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PREFACE

Preface
Greetings to all of honorary Indonesian Journal of Applied Chemistry (J. Kim. Terap. Indones.) readers!

Deepest gratitude from all of us should be conveyed sincerely to Allah The Highest and Most Merciful whom allowed and blessed the publishing of Indonesian Journal of Applied Chemistry (J. Kim. Terap. Indones.) Volume 21 No.1 June 2019. Whom also allowed and blessed this journal to reach all of readers hands, through a systemic supervision by our respectful reviewers.

Indonesian Journal of Applied Chemistry (J. Kim. Terap. Indones.) is a product of our continuous improvements from the originally called Jurnal Kimia Terapan Indonesia (JKTI). In a way to transform into International Journal, several quality improvements had been conducted including (i) all articles were written in English, (ii) close involvement of International reviewers, (iii) adopting Open Access Journal System in submitting, reviewing and publishing articles, (iv) using compact article template and (v) having a registered e-ISSN to accommodate reaccreditation and global indexing process.

In this edition, several astonising articles from well-known Indonesian Institutions were served. They are: (i) Preliminary Economic Study of ZnO Nanoparticles Production by Sol-Gel Synthesis Method, (ii) Self-Healing Concrete Using Bacteria Calcification from Karst Cave Environment, (iii) Conversion of Hemicellulosa from Kenaf Core Fiber to Xylose through Dilute Sulfuric Acid Hydrolysis, (iv) Phenol Biodegradation and Catechol 2,3-Dioxygenase Gene Sequencing of Bacillus cereus IrC2 Isolated from Rungkut Indonesia, (v) The Effect of Acid Hydrolysis Treatment on the Production of Nanocellulose Based on Oil Palm Empty Fruit Bunches, (vi) Characterization of Protease Crude Extract from Indigenous Lastic Acid Bacteria and the Protein Degradation Capacity in Local Tuber and Cereal Paste Flour, (vii) Use of Mg-Al/hydrotalcite Catalyst in Biodiesel Production from Avocado Seed Oils: A Preliminary Study.

By this letter, editors would be honored to express our gratitude and appreciation to all reviewers for all of their hard work and kind cooperation in reviewing and improving the quality of articles in this journal. And for sure, to all authors in this journal, your trust and willingness in publishing your articles in this journal are highly appreciated.

As the closing remarks, editors always invite all researcher to publish their articles in Indonesian Journal of Chemistry (J. Kim. Terap. Indones.) in order to spread out their findings and knowledge in applied chemistry related field. To be heard and known by all researcher around the world in the same field. Article manuscripts can be submitted from our official website http://kimia.lipi.go.id/inajac/index.php

Your critics and suggestions were very welcome in the way to support our continuous improvement efforts. Our biggest wish is this journal will convey benefits to all honored readers and contribute to chemistry knowledge. Have a good read!

Serpong, 30 Juni 2019
Editor in Chief
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**ABSTRACT**

Preliminary Economic Study on the Production of ZnO Nanoparticles Using a Sol-Gel Synthesis Method

Fikri Aziz Shalahuddin¹*, Sera Serinda Almekahdinhah¹, Asep Bayu Dani Nandiyanto¹

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<td>Vol. 21, No. 1, June 2019, pages: 1-6</td>
<td>The economic evaluation is one of the key points in building chemical industries. This paper presented a preliminary economic evaluation of the large-scale production of zinc oxide (ZnO) nanoparticles using the sol-gel method, which is very useful for helping decision whether the fabrication of this material profitable or not. Particularly, the study was done by changing the cost of raw material, which was compared to several economic parameters such as GPM, PBP, and CNPV. The result showed that the project was profitable by increasing raw material cost below 100% from the estimated raw material cost, informing the fact for the prospective fabrication for fulfilling the demand of ZnO nanoparticles.</td>
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**Keywords:**
Zinc Oxide Nanoparticle, Preliminary Economic evaluation, Feasibility study.
Self-Healing Concrete Using Bacteria Calcification from Karst Cave Environment

Ananto Nugroho 1, 2 *, Agung Sumarno 1, 3, Luna Nurdianti Ngeljaratan 1, Deni Zulfiana 1, Ni Putu Ratna Ayu Krishanti 1, Triastuti 1, Eko Widodo 1

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Abstract

Karst regions in Indonesia have the uniqueness of the landscape and biodiversity. The karst is formed by the dissolution of rocks and the precipitation of mineral. In the cave, there are ornaments of stalactite and stalagmite which are formed by the process of mineral precipitation. We have isolated, screened, and identified the soil bacterium from the cave environment (Lysinibacillus macroides). These bacteria are able to precipitate calcium carbonate and can be developed as a self-healing agent concrete. We investigated the proportions and the properties of mixtures concrete containing lightweight aggregate and volcanic ash impregnated with bacteria. A comparison study was made by concrete cylinders subjected to compressive strength tests with and without the bacteria. It found that the strength of concrete with bacteria decreased by less than 10.56% for 28 days of cured specimens. This study showed that the effects of bacteria on the strength of concrete are not considerable. However, these bacteria are effective to repair in the microcrack less than 0.3 mm.

Keywords: Self-healing, concrete, bacteria, volcanic ash

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Conversion of Hemicellulose from Kenaf Core Fiber to Xylose through Dilute Sulfuric Acid Hydrolysis

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Abstract

Kenaf (Hibiscus cannabinus) is a lignocellulosic plant that is usually utilized as a fiber source for sack production. The core from kenaf fiber has not been utilized yet in Indonesia, therefore it is still considered as a waste. Hemicellulose from kenaf core can be hydrolyzed to xylose through dilute sulfuric acid hydrolysis in high temperature. Hydrolysis in this study was done by using autoclave at 121°C and 10% (m/v) biomass: acid ratio for 15 and 45 minutes with a variation on acid concentration (2%, 4%, and 6% v/v). Xylose concentration in the hydrolyzate tends to increase with higher acid concentration and longer heating time. 6% (v/v) sulfuric acid concentration and 45 minutes of heating time produce the highest xylose concentration (20.53 gr/L) and yield (86.50%).

Keywords: kenaf core waste, hemicellulose, xylose, hydrolysis, sulfuric acid

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Phenol Biodegradation and Catechol 2,3-Dioxygenase Gene Sequencing of Bacillus cereus IrC2 isolated from Rungkut Indonesia

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Abstract

Phenol is toxic organic compounds that harmful to humans, mammals, and disrupt the aquatic environment, especially higher-organisms in a fresh-water environment. The biodegradation method using bacteria to degrade hazardous chemical and detoxify wastewater is an effective and efficient method. Bacillus cereus IrC2 isolated from sludge in an industrial wastewater treatment plant in Rungkut – East Java, Indonesia has been examined for the ability to degrade phenols in a minimal salt medium. Bacillus cereus IrC2 is Gram-positive bacterium. This bacterium is motile, rod-shaped and its nucleotides sequence of 16S rRNA gene has been sequenced and can be accessed in GenBank with accession number MK511840. Bacillus cereus IrC2 is capable to use phenol up to 400 ppm as the sole carbon source to grow for 48 hours incubation. Phenol degrades 96% from initial concentration. Degradation of phenol was calculated by colorimetric method using 4-aminocoumarin reagent and confirmed by GC-MS analysis. The aerobic degradation of phenol pathways consists of three steps; in the first step, two hydroxyl groups are inserted into aromatic ring and catalyzed by mono or dioxygenase to produce dihydroxy aromatic compounds which are mostly catechols. Catechol enters the next step of aromatic ring cleavage catalyzed by catechol 1,2-dioxygenase and/or catechol 2,3-dioxygenase. The catechol 2,3-dioxygenase gene of Bacillus cereus IrC2 has been amplified by PCR and cloned into pTA2 vector. The cloned plasmid (pTA2-catE) was transformed into E. coli DH5α and selected blue-white colonies. The insert sequence was determined by Sanger deoxy sequencing method. The catechol 2,3-dioxygenase gene nucleotides sequence of Bacillus cereus IrC2 was submitted into GenBank with accession number MK561609.

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The Effect of Acid Hydrolysis Treatment on The Production of Nanocellulose Based on Oil Palm Empty Fruit Bunches

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Abstract
Nanocellulose has been known as promising reinforcing material in various polymer based product resulted in remarkable improvement in mechanical and thermal properties. Hence, studies to date have developed and explored various sources of biomass to produce nanocellulose. This study aims to synthesize and fully characterize nanocellulose obtained from abundantly available oil palm empty fruit bunches via two different methods which are strong (H₂SO₄) and mild acid (H₃PO₄) hydrolysis at 50 °C for 3.5 hours. Based on the morphological study using Transmission Electron Microscopy, rod-like nanocellulose was obtained using strong acid hydrolysis while mild acid hydrolysis produced long filament shape. X-Ray diffraction analysis showed that the degree crystallinity of nanocellulose produced from strong acid hydrolysis was higher, which is 96% than that of mild acid hydrolysis recorded with 86%. While the sulphuric acid hydrolysis usually produces lower thermal stability than that of other types acid hydrolysis, surprisingly, in this study, the thermal stability of nanocellulose from strong acid hydrolysis was relatively similar to mild acid hydrolysis due to the formation of single crystal structure affording unique characteristic of the obtained nanocellulose.

Keywords: Oil Palm Empty Fruit Bunches, Nanocellulose, Acid Hydrolysis, Cellulose Nanocrystal, Single Crystal

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Characterization of Protease Crude Extract from Indigenous Lactic Acid Bacteria and the Protein Degradation Capacity in Local Tuber and Cereal Paste Flour

Tatik Khusnati, Nanda Sabbaha Nur Kasfillah, Vilya Syafriana, Resti Sofia Zahara, Padmono Citroreksoko, Sulistiani and Trisanti Anindyawati

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Abstract

Protease hidrolyzed protein in flour in order to more digest by human ulcer. *Lactobacillus plantarum* B110 and *Lactobacillus satsumensis* are indigenous lactic acid bacteria that produce protease. The objective of this research is to characterization of protease crude extract from indigenous lactic acid bacteria and the protein degradation capacity in local tuber and cereal paste flour. Tuber and cereal flour used were purple sweet potato (*Dioscorea alata*), cassava (*Manihot esculenta*), rice (*Oryza sativa*), corn (*Zea mays*) and wheat (*Triticum*) as comparison. Protease activity was tested by Horikoshi method (1971) and protein degradation was by formol titration. Research results showed that optimum activities and stabilities of *Lactobacillus plantarum* B110 were at pH: 7.5, 45°C and pH: 5.0-8.0, 35-50°C, while that *L. satsumensis* EN 38-32 were at pH: 7.0, 40°C and pH: 6.0-8.0, 20-45°C. Increases in protein degradation capacity of the paste flour additional proteases crude extract from *L. plantarum* B110 were 0.0838% (purple sweet potato), 1.3299% (cassava), 0.5834% (corn), 0.7499% (rice) and 1.5551% (wheat as comparison); while that *L. satsumensis* EN 38-32 were 0.20% (purple sweet potato), 0.32% (cassava), 0.87% (corn), 1.17% (rice). Based on increases in protein degradation capacity, protease crude extract from *L. plantarum* B110 and *L. satsumensis* EN 38-32 were sequently better to hidrolyze protein of cassava and rice paste flour than that other tuber and cereal.

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Use of Mg-Al/hydrotalcite Catalyst in Biodiesel Production from Avocado Seed Oils: A Preliminary Study

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Abstract

Biodiesel production from avocado seed oils has been carried out using the heterogeneous catalyst of Mg-Al/hydrotalcite. Transesterification process was conducted by varying temperature reaction and oil-methanol molar ratio. The reaction temperature was 30, 40, 50, and 60°C, whereas the oil-methanol molar ratio was 1:3, 1:6, 1:9, and 1:12, respectively. The as-synthesized Mg-Al/hydrotalcite catalyst was characterized using X-ray diffraction and FTIR. Meanwhile, the biodiesel was analyzed their density, viscosity, water content, and 1H-NMR analysis. The results showed that optimum condition in biodiesel production was the oil-methanol molar ratio of 1:6 at a reaction temperature of 60°C for 60 minutes and catalyst quantity of 2% yielding biodiesel conversion percentage was approximately 15.90%. However, these preliminary findings showed that Mg-Al/hydrotalcite was able to convert the avocado seed oils into biodiesel even if still need further analysis and research so that produces a higher percentage of biodiesel conversion.

Keywords: Avocado seed oils, biodiesel, Mg-Al/hydrotalcite catalyst, renewable and green fuels

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