi1

Departement of Chemistry, Mulawarman University, Samarinda

Corresponding email: hindryawati@gmail.com

ABSTRACT

Synthesis Ti/W/Si composite as catalyst in photodegradation of Rhodamine B has been done. The stages of this research are synthesis Ti/W/Si and photodegradation process. Ti/W/Si was characterized using SEM and XRD. In the SEM results, there are heterogeneous pore in the surface morphology of Ti/W/Si, furthermore the Ti/W/Si diffraction pattern shows the presence of WO3 (monoclinic), TiO2 (tetragonal) and SiO2 (trigonal). The percentage degradation of Rhodamine B using 0.15 grams catalyst under visible light was 85.2%.
Bacterial and Fungal Endophytes from Mangrove of Sei Pakning Coast of Bengkalis, Riau Province, Indonesia

Yuli Haryani 1, Tetty Martalinda 2, Rahmiwati Hilma 3, Noviza Delfira 4, Fifi Puspita 3, Amelia Friska 1, Dita Juwita 1, Rudi Hendra 3, Yuana Nurulita 3, dan Fri Ardi 5

1 Chemistry Department, Faculty of Mathematics and Natural Sciences, University of Riau
2 Chemistry Department, Faculty of Health and Natural Sciences, Muhammadiyah University
3 Biology Department, Faculty of Mathematics and Natural Sciences, University of Riau
4 Agrotechnology Department, Faculty of Agriculture, University of Riau
5 Faculty of Pharmacy, Andalas University

*Corresponding email: yuli.haryani@lecturer.unri.ac.id

ABSTRACT

Mangrove is the collective term used to describe a group of plants which inhabit the region where the land meets the sea. Their environments hold a rich source for discovery of the new microbiota which extensive applications in pharmaceutical science. This study aimed to isolate endophytic bacteria and fungi from the roots, stem barks, and leaves of Mangrove trees of Sei Pakning coast, Bengkalis. Isolation was carried out by direct inoculation for each sterile segment sample and by inoculating the suspension of sterile segment sample in sterile NaCl 0.85% on the surface of plates. Mangrove samples were identified as Ceriops tagal (Perr) C.B. Rob., (the major vegetation) and Bruguiera sp. A total of 137 isolate of bacteria were isolated from root (27.8%), stem barks (60.6%), and leaves (11.7%). While 24 isolates of endophytic fungi were found from roots (8 isolates), stem barks (2 isolates), and leaves (14 isolates). Recent research is on screening of isolates producing metabolites with antimicrobial activity, especially for anti-vibriosis.

Keywords: bacteria, endophytes, fungi, Sei Pakning

Potency of Macaranga hullettii King ex Hook.f. Leaves as an anti-caries agent

Eva Marliana 1,2, Ritbey Ruga 1,2, Rita Hairani 1,2, Winni Astuti 1,2

1 Department of Chemistry, Faculty of Mathematics and Natural Science, Mulawarman University, Samarinda, East Kalimantan, Indonesia
2 Research Center for Medicines and Cosmetic from Tropical Rainforest Resources, Mulawarman University, Samarinda, East Kalimantan, Indonesia

*Corresponding email: eva.marliana@yahoo.com

ABSTRACT

Dental caries is a major oral health problem affecting children and the vast majority of adults. Dental caries is caused by the action of acids which is produced when sugars in foods or drinks react with bacteria on the tooth surface. The most common bacteria that significant contribute to tooth decay is Streptococcus mutans. In order to get the natural sources as anti-caries, the investigation on anti-caries potency of Macaranga hullettii King ex Hook.f. leaves was performed toward Streptococcus mutans ATCC 25175 using paper disc diffusion method. Ampicillin was used as a positive control in this study. The results exhibited that extract and fractions of Macaranga hullettii King ex Hook.f. leaves showed inhibition zones toward Streptococcus mutans ATCC 25175. It can be concluded that Macaranga hullettii King ex Hook.f. leaves has a good potency as anti-caries agent. Keywords: Macaranga hullettii King ex Hook.f., Anti-caries, Streptococcus mutans ATCC 25175
The Optimum Condition of Lipase of Endophytic Bacteria from Macaranga Hullettii King Ex Hook F.

Winni Astuti¹, Nelly Marliani, Eva Marliana, Rudi Kartika

¹ Laboratory of Biochemistry, Dept. of Chemistry, Faculty of Mathematics and Natural Science, Mulawarman University
² Research Center for Medicine and Cosmetics from Tropical Rainforest Resources

Corresponding email: winniastuti@gmail.com

ABSTRACT

Extracellular lipases from the endophytic bacteria isolated from Macaranga hullettii King ex Hook f. have been screened and isolated. Screening extracellular lipases employed agar plate containing rodhamin B. We got 6 endophytic bacteria isolates that produced extracellular lipase. Furthermore, the lipase from one of 6 isolate was characterized. The lipase was produced for 72 hours. The characterizes of optimum working conditions of the lipase were at temperature of 40°C, pH 8 and optimum olive oil concentration of 1.5%.

Optimisation of Molecularly Imprinting Polymers beta-Sitosterol of Precipitation Polymerisation Method Results As Adsorbent

St. Fauziah¹, Andi Irwan Gunawan¹, Nunuk Hariani Soekamto¹, Prastawa Budi¹, Paulina Tabà¹, Ajuk Sapar²

¹ Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Hasanuddin, Makassar, Indonesia
² Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Tanjungpura, Pontianak, Indonesia

Corresponding email: stfauziah_as@yahoo.co.id

ABSTRACT

Synthesis of Molecularly Imprinted Polymers (MIP) using the precipitation polymerization method has been carried out. The synthesized MIP is a cavity polymer with the shape, size and active side related to beta-sitosterol as a template molecule. This study aims to determine the performance and MIP adsorption capacity of beta-sitosterol. Optimization of MIP adsorption capability is based on the influence of time and concentration. The results showed that MIP is a white solid like powder. The optimum time of MIP_beta-sitosterol_MAA-co-TRIM to adsorb beta-sitosterol is 120 minutes. MIP_beta-sitosterol_MAA-co-TRIM adsorption follows a pseudo-second-order kinetics model and conforms to the Freundlich isothermal model with an adsorption capacity value was 0.9441 mg/g. This shows that optimization of time and concentration can increase the ability and capacity of adsorption of MIP_beta-sitosterol_MAA-co-TRIM to beta-sitosterol, so it is very well applied as an adsorbent to adsorb beta-sitosterol using SPE method.

Keywords: MIP, Monomers, Precipitation, beta-sitosterol, Polymers.
Synthesis of Biodiesel from Waste Vegetable Oil

Edwin Permana¹, M. Naswir², Meyly Ekawati², Haikal², SD Sumbogo Murti³

¹ Program Studi Kimia Industri, Fakultas Sains dan Teknologi Universitas Jambi
² Program Studi Kimia, Fakultas Sains dan Teknologi Universitas Jambi
³ Badan Pengkajian dan Penerapan Teknologi (BPPT) Serpong, Tangerang Selatan

*Corresponding email: edwinpermana86@unja.ac.id

ABSTRACT

Biodiesel is an alternative fuel that can be renewed. In this study, the production of biodiesel from used waste vegetable oil through the initial treatment reaction (saponification) then carried out the transesterification and it was obtained that % yield of biodiesel produced ranged from 50-60%. Furthermore, biodiesel is used for the synthesis of green diesel through the hydrodeoxygenation reaction using the beatch of autoclave reactor with sulfided NiMo/Al₂O₃ catalyst. The optimal conditions of the synthesis biodiesel for saturate the double bond and remove oxygen are for a pressure of 30 bar at a temperature of 400°C and a pressure of 50 bar at 350°C. The result of characterization for gas products using GC-TCD shows the components of H, O₂, CO, CH₄ and CO₂ which indicate the selectivity of the HDO reaction to DCO/DCO₂ and cracking. The quality of biodiesel per quality standard, density at 30 bar pressure 450°C and 50 bar temperature 400°C and pour point at 30 bar temperature 400°C, 50 bar temperature of 400 and 450°C. The quantity of biodiesel produced for used cooking oil is 56.67; 57.08; 66.98; 52.97; and 58.59%. In quality testing, the parameters tested include density, acid number, flash point, pour point, and viscosity. The results showed that the used cooking oil samples showed consecutive results were 0.8919 g/mL; 0.751%; > 200 °; 9 ° and viscosity 46.88 mm²/s. Whereas for biodiesel yields were 0.8871 g/mL; 0.3375%; 184 °; 9 ° and 32.65 mm²/s.
Synthesis of Bioplastics from Starch of Dioscorea hispida as Matrix Biocomposites and Palm Fronds (Cellulose) as Fillers

Edwin Permana¹, Diah Riski Gusti, Mardian Peslinof, Indra Lasmana Tarigan³

¹ Dept. of Industrial Chemistry, Jambi University, Jambi
² Dept. of Physics, Jambi University, Jambi
³ Dept. of Chemistry, Jambi University, Jambi

*Corresponding email: edwinpermana86@unja.ac.id

ABSTRACT

Bioplastic is one type of plastic made from renewable biomass, such as starch. However, starch has not been able to produce bioplastics because of the strength still low and thus requires the addition of biopolymers such as cellulose and plasticizers. The source of cellulose in this study was from palm midrib, starch from Dioscorea hispida Dennst has a potential filler for strengthening bioplastics by using glycerol as a plasticizer. Palm midrib cellulose was extracted by alpha-cellulose isolation by delignification method. Cellulose extraction from Palm midrib by using variations of NaOH concentrations were 15, 20 and 25% by weight, and NaOCl 3.5% as bleaching. Bioplastic films were prepared by varying glycerol 0.5, 1 and 1.5 gr. The density of bioplastic films produced has a fluctuating value. Water absorption of bioplastic films was still high when compared to LDPE commercial plastics. Mechanical properties include tensile strength and elongation at break. The results showed that the best bioplastic found at NaOH 20% with the addition of 1.5 g glycerol. The physical properties of bioplastic were density 0.3 gr/ml and water absorption 128.57%. Mechanical properties in this bioplastic film are tensile strength is 14.57 MPa/mm² and elongation 5.44%. Bioplastic with the addition of high glycerol shows a cracked surface structure.
Synthesis of 5-isopropyl-2,3-dimethylhydroquinone and The Solubility Analysis in 1-Octanol/Water
Alma Miranda, M. Farid Rahman, Suratmo, Siti Mariyah Ulfa
Dept. of Chemistry, Brawijaya University, Malang
*Corresponding email: ulfa.ms@ub.ac.id

ABSTRACT
The developing of quinone based drug have received considerable interest, especially quinone-containing alkylating agent for an anticancer drug. The low cost of benzoquinone or hydroquinone (HQ) becomes a research interest for the starting material to be developed. Here, the synthesis of 5-isopropyl-2,3-dimethylhydroquinone (2) was performed based on the Friedel-Craft alkylation reaction. The reflux between 2,3-dimethylhydroquinone (1) with glacial acetic acid and H2SO4 98% was carried out for 15 minutes. The collected crude product was purified by SiO2 column and eluted with n-hexane 100%. Compound 2 was obtained at 54.03%. Analysis using FT-IR showed the stretching of CH sp3 at 2963 cm\(^{-1}\) and the isopropyl stretching (CH\(_3\)CH\(_2\)CH\(_3\)) at 952 cm\(^{-1}\). The 1H-NMR analysis reveals the chemical shift of \(-OH\) at 4.63 ppm (s, 2H), the isopropyl proton at 3.15 ppm (m, 1H, \(J = 6.8\) Hz), and aromatic proton (Ar-H) at 6.47 ppm (s, 1H). Further analysis is determined by 2D HETCOR (HMBC and HMQC). The solubility test (expressed by LogP) of compound 2 is calculated using ALOGPS 2.1 program. Compound 2 gave LogP = 2.45 and the starting material 1 gave LogP = 1.22. It is suggested that the hydrophobicity/lipophilicity of the synthesized compound is higher than the starting material. The in vitro analysis of solubility of compound 2 is under consideration.

Adsorption-Photocatalytic Degradation of Methyl Orange on TiO2/AC Composite Material
Anggun Lila, Osi Arutanti
1Research Center for Chemistry, Indonesian Institute of Sciences, Kawasan Puspitek, Serpong, Tangerang 15314, Indonesia
2Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Jl. Kampus Timur, Sekaran, Gunung Pati, Semarang, Central Java 50229
*Corresponding email: osiarutanti@yahoo.com

ABSTRACT
The decomposition of organic dyes via photocatalytic processes for wastewater purification is still an interesting research topic from the environmental conservation point of view. Herein, the adsorption-photocatalytic performance of titanium dioxide (TiO\(_2\)) to decompose methyl orange was investigated systematically. This work demonstrates the synthesis of composite TiO\(_2\)/AC via the sol-gel method. The optimum photocatalyst TiO\(_2\) was prepared by varying the composition of activated carbon and the annealing temperature. The result showed that the different conditions affected the specific surface area, crystallinity, and photocatalytic performance. The result showed that 1:3 mass composition with annealing temperature at 400 °C was the optimum condition. More than 90% of 4 ppm of Methyl Orange can be degraded in 100 minutes. This value was 50% higher than that of pure annealed-TiO\(_2\).

Rahmat Gunawan\textsuperscript{1}, Erwin\textsuperscript{2}, RR Dirgarini JNS\textsuperscript{1}

\textsuperscript{1}Lab. of Physical Chemistry, Dept. of Chemistry, Mulawarman University
\textsuperscript{2}Lab. of Organic Chemistry, Dept. of Chemistry, Mulawarman University

*Corresponding email: rahmat.gunawan@yahoo.co.id

ABSTRACT

Electron transfer studies on the interaction of molecular systems cyanidin-TiO\textsubscript{2}-graphene and curcumin-TiO\textsubscript{2}-graphene have been carried out. The method used in all calculations uses the Density Functional Theory method. The calculation of the HOMO-LUMO difference from the cyanidin and curcumin molecules is 8.03 eV and 7.65 eV, respectively. The best distance calculation between cyanidin and curcumin molecules on the TiO\textsubscript{2}-graphene surface is 4.4 Å and 4.6 Å, respectively. While the PDOS calculation obtained the price of band gap from the TiO\textsubscript{2}-graphite system was 2.03 eV while in the cyanidin and curcumin system the TiO\textsubscript{2}-graphite system was 3.51 eV and 3.75 eV, respectively. The electron transfer shown by the value of the isosurface shows the transfer of electrons from the p and d sub orbitals from the TiO\textsubscript{2}-graphite surface to the s and p sub orbitals on the cyanidin and curcumin molecules of +0.746 e / Å and 0.875 e / Å, respectively. These results indicate that the interaction of the curcumin molecule in the TiO\textsubscript{2}-graphite system is stronger than the cyanidin molecule.
Experimental and Theoretical Study of Pinostrobin as Copper Corrosion Inhibitor at 1 M H$_2$SO$_4$ Medium

Saprizal Hadisaputra *, Agus Abhi Purwoko , Saprini Hamdiani , Rosita Wati , Dina Asnawati , Yuniar Ponco Prananto 

* Chemistry Education Division, Faculty of Teacher Training and Science Education, University of Mataram, Jalan Majapahit No 62, Mataram, 83125, Indonesia.

Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Mataram, Jalan Majapahit No 62, Mataram, 83125, Indonesia.

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Brawijaya University, Malang 65145, East Java, Indonesia.

*Corresponding email: rizal@unram.ac.id

ABSTRACT

The effect of variations in concentration and temperature on the efficiency of pinostrobin corrosion inhibition of copper in 1M H$_2$SO$_4$ was studied using an experimental and theoretical approach. The experimental study begins by isolating pinostrobin from the boesenbergia rotunda L. rhizome. The isolated pinostrobin was then tested as a corrosion inhibitor in copper using the weight loss method. The DFT method with a combination of LanL2DZ and 6-311++G (d, p) basis sets was applied for theoretical studies. Pinostrobin was successfully isolated with a crystal yield of 57.65%, a melting point of 98.5 oC and purity of 99.99%. The maximum corrosion inhibition efficiency of pinostrobin is 65.71% at a concentration of 500 ppm, temperature 328 K and an optimum time of 4 hours. The thermodynamic parameter shows that the Ea value < 80 kJ / mol indicates physical adsorption. Corrosion reaction takes place spontaneously which is strengthened based on the value of $\Delta G_{ads} <$ -20 kJ / mol. Theoretical studies indicate the addition of amine NH$_2$ substituents to pinostrobin increases the efficiency of inhibition to 73.07% while the addition of amino NO$_2$ substituents decreases the efficiency of corrosion inhibition to 60.97%. Experimental and theoretical studies have good correlation explaining the efficiency of corrosion inhibition from pinostrobin.
Optical and Electrical Properties of Au-Ag Nanoalloys Synthesized through Photochemical Reduction using Femtosecond Laser

Affi N. Hidayah¹, Y. Herbani¹

¹ Research Center for Physics, Indonesian Institute of Sciences, Tangerang Selatan, Banten, Indonesia

*Corresponding email: affi001@lipi.go.id

ABSTRACT

Currently, significant attention has been given to the nanoalloy material synthesis due to the emergence of their novel catalytic, energy storage, and optical functionalities beyond those of pure metals. Especially for Au-Ag alloy nanoparticles (NPs). A high pulsed femtosecond laser was used to synthesize Au-Ag nanoalloys through a photochemical reduction, facilitated by the abundant solvated electron and hydrogen radicals generated during the irradiation. We used a Ti:sapphire femtosecond laser (SpitfireAce, Spectra-Physics) with 100 fs full-width-half-maximum (FWHM) pulses at a fundamental wavelength of 800 nm, a laser power of 2.1 Watt/pulse and a repetition rate of 1 kHz. The laser beam was focused using an aspheric lens with a focusing length of 8 mm (NA = 0.5), directed perpendicularly to the side-wall of the glass cuvette. The samples were prepared from the solutions of gold and silver ions and added into a quartz cuvette (10 x 10 x 45 mm dimension) in various volume ratios. The samples called AuxAgy, where x and y were the volume fraction for Au and Ag ions, respectively with a total volume of 3 ml were irradiated for 10 minutes of irradiation time. After irradiation, each sample was characterized by UV-Vis spectrophotometry (MayaPro 2000, Ocean Optics) to observe optical properties that were Surface Plasmon Resonance (SPR) peak was observed. Only Au0Ag100, Au20Ag80, Au80Ag20 and Au100Ag0 were characterized by Particle Size Analyzer to measure zeta potential and conductivity. The result shows in Table 1, where Au0Ag100 has the highest conductivity and Au100Ag0 has the lowest conductivity and Au20Ag80, and Au80Ag20 have the conductivity value between Au0Ag100 and Au100Ag0.
Indonesian people often use black glutinous rice as an ingredient for making snacks. Black glutinous rice production in Indonesia produces husk, which the application is limited. Black glutinous rice husk can be classified as biomass and used as activated charcoal. Activated charcoal is widely used by various sectors such as agriculture, health, environment, and industry. This research is aimed to study the characteristics of activated charcoal obtained from black glutinous rice husk using infrared spectroscopy. The raw husk characteristic was analyzed through a proximate test. The husk was converted into charcoal using the roasting method. The charcoal was then activated using H₃PO₄, 85% solution of a ratio of 1:2 for 2 hours at 60°C. The charcoal before and after activation were characterized using infrared spectroscopy. Proximate test results show black glutinous rice husk contents were 73.77% carbohydrate, 15% ash content, and 7.87% water. From the infrared spectra of charcoal before and after activation, it can be seen that the functional groups in both charcoal were still the same as the functional groups of the raw material. This indicates that hemicellulose, cellulose, and lignin in black glutinous rice husk have not completely decomposed into carbon. However, the IR spectra of charcoal after activation shows that the peaks of Si-H were not found anymore, indicating the hydrogen from the Si-H bond was drawn by phosphate ions in the activation process. Keywords: Black glutinous rice, husk, roasting method, activated charcoal, infrared spectroscopy
The Mechanically Extraction Process of Gambier (Uncaria Gambier Roxb) Leaves From Limapuluh Kota West Sumatera and Its Antioxidant Activity

Galuh Widiyarti*, Andini Sundowo, Euis Filailla and Joddy Arya Laksmono

Research Center for Chemistry, Indonesian Institute of Sciences (LIPI)
PUSPIPTEK Serpong, Tangerang Selatan, Banten 15314, Indonesia

*Corresponding email: galuh.laksmono@gmail.com

ABSTRACT

The extraction process of gambier (Uncaria gambier Roxb) leaves was conducted mechanically by using electric hydraulic press, manual hydraulic press, and screw press. The gambier leaves was obtained from Limapuluh Kota District, West Sumatera, Indonesia. The aqueous extracts obtained were then phytochemical screened to determine the presence of different classes of secondary metabolites, namely alkaloids, polyphenols, flavonoids, and terpenoids contents. Other than that, water, catechin and epicatechin contents of the extracts were also determined. Antioxidant activity of the extracts was performed by 1,1-diphenyl-2-pikrilhidrazyl (DPPH) method and compared to vitamin C as a standard antioxidant. The phytochemical screening indicated the present of alkaloids, polyphenols, flavonoids, and terpenoids of the extracts. Whilst catechin and water contents of the extracts analyzed based on gambier’s SNI by spectrophotometry and thermogravimetry showed that catechin and water contents of the extracts were about 40% and less than 10%. Besides, analysis result of catechin and epicatechin contents of the extracts using HPLC showed that catechins and epicatechins contents of the extracts about 5.77-18.3X10^2 and 6.29-8.89X10^5 ppm. The antioxidant activity of the extracts were about 1.5 to 1.8 times stronger than vitamin C with IC50 value of the extracts of 4.37-6.69 µg/mL so that the extracts were categorized as very active as an antioxidant.
Thermal Stability of Lining Leather with Different Pre-treatment Process

Iwan Fajar Pahlawan¹, Dona Rahmawati ¹, Heru Budi Susanto ²

¹Center for Leather, Rubber and Plastics, Ministry of Industry
²Indonesian Footwear Industry Development Center, Ministry of Industry

*Corresponding email: iwan.fp@kemenperin.go.id

ABSTRACT

Leather, as a bio-based material, has a challenge in its manufacturing. Conventional manufacturing with chromium tanning agent has been challenged to be replaced with other tanning agent. Thermal stability is a major concern in leather tanning operation. This study aimed to investigate the thermal stability of lining leather with different pre-treatment prior to tanning operation. Pickled sheepskins were processed into lining leather article with a combination tanning agents between Gambier extract and aluminium sulfate. The pre-treatment process included the use of bating agent and pre-tanning agents. It is found that the pre-treatment process improved the hydrothermal properties of the leather. The presence of pre-tanning agents improved the leather’s shrinkage temperature up to 80 degree of Celsius. It is confirmed by the leather’s degree of tannage where pre-treatment with the addition of pre-tanning agents is higher (> 50%) than those without the pre-tanning agents (< 35%). Furthermore, thermogravimetric analysis showed that the combination-tanned leather prepared with pre-tanning agents has higher stability against heat exposure. It is concluded that pre-tanning agents could improve the penetration of tanning agents used in the tanning operation.
Characteristic of the results optimization the reduction process of saprolite ore composite in Tube Furnace

Angella Natalia Ghea Puspita, Adji Kawigraha, Nur Vita Permatasari

1 Center of Mineral Resource Technology (PTPSM), Agency for Assessment and Application Technology (BPPT), Serpong, Banten, Indonesia

*Corresponding email: angella.natalia.ghea.puspita@gmail.com

ABSTRACT

The potential resources and reserves of nickel ore in Indonesia is the third largest in the world. The potential quite large but the nickel content found in nature is very small. To increase the added value of nickel ore, it is necessary to process/refine nickel ore. The processing/refining technology of nickel ore carried out through the Pyro metallurgy and Hydro metallurgy technique. Hydro metallurgy technique involves chemical reactions with other additional loads, while the Pyro metallurgy technique involves high temperatures and large energy. Percentage (%) coal ratio, process temperature, process time, and addition of additives are more important parameter of processing of nickel ore using Pyro metallurgy technique. The pyro metallurgy process using process reduction in Tube Furnace by using saprolite ore composite. The result of reduction process of saprolite ore composite in Tube Furnace analyzed using X-Ray Powder Diffraction (XRD). XRD analysis to know the chemical compound of the ore composite. The objective of this research is to know the characteristic of result optimization the reduction process of saprolite ore composite in Tube Furnace. Key word: characteristic, composite, saprolite ore, reduction process, Tube Furnace, X-Ray Powder Diffraction (XRD).

Synthesis of 5-(4-bromobutyl)-2,3-dimethyl-1,4-benzoquinone and The Solubility in n-Octanol/Water Partition System

Nadiyah Zuhroh and Siti Mariyah Ulfa

Chemistry Department, Faculty of Science, Brawijaya University, Jl. Veteran Malang, 65145 Indonesia

*Corresponding email: ulfa.ms@ub.ac.id

ABSTRACT

The modification structure of 1,4-benzoquinone is fascinating in the frame of drug design to adjust the solubility (hydrophobicity/lipophilicity) in a biological system. The solubility properties of a new drug are important, especially for oral drug administration. Based on the previous report, 2-isopropyl-5-methyl-1,4-benzoquinone (known as thymoquinone) which is the major constituent in Nigella sativa seed extract is an active compound with poor lipophilicity, here, we reported the synthesis of 5-(4-bromobutyl)-2,3-dimethyl-1,4-benzoquinone with higher lipophilicity compared with thymoquinone. The synthesis is performed by oxidation reaction of 2,3-dimethyl-1,4-hydroquinone (1) with H2SO4 followed by bromoalkylation reaction using bromopentanoic acid in the presence of AgNO3 and (NH4)2S2O8. The oxidation product 2,3-dimethyl-1,4-benzoquinone (2) and alkylated-quinone 5-(4-bromobutyl)-2,3-dimethyl-1,4-benzoquinone (3) were obtained in 52.64% and 5.85%, respectively. The FTIR analysis of compound 3 showed the additional C-Br stretching at 562 cm-1. The solubility test in n-octanol/water system using HPLC for compound 3 gave log P value 2.99. However, the log P of thymoquinone was 2.21. By this result, it is showed that the modification of 1,4-benzoquinone by alkylating agent increased the solubility of the compound.
Anti-inflammatory Activity of Neural Tension Reducing Herbal Medicine Based on Edema Inhibition of CARR-induced Sprague Dawley paws

Dewi Tristantini, Raiska Bani Pramadhanya, Aisyah Hanifah

1 Dept. of Chemical Engineering, University of Indonesia, Depok
*Corresponding email: detris@che.ui.ac.id

ABSTRACT

Trigeminal Neuralgia as one of Neural Tension disease is a neural disorder causing great pain. Increasing neural tension may induce nerve inflammation which producing compounds responsible for signaling pain, fever dan heat signal. The traditional herbal recipe has found out that a combination of ginger (Zingiber officinale), nutmeg (Myristica fragrans), dan clove (Syzygium aromaticum) is empirically believed to contribute as neural tension herbal medicine with anti-inflammatory activity. Result from herbs formulation and reflux extraction than analyzed for anti-inflammatory activity using in vivo & Winter method with Sprague-Dawley white male rats (Rattus norvegicus) and quantitative phenol content. Anti-inflammatory analysis was done by 6 groups of rats, which is normal control, negative control, positive control, dosage I (given 1.125 mL/200 g BW herbal extract), dosage II (given 2.25 mL/200 g BW herbal extract) and dosage III (4.5 mL/200 g BW herbal extract). Anti-inflammatory of 10 g herbs extract in 250 mL solvent then observed through the inhibition of oedema formation on rats paw along the time. Dosage III group has the higher inhibition percentage as in 75.76%, which almost equivalent as normal control group (82.28%).
**Identification of Volatile Compounds in Meat and Bones Broth in Different Cattle using Solid Phase Micro Extraction-Gas Chromatography Mass Spectrometry (SPME-GCMS)**

Diana Candra Dewi[1, 2], Chanif Mahdi[1,*], Hermin Sulistyarti[1], Aulaniam[1]

1. Department of Chemistry, Faculty of Science, Brawijaya University, Malang, Indonesia
2. Halal Research Group, Department of Chemistry, Faculty of Science and Technology, UIN Maulana Malik Ibrahim, Malang, Indonesia

*Corresponding email: chanif@ub.ac.id

**ABSTRACT**

The flavor is one of the sensory attributes for consumers to distinguish broth cattle. One way to determine the differences broth cattle between is by identification the volatile compound that contributes to the aroma of food. The aim of this research was to determine the composition of volatile compounds in meat and bone broth from beef, pork, goat and chicken. The broth is produced by using an oven at 100°C for 3 hours. Volatile compounds in broth samples were extracted using solid phase-micro extraction (SPME) method for 1 hour at room temperature and analyzed by gas chromatography-mass spectrometry (GCMS). Ten predominant volatile compounds from each bone broth were compared to determine possible volatile markers, also from each meat broth. The volatile compounds found in each bone broth were hexanal, nonanal, methyl-d1 1-dideuterio-2-propenyl ether, and naphthalene. The possible volatile marker was determined when a compound only found in one kind of broth. 2,3-octandione and 1,3-dichlorobenzene were only found in pork bone broth, 1-(2-aminophenyl)ethanone oxime was only found in beef bone broth, tetradeacmylcyloheptasiloxane and bis(2-ethylhexyl) ester hexanedioic acid were only found in goat bone broth while benzaldehyde and hexanoic acid were only found in chicken bone broth. The compounds such as decamethylcyloheptasiloxane, dodacemethylcycloheptasiloxane and hexanoic dicoctyl ester acid were only found in pork meat broth, 3-hydroxy-2-butanoic acid, (+)-isomenthol, neryl acetone, and propanoic acid, 2-methyl-1(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester were only found in beef meat broth, hexanedioic acid, bis(2-ethylhexyl) ester, 3,6-dioxaoctane-1,8-diamine, 1-trimethylsilyloxy-4-methoxy-2-phenylbutane and 3,6,9,12,15-pentaoxananodecan-1-ol were only found in goat meat broth while benzaldehyde and decamethylcyclopentasiloxane were only found in chicken meat broth. Keywords: volatile compounds, broth, meat, bone, SPME, GCMS.
Preparation of Nanoparticles from Curcuma longa L. and Cosmos caudatus Extracts and Their In Silico Anti-cancer Activity

Anna Safitri1, Amila Safira Putri1, Tri Dewi Octavianty1, Nopi Tri Wahyudi1

1Chemistry Department, Brawijaya University, Malang, 65145, Indonesia
2Research Center for Smart Molecules of Natural Genetic Resources (SMONAGENES), Brawijaya University, Malang, 65145, Indonesia

*Corresponding email: a.safitri@ub.ac.id

ABSTRACT

This study aims to prepare nanoparticles from Curcuma longa L and Cosmos caudatus extracts, and to investigate their physico-chemical characterizations. Their potential as anti-cancer agents is investigated by in silico molecular docking of compounds contained in the kenikir and turmeric, and using caspase-8 as protein target. The compounds investigated are curcumin from turmeric, and lutein from kenikir, and also mixture of curcumin and lutein. The first step in this research was maceration extraction of Curcuma longa L and C. caudatus, using ethanol (96%), and formulated into nanoparticles. Nanoparticles were characterized using spectrophotometry UV-Vis, FTIR spectrometry, and SEM (scanning electron microscopy). UV-Vis spectra confirmed that formation of nanoparticles emerged in the UV-vis region around 420 nm. FTIR analysis revealed the existence of functional flavonoids compounds from the extracts, showing at wavenumber 1440-1420 cm⁻¹. From SEM analysis, the formation of nanoparticles results in mostly flake-like morphology with particles size found within the range of 15-30 nm. The interaction of curcumin and lutein showed similar binding pattern on caspase-8 protein. The curcumin, lutein and complex of curcumin-lutein had several hydrogen bonds, hydrophobic interactions, and van der Waals interactions. The LD50 of the interaction between curcumin and caspase-8 was 2000 mg/kg, lutein and caspase-8 was 10 mg/kg, and the compound of lutein-curcumin was 2000 mg/kg. This study implies that curcumin and lutein have potential as activator for caspase-8 protein and might have potential as pro-apoptosis for cancer cells. The biologically synthesized nanoparticles could be of immense use in medical field for their potential as anti-cancer drugs. keywords: Curcuma longa L, Cosmos caudatus, nanoparticles, SEM, FTIR, in silico, caspase-8
Potency of Modified Cassava Flour as Binder and Thickener In Formulation Of Instant Infant Porridge Using Fortificant of Natural Folic Acid

Agustine Susilowati\textsuperscript{1}, Yati Maryati \textsuperscript{1}, and Aspiyanto\textsuperscript{1}
\textsuperscript{1} Research Center for Chemistry, Indonesian Institute of Sciences, Kawasan Puspiptek, Serpong-Tangerang Selatan, Banten

Corresponding email: agustine.1408@yahoo.co.id

ABSTRACT

A dry mixing between modified cassava (mocaf) and formula of infant porridge fortified with powder mixture of soy bean/mung bean tempeh, nixtamalized yellow corn, and fermented broccoli as fortificant of natural folic acid of A and B had been conducted in order to get instant infant porridge as complementary feeding (CF). This experiment activity aims to find out optimization in adding mocav as binder and thickener of folic acid and the best type of natural folic acid fortificant in preparing instant infant porridge and difference in characteristic after pouring on the whole composition, particularly folic acid, characteristic of folic acid monomer, volatile compounds, particle size and distribution of particle size both instant infant porridge and soup. The experiment activities were subsequent performed on mocaf flour concentration of 0, 6, 12, 18, 24, and 30\% (w/w of base formula of infant porridge) with porridge formula flour being formulated using fortificant folic acid equivalence with 1000 µg/mL to produce powder of instant infant porridge A and B. Further, each treatment was conducted a pouring with hot water so that it is get porridge with ready-to-consume using C and D. The result of experiment work showed that based on folic acid, optimization of dry mixing was achieved on type of fortificant A at mocaf concentration 18\% (w/w base formula of porridge) with composition of folic acid 689.73 µg/mL, dissolved protein 45.375 6.61 mg/mL, total solids 91.64\%, total sugars 352.17 mg/mL and reducing sugars 37.38 mg/mL increasing folic acid 18.30\% compared without adding mocaf. In this optimum condition, pouring process generates infant porridge with ready-to-consume with composition of folic acid 445.76 µg/mL, dissolved protein 6.61 mg/mL, total solids 9.905\%, total sugars 120.87 mg/mL and reducing sugars 27.824 mg/mL, however it drops folic acid to 18\% compared without adding mocaf. Keywords : folic acid, modified cassava (mocaf), porridge, formulation.
Mechanical and Thermal Properties of Nano-chitosan – Reinforced Starch-based Biocomposite Films from Sago (Metroxylon sagu)

Athoillah Azadia, Sugeng Supriyadi

1 Department of Mechanical Engineering, Universitas Indonesia, Depok, Indonesia

*Corresponding email: sugeng@eng.ui.ac.id

ABSTRACT

A biocomposite system incorporating nano-chitosan and sago starch (n-CS–SS) were developed by casting and solvent evaporation method. The aim of this work was to characterize and analyze the effects of the nano-chitosan concentrations (0, 2, 4, 6 and 8 wt% of starch) on physicochemical, mechanical and water vapor barrier properties as well as morphological characteristics of the nano-chitosan/sago starch (n-CS/SS) films. Possible intermolecular interactions between n-CH and SS were confirmed by Fourier-transform infrared spectroscopy (FTIR) and the reduction of crystallinity in XRD. The experimental data showed that the incorporation of nano-chitosan resulted in an increase in film solubility, tensile strength and elongation at break and a decrease in Young's modulus. Elongation at break of the n-CS/SS films increased with increasing of nano-chitosan concentration. The water vapor permeability (WVP) of n-CS/SS films increased with an increase of chitosan concentration and the same tendency observed for the moisture content. The addition of nano-chitosan in starch-based films increasing thermal stability was confirmed by thermogravimetric analysis (TGA) and differential thermal analysis (DTA). Scanning electron microscope (SEM) shows the surface morphology and interface of n-CS/SS composite films and suggests sufficient homogenization of starch and chitosan in biodegradable composite films. Keywords: sago starch, nano-chitosan, starch-based film, biocomposite.
Identification of Metal Binding Sites on HSA 4K2C

Syahputra Wibowo1,2; Sutiman B. Sumitro2; Sri Widyarti2
1. Doctoral Student of Biology, Faculty of Mathematics and Natural Sciences, Brawijaya University, Malang
2. Department of Biology, Faculty of Mathematics and Natural Sciences, Brawijaya University, Malang
*Corresponding email: swid@ub.ac.id

ABSTRACT

Human serum albumin (HSA) is a vital protein in the human blood serum that has transporter capacity that carries a wide range of ions, drugs, fatty acids, free radicals, nutritionals and also scavenger (Fasano et al., 2005). This ability make albumin become a protein that plays a big role in keeping homeostasis state in the human body. The HSA 4K2C is a recent model of human protein albumin without binding to any ligands deposited in Protein Data Bank in 2013 compared to previous HSA 1AO6 (1997). This research aim to determine 4K2C HSA characterization as well as its ability to bind transition metal ions. Data mining was performed to obtain HSA (4K2C) from PDB and transition metal ions such as Cu2+ (ID : 27099), Fe2+ (ID : 27284), Mn2+ (ID : 27854), Mn3+ (ID : 105130) and Fe3+ (ID : 29936) from PubChem. The analysis consists of ProtParam, Motif Search, CFSP, DLP-SVM, and docking. Docking used PyRx Autodock Vina with search space Center X (9.3232), Y (-23.360), and Z (5.6878) and Dimensions X (85.7204), Y (109.1736) and Z (79.3440). Analysis of receptor-ligand interactions used DS 2016. The results of the ProtParam analysis provide some information on Human Serum Albumin (4K2C) protein, which is it has 585 amino acids with an isoelectric point (pI) of 5.67, an index of protein instability of 38.85, then total amino acids (aa) residues of negatively charged (Asp + Glu) are 98 while the positively charged ones (Arg + Lys) are 83. Motive Search shows that there are three HSA motifs namely motif 1 (aa. 551-575), motif 2 (aa. 353-377), and motif 3 (aa. 61-185). CFSP shows ?-helix structure is the dominant structure compared to ?-sheet, turn and coil in 4K2C. DLP-SVM shows two domain linkers where DL-1 (aa. 410-451) and DL-2 (aa. 96-122). Docking shows the ability of HSA 4K2C in binding metal ions such as Cu2+, Fe2+, Mn2+, Mn3+ and Fe3+. The binding site showed a unique pattern of Fe2+, Mn3+ and Cu2+ bound to the same amino acid residues such as Gln29 (A), Tyr30 (A) and Gln32 (A). While Fe3+ and Mn2+ also bound to the same amino acid residues such as Cys34 (B), Arg144 (B), Leu31 (B), Gln32 (B). However, the side chain differs where Fe3+ in the side chain B while Mn2+ in the side chain A with additions bound to His39 (A). The type of bond between Cu2+, Mn3+, and Fe2+ ions to HSA 4K2C is metal acceptor, whereas in Fe3+ and Mn2+ ions divided into two, the metal donor and acceptor. Albumin is a protein that has high stability, unfolding events not found in normal 4K2C HSA on molecular dynamics simulations of 15.000 ps, unless on glycated condition (Wibowo et al., 2019). Albumin has MBS (Multi-Metal Binding Site) which is represented by the docking of several metal ions which bind to the same amino acid residues in the A side chain (Blindauer et al., 2008). The interaction of transition metal ions on the amino acid residue of Gln and His was also due to the hydrophilic and polar properties of the two amino acid residues. The capability of certain amino acids residue as a metal donor as well as the acceptor is determined by the affinity of each amino acid. The amino acids Cys, Asp, and Glu can be as donor and acceptor (Dudev & Lim, 2014). The binding affinity of transition metal ions to HSA 4K2C has the same amount of energy as -1.2 kcal/mol. Shielding effect allegedly plays a role in determining the size of binding affinity energy (Chen et al, 2019).
Effect of Graphene Oxide in the Ozonolysis Reaction of b-Carotene
Aisha Bella Anindita, Masruri, Rachmat Triandi T, Siti Mariyah Ulfa*
Dept. of Chemistry, Brawijaya University, Malang
*Corresponding email: ulfa.ms@ub.ac.id

ABSTRACT

b-Carotene is a class of carotenoids with two cyclic frameworks connected with the extensive conjugated double bond system. The oxidative cleavage of b-carotene through oxidation or enzymatic reaction gave apocarotenoids, such as the well-known vitamin-A. Here, in this research, we focused on the oxidation of b-carotene by using ozonolysis reaction supported by graphene oxide (GO) catalyst. The reaction was carried out for 1, 3, and 5 h in the presence of GO and ozone bubbling. To elucidate the ozone reactivity, reaction without GO was also carried out. The product for 5 h using GO showed the formation of oxidation product, supported by the presence of C=O stretching at 1727 cm\(^{-1}\), -OH stretching at 3459 cm\(^{-1}\), and C-O ester at 1276 cm\(^{-1}\) by FTIR. The UV-Visible analysis showed the blue shift of b-carotene absorption from 450 nm to 270-280 nm. However, the reaction using ozone itself (without GO catalysts) showed the formation of the product after 1 h reaction. The ozone showed react faster with the organic compound, especially those rich in unsaturated compounds, such as carotenoid results in the formation of carbonyl compounds species such as carboxylic acids. Further analysis of the reaction product using LCMS is under consideration.

Enzymatic esterification of glycerol and stearic acid using immobilized lipase in chitosan matrix
Sasangka Prasetyawan^, Anna Roosdiana^, Zahza Fatika Rahma^
^Chemistry Department, Brawijaya University
*Corresponding email: sasangka@ub.ac.id

ABSTRACT

Glyceril stearate is an ester with ability as an emulsifier. This ester can be produced by using immobilized lipase. This aims of this study were to determine the optimum condition of esterification of glycerol with stearic acid based reaction time, reaction temperature and reactant ratio. The esterification reaction was done by varying reaction time (6, 12, 18, 24, 30) hours, reaction temperature (30, 35, 45, 50, 55)oC, and ratio of stearic acid : glycerol (1: 1, 1: 2, 1: 4, 1: 6, 1: 8) mmol until the optimum conditions are obtained based on conversion percentage. The produced ester were identified by FTIR spectrophotometer and characterized by the value of Hydrophilic-Lipophilic Balance (HLB). The results were obtained at optimum conditions on reaction time 24 hours, reaction temperature 45oC and ratio of stearic acid : glycerol (1:2) mmol with conversion percentage of 9.77% and HLB values of 5.01 that was included in the w/o emulsifier type. In addition, the FTIR spectra obtained showed a strong absorption at wave numbers 1703.03 cm\(^{-1}\) (C=O), 1043.02 cm\(^{-1}\) (C-O), and 3402.20 cm\(^{-1}\) (O-H) that showed the characteristic absorption of stearoyl glycerol ester.
Critical size and magnetic properties of a nanocube geometry of alloy of iron base ferromagnetic materials

L. Rohman¹, E. Purwandari¹, and D. Djuhana²

¹ Department of Physics, Faculty of Mathematics and Natural Sciences, University of Jember Kalimantan Street No. 37, Tegal Boto, Jember 68121, Indonesia
² Department of Physics, Faculty of Mathematics and Natural Sciences, University of Indonesia, Depok 16424, West Java, Indonesia

Corresponding email: el_rahman.fmipa@ unej.ac.id

ABSTRACT

Abstract. The Critical size determines the magnetic domain structure of ferromagnetic material. Magnetic material has a single domain structure up to a critical size. For a spherical geometry, various theoretical methods have been known to calculate the critical diameter, but for nanocube materials, there are still no theoretical equations to calculate them. In this study, a general equation has been developed to calculate the critical size of ferromagnetic material in the form of nanocubes. This general equation is determined based on the simulation results of the groundstate state of various nanocubes-shaped ferromagnetic materials. The critical size found in the critical length of the cube sides, below the critical size, the materials have a single domain structure while above the critical size that the ferromagnetic material has a multi-domain structure. The magnetic properties of a single domain structure material will be stronger than the multi-structured one, and this can be proven from the ferromagnetic hysteresis curve and the total energy density. Keywords: The critical size; nanocube geometry; the magnetic domain structure, magnetic properties; ferromagnetic materials; and alloy of iron base

Photoluminescent Gold(I) Pyrazolate Complex for Chemosensors of Ethanol Vapors

Almira Praza Rachmadian¹, Matheus Randy Prabowo², Leny Yuliati¹, Hendrik O. Lintang¹

¹ Department of Chemistry, Faculty of Science and Technology, Universitas Ma Chung, Malang, Indonesia
² Ma Chung Research Center for Photosynthetic Pigments, Universitas Ma Chung, Malang, Indonesia

Corresponding email: hendrik.lintang@ machung.ac.id

ABSTRACT

Volatile organic compounds (VOCs) have particularly gained attention in the detection of their effect on human health and the environment using photoluminescent materials or compounds. However, metal complexes with interesting photoluminescent properties have rarely been developed for the detection of alcohols such as ethanol as one of the VOCs. In this study, a gold(I) pyrazolate complex from 4-(3,5-dimethoxybenzyl)-3,5-dimethyl pyrazole ligand was successfully utilized for the photoluminescent chemosensor of ethanol vapors. Under the illumination of 278 nm light source, this complex emitted bright emission at 609 nm from its excited triplet states of the pyrazole ligand to gold(I)-gold(I) charge transfer. Upon exposure to ethanol in 15 minutes, this chemosensor suffered photoluminescent quenching up to 80% from the original emission intensity. Moreover, X-ray diffraction of this complex was in good agreement as shown from the decrease in its crystallinity. This phenomenon revealed that the molecular assembly of the gold(I) complex became less-ordered in the presence of ethanol, resulting in photoluminescent quenching. Keywords: ethanol detection, chemosensor, gold(I) complex, photoluminescence, quenching.
Influence Of Activation Time On Ibuprofen Adsorption Using Zinc Oxide From Gelatin Templating Method

Maria Ulfa*1 and Umi Wahidatul Latifah1

1Dept. of Chemistry Education, Faculty of Teacher Training and Education, Sebelas Maret University, Jl. Ir. Sutami 36A, 57126 Surakarta, Central Java Indonesia

*Corresponding email: ulfa.maria2015@gmail.com

Abstract: The present work aims to investigate the performance of activated zinc oxide for ibuprofen adsorption. The zinc oxide was synthesized by the templating method using F127 and gelatin as a soft template and sulfuric acid as a catalyst. The zinc oxide was activated by an HCL solution 1M for 1, 8, and 24 hours. The raw and activated zinc oxide were characterized by XRD and by infrared spectroscopy. The HCl treatment increases both of the numbers of Zn-O-Zn groups and peak of Zn-O from diffractogram but decreases hydroxil group content. Ibuprofen adsorption studies of kinetics and isotherms were carried out at room temperature with solid-liquid ratio 3:5 (v/v) at water-hexane solution. The adsorption properties were correlated to the activated conditions. The isotherms of adsorption were better reproduced by Langmuir–Freundlich models using activated zinc oxide by HCl at 8 hours. The best performance of ibuprofen adsorption resulted from activated zinc oxide at 8h using water-hexane 1:9 as ibuprofen solvent. Not only the activation time but also a high ratio of water-hexane influence the adsorption of ibuprofen performance

Keywords: activation, HCl, zinc oxide, solvent, ibuprofen, water, hexane

MESO GAMMA ALUMINA FOIL (MGA-Foil) FOR NEW 99Mo/99mTc RADIOISOOTOPE GENERATOR COLUMNS

Kadarisman1, Endang Sarmini1, Herlina1, Sriyono1, Miftakul Munir1 dan Marlina1

1Center for Radioisotopes and Radiopharmaceuticals Technology
National Nuclear Energy Agency

*Corresponding email: kadarisman_w@yahoo.com

Abstract The Mo-99 radioisotope as the parent of the Tc-99m that is produced from the natural Mo-98 target has a low specific radioactive concentration (? 50 mCi / g Mo). Therefore 99Mo / 99mTc generator need the using a column filler that has a high adsorption capacity of molybdenum . In this research, synthesized Meso Gamma Alumina Foil (MGA-Foil) for molybdenum absorbent material. MGA-Foil is synthesized from aluminum foil waste by dissolving using HCl, precipitated with ammonia and calcination at 600oC. MGA-Foil is characterized using FTIR, SEM, BET, TEM, XRD and TGA. The synthesized MGA-Foil has a chemical composition of Al 50.91%, O 48.32% and Cl 0.77%, pore diameter 4.56 nm, surface area 209.8 m2 / g, adsorption capacity 60.37 mg Mo / g MGA-Foil and Tc-99m radioisotope produced which can be used for MIBI, Etambutol and MDP tagging kits. Keyword; Alumina, Meso, Gamma, Molybdenum-99, Technetium-99m, Adsorption
Phytochemical Screening and In-Vitro Anti-oxidant Activity of Aqueous Extracts of Ruellia tuberosa L.

Christine Natalia Palisi, Anna Roosdiana, Anna Safitri

1Chemistry Department, Brawijaya University, Malang
2Research Center for Smart Molecules of Natural Genetic Resources (SMONAGENES)

Corresponding email: a.safitri@ub.ac.id

ABSTRACT

Our previous studies indicated that root extracts of pletekan plant (Ruellia tuberosa L.), extracted with n-hexane and ethanol/water (1/1) had anti-diabetic activity, as indicated by in vivo study using animal diabetic models. This study aims to investigate the phytochemical compounds contained in the aqueous extracts of R. tuberosa L., and to determine their anti-oxidant activities. The dried R. tuberosa L were extracted using maceration technique, with distilled water, in the volume of 4? dried weight, for 24 h. The phytochemical screening tests revealed the presence of flavonoids, ascorbic acids, tannins, and phenolic compounds in those extracts. In vitro antioxidant study using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) scavenging assay showed that the crude hydroethanolic extracts expressed high free radical scavenging activity with the IC50 value of 15.22 ug/mL. In a similar test, vitamin C was used for a reference, and has resulted in the IC50 value of 3.18 ug/mL. Conclusively, aqueous roots extracts of R. tuberosa L. could be considered a remedy for diseases which are associated with free radicals, i.e. diabetes mellitus. Keywords: antioxidant, IC50, R. tuberosa L, aqueous extracts, DPPH
In silico analysis and molecular docking studies of potential alpha-glucosidase inhibitor using Aqueous Extracts Compounds of Ruellia tuberosa L. (betaine, daidzein, and hispidulin)

Calista Diva Eka Rahma,¹ Dewi Ratih Tirto Sari,² Anna Safitri¹,³
¹Chemistry Department, Brawijaya University, Malang, 65145, Indonesia
²Biology Department, Brawijaya University, Malang, 65145, Indonesia
³Research Center for Smart Molecules of Natural Genetic Resources (SMONAGENES), Brawijaya University, Malang, 65145, Indonesia

*Corresponding email: a.safitri@ub.ac.id

ABSTRACT

The purpose of this study is to analyze the inhibitory action of aqueous extracts of R. tuberosa L to alpha-glucosidase by computational docking studies. For this, three compounds contained in the extracts (betaine, daidzein, and hispidulin) were chosen as ligands for molecular interaction. The crystallographic structure of molecular target, alpha glucosidase was obtained from PDB database (PDB ID: 5kzx). Computational docking analysis was performed using HEX 8.0.0 program, and visualized using Discovery Studio visualizer v19.1.0.18287, 2018 version, based on scoring functions. The interaction between betaine, daidzein and hispidulin in docking with alpha-glucosidase showed different active sides of the bond. The types of bonds involved in the interaction between the enzyme and those ligands were hydrogen and hydrophobic bonds. Energy generated from docking between betaine, daidzein and hispidulin with alpha-glucosidase were -167.6; -249.5; -251.2 cal/mol, respectively. Hispidulin showed the lowest energy, suggesting that hispidulin has the strongest interaction to alpha-glucosidase. In addition, daidzein bound to the active sides of alpha-amylase indicates that daidzein is in inhibitor for alpha-amylase, therefore, has the potential to have anti-diabetic activity. These were followed by daidzein, then betaine. Overall, this study implies that aqueous extracts of R. tuberosa L have potential as inhibitor for alpha-glucosidase protein, and have potential to be used as anti-diabetic agent. Further in vitro and in vivo studies are needed to confirm this in silico analysis. Keywords: Ruellia tuberosa L, in silico, alpha-glucosidase, betaine, hispidulin, daidzein
Synthesis of Cobalt (II)-Mediated Molecularly Imprinted Polymer Monolithic Column Using Ionic Liquid as a Porogen and Its Application to a Chiral Stationary Phase For Liquid Chromatography

Suci Amalia[1, 2], Nilna Assasiatur Rafika, Shova Audinia Hardiyanti, Bagas Dwi Pamungkas, I Gede Bhaskara Adi Pratama, Adi Dwi Ashari, Bhisma Wildan Khabibi, Elvina Dhiaul Iftitah, Warsito, Akhmad Sabarudin[1,3]

[2] Department of Chemistry, Scince and Technology Faculty of University Islam Negeri Maulana Malik Ibrahim Malang, Gajayana Street No. 50, Malang 65144, Indonesia.

* Corresponding email: amel.kimiaa@gmail.com

ABSTRACT

A monolithic molecularly imprinted polymer (MIP) column was prepared as the stationary phase for high performance liquid chromatography (HPLC) separation of enantiomer rac-citronellal and rac-pulegone. MIP column was prepared in ionic liquid by use of the metal pivot concept. It was synthesized by use of a mixture of (R)-(+)citronellal or (R)-(+)pulegone (template), 4-vinylpyridine (functional monomer), ethylene glycol dimethacrylate (EDMA) or trimethylolpropane trimethacrylate (TRIM) as crosslinker monomer, and metal ion Co2+ as pivot between the template and functional monomer. A ternary mixture of [BMIM]BF4-dimethylformide-dimethyl sulfoxide are 10:1:5 (v/v) for EDMA cross linker and 1:1:1 (v/v) for TRIM cross linker. The mixture also containing metal ion Co2+ was used as the porogenic system. Separation of the enantiomers of rac-citronellal or rac-pulegone was successfully achieved on the MIP thus obtained. Separation using monolith columns without a template gives different retention time results when compared with MIP columns. Compounds which are separated using MIP columns will last longer in the column. The SEM-EDX analysis results show that the particle size of MIP is very uniform.
Rapid Microfluidic Paper Based Analytical Device For Blood Urea Nitrogen-Creatinine Analysis Using Colorimetric And Distance Based Detection

Reski Helena Rupilu¹, Vania Devi Ariesta¹, Eva Puspita Indriyani¹, Ika Wuri Mahdiasanti¹, Ulfa Andayani¹, Akhmad Sabarudin*¹,²

¹ Dept. of Chemistry, Faculty of Science, Brawijaya University, 65145, Indonesia
² Research Center for Advanced System and Material Technology, Brawijaya University, 65145, Indonesia

*Corresponding email: sabarjpn@ub.ac.id

ABSTRACT

This work represents the fabrication of smart clinical system in microfluidic form, which is called as a microfluidic paper based analytical device (µPAD) for rapid detection of kidney disfunction. Two crucial parameters for kidney injury are based on blood urea nitrogen (BUN) and creatinine in blood. Urea detection is based on urea hydrolysis, in which ammonia and carbon dioxide are catalyzed by urease, the ammonia ions produced then reacted with the Berthelot reagents which produce blue-green signals. Creatinine detection is based on the formation of Javonsky complex (orange-red) as a product of creatinine-picric interaction in alkaline solution. This blue-green and orange-red signals are the basis for direct analysis with naked eye. The detection system involves two different designs, which are colorimetric (notified as design 1) and distance based (notified as design 2). The RGB intensity (design 1) were measured with Image J software and then compared with the measurement of color band length. Keywords: µPAD, BUN, creatinine, RGB, color band length.
The Dissolution of Cerium from Tin Slag through Alkaline Fusion and Acid Leaching

Kurnia Trinopiawan\(^1\), Kurnia Setiawan Widana\(^1\), Budi Yuli Ani\(^1\)

\(^1\)Center for Nuclear Minerals Technology, National Nuclear Energy Agency of Indonesia, Jakarta

*Corresponding email: kurniat@batan.go.id

ABSTRACT

Tin slag as a tin smelting waste has the main content of silica, and the rest are elements that have quite high economic value. Rare earth elements contained in tin slag was around 3%, where the dominant rare earth elements was cerium with 1% content in slag. The objective of this study was to determine the optimum conditions for the cerium extraction process, especially in the leach process, by conducting an alkaline fusion with sodium hydroxide prior to acid leaching. This pre-treatment was aimed to break the silica structure in the slag. Direct leaching was not effective, because the silica structure prevents the reagent from dissolving cerium or other elements in the slag. The fusion product, called frit, is dissolved with hydrochloric acid. Acid concentration, temperature, particle size, solid-liquid ratio, speed of agitation, and the duration of leaching were determined. Keyword: tin slag, cerium, acid leaching, alkaline fusion.

A Green Method to Prepare Composite of Graphene Oxide-Manganese Oxide using a Modified of Hummer's Technique

Masruri Masruri\(^1\), Marselus Jeques Gros\(^2\), Rachmat Triandi Tjahjanto\(^2\)

\(^1\)Dept. of Chemistry, Brawijaya University, Malang

*Corresponding email: masruri@ub.ac.id

ABSTRACT

A composite graphene oxide-manganese oxide (GO-MnOx) was facilely fabricated in one-step preparation by a modified of Hummer's technique. The Hummers method to graphene oxide preparation produced manganese residue which is a waste, therefore, we modified the Hummers method to convert manganese residue into value-added materials with aqueous sodium hydroxide (NaOH). The number of Mn on composite and surface chemistry was investigated. GO-MnOx was characterized by atomic absorption spectroscopy (AAS), UV-Visible spectrometer, Fourier transform infrared (FT-IR), X-ray diffraction (XRD), and transmission electron microscopy (TEM). GO-MnOx 1 and 2 have the number of Mn of 1.4231 and 2.0958 microgram/g, respectively. FTIR showed the presence of functional groups such as hydroxyl, epoxy, carboxyl, carbonyl, and manganese oxide. XRD confirmed the interlayer spacing of GO-MnOx synthesized by our techniques is lower than GO-MnOx produced by other processes. TEM showed that GO-MnOx is single layer yet and Mn species was not homogeneously distributed on composite.
Elctrochemical Behavior of Nickel Laterite Ores Dissolution in Sulphuric Acid

Abdul Hatta Gunawan Wibowo1, Arya An Ambari1, Faizinal Abidin1,2, Sri Harjanto1

1Department of Metallurgical and Materials Engineering, Faculty of Engineering, Universitas Indonesia, Kampus UI Depok 16424, Indonesia

2Center For Mineral Resources Development Technology, Agency For The Assessment And Application Of Technology, 820 Building, Earth System Technology (Geostech), Puspiptek Area, South Tanggerang 15314, Banten – Indonesia

*Corresponding email: sri.harjanto@ui.ac.id

ABSTRACT

Hydrometallurgical process of laterite nickel ore is carried out by atmospheric leaching or high pressure acid leaching. This study to characterize the electrochemical laterite nickel ore using sulphuric acid at atmospheric condition. Sulphuric acid solutions were used with concentrations of 1 M, 2 M, 4 M and 6 M. The study was carried out by sample and solution preparation, characterization by SEM-EDAX and Petrography method, and electrochemical characterization using the OCP, EIS method and LSV. The characterization results showed that the highest dissolution rate in both solutions was obtained at a concentration of 6 M solution. Increased concentrations of sulfuric acid reduced the value of OCP testing. The EIS test results showed that the lowest R2 or Rct was obtained at 2M concentration of 269.59 Ohm. The results of the second LP acid solution showed the formation of a passive layer at each concentration. The highest dissolution rate occurred at a concentration of 6M where the corrosion rate was 1.00 mm / year. Increasing the concentration led to the breakdown of the passive layer on the surface which can be seen from the Nyquist curve, the value of R2 is lower, the value of Q1 is higher and the value of N is lower, formation of passive layers returns to increasing concentration starting from 4M. The three electrochemical tests show an increase in concentration effected increasing the dissolution rate and breaking the passive layer on the surface.
Synthesis of Ni/MCM-41 Based on Silica of Lapindo Mud as a Catalyst of Palm Oil Hydrocracking

Febi Yusniyanti¹, Wega Trisunaryanti², Akhmad Syoufian²

¹ Department of Chemistry, Faculty of Science and Technology, State Islamic University Maulana Malik Ibrahim, Malang, East Java, Indonesia
² Department of Chemistry, Faculty of Mathematics and Natural Science, Universitas Gadjah Mada, Yogyakarta, Indonesia

Corresponding email: febi100292@gmail.com

ABSTRACT

Synthesis of Ni/MCM-41 based on silica of Lapindo mud as a catalyst of palm oil hydrocracking process have been carried out. The MCM-41 was synthesized using the silica of Lapindo mud as source of silica and cetyl trimethyl ammonium bromide (CTAB) as a template, by hydrothermal method at temperature of 100 ºC for 24 h. CTAB was removed using ethanol/HCl solution by reflux method. The nickel metal from NiCl₂·6H₂O salt precursor was loaded to the MCM-41 using wet impregnation method with ratio of nickel metal and MCM-41 was 1:200 and 1:50 (b/b). The MCM-41, Ni(0.5%)/MCM-41 and Ni(2.0%)/MCM-41 sample were analyzed by XRD, FT-IR, TEM, and GSA. The Hydrocracking process of palm oil was done using Ni(0,5%)/MCM-41 catalyst. Ratio of catalyst/palm oil feed is 1:50 (wt/v) at temperature of 400 ºC and H₂ gas was used with flow rate 20 cc/min. The hydrocracking product was analyzed using GC-MS. The result showed that The structure of MCM-41 was well-ordered and have average pore radius of 3.67 nm and surface area of 398.886 m²/g. Loading of 0.5 and 2.0 % (wt/wt) of nickel metal into the MCM-41 affected the MCM-41 structure. Product of hydrocracking used Ni(0.5%)/MCM-41 catalyst showed the conversion of hydrocarbon of 40.71% (wt/v) with selectivity toward gasoline and diesel fraction of 66.33% and 19.44% respectively. Keywords: MCM-41, Lapindo Mud, Hydrocracking, Palm Oil, Gasoline, Diesel
Effect Of Water Depth And Water Flow Velocity On The Microstructure And Mechanical Properties Of Underwater Wet Welded Low Carbon Steel

Fajar Paundra1, Juan Anindito1, Nurul Muhayat1, Triyono1, Y.C.N. Saputro2

1 Mechanical Engineering Department, Universitas Sebelas Maret Surakarta, Indonesia
2 UPTB Solo Technopark Technical Unit on Regional Development Planning Board Surakarta, Indonesia
*Corresponding email: triyonomesin@uns.ac.id

ABSTRACT

Underwater wet welding is the cheapest and easiest method for maintaining and repairing of offshore engineering equipment. It has disadvantage due to the water environment such as the high cooling rate and the hydrostatic pressure. The aim of this research is to determine the effect of water depth and water flow velocity on the microstructure and mechanical properties of the underwater wet welded low carbon steel. Underwater wet welding process was carried out by the SMAW (shielded metals arc welding) method in a water depth of 2.5 m and 5 m with variations in the water flow velocity of 0 m/s, 1 m/s and 2 m/s. The welding in the land was also performed as a comparison. X-ray radiographic test was performed to determine the type of welding defects. The types of defects include incomplete penetration (I), spatter (S), porosity (P), undercut (U), concavity (V), and irregular surface (Z) were found in the weld metal. The water depth and the water flow velocity were closely related to the cooling rate and hydrostatic pressure. Cooling rate affects the microstructure. The results of the microstructure investigation show that the grain size be smaller and smoother as increasing of the water depth and the water flow velocity. Tensile strength and hardness increased as increasing of the water depth and the water flow velocity.

Design, synthesis and biological activities of quinine derivatives as ?-glucosidase inhibitors

Teni Ernawati1, Minarti 1, Puspa Dewi N Lotulung1

1 Research Center for Chemistry, Indonesian Institute of Sciences
*Corresponding email: teni.ernawati.lipi@gmail.com

ABSTRACT

Insights into the role played by modified quinine in the asymmetric hydroxy group inspired studies of modified quinine as chiral organic that lead to the development of antihyperglycemic agent. These studies demonstrate the potential of modified quinine as wide spectrum bioactivity of quinine. Series quinine derivatives was synthesized and evaluated for for ?-glucosidase inhibitory effects. The structure of quinine derivatives was characterized by IR, melting point, UV, 1H NMR, 13C NMR, and mass spectral analysis.
Identification and Characterization of Aqueous Extracts of Ruellia tuberosa L using Liquid Chromatography-High Resolution Mass Spectrometry (LC-HRMS)

Salsabila Intan Savitri, Anna Roosdiana, Anna Safitri

1 Chemistry Department, Brawijaya University, Malang, 65145, Indonesia
2 Research Center for Smart Molecules of Natural Genetic Resources (SMONAGENES), Brawijaya University, Malang, 65145, Indonesia

*Corresponding email: a.safitri@ub.ac.id

ABSTRACT

In the current work, pletekan plant (Ruellia tuberosa L) were extracted using maceration technique, followed by identification and characterization of the resulted extracts. Bioactive compounds such as terpenoids, flavonoids, alkaloids, phenolic, and tannins are secondary metabolite compounds that usually dissolve in polar solvents, thus, in this study water was used to extract the plant. The LC-HRMS technique was applied to characterize the resulted extracts. Solvents used for LC-HRMS were 0.1% formic acid in water, and 0.1% formic acid in acetonitrile. Column used was analytical column Hypersil GOLD aQ 50 x 1 mm x 1.9 μ particle size, with the flow rate of 40 μL/min, ran for 70 min, in positive ion mode detection. As many as 95 compounds were detected in the extracts. Of these, the major compounds of interests were betaine (50.1%), nicotinic acid (2.3%), hispidulin (0.52%), ω-linolenic acid (0.83%), 4-coumaric acid (0.37%), and daidzein (0.11%). Betaine was identified at RT 0.89 min, nicotinic acid at RT 1.32 min, hispidulin at RT 13.53 min, daidzein at RT 28.4 min, ω-linolenic acid at RT 56.65 min, and 4-coumaric acid at RT 58.81 min. Hispidulin and daidzein are flavonoid compounds, while 4-coumaric acid is phenolic compound, these compounds have high anti-oxidant activity. Nicotinic acid, also known as niacin is vitamin B3 that can reduce the amount of cholesterol and triglycerides in the liver. Betaine, the oxidation product of choline, can act as an organic osmolyte to protect cells under stress, and finally alpha-linolenic acid, essential fatty acid that needed in human diet. These have proved that many beneficial compounds contained in the aqueous extracts of R. tuberosa L, and the extract have potential to be used for natural remedy. Key words: Ruellia tuberosa L, betaine, hispidulin, alpha-linolenic acid, coumaric acid, nicotinic acid, daidzein, LC-HRMS
In this current work, the potential anti-diabetic properties of aqueous extracts of Ruellia tuberosa L were determined by conducting in silico modeling approach. Ligands used in the study were betaine, hispidulin dan daidzein. Those ligands are compounds that contained in aqueous extracts of Ruellia tuberosa L. The ligands were downloaded from PubChem, the ID betaine is CID 247, daidzein is CID 5281708, and hispidulin is CID 5281628. Protein target was alpha-amylase. Alpha-amylase was obtained from PDB, with the ID 5kez. The downloaded protein has been pre-treated with removing water and other solvents that may bound to the proteins. Betaine, hispidulin, and daidzein were docked with alpha-amylase using HEX 8.0.0 program, and visualized using Discovery Studio visualizer v19.1.0.18287, 2018 version. The interaction between betaine, daidzein and hispidulin in docking with alpha-amylase showed different active sides of the bond. In addition, the types of bonds involved were including hydrogen and hydrophobic bonds which show interactions between the three ligands and α-amylase. Energy generated from docking between betaine, daidzein and hispidulin with α-amylase were -137.6, -245.8, -236.7 cal/mol, respectively. Daidzein compounds showed the lowest energy, indicating that daidzein is strongly bound to alpha-amylase. In addition, daidzein bound to the active sides of alpha-amylase indicates that daidzein is in inhibitor for alpha-amylase, therefore, has the potential to have anti-diabetic activity. Keywords: Ruellia tuberosa L, in silico, alpha-amylase, betaine, hispidulin, daidzein
Effect of NaCl Addition and The Incubation Time on Gallic Acid Concentration in Cabbage Fermentation using Lactobacillus plantarum

Viky Arina Zuhria1, Arie Srihardyastutie2, Anna Safitri3, Sasangka Prasetyawan1

1 Dept. of Chemistry, Brawijaya University, Malang
2 Research Centre for Smart Molecules of Natural Genetic Resources, Brawijaya University

ABSTRACT

Cabbage (Brassica oleracea var. capitata) is one type of vegetable that is often consumed. Cabbage contains gallic acid compounds which have potential as antioxidant. Gallic acid is produced from the hydrolysis reaction of the antinutrient compound, that is tannin. The tannin hydrolysis reaction is assisted by the presence of the tanase enzyme. One way to produce the tannase enzyme is by the process of fermentation using Lactobacillus plantarum. Therefore, this research was focused on the effect of NaCl addition and the incubation time on the gallic acid concentration during cabbage fermentation using Lactobacillus plantarum. Variations in the addition of NaCl used are 0 %, 0.5 %, 1.0 %, and 1.5 %. While the incubation time variations used are 4, 5, and 6 days. The fermentation conditions used were 5 % inoculum volume and pH 6. Gallic acid in fermented cabbage (biomass and filtrate) were determined using Folin-Denis method. The addition of 1.0 % NaCl and fermentation for 5 days are the optimum conditions in cabbage fermentation using Lactobacillus plantarum. During these conditions, the gallic acid produced in biomass and filtrate are equal to 20.11 mg/100 g and 400 mg/100 g, respectively. This experiment proves that the addition of NaCl and the incubation time can affect the level gallic acid produced in the process of cabbage fermentation. Keyword: Cabbage, Gallic Acid, Fermentation, Lactobacillus plantarum

A Potential of Micro/Nano-Cellulose from Pineapple Leave Isolated by Hydrolysis-Assisted Sonication

Luqi Khoiriyah Latif1, Masruri Masruri2, Barlah Rumhayati1

1Dept. of Chemistry, Brawijaya University, Malang, Indonesia

ABSTRACT

Cellulose has been reported have many functions for separation and absorption of heavy metals and organic materials waste or pollutants. This paper is reported preparation of micro/nano size of cellulose from the waste of pineapple leaves. The strategy involves delignification, bleaching, and hydrolysis process. The hydrolysis step plays an important role for cutting of the cellulose chain, and ultrasonication assisted hydrolytic procedure is applied. In addition, the product isolated is characterized by means of FTIR spectrometry and Scanning Electron Microscopy for its morphology features, including the Particle Size Analysis. It was isolated the cellulose from raw material is about 59.5% yield and hydrolysis assisted ultrasonication with 30% of sulfuric acid for 1 hour at room temperature provides micro/nano-cellulose in 0.1% yield. The FTIR show O-H, C-O- specific band for cellulose in 3402 cm-1, 1385 and 1200-1300 cm-1, respectively. This finding is lead for further application of this micro/nano-cellulose for absorbing of heavy metals and dye pollutants.

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ABSTRACT

Cellulose has been reported have many functions for separation and absorption of heavy metals and organic materials waste or pollutants. This paper is reported preparation of micro/nano size of cellulose from the waste of pineapple leaves. The strategy involves delignification, bleaching, and hydrolysis process. The hydrolysis step plays an important role for cutting of the cellulose chain, and ultrasonication assisted hydrolytic procedure is applied. In addition, the product isolated is characterized by means of FTIR spectrometry and Scanning Electron Microscopy for its morphology features, including the Particle Size Analysis. It was isolated the cellulose from raw material is about 59.5% yield and hydrolysis assisted ultrasonication with 30% of sulfuric acid for 1 hour at room temperature provides micro/nano-cellulose in 0.1% yield. The FTIR show O-H, C-O- specific band for cellulose in 3402 cm-1, 1385 and 1200-1300 cm-1, respectively. This finding is lead for further application of this micro/nano-cellulose for absorbing of heavy metals and dye pollutants.
Effectiveness of Using Trichoderma viride as Biosorbent for Remazol Brilliant Purple in Batik Waste Water Treatment

Wiwin Dwi Febrianti1, Galuh Rahmaniah1, Anna Safitri1,2*
1Chemistry Department, Brawijaya University, Indonesia
2Research Centre for Smart Molecules of Natural Genetic Resources, Brawijaya University, Indonesia
*Corresponding email: a.safitri@ub.ac.id

ABSTRACT

Batik industries are among the rapidly growing textiles industries in Indonesia. Batik industries contribute to Indonesia's economy development due to high demands from local and abroad. However, wastewater from these industries causes a vast pollution to the environment due to the dye content because the manufacturers release their effluents into environment without appropriate treatment. Therefore, treatments on batik effluent pollution to the environment are very crucial and get an enormous attention from the researchers. In this study, the potential application of T. viride for biosorption of remazol brilliant violet (RBZ) in batik waste water was investigated. The research was focused on the determination of optimum conditions of biosorption including initial pH, biosorption time, and initial concentration of RBZ. Changes in functional groups contained in the T. viride after biosorption process have also been monitored using FT-IR spectrophotometry. Results showed that maximum biosorption of RBZ was achieved at initial pH 4, with biosorption time at 30 h, and optimum concentration of RBZ at 60 mg/L, with the rate of biosorption was 79.27%. The FTIR results indicated that biosorption process affected the functional groups in the T. viride. The FTIR spectra revealed that the groups that are affected during the biosorption process are mainly from proteins and lipids, and also slightly from carbohydrates and nucleic acids. The biosorption process of RBZ using T. viride can be applied as one of green alternative solutions for synthetic dyes removal in the environment. Keywords: biosorption, remazol brilliant violet, FTIR, Trichoderma viride

Infrared Spectroscopy and X-Ray Powder Diffraction on Mineral Identification at Roasted – Acid Leached of Laterite Nickel Ores

Nur Ikhwani1, Faizinal Abidin1, Abdul Hapid1, Adjik Awigraha1
1Center For Mineral Resources Development Technology, Agency For The Assessment And Application Of Technology, 820 Building, Earth System Technology (Geostech), Puspiptek Area, South Tangerang 15314, Banten – Indonesia
*Corresponding email: nur.ikhwani@bppt.go.id

ABSTRACT

Processing of laterite nickel ores can be carried out through the pyro-hydrometallurgical process route. This research was conducted to study the relation between changes in functional groups of chemical bonds with forming minerals in fresh nickel ores, roasted ores and leaching residues. Limonite nickel laterite ore were mixed with 4% lignite coal, roasted at 1000°C for 60 minutes and heating rate is 10°C/minute. Leaching of roasted ores using sulphuric acid with concentration 1 molar, 2 molar, 4 molar and 6 molar at 50°C for 60 minutes. Fresh nickel ore, roasted ore and leaching residues are characterized using Fourier Transform Infrared (FTIR) and X-Ray Powder Diffraction (XRPD). The main mineral in fresh nickel ore is goethite, mineral in roasted ore that are formed magnetite and olivine, while the minerals in the leached residue only found magnetite. Changes in minerals formed in laterite nickel ore after roasting and acid leaching are also shown by changes in the functional groups of chemical bonds on the results of FTIR characterization.
Preparation of *Cyperus diffusus* Vahl Cellulose - Polyanniline Composite for Dye Removal

Ricky Jenihsan Burhan\(^1\), Aswin Falahudin\(^1\), Irfan Gustian\(^1\), Salprima Yudha S\(^*\)

\(^1\)Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Bengkulu
Jalan W.R, Supratman, Kandang Limun, Kota Bengkulu 38371A, Indonesia

\(^*\)Corresponding email: salprima@unib.ac.id

**ABSTRACT**

*Cyperus diffusus* Vahl plant was utilized as an alternative of cellulose source in the preparation of cellulose-polyanniline composites. Sodium hydroxide, hydrogen peroxide and sulfuric acid were used as reagent for isolation of *C. diffusus* Vahl cellulose. Analysis of the isolated materials using Fourier transforms infra red (FTIR) show that the current cellulose has similar peaks pattern with the reported cellulose. For instance, the peaks appeared at 3350 cm\(^{-1}\) for OH stretching, 2889 cm\(^{-1}\) for C-H vibration, and supported by other peaks indicated the presence of cellulose functional groups. Synthesis of cellulose-polyanniline composite and its application for dye removal will be discussed more detail in the seminar.

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Preparation of Silver-Incorporated *Rhynchospora corymbosa* (L.) Cellulose via *in situ* Green Reduction and Its Antibacterial Study

Fitri Rosdiana\(^1\), Aswin Falahudin\(^1\), Risky Hadi Wibowo\(^2\), Salprima Yudha S\(^*\), Irfan Gustian\(^1\)

\(^1\)Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Bengkulu,
Jalan W.R, Supratman, Kandang Limun, Kota Bengkulu 38371A, Indonesia
\(^2\)Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Bengkulu,
Jalan W.R, Supratman, Kandang Limun, Kota Bengkulu 38371A, Indonesia

\(^*\)Corresponding email: salprima@unib.ac.id

**ABSTRACT**

Silver incorporated *Rhynchospora corymbosa* (L.) cellulose composite was obtained by direct attachment of silver ions to the natural cellulose followed by green reduction of the ions to silver metallic using aqueous extract of fresh *R. corymbosa* (L.). The cellulose was isolated by treating the raw material with NaOH, H\(_2\)O\(_2\), and H\(_2\)SO\(_4\). Fourier transform infra-red (FTIR) analysis of the isolated cellulose shows some peaks at 3330 cm\(^{-1}\), 2890 cm\(^{-1}\), 1320 cm\(^{-1}\), 1030 cm\(^{-1}\), 895 cm\(^{-1}\) which corresponding to OH stretching, methylene stretching, OH bonding, C-O bonding, and 1,4 beta-glycoside, respectively. Further results will be presented in the seminar.
The Effect of Acid Type in Mechanochemical Treatment of Rice Husk Ash for Concrete Application

Jaka F. Fatriansyah, S. A. Khairunnisa, D. Dhaneswara, M. Z. Rahmatullah, B. A. Ramadhan

Metallurgical and Materials Engineering, Faculty of Engineering, Universitas Indonesia, Depok, Indonesia

*Corresponding email: jakafajarf@gmail.com

ABSTRACT

Concrete was successfully produced using rice husk ash (RHA) as a partial cement substitute. RHA was mechanochemically treated using ball mill as mechanical force and acids (HCl and CH₃COOH) as a chemical force. Mechanochemical treatment decreases particle size as demonstrated by particle size analyzer test and reduces the crystallinity of RHA as demonstrated by X-ray diffraction analyses. These characteristics make RHA more suitable as partial substitution of cement as well as pozzolanic material. The compressive strength of concrete increases 11-26% by the addition of RHA as cement substitution. The pronounced increase of compressive strength was obtained from RHA mechanochemically treated with HCl which has a compressive strength of 14.8 MPa in comparison of standard concrete which has a compressive strength of 11.72 MPa. Keywords: silica, rice husk ash, concrete, mechanochemical.

Evaluation of The Stability and In Vitro Anti-inflammatory Activity of Partially Purified Bromelain Nanoemulsion

FTransiskus Randy, Siswati Setiasih, Sri Handayani, Sumi Hudiyono

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Indonesia, Depok, Indonesia

*Corresponding email: sumi.hudiyono@sci.ui.ac.id

ABSTRACT

Bromelain is an enzyme belonging to cysteine protease. It is known for topical use as debridement for inflammation treatment. Nanoemulsion of bromelain (NEB) is promising to solve this problem and also increase its stability. NEB was made by high emulsification method using homogenizer and sonicator. Nanoemulsion’s physical and chemical stabilities were evaluated. The bromelain as active compound was isolated from pineapple (Ananas comosus [L.] Merr) core which was purified by fractionation using ammonium sulfate and then followed by dialysis. After 30 days of storage, nanoemulsion F2 was found to be the most appropriate formula to encapsulate bromelain with good physical and chemical stabilities. This formula showed clear visual appearance with globule diameter of 37.42 nm with polidispersity index of 0.40. The results showed that the fraction of bromelain obtained from each purification step showed an increase in specific activity. The specific activities of fractionation using 20-50% ammonium sulphate and dialysis were 152.05 and 266.58 U/mg, respectively. The purest bromelain fraction was encapsulated into nanoemulsion F2. The anti-inflammatory activity of bromelain fraction was tested as in vitro based on HRBC membrane stabilitation method. The result showed that dialysis fraction of bromelain exhibits ability as anti-inflammatory agent with percentage of stability 79.76%. Keywords: bromelain, specific activity, anti-inflammatory, nanoemulsion, HRBC membrane stabilitation method.
Protein Extract from Earthworm L. Rubellus with High Pressure Homogenizer

Suhartono*, Mursilah1, Erdawati1

1 Department of Chemistry, Universitas Negeri Jakarta, Indonesia

*Corresponding email: suhartono@unj.ac.id

ABSTRACT

To determine the amino acid content of L. rubellus worm protein extracts, the study began with protein hydrolysis using 5% lactic acid which gave 42.4% yield. Furthermore, protein extracts were pressured 100, 150 and 2000 bar by using High Pressure Homegenizer (HPH) to increase the amount of protein extracts. The test results showed that at 200 bar pressure, 8.69% dissolved protein was produced. Finally, protein extracts are purified using nano emulsions, chitosan, 2.4 and 6%. Purification results show that L. Rubellus worms contain 14 kinds of amino acids consisting of 7 essential amino acids and 6 non-essential amino acids. Based on the amount of amino acids threonin, alanine, glycine, valine and isoleucine. Lysine and leucine are amino acids whose amounts exceed 1000 mg / kg. The addition of L. rubellus casing protein extract to koi fish feed, can, increase its proximate content. Keywords: earthworm L. rubellus, High Pressure Homogenizer, nano emulsion chitosan, amino acid

Chitosan-Montmorillonite Composites As High-Performance Adsorbent For Red Congo Dyes

Arif Rahman*, Moersilah1, Edith Allanas1, Barkah Hani Pramesti1

1 Dept. of Chemistry, State University of Jakarta, Indonesia

*Corresponding email: arifrahman@unj.ac.id

ABSTRACT

Chitosan-montmorillonite composite from local minerals has been synthesised and applied as an absorbent of red congo dyes. The synthesis of chitosan-montmorillonite composites was carried out using the intercalation method. Characterisation using X-ray diffraction showed the insertion of chitosan molecules into an interlayer gallery in the montmorillonite structure, while FTIR spectra showed chitosan immobilised in the montmorillonite structure using the interaction of hydrogen bonds with its hydroxyl groups. The chitosan-montmorillonite composite performance test showed a high adsorption capacity of 97.513 mg/g with a 45 minutes adsorption equilibrium time at optimum pH 6.
Magnetite-Montmorilonite Composites as Aqueous Co$^{2+}$ and Cd$^{2+}$ Ion Adsorbers

Moersilah$^1$, Arif Rahman$^1$, Edith Allanas$^1$, Rosmalia$^1$

$^1$ Dept. of Chemistry, State University of Jakarta, Indonesia

*Corresponding email: arifrahman@unj.ac.id

ABSTRACT

In this study, the performance of magnetite-montmorilonite composites in absorbing Co$^{2+}$ and Cd$^{2+}$ composites made from Pacitan bentonite and natural iron ore reported. Composites are synthesised by inserting iron oxide into the interlayer of bentonite and then calcined at 400 °C for 1 hour. magnetite formed in the interlayer gallery of bentonite has a magnetite structure and high thermal stability. The adsorption of Co$^{2+}$ and Cd$^{2+}$ cations was carried out in aqueous solution by batch method at various initial pH variations, contact time, and initial concentration of the solution. The results showed that the two metal cations were absorbed maximum at pH 5 in contact time of 10 minutes for Co$^{2+}$ and 105 minutes. The maximum concentration of Co$^{2+}$ that can be absorbed occurs at 50 ppm and 70 ppm for Cd$^{2+}$. Adsorption of the two cations follows the Langmuir adsorption isotherm pattern with an R$^2$ of 0.945 for Co$^{2+}$ and 0.995 for Cd$^{2+}$. The adsorption energy of Co$^{2+}$ adsorption is -23.42 kJ / mol and -32.45 kJ / mol for Cd$^{2+}$.

The Effect of Gelatin on Fabrication of Composite Film Based on Glycerol - Garut Starch

Ellya Indahyanti$^1$, Diah Mardiana$^1$, Vindy T.P. Prameswari$^1$

$^1$ Dept. of Chemistry, Faculty of Science, Brawijaya University, Malang, Indonesia

*Corresponding email: ellya@ub.ac.id

ABSTRACT

Starch is widely used in the fabrication of new materials. One of the less used starch sources is garut (Maranta arundinacea). In this study, garut starch was combined with gelatin and banana fiber to produce a composite film that is environmentally friendly. Garut starch was made in a conventional way. The composite solution was made from starch and gelatin which total weight is 2 g (dried). This green composite was fabricated in various gelatin composition from 0 to 50%. Glycerol solution 2% was added into the previous mixture, then was heated at 80-85 °C for 40 minutes. Therefore, the film was fabricated by poured into the mold and dried. Isolation of garut starch obtained about 25 % dry weight. The higher the gelatin composition, the more hydrophilic film produced. It was showed by the swelling degree of the film.
The Impregnation of Glucomannan into Cellulose Acetate Membrane Through Physical and Chemical Modification

Diah Mardiana\textsuperscript{1}, Zubaidah Ningsih\textsuperscript{1}, Ellya Indahyanti\textsuperscript{1}, Ni Luh Saraswati\textsuperscript{1}, Adi Febrianto\textsuperscript{1}

\textsuperscript{1} Department of Chemistry, Faculty of Science, Brawijaya University, Malang.

*Corresponding email: mdiah@ub.ac.id

ABSTRACT

Modification of cellulose acetate membrane using konjac glucomannan has been conducted. The glucomannan, which has a cellulose-like backbone structure, has been adding to modify the cellulose acetate membrane through physical impregnation and composite formation. The research aims were to determine the effect of glucomannan on the physical and chemical properties of the modified cellulose acetate membrane. It has been done at the various compositions of glucomannan dispersion using wet vacuum impregnation, whereas the composite, synthesized at variation time of 4, 6, 8 and 10 minutes with crosslinker gelatin, produced by hot-press technique. Furthermore, the characterization including determination of pore size, porosity, hydrophilicity and degree of crystallinity has been carried out, completed by identification of the functional group, analyzed by FTIR spectrophotometry. The membrane performance was determined based on water flux and rejection coefficient on NaCl and MgCl\textsubscript{2} salts. The result showed that the membrane modification through composite formation was better than impregnation. It caused changes in physical properties. The smallest pore size of 0.787 \(\mu\)m and the most hydrophobic with a glucomannan content of 1.33 \% has achieved at 4 minutes reaction. Moreover, the composite has a water flux of 96.74 L/m\textsuperscript{2}h and the ability to reject NaCl and MgCl\textsubscript{2} salts was 5.42\% and 34.94\%, respectively. Keywords: cellulose acetate, membrane, glucomannan,

Toxicity and Radical Scavenger Properties of Various Extracts of Sponge Clionidae sp. Kangean Islands

Alyaa Farrah Dibha\textsuperscript{1}, Moh. Farid Rahman\textsuperscript{1}, Masruri\textsuperscript{1}

\textsuperscript{1} Dept. of Chemistry, Brawijaya University, Malang

*Corresponding email: mfaridrhm@gmail.com

ABSTRACT

Sponge Clionidae sp. is a multicellular animal that has the ability to compete with other life biota because it has active secondary metabolites that are used for survival. Sponge has cytotoxic, anticancer and antitumor bioactive properties, so sponges can be used in the pharmaceutical field but the toxicity and antioxidant levels must be done to determine the uses level. Toxicity levels of the sponge Clionidae sp. seen from the toxicity test against Artemia salina L. and the IC\textsubscript{50} value of the antioxidant test against DPPH radicals. In this research, maceration extraction of sponge Clionidae sp. was carried out with sonication using methanol, butanol, ethyl acetate and n-hexane as solvents. Then, the crude extract was tested for toxicity levels by the BSLT (Brine Shrimp Lethal Toxicity) method and the antioxidant test by the DPPH method. Sponge extracts with ethyl acetate has the highest LC\textsubscript{50} and IC\textsubscript{50} values of 62.50 ppm and 89 ppm. Identification of extract sponge with ethyl acetate was carried out using a UV-Vis spectrophotometer instrument, resulting a maximum wavelength is 407 nm, ethyl acetate sponge extract showed the presence of O-H stretch groups 3327 cm\textsuperscript{-1}, C-H stretch 2922 cm\textsuperscript{-1}, C = C aromatic 1462 cm\textsuperscript{-1}, and C = O 1711 cm\textsuperscript{-1} by FT-IR. Further analysis was carried out to identify compounds with LC-MS. Keywords: Sponge, Clionidae sp., Toxicity, Antioxidants
Phytochemistry and antibacterial evaluation of *Elaeocarpus ganitrus*

Retno indriatie,1,2 Siti Mudaliana,1 Febriyana Rizky Hapsari,1 Masruri MASRURI2*

1UPT Materia Medica, Jl. Lahore Batu, Indonesia
2Chemistry department, Brawijaya University, Jl. Veteran 65145 Malang

Email: Masruri@ub.ac.id

Abstract

The *Elaeocarpus ganitrus* has local name as genitri or janitri. It has been used traditionally as traditional medicine. This paper is reported the phytochemistry and their antibacterial activity on *Staphylococcus aureus* and *Escherichia coli*. Several extracts have been afforded using high speed extraction technique using methanol, ethylacetate and n-hexane as solvents. The extract is composed of alkaloid, tannin, and flavonoid. The negative result is afforded for saponin test. The MIC of all extracts in both bacteria are above 10 mg/mL. Moreover, the quantitative analysis by using spiking method using liquid chromatography is found quercetin and rutin in a minor quantity for some sample extract.

Keywords: Elaeocarpus ganitrus; phytochemistry, antibacterial, quercetin, rutin

On the Occupancy of Carbon Dioxide Molecules of Ice XVII Structure

Irwansyah Putra Pradana1, Diah Mardiana1, Lukman Hakim1*

1Department of Chemistry, Faculty of Science, Brawijaya University, Malang

*Corresponding email: lukman.chemist@ub.ac.id

ABSTRACT

Carbon dioxide emission is a serious problem that causes global climate and has long motivated many research fields to discover new technologies for reducing the content of carbon dioxide in the atmosphere. Carbon dioxide clathrate hydrate is a promising material that can be used to trap carbon dioxide. Recently, Amos et al. experimentally reported the formation of carbon dioxide hydrate of ice XVII at the ratio of carbon dioxide-to-water molecules of 1:3.55. In this work, to obtain a molecular detail of carbon dioxide occupancy inside ice XVII, a hybrid isobaric Grand-Canonical Monte Carlo simulation is performed. A rigid body model for carbon dioxide and water molecules is employed. The potential energy is assumed to be pairwise additive and the pair potential energy is smoothly truncated. A constant NPT MD simulation is priorly performed to obtain the carbon dioxide chemical potential. The simulation results reproduce the maximum molar ratio of carbon dioxide-to-water at low temperature and pressure region, and they provide a detailed description of the carbon dioxide molecule configuration inside ice XVII, as well as the influence toward the stability of ice structure. Keywords: carbon dioxide, ice XVII, clathrate hydrate, guest occupancy, grand canonical Monte Carlo simulation.
Recent Trend In Mixed Matrix Membranes Based On Material Of Institut Lavoisier (Mil-53(Al) As Filler For Co2 Gas Separation

Galang Andreanto¹, Witri Wahyu Lestari¹

¹ Dept. of Chemistry, Sebelas Maret University, Surakarta

Corresponding email: witri@mipa.uns.ac.id; andreanto_chemistry@student.uns.ac.id

ABSTRACT

MMMs (Mixed Matrix Membranes) defined as a modified heterogeneous membrane constructed from organic polymer matrices and filler in the form of porous materials. As a new generation of porous material, metal-organic frameworks (MOFs) have shown great promise for gas separation and purification because of their unique features such as large surface areas, high porosity, high crystallinity, designable structure, and tunable pore sizes. MILs (Material of Institut Lavoisier) constitute a subfamily of MOFs that commonly built by trivalent metal cations and carboxylate-based ligand to form extended structures and robust frameworks. MIL-53 is the most well known MOFs membrane-type based aluminum and iron cation. MMMs filled with MIL-53(Al) have been considered as promising materials for CO2/CH4 separation processes efficiently. Recent research about MMMs based MIL-53 are MIL-53(Al)/PVDF, Amino-Silane/NH2-MIL-53(Al)/Polyethersulfon, Poly(ether-b-amide)/MIL-53(Al). All three MMMs have synthesized in flat-sheet form. However, numerous problems in the application are still under investigation such as improper dispersion and poor adhesion of fillers (MIL-53) within the polymer matrix, which could decrease the gas separation performance of MMMs. To overcome the problems, some innovations in fabrication hollow fiber MMMs have been performed to make better scalable geometry for a large scale compared to flat-sheet MMMs. Another approach to enhance the MMMs performance is by Post Synthesis Modification or thermal treatment i.e polydimethylsiloxane (PDMS) coating and so on. This review briefly outlines the recent progress in MMMs containing MIL-53(Al) filler for CO2 separation. Keywords: Mixed Matrix Membranes, CO2 separation, MIL-53(Al)
Voltammetric Determination of Paracetamol using Polyvinil Alcohol (PVA)-Fe3O4 Modified Glassy Carbon Electrode

Robiatul Andawiyah1, Ani Mulyasuryani1, Hermin Sulistyarti1

1 Dept. of Chemistry, Brawijaya University, Malang
*Corresponding email: robiatulandawiyah23@gmail.com

ABSTRACT

Modification of glassy carbon electrode as the working electrode of voltammetry has been carried out using molecularly imprinted polymer (MIP) polyvinyl alcohol (PVA)-Fe3O4. The PVA-Fe3O4 was coated on the glassy carbon electrode. The performance of modification was resulted based on measurement of paracetamol in buffer Britton Brinson 0.04 M using cyclic voltammetry (CV) and different pulse voltammetry (DPV). In this study, the effect of Fe3O4 addition, paracetamol concentration (% w/w) in membrane, optimization of measurement and pH condition were studied. The best paracetamol concentration was 3% (w/w) with Fe3O4 addition and the optimum pH was 2 that had the highest peak anodic current. Keywords: Paracetamol, Molecular imprinted polymer, Voltammetry, Glassy carbon electrode
Preparation of Granule Phosphated-Natural Zeolite of Turen for Adsorption of Anionic Dyes

Danar Purwonugroho¹, Tutik Setianingsih¹, Siti Mutrofin¹, Dian Arlantika¹, Silvia Rahmawati¹

¹ Chemistry Department, Faculty of Science, Brawijaya University, Malang
 Corresponding email: danar@ub.ac.id

ABSTRACT

It is predicted that the phosphatization of zeolite can increase its adsorption ability toward anionic species due to the presence of a positive charge of the PO₄ groups in the zeolite framework. The aims of this research were to prepare of granulated adsorbent of phosphate natural zeolite for Eryochrome black T (EBT) and methyl orange (MO) sorption. Acid activated natural zeolite was homogeneously mixed with ammonium dihydrogen phosphate in the various Si/P ratio of 1/3; 1/6; 1/9; and 1/12. The mixtures were then heated in the furnace at 235°C for 5 hours. Phosphated zeolite which had the highest adsorption capability to anionic dyes was immobilized in calcium alginate to produce a granulate adsorbent. Infrared spectroscopy was used to confirm the presence of PO₄ groups in the zeolite framework. Batch adsorption experiments were performed to evaluate the performance of granulated adsorbent, including the effects of pH, contact time, as well as adsorbate concentration. The concentration of dye was determined by using a visible spectrophotometer. The results showed that the phosphatization of natural zeolite had been successfully carried out. It was confirmed by the new adsorption bands of PO₄ in IR spectra (1137.92 cm⁻¹, 960.48 cm⁻¹, and 653.82 cm⁻¹) that was amplified by shifting adsorption bands of SiO₄/AlO₄. The substitution of SO₄/AlO₄ groups by PO₄ groups increased the adsorption ability of zeolite toward EBT and MO. The best Si/P ratio were 1/6 and 1/3 for EBT and MO, respectively. The optimum pH of adsorption using the granulated adsorbent for both EBT and MO was 2. However, the optimum contact time for EBT adsorption was different from that of MO, which was 60 minutes for EBT and 30 minutes for MO. It was also found that the adsorption capacities of the adsorbent were 25.25 mg/g for EBT and 30.54 mg/g for MO. Keywords: zeolite, Turen, phosphatization, alginate, anionic dyes
Enhancement Strategies for CO2 Capture in Metal-Organic Frameworks (MOFs)

Witri Wahyu Lestari¹, Early Al Hafizh²

Dept. of Chemistry, Sebelas Maret University, Surakarta

Corresponding email: witri@mipa.uns.ac.id

ABSTRACT

One of the causes of global warming is the high levels of CO2 in the atmosphere due to fossil fuels, power plants, and chemical processes. Concentrations of CO2 in the troposphere have present increased to 380 ppm with an annual increase of about 1 ppm[1][2]. Hence, special care is necessary to diminish CO2 level in the atmosphere. Metal-organic Frameworks (MOFs) are constructed from a combination of metals ions with organic linkers using strong bonds to create open crystalline frameworks. This class of materials is potentially used to capture CO2 due to the high porosity, crystallinity, and the occupancy of unsaturated metal centers and functionalized organic linker[3][4]. Some strategies can be performed to enhance the CO2 capture capacity of MOFs by modifying the metal centers, organic linker via building block approach and post synthesis modification, exchange extra-framework cations within some anionic MOFs[5], electrostatic force involvement through metal ions doping and polar species modification[6], or combining with other materials such as zeolite[7], graphene[8], graphene oxide[9], and graphite oxide[10] to form composite based MOFs will be discussed in this review. Keywords: MOFs, CO2 capture, strategies

Sri Wardhani *, Danar Purwonugroho1 Fibrianty Wulansari 1, Darjito1

1 Dept. of Chemistry, Brawijaya University, Malang
*Corresponding email: wardhani@ub.ac.id

ABSTRACT

In this research, the effect of photocatalyst composition on waste, irradiation time, type of light source on photodegradation of batik waste has been studied. Zeolite was activated with 0.4 M HCl. Synthesis of TiO2-N was carried out by mixing TiO2 and urea, and the sonication method. TiO2 and TiO2-N are impregnated on activated zeolites. Photocatalyst beads are prepared by mixing chitosan and acetic acid solutions into 0.4 M NaOH solution at a flow rate of 50 mL/hr. The photocatalysts produced were characterized using FTIR. Photodegradation of batik waste was carried out in the sun and UV for 5 hours and determined the COD value of batik waste. The effect of irradiation time is carried out on irradiation for 2, 4, 5, 6 and 8 hours. The results of the TiO2/zeolite-chitosan photocatalyst FTIR characterization and TiO2N / zeolite-chitosan showed the absorption bands respectively at wave numbers 1055.75 cm⁻¹ and 1057.68 cm⁻¹ showed the existence of asymmetric stretching vibration vibrations, wave numbers 695.09 cm⁻¹ and 693.16 cm⁻¹ indicate the presence of bending vibrations - Ti-O, wave numbers 457.86 cm⁻¹ and 457.86 cm⁻¹ indicate the existence of bending vibrations bonds - Al-O and - Si-O and in TiO2N/zeolite-chitosan there is absorption at the wave number 511.86 indicating the existence of Ti-N vibrational bonds. The results showed the optimum composition of TiO2/zeolite-chitosan photocatalyst on batik waste was 3:1 with UV light and 4:1 with sunlight with percent degradation of 58.89% and 32%, respectively. The optimum composition of TiO2N / zeolite-chitosan and batik waste is 4:1 irradiation using UV light or sunlight with percent degradation of 52% and 66.67%, respectively. The optimum irradiation time for UV rays and sunlight is 5 hours on TiO2 /zeolite-chitosan and TiO2N/zeolite-chitosan. Keywords: photodegradation, batik waste, TiO2/zeolite, TiO2N/Zeolite
Membrane Polyvinyl Alcohol (PVA) - Fe3O4 on Screen Printed Carbon Electrode (SPCE) for detection of Paracetamol

Ani Mulyasuryani¹, Waluyo Tirto Nugroho¹, Hannisa Triesani Mandiri

¹Dept. of Chemistry, Brawijaya University, Malang
Corresponding email: mulyasuryani@ub.ac.id

ABSTRACT

Potentiometric sensors have been developed to detect paracetamol based on screen printed carbon electrode (SPCE) with PVA - Fe3O4 as a selective membrane. The membrane is made of PVA as a basic polymer which is crosslinked with glutaraldehyde, with citric acid as a catalyst, Fe3O4 as a modifier, and paracetamol as a printed molecule. In this study the effect of citric acid and Fe3O4 was studied, the concentrations of citric acid studied were 1; 2; and 3% (w / w), Fe3O4 0%; 0.5%; and 2% w / w. Sensor performance The sensor is evaluated at pH 7 to 11. The results show that the concentration of citric acid and Fe3O4 in the membrane can affect sensor performance. The best sensor performance is produced on membranes with 3% citric acid and 0.5% Fe3O4 w / w, at pH 11. This sensor works in a concentration range of 1x10⁻⁹ to 1x10⁻⁵ M, with a sensitivity of 42.6 mV /decade and response time 170 seconds.

Keywords: Paracetamol, Polyvinyl Alcohol, Screen Printed Carbon Electrode, Fe3O4, glutaraldehyde, selective membrane
Surface Modification On Metal Organic Frameworks (MOFs) As Drug Delivery System Of Curcumin

Witri Wahyu Lestari1, Amalia1, Moh Ali Khafidhin1

Dept. of Chemistry, Sebelas Maret University, Surakarta

*Corresponding email: witri@mipa.uns.ac.id

ABSTRACT

Curcumin is a natural plant that has recently received great attention as an herbal drug. However, clinical applications are limited to bioavailability and low solubility. Development of drug delivery system can be a solution for optimization of drug absorption in the body. Metal-organic frameworks (MOFs) have the potential to be used as drug delivery system because they have good porosity and crystallinity features and can be designed with a variety of choices. Application of MOFs as drug delivery system can be made from metal ions and organic linkers which have good biocompatibility. Magnetic properties of metal ions in MOFs facilitate the mobilization of MOFs in delivering drugs to the target cell. Loading and slow release capacity, and stability of MOFs in drug delivery system can be increased through surface modification both during and after synthesis. Herein in this review some modification that has been made include, coating the MOFs with magnetic materials, organics polymers, graphene oxide and hollow mesoporous silica (HMS) will be discussed. The effect of surface modification on MOFs can increase its stability and loading capacity. The responsive loading and releasing ability of curcumin drug models is observed under acidic pH conditions. In contrast to the results under alkaline pH conditions which tend to be more easily degraded. Keywords: curcumin, MOFs, HMS, magnetic coated, graphene oxide, polymers

Thiocyanate Doping in Gel-Growth Cobalt Oxalate Crystals

Mohammad Misbah Khunur1, Dini Tri Wahyun1, Gigih Wahyu Kurniawan1, Yuniar Ponco Prananto1

1 Department of Chemistry, Faculty of Science, Brawijaya University, Malang

*Corresponding email: prananto@ub.ac.id

ABSTRACT

The presence of other anions, as impurities and/or doping agents, may alter crystallization and the properties of the crystal. The objective of this research is to examine the effect of thiocyanate doping in the synthesis of cobalt oxalate crystals grown in silica gel. The synthesis was conducted at room temperature for 12 weeks in a U-tube glass filled with silica gel. The gel was prepared from Na2SiO3 at pH 5 using dilute HNO3 with a gelling time of 5 days. Supernatant solutions of (NH4)2C2O4 and Co(NO3)2/KSCN were added on each side of the tube. The Co(NO3)2 and KSCN were firstly mixed before adding onto the gel to increase the possibility of thiocyanate doping in the crystals. Various molar ratio of Co(II):C2O42−:SCN− were used (1:1:0, 1:1:1, 1:1:2, 1:1:3, 1:1:4, and 1:1:5). FT-IR and SEM were used to analyze the crystal. The result shows that red block crystals were formed. FTIR analysis for all molar ratios reveals that they all give considerably identical spectra with an absence of thiocyanate peaks around 2200 cm−1, suggesting that all molar ratios give an identical product of cobalt(II) oxalate hydrate. SEM analysis shows that the size of the crystals was significantly bigger (±1-2mm) than previously reported crystals. The Co(II) remains to bind to the oxalate than to thiocyanate due to the chelating effect. However, inconclusive findings were observed regarding the influence of the molar ratio on the crystals yield. The use of a higher concentration of thiocyanate (fivefold molar ratio) did not affect the composition of the product, and the product remains crystallized as cobalt(II) oxalate hydrate. Keywords: thiocyanate, cobalt oxalate, silica gel, molar ratio, crystal.
**Preparation of Nanocellulose Bioplastic with a Gradation Color of Red and Yellow**

Zulfa Durrotun Nasihin¹, Masruri MASRURI*¹, Arie Srihardyastutie¹

¹Dept. of Chemistry, Brawijaya University, Malang

Corresponding email: masruri@ub.ac.id

**ABSTRACT**

A bioplastic derived from nanocellulose isolated from the waste of pine flower (Pinus Merkusii) has been made. The red and yellow color of bioplastic is afforded from the extract of dragon fruit and turmeric. Meanwhile, the nanocellulose was hydrolyzed by citric acid using a 30% concentration. The nanocellulose applied has a crystallite size is 15.09 nm (calculated used on XRD spectra using Scherrer equation). The result indicated that increasing extract concentration of dragon fruit increased the red intensity of bioplastic, and also the increase in extract concentration of turmeric increasing intensity the yellow color of bioplastic. This study paves the way for further application. Keywords: Pine flower, Nanocellulose, Citric acid, Bioplastic

**Isolation Of Oxalic Acid From Corn Stalk for Photoreduction Of Cr(VI)**

Ana Nurjanah, Barlah Rumhayati¹, Adam Awiryawan

Department Of Chemistry Faculty Of Mathematics And Natural Sciences Brawijaya University, Malang

Corresponding email: rumhayati_barlah@ub.ac.id

**ABSTRACT**

The aim of this research was to isolate oxalic acid from corn stalk for photo-reduction of Cr(VI). The oxalic acid was isolated from corn stalks powder using NaOH and then precipitated with the addition of CaCl₂, acidified with H₂SO⁴, and crystallized oxalic acid crystals. The melting point and functional groups of the resulted oxalic acid crystals were characterized using the melting point apparatus and FTIR. The photo-reduction was carried out in a closed reactor equipped with two UV lamps of 30 watts. The photo-reduction of Cr(VI) in the groundwater was conducted by adding of 0.03 mg of oxalic acid and 4 ml of FeCl₃ 100 mg/l into 25 mL of water sample. Photo-reduction was conducted for 120 minutes by agitation. The percentage of reduced Cr(VI) was calculated based on the difference between the initial Cr (VI) ion concentration and the final Cr (VI) concentration. Determination of the concentration of Cr (VI) ions was carried out using a spectrophotometer visible at 540 nm based on the formation of Cr(VI)-diphenylcarbazide at pH 2. The results showed that the isolated oxalic acid has hydroxyl and carbonyl groups at 3441cm⁻¹ and 1627 m⁻¹ respectively identical with the oxalic acid standard. The crystals have a melting point at 106 - 107 C. The isolated oxalic acid was effective to reduce Cr(VI) in the groundwater up to 91.5 %. Keywords: Cornstalk, oxalic acid, photo-reduction, Cr(VI), diphenylcarbazide.
The Effect of Hydrolysis Reaction Time in Conversion of Cellulose to Nanocellulose from Pinecone Flower Waste (Pinus merkusii Jungh Et De Vriese)

Sri Eva Lusiana¹, Masruri²*, Arie Srihardyastutie³, Moh Farid Rahman⁴

¹Dept. of Chemistry, Brawijaya University, Malang

*Corresponding email: masruri@ub.ac.id

ABSTRACT

This research was studied the effect of hydrolysis reaction time using sulfuric acid in the isolation of nanocellulose. The study of the effect of reaction time was carried out by mixing cellulose in sulfuric acid of 10%. The reaction undergo 45°C with variations reaction time of 30, 40, 60 and 90 minutes. Then the yield of nanocellulose was calculated and its chemical composition was determined. Morphological and size particle characterized by transmission electron microscopy (TEM). Fourier transform infrared (FTIR) spectroscopy showed the removal of non-celluloic constituens. The crystallinity was also investigated by X-ray diffraction (XRD). Keyword: Pinecone flower, Hydrolysis, Nanocellulose, Sulfuric acid

Crystallinity of Nanocellulose Isolated from The Flower Waste of Pine Tree (Pinus merkusii)

Mahrullina Mahriotul Aisiyah¹, Masruri MASRURI*, Arie Srihardyastutie³

¹Dept. of Chemistry, Brawijaya University, Malang

*Corresponding email: masruri@ub.ac.id

ABSTRACT

Pine flower is an agricultural waste that has high cellulose content. Cellulose is a major material for making nanocellulose. Nanocellulose has been isolated from the flower waste of pine tree (Pinus merkusii). The process was initiated by delignification with sodium hydroxide 6%, bleaching process with sodium hypochlorite 6%, and followed by hydrolysis with acetic acid under stirring at 45°C for 1 hour. Three different concentration of acetic acid (10%, 30%, and 60%) was studied toward nanocellulose crystallinity. Nanocellulose was characterized by FTIR and XRD spectroscopy. The result show that %yield of nanocellulose was 87.4%, 94.2%, dan 91.8% respectively. Nanocellulose has high crystallinity. Besides that, the crystallite size of nanocellulose calculated using Scherrer equation was 11.95nm, 13.44nm and 10.75nm. Keywords: Pine flower, Crystallinity, Nanocellulose, Hydrolysis, Acetic acid
Sonication-Assisted Pinecone Flower Cellulose Hydrolysis Using Formic Acid

'Urfa Zakiyya 'Uyunin, Masruri MARSURI*, Arie Srihardyastutie

Dept. of Chemistry, Brawijaya University, Malang

*Corresponding email: masruri@ub.ac.id

ABSTRACT

Nanocellulose has many applications in industrial sectors such as pulp and papermaking and the production of synthetic textile fibers. This paper reports on formic acid in different concentrations (10%, 30%, 60%) to hydrolyze cellulose that was isolated from waste pine flower and obtained percent yield 92.4%, 94.6%, and 89.6%. The process was assisted by ultrasonication at 48 kHz under constant temperature 45°C. Product was characterized by FT-IR and XRD spectroscopy. The crystallite size of nanocellulose calculated using Scherrer Equation was found 18.34 nm, 15.09 nm, and 15.07 nm for formic acid concentration 10%, 30%, and 60% respectively. Keywords: Waste pinecone flower, Nanocellulose, Formic acid

The Influence of Water Vapor – Activated Tamarind Seeds (Tamarindus indica L.) Particle Size on Adsorbent's Physical Properties

Mimi Salmawati, Zubaidah Ningsih A.S, Diah Mardiana

Dept. of Chemistry, Faculty of Science, Brawijaya University, Malang

*Corresponding email: mdiah@ub.ac.id

ABSTRACT

The increasing problem of dyestuff liquid waste in the textile industry occurs due to the low adsorption of textiles toward dyes. Therefore, various efforts have been made to enhance the fabric's absorption. One method that has been done is by adding biomass-derived dye-binding additives which act as adsorbent. One of the potential biomass is tamarind seeds. The purpose of this study is to determine the effect of particle size of tamarind seeds, which is physically activated, on the adsorbent character. The variation of adsorbent particle size applied were -80 + 100 mesh, -100 + 120 mesh, -120 + 150 mesh, and less than 150 mesh. Tamarind seed was activated using water vapor at high pressure prior to the application. The adsorbent characters were studied based on particle size distribution, powder porosity, average relative molecular mass, surface area, and hydrophilicity. In addition, tamarind chemical structure was analyzed using FTIR spectrophotometry while adsorbent potency was studied in the form of an adsorbent thin film. The results showed that particle size mainly affected porosity, hydrophilicity and gel flow properties. The highest porosity was achieved by particle size smaller than 150 mesh. The highest hydrophilicity, which was determined based on the contact angle, was obtained by particle sizes of -120 + 150 mesh. Keywords: adsorbent, tamarind seeds, particle size
Instrumentation-free for Simultaneous Determination of BUN-Creatinine Using Microfluidic Paper-based Analytical Device

Eva Puspita Indriyani1, Vania Devi Ariesta1, Reski Helena Rupilu1, Yohana Felisita Wisang1, Khusnul Ilmiyah1, Ika Wuri Mahdiasanti1, Hermin Sulistyarti1, Akhmad Sabarudin1,2

1 Dept. of Chemistry, Faculty of Science, Brawijaya University, 65145, Indonesia
2 Research Center for Advanced System and Material Technology, Brawijaya University, 65145, Indonesia

Corresponding email: sabarjpn@ub.ac.id

ABSTRACT

A microfluidic paper-based analytical device (µPAD) for simultaneous determination of Blood Urea Nitrogen (BUN) and Creatinine was developed. The microfluidic system comprises main channels with two identical fluidic channels as reaction zone. In fabricating the µPAD, wax printing is used to create hydrophobic barrier on the surface of paper. Distance-based method was used in this design of µPAD to determination of BUN and creatinine. BUN was detected according to Barthelot reaction in which ammonium ions resulted from the hydrolysis of urea were reacted with the mixture of reagents containing salicylate, nitroprussiate, sodium hypochlorite and sodium hydroxide to form a blue-green complex. Creatinine was detected using Jaffé reaction by employing a picric acid under alkaline conditions to generate an orange complex of a creatinine-picrate. Concentration of BUN and creatinine was analyzed through the length of the color band of the complex produced from the sample zone to the detection zone (distance-based) which is proportional to the BUN and creatinine concentration in the samples. Some parameters investigated include channel width, volume of sample and reagents, time reaction. Keywords: µPAD, distance-based, BUN, creatinine, Barthelot reaction, Jaffé reaction.

Tuning Fork Design of Microfluidic Paper-based Analytical Device for Simultaneous Detection of Serum Creatinine and Blood Urea Nitrogen

Vania Devi Ariesta1, Eva Puspita Indriyani1, Reski Helena Rupilu1, Yohana Felisita Wisang1, Khusnul Ilmiyah1, Ika Wuri Mahdiasanti1, Hermin Sulistyarti1, Akhmad Sabarudin1,2

1 Dept. of Chemistry, Faculty of Science, Brawijaya University, 65145, Indonesia
2 Research Center for Advanced System and Material Technology, Brawijaya University, 65145, Indonesia

Corresponding email: sabarjpn@ub.ac.id

ABSTRACT

This experiment describes the fabrication of microfluidic paper-based analytical device (µPAD) for the simultaneous detection of two renal function biomarkers in blood serum. This experiment provides an inexpensive, disposable, simple, and easy to use distance-based method for the quantification of serum creatinine (sCRE) and blood urea nitrogen (BUN) in synthetic samples. µPAD consists of one sample zone with two arms of channel which resembles a tuning fork. These two arms of channel act as the flow path and detection zone at once. sCRE detection is based on Jaffé reaction, in which creatinine reacts with picric acid in alkaline condition to produce an orange complex. BUN detection is based on Berthelot reaction, in which urea is hidrolyzed by urease to produce ammonia which then reacts with the mixture of salicylate, sodium nitroprusside, and hypochlorite resulting a blue indophenol complex. The distance of each complex color is proportional to the concentration of sCRE and BUN. In this experiment, various parameters are optimized to obtain the best performance of the fabricated µPAD, those are volume of sample and reagents, flow rate based on the length of channel, and reaction time. Keywords: µPAD, distance-based, sCRE, BUN, Jaffé reaction, Berthelot reaction.
Preliminary Phytochemical Screening and Fluorescence Characterization of Several Medicinal Plant Extracts

Qonitah Fardiyah1,2, Suprapto1, Fredy Kurniawan*1,3

1Instrumentation and Analytical Sciences Laboratory, Department of Chemistry, Faculty of Sciences, Institut Teknologi Sepuluh Nopember, Surabaya 60111, Indonesia.
2Analytical Chemistry Laboratory, Department of Chemistry, Faculty of Mathematic and Natural Science, Brawijaya University, Malang 65145, Indonesia.
3ITS Halal Center, Institute of Research and Community Service, Institut Teknologi Sepuluh Nopember, Surabaya 60111, Indonesia.

*Corresponding email: fredy@chem.its.ac.id

ABSTRACT

Abstract. The aim of present study was to carry out preliminary phytochemical screening and fluorescence characterization of several medicinal plant extracts. These plant extracts were obtained by maceration process from part of the leaves. The solvent used in maceration process are ethanol as a polar solvent. The maceration process is carried out for 3 days at room temperature. The several medicinal plants used are Andrographis paniculate L. Ness, Strobilanthes crispus, Piper ornatum and Annona muricata. The fresh leaf and dried powder of the leaves of several medicinal plants were studied by preliminary phytochemical screening and characterized using fluorescence spectrophotometer. The result of preliminary phytochemical screening showed the presence of secondary metabolites compounds flavonoid, alkaloid, tannin, saponin, polyphenol and terpenoid in several medicinal plant extracts. The fluorescence characterization spectra were obtained show that several medicinal plant extracts have optimum absorption at wavelength of excitation 340 – 343 nm which is ultraviolet area and re-emitted at wavelength of emission 639 – 685 nm which is ultraviolet visible area. Keywords: medicinal plants, phytochemical, fluorescence, excitation, emissions
Development of Spectrophotometric Method for Mercury Determination Based on Formation of Mercury(II)-Thiocyanate

Hermin Sulistyarti1,2, Qonitah Fardiyah1,2, Erwin Sulistyo1,2, Eka Ratri Wulandari1,4, Hikmanita Lisan Nashukha1

1Research Group of Low Cost and Automated Method and Instrumentation, Dept. of Chemistry, Brawijaya University, Malang
2Dept. of Chemistry, Brawijaya University, Malang, Indonesia
3Dept. of Mechanical Engineering, Brawijaya University, Malang
4Vocational Program, Brawijaya University, Malang

*Corresponding email: hermin@ub.ac.id

ABSTRACT
A new spectrophotometric method for mercury determination has been developed based on the complexation of mercury (II) in ascertained excess of thiocyanate. The remaining thiocyanate is reacted with iron (III) to form red iron (III)-thiocyanate complex which gave maximum absorbance at 460 nm. The concentration of mercury (II) is inversely proportional to the absorbance of the complex. The method was optimized to the concentrations of thiocyanate and iron (III). Selectivity of the method has also studied based on percent recovery of mercury (II) in the presence of common metal ions in the tailing waters of gold mine. Under the optimum conditions, the method showed linear correlation to concentration from 1-30 mg/L with detection limit of 0.58 mg/L. The method was not interfered in the presence of all metal ions studied up to 50 mg/L, except of silver which was tolerated at 10 mg/L. The developed method has been satisfactorily applied for mercury (II) determination in synthetic and tailing waters of gold mine samples.

Keywords: Mercury, spectrophotometry, thiocyanate, mercury(II)-thiocyanate, iron(III)-thiocyanate.

Microwave-Assisted Enzymatic Biotransformation of Oleic Acid to Speciality Esters using Lipase from Candida antartica recombined Aspergillus oryzae

Elvina Dhaual Iftitah1,2, Arie Srihardyastutie1, Muhammad Yanuar Ramadhan1

1 Dept. of Chemistry, Brawijaya University, Malang
2 Essential Oil's Institute, Brawijaya University, Malang

*Corresponding email: vin_iftitah@ub.ac.id

ABSTRACT
Application of microwave irradiation to the enzymatic biotransformation can address the drawbacks of biotransformation process, such as long duration, slow reaction rate and poor conversion. Microwave energy creates rampant localized super heating which enhances the reaction rate and reduces the time significantly. The present article gives a brief account on uses of microwave energy in enzymatic biotransformation of oleic acid using ammobilized Lipase from Candida antartica recombined Aspergillus oryzae. It briefly discusses various products which obtained in 40 øC during 10, 20 and 30 minutes of microwave irradiation. Product was analyzed by GC-MS and almost all of products were verified as esters compounds : methyl-octadecanoic, methyl-hexadecanoic, methyl tetradecanoic and methyl dodecanoic. This article also discusses that the various products from oleic acid could play a role as potential intermediat compound for biosynthesis of cyclic lactone, gamma-dodecalactone. Key word: Microwave-Assisted, Enzimatic Biotransformation, Oleic Acid, Candida antartica recombined Aspergillus oryzae, gamma-dodecalactone
**Immobilization Xylanase From Trichoderma Viride On Bentonite Ca-Alginate Matrices**

Sutrisno¹,², Aulanni’am², Anna Roosdiana²

¹ Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Brawijaya, Indonesia  
² Research Group of “Low Cost & Automated Method and Instrumentation Analysis” (LCAMIA), University of Brawijaya, Indonesia

Corresponding email: tris_mc@ub.ac.id

**ABSTRACT**

Xylanase is an enzyme that catalyzes the hydrolysis reaction of \( \beta (1 \rightarrow 4) \) glycosidic of xylan. The free enzyme can be used once and are easily damaged by environmental influences. Therefore, immobilized enzyme is needed in order to be used repeatedly and have higher activity and stability. The aims of this research are to determine the optimum conditions for immobilization of xylanase using an sea sand Ca-alginate and it reuse. The xylanase immobilization was performed on variation of xylanase concentration (2 - 4 mg / mL) and variation of alginate concentration (1.5 – 3.5 %w/v) using 0.1 g zeolite at room temperature and a shaking rate of 100 rpm. The amount of immobilized xylanase on matrices was determined by spectrophotometry using the Biuret reagent and the immobilized xylanase activity formed was determined spectrophotometrically using a DNS reagent. The efficiency of reuse of immobilized xylanases was determined by measuring the activity of immobilized xylanases after enzymes were used repeatedly. The results showed that the optimum condition of xylanase immobilization at zeolite was achieved at xylanase concentration 3.5 mg/mL and alginate concentration 3.0 %w/v with immobilized xylanase of 12.533 mg and activity 14.896 \( \mu \)g/mg.minute. This immobilized enzyme can be reused for 5 times with residual activity of 53.27%. Keywords: adsorption methods, entrapment, activity, reducing sugars, xilo-oligosaccharides

**Modification Of Bilimbi Membrane By Impregnation Method With Calcium Carbonate**

Uswatun Hasanah, Budi Kamulyan, Lukman Hakim

Chemistry Departement, Mathematics and Natural Sciences Brawijaya University, Malang

All correspondence should be addressed:(e-mail: uswahas@ub.ac.id)

**Abstract**

The fruit of bilimbi (Averrhoa bilimbi) exhibits properties as a membrane and preliminary research has been conducted on its characteristics. The aim of this research is to modify the membrane of bilimbi by impregnation with calcium carbonate. Membrane characterization was performed to determine the characteristics of the resulting membrane including: tensile strength (with IMADA tensile strength test), porositas (with bulk density), hydrophility (swelling index) estimated pore size (bubble point method) and functional groups with FTIR and surface morphology with SEM. The results showed that membrane impregnation with CaCO3 with a particle size of about 90 μm decreases porosity, hydrophility and increases density and pore size. The pore size of the star fruit membrane without impregnation is around 1 μm and the membrane impregnated with CaCO3 is about 1.2 μm. Within the CaCO3 concentration range of 5, 10 and 15%, the higher the concentration, the higher the density, the hydrophility decreases slightly and the porosity decreases.

Keywords: membrane of bilimbi, membrane character
The Development of Synthesis Method of Fe₃O₄ Nanoparticles Coated By Biocompatible Polymer Loaded Doxorubicin for Drug Delivery System

Ika O. Wulandari, Hermin Sulistyarti, Anna Safitri, D.J. Djoko H. Santjojo, Akhmad Sabarudin

1 Department of Chemistry, Faculty of Science, Brawijaya University, Malang, Indonesia
2 Department of Physics, Faculty of Science, Brawijaya University, Malang, Indonesia
3 Research Center for Advanced System and Material Technology, Brawijaya University, Malang, Indonesia

*Corresponding email: sabarjpn@ub.ac.id

ABSTRACT

In this study, magnetic nanoparticles (MNPs) coated with a combination of oleic acid and chitosan were synthesized by Ex-situ and In-situ coprecipitation methods. Morphology and particle size, crystal structure and crystallite size, chemical structure, and magnetic saturation were characterized by Scanning Electron Microscope (SEM), X-Ray Diffraction (XRD), Fourier Transform Infrared (FTIR), and vibrating magnetometry samples (VSM), respectively. SEM images showed the spherical morphology of nanoparticles. The X-ray diffraction pattern identified that nanoparticles containing Fe₃O₄ and 7-Fe₂O₃. The particles and crystallite size of the nanoparticles tended to decrease with increasing oleic acid to the optimum composition. Further functionalization through the chitosan addition (crosslinked by Tripolyphosphate/sulfate) is contributed to the hydrophilicity properties of nanoparticles. Through VSM analysis, MNPs-oleic acid-chitosan showed superparamagnetic behavior. There was a linear correlation between magnetic saturation and Fe₃O₄ content of nanoparticles drug loading and drug release were carried out by using Doxorubicin. These nanoparticles showed a high drug loading efficiency with lower chitosan composition. The loading efficiency of Doxorubicin is related to the conjugation with carboxylic groups and hydrophobic sites from oleic acid and magnetic nanoparticles. Keywords: Fe₃O₄, Oleic Acid, Chitosan, Ex-Situ, Coprecipitation.
Adsorption Of M(II) (M = Mn, Cu, Zn) In Various Ph And Contact Time Using Chitosan-Silica Prepared By Sol-Gel Method


Department of Chemistry, Brawijaya University, Malang-65145, Indonesia

*E-mail: darjito@ub.ac.id

Abstray

Chitosan–silica prepared by sol-gel method was used for adsorption of M(II) (M = Mn$^{2+}$, Cu$^{2+}$, Zn$^{2+}$) in solution at room temperature. The prepared chitosan–silica was characterized by Fourier Transform Infrared (FTIR), Scanning Electron Microscopy (SEM). Effect of pH of the metal solution and adsorption contact time toward the adsorption capacity were investigated. The correlation between M(II) concentrations and the adsorption capacity, which was determined at optimum pH and optimum adsorption contact time, is also discussed. FTIR and SEM results are identical to that of chitosan–silica reported previously. Chitosan-silica performs the highest adsorption capacity for Cu$^{2+}$, Mn$^{2+}$, and Zn$^{2+}$, successively. The optimum pH for Mn$^{2+}$, Cu$^{2+}$ and Zn$^{2+}$ adsorptions were obtained at pH 5. It is suggested that due to the combination of ionic size and HSAB concept, Cu$^{2+}$ gives the highest adsorption capacity than that of Mn$^{2+}$ and Zn$^{2+}$. The optimum contact time for Mn$^{2+}$ and Cu$^{2+}$ adsorption was obtained at 75 minutes with adsorption capacities of 6.56 ± 0.04 mg/g and 15.46 ± 0.02 mg/g, respectively, whereas Zn$^{2+}$ adsorption was obtained at 60 minutes with an adsorption capacity of 5.01 ± 0.12 mg/g.
The Influence of the Solvents on Natural Colorants for Halal Fat Identification

Rurini Retnowati, Hemin Sulistyarti, Suratmo 1)

Chemistry Department, Mathematics And Natural Sciences Faculty, Brawijaya University
rretnowati@ub.ac.id

One of the halal concepts is food that does not contain the slightest "lard" or food fat derived from pigs. One method that can developed for animal fat analysis is the UV-Vis spectrophotometry method using natural dyes. One of the factors that influenced the analysis was the solubility of animal fats and natural dyes in organic solvents. This research was conducted to study the differences in the profile of UV-Vis spectrum in animal fat (chicken, beef, goat, pig) using various natural dyes in different solvents with different stages of research: 1) Screening of plant dyes based on their solubility in solvents with polarity different; 2) Analysis of animal fat by UV-Vis spectrophotometry using plant dyes in Screening solvents. The results showed that plant dyes from Curcuma longa, curcuma heynnea, Areca catachu and Uncaria were soluble in ethyl acetate and isopropanol so, as well as animal fats. UV-Vis Spectrum Profile of animal fat with turmeric dyes in ethyl acetate respectively for chicken, beef, pig, goat fat shows λ: 484; 792; 488.5; 741 nm with A: 3,913; 0.816; 3,524; 0.175 and in isopropanol solvents have λ: 751; 787; 712; 499 nm and A: 0.007; 1,012; 0.479; 3,913. The UV-Vis spectrum profile of oil with turmeric dyes in ethyl acetate solvent can distinguish lard from cow and goat fat, because in isopropanol solvent cannot distinguish lard from chicken and sap-, but can distinguish lard and goat. Whereas with temugiring dyes in ethyl acetate cannot distinguish pigs from chickens, cows and goats and in isopropanol solvents can distinguish pigs from cows. For jambe and gambier dyes in ethyl acetate and isopropanol can not distinguish pigs from chickens, cows and goats.

Keywords: Fat animal, natural colorants, Spectrophotomettry UV-Vis