LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : JURNAL ILMIAH*

Judul Jurnal Ilmiah (Artikel)	: Preparation and characterization of KF/CaOMgO catalyst for monoglycerides synthesis	
Nama Penulis	: Didi Dwi Anggoro, Luqman Buchori, **Indro Sumantri**, Herawati Oktavianty	
Jumlah Penulis	: 4 orang	
Status Pengusul	: **Penulis ke tiga**	
Identitas Jurnal Ilmiah	: a. Nama Jurnal	: Malaysian Journal of Fundamental and Applied Sciences
	b. Nomor ISSN	: p-ISSN:2289-5981; e-ISSN: 2289-599X
	c. Volume, Nomor, Bulan, Tahun	: Vol. 15, No. 5, October 2019, pp.640-643
	d. Penerbit	: UTM Press, Universiti Teknologi Malaysia
	e. DOI artikel (jika ada)	: http://doi.org/10.11113/mjfas.v15n5.12343
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	g. Terindeks di Scimagojr/Web of Science, ESCI (belum terindek Scopus)	
Kategori Publikasi Jurnal Ilmiah (beri ✓pada kategori yang tepat)	: √ Jurnal Ilmiah Internasional / Internasional bereputasi	
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Semarang, 14 Januari 2022

Reviewer 1

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Reviewer 2

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LEMBAR
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Jumlah Penulis	:	4 orang		
Status Pengusul	:	**Penulis ke-2**		
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Kategori Publikasi Jurnal Ilmiah : [√] Jurnal Ilmiah Internasional
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Semarang, Oktober 2019
Reviewer 1

Prof. Dr. Istadi, ST, MT
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(Bidang Ilmu/Unit kerja : Teknik Kimia/Universitas Diponegoro)

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b. Ruang lingkup dan kedalaman pembahasan (30%)	6			5,80
c. Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	6			5,50
d. Kelengkapan unsur dan kualitas terbitan/jurnal (30%)	6			5,00
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2. **Ruang lingkup dan kedalaman pembahasan:** Isi artikel meliputi pembuatan serbuk katalis KF/CaO-MgO untuk sintesis monogliserida dari gliserol dan minyak sawit mentah. Isi artikel masih dalam ruang lingkup jurnal Malaysian Journal of Fundamental and Applied Sciences. Hasil percobaan disajikan dengan baik dan dibahas dengan cukup jelas dan didukung dengan pustaka yang relevan dan mutakhir. Namun hanya 3 (12.5%) pustaka yang digunakan dalam pembahasan.
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Semarang, Oktober 2019
Reviewer 2

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Preparation and characterization of KF/CaO-MgO catalyst for monoglycerides synthesis

DD Anggoro, L Buchori, H Oktavianty… - Malaysian Journal of …, 2019 - mjfas.utm.my

Abstract A heterogeneous KF/Ca-MgO catalyst was prepared by impregnation method, and was characterized by Tanabe method, BET and X-ray diffraction. The effects of weight KF addition, temperature and time of calcination on catalyst preparation were investigated. The influence of basicity value of catalyst also was investigated. KF/Ca-MgO catalyst can performed the active compounds to produced a high MG yield of 49, 76% for 2% w KF addition, at 550 0 C of calcination temperature and 2 hours of calcination time. It is has a …

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RESEARCH ARTICLE

Preparation and characterization of KF/CaO-MgO catalyst for monoglycerides synthesis

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Abstract

A heterogeneous KF/CaO-MgO catalyst was prepared by impregnation method and was characterized by X-ray diffraction, BET and Tanabe method. The effects of weight KF addition, temperature and time of calcination on catalyst preparation were investigated. The influence of basicity value of catalyst was investigated. KF/CaO-MgO catalyst could perform the active sites to produced a high MG yield of 47.96% for 2%w KF addition, at 550 °C of calcination temperature and 2 hours of calcination time. It has a high spesific surface area (110,924 m^2/g) that favorable for contact between catalyst and substrates, which effectively improved efficiency of glycerolysis. The high activity of the catalyst was described to the formation of $KCaF_3$ and $MgKF_3$ crystals.

Keywords: KF/CaO-MgO catalyst, basicity, impregnation method, glycerolysis, monoglycerides

INTRODUCTION

To date, monoglycerides (MG) needed by the industry is increasing. MG is widely used as emulsifier, wetting agent, lubricant and so on in the food industries, cosmetics, pharmaceuticals [1, 2], oil well drilling [3], textile [4], packaging [5], plastic processing [6], and material construction [7].

Indonesia is one of the largest producer countries of palm oil in the world. Indonesia's crude palm oil (CPO) production had shown a significant increase over the last 5 years. In 2012, Indonesia had produced palm oil as much as 26 million tons and reached 33.2 million tons by 2016 [8]. More than half of palm oil production is used to meet domestic demand especially the cooking oil industry and the rest is exported. Utilization of palm oil is less effective due to the lack of development in downstream palm oil industries. Palm oil contains 41% saturated fat, 81% palm kernel oil, and 86% coconut oil [10].

Table 1 Composition of fatty acid on palm oil [9].

No	Component	Mass %
1	Myristic Acid	1,1 – 2,5
2	Palmitic Acid	40-46
3	Stearic Acid	3,6-4,7
4	Oleic Acid	39-45
5	Linoleic Acid	7-11

There are several methods of making monoglycerides, among others, through the direct esterification of glycerol and esterification of indirect glycerol by transesterification of glycerol-triglyceride or glycerol-fatty acid of methyl ester (FAME), glycerolysis, enzymatic reactions and chemical deactivation. Glycerolysis reactions are simpler and more economical because they do not require the process of hydrolyzing fat into fatty acids, the separation of fatty acids, purification and selective esterification steps as in enzymatic methods [11].

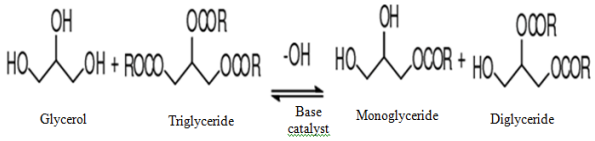

Fig. 1 Glycerolysis reaction [11].

Glycerolysis is an important reaction between glycerol with oils or fats to produce MG. Glycerolysis reactions will run slowly without using catalyst. The existence of catalyst will make the reaction to run quickly and can take place under normal pressure and temperature conditions [12]. The reaction can be carried out in the presence of an acid catalyst or an alkaline catalyst. Reaction with an alkaline catalyst is usually faster [13].

The most common catalyst used in glycerolysis is base catalyst. glycerolysis reactions using a catalyst may use homogeneous or heterogeneous catalysts, each of them has deficiencies and advantages. Comparing to homogeneous catalysts (such as NaOH), heterogeneous catalysts (such as Ca/MgO) have several advantages, such as no production of soap, no need for neutralization and extraction, easier product separation and can be used repeatly. The use of a heterogeneous catalyst may also be increased in activity by modification of the catalyst in the form of a composite or doping to a catalyst. Heterogeneous catalysts consist of two main components, namely as active sites (dopants) and buffers. The active site serves to increase the reaction rate and direct the reaction toward the desired product. The buffer which is generally a porous solid serves as a container for the distribution of the active site so that the catalyst has a larger surface area [14]. The mechanism of base catalyst in transesterification is shown in Fig. 2.

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RESEARCH ARTICLE

Identification and optimization of biosurfactant producing bacteria isolated from rag layer crude oil emulsion

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Abstract

Biosurfactants are surface active compounds that synthesized as secondary metabolite by wide range of bacteria and have characteristic in lowering surface and interfacial tension. This study aimed to isolate and identify biosurfactant producing bacteria from rag layer crude oil emulsion. Rag layer is considered as undesirable material as it is difficult to be separated because of the stable interaction between different components. Mineral salt medium supplemented with glucose and crude oil was used to screen the ability of isolates to produce biosurfactant. Five bacterial strains that successfully isolated from rag layer crude oil emulsion sample were screened for hydrocarbon degradation and biosurfactant production. Two isolates shown positive results in drop collapse test, surface tension measurement and emulsification index, namely P3b and P4. 16S rRNA analysis revealed P3b and P4 to be closely related to *Enterobacter xiangfangensis* while P4 was *Shewanella chilikensis*, respectively. Only isolate P3b was selected for further study. *Enterobacter xiangfangensis* SSP3b16 was found to grow optimally at 37°C, pH 7.0 and 10mM glucose. The highest reduction of surface tension was recorded when culture medium supplemented with 7 % (v/v) glucose and 2 g/L ammonium nitrate. From this study, the biosurfactant production by *Enterobacter xiangfangensis* SSP3b16 can potentially be exploited to enhance oil recovery as well as in solving the rag layer problem in oil industries.

***Keywords*:** Biosurfactant, crude oil, rag layer, *Enterobacter* sp., *Shewanella* sp.

INTRODUCTION

Surfactants are amphiphilic molecules comprising of hydrophobic and hydrophilic moieties that can accumulate at the interface between fluid phases with different polarities such as oil/water or air/water interfaces (Souza *et al*., 2014; Moya *et al*., 2015, Varjani *et al*., 2016). Biosurfactants are surface-active compounds that excreted by a wide range of microorganisms. Microorganisms can be found in various sources such as water and land. Interestingly, they also can be found in extreme environment such as oil reservoirs and can persist at wide range of temperatures, pH values and salinity (Chirwa and Bezza, 2015). Microorganisms such as *Pseudomonas aeruginosa* are well known as biosurfactant producers (Zhang *et al*., 2012). Recently, *Achromobacter* sp., *Bacillus* sp., *Citrobacter* sp., *Lysinibacillus* sp., *Ochrobactrum* sp. and *Pseudomonas* sp. are found to yield different types of biosurfactants and exhibited the potential as hydrocarbon degraders (Joy *et al*., 2017).

Unconventional petroleum refers to crude hydrocarbons that are extracted using techniques other than the conventional (oil well) method. However, the formation of a multiphase complex layer known as oily sludge, petroleum emulsion or rag layer, is a typical problem that arises during oil recovery, transportation and treatment of unconventional crude oils (He *et al*., 2015; Khatri *et al*., 2011). As the rag layer consists of a large amount of impurities such as salts, clays, asphaltenes, resins, heavy metals and naphthenic acids, a high interfacially active properties is exhibited, leading to the formation of a thick layer of highly stable multiphase emulsions at the oil and water interface (Kralova *et al*., 2011; Langevin and Argillier, 2016; Sánchez-Lemus *et al*., 2016). Inappropriate handling and mismanagement of rag layer can be detrimental to public health and surroundings due to its high toxicity and high production quantity (Hu *et al*., 2013). Accidential spillage or improper disposal of oily sludge waste can threaten the ecosystem and living organisms because the toxic organic materials can contaminate the food chain (Reddy *et al*., 2011; Wang *et al*., 2015).

This rag layer is difficult to resolve even after several demulsification phases. Demulsification is a process to break the emulsion by disrupting the stable structure between two immiscible liquids that are suspended together. This emulsion is said to be kinetically stable but thermodynamically unstable. Water-in-oil emulsion will increase the viscosity of a liquid and thus, increase the pumping costs, causing the corrosion of equipment and ultimately the equipment failure (Kilpatrick, 2012).

Even though the production of biosurfactants has been widely studied in bacteria, continuous research is still highlighted on finding the most efficient and effective biosurfactants. Recent studies have reported on the ability of bacteria to produce biosurfactants using various types of carbon sources such as lactose, sucrose and crude oil (Hu *et al*., 2015; Antoniou *et al*., 2015; Parthipan *et al*., 2017; Patowary *et al*., 2017). However, to our knowledge, information regarding the isolation of biosurfactant producing bacteria specifically from crude oil rag layer emulsion is lacking. The present study was

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RESEARCH ARTICLE

Simulation of Chinese finger grip braided sleeve designs for transtibial prosthetics

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Abstract

This work focused on the development of a below knee prosthetic that designed to eliminate various discomforts that are commonly prevalent among the general population of the amputees. The major parts of the transtibial prosthesis are foot, pylon, socket and sleeve. The sleeve-socket compatibility plays an important role in determining the comfort level of an amputee. 'Chinese finger grip braided design' for the sleeve has been proposed by few researchers for better grip and improved comfort level of the amputees. But the detailed design of the braid is not analyzed so far. In this research, two different Chinese finger grip braided designs of the sleeve were proposed and their suitability for transtibial prosthesis was analyzed. The proposed designs were modelled using SOLIDWORKS software and sufficient evaluation of the same has been carried out using OPENSIM and ANSYS software.

***Keywords*:** Transtibial prosthetics, amputee, sleeve, analysis, modelling

INTRODUCTION

Amputation is often carried out as a last resort to arrest an infection or may be due to congenital defects. This research focused on the effect of lower limb amputations (LLA) on the life of amputees and aimed to provide a design which can eliminate the common problems among the amputees. Prostheses are artificial limbs that commonly used to replace the limbs that are lost or missing [1]. Esfandiari *et al.* [2] reported that amputations, especially the lower limb amputations have a profound traumatic effect on the mental health of the amputees. A reduction in their emotional pain with time is expected, but in contrast their emotional pain often remains the same. This study has also correlated the long term side effects with prolonged prosthetic use and has documented this issue. Also, people who undergo dysvascular amputation of the leg are affected more intensely than the people who undergo amputation due to trauma [3]. It has been reported that there will be a constant change in the shape of the stub with time based on various factors such as the hydrate content in the body, oedema and so on [4]. Continuous compressive action on the stub of the amputees has been expected to deliver good dynamic balance among the amputees but the downside being that, this compressive action affects the deep leg veins of the amputees, causing their ability to control their motion to deteriorate with each passing day [5]. Further, it has been identified that under dynamic conditions, the amputees generally exert more loads on the normal foot than on the artificial limb thus, causing stiffness in gait and rapid wear of the joints in the other leg by stressing it more than it is used to [6].

A study on the feasibility of the usage of exoskeleton for the amputees is discussed by Aliman *et al.* [7] and the authors cite that there is currently no universally feasible solution wherein the lower limb amputees can benefit from these exoskeletons that are commercially available. The focus of such products has been kept on military and endurance applications, thereby suggesting that a cheaper alternative for the same can be considered. Another product that is recently gaining traction is a type of prosthesis which does not require any sockets and the prosthetic is actually mounted rigidly to the bone itself through titanium screws known as the osseointegrated prosthetics. But scientific studies report that the entire gamut of problems cannot be eliminated through this type alone and the removal the socket will only cause problems in the metal-skin and the metal-bone interface and thus, increasing the chances of infection [8]. Despite the advancements in technology, there are exist problems in the form of pain among the amputees, in addition to causing discomfort and also indirect pain such as back pain, phantom limb pain and so on. Therefore, prime importance must be given to ensure the comfort of the amputees under all circumstances so that the drawbacks can be avoided [9]. Considering all the above factors, alternate Chinese finger grip braided designs for sleeves were investigated in this research. The design was simple, metabolically efficient and cost effective. But its feasibility needed further investigation.

DESIGN AND APPROACH

Initially a study was carried out on the various prosthetics available, the complexities of each available models and their long term effects on the users. The most common types are transtibial and transfemoral prosthetics that categorized as lower limb prosthetics while transradial and transhumeral prosthetics that classified as the upper limb prosthetics. In this research, the transtibial prosthetics were considered for analysis as they could cause significantly higher emotional strain and dissatisfaction level in the patients [10,11]. The following are the components of the lower limb prosthetics.

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RESEARCH ARTICLE

Characterization and antioxidant properties of ethyl acetate fractions from pyroligneous acid obtained by slow pyrolysis of palm kernel shell

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Abstract

Sustainable utilization of palm kernel shell biomass can be achieved by thermochemical conversion method of slow pyrolysis, which is economical and eco-friendly. Palm kernel shell biomass has unlimited potential as an alternative form of fossil fuels and source of value added chemicals. Pyroligneous Acid (PA) is found to contain phenolic compounds with antioxidant activity, which have various applications. However, the low concentration of the antioxidant phenols makes the production of chemicals and medicines from palm kernel shell less viable. A higher yield percentage can be obtained from fractionation, which can also simplify identification of compounds. The total phenolic contents (TPC) were determined using the Folin ciocalteau assay, antioxidant activities using DPPH and FRAP assays and GC-MS was used to characterize the chemical constituents of the fractions with phenolic activities. Optimum pyrolysis condition was achieved at 429 °C with a 40.44 % yield. The obtained results showed the presence of phenolic activity in all 23 different samples. The fractions with the highest phenolic activity yielded TPCs of 181.75 µg/mL ± 17.0, 174.95 µg/mL ± 0.39 and 181.76 µg/mL ± 15.54. These fractions also simultaneously exhibited high DPPH activity of 23.97%, 31.39% and 52.58% respectively. Sixteen different types of phenolic chemical compounds and their derivatives were also identified with up to 60% higher concentrations when compared to previous studies without fractionation. These results indicated that the proposed approach allows for higher percentage yield of viable, pure and natural alternatives for use as chemicals and medicines, while simultaneously reducing agricultural waste.

Keywords: Palm kernel shell, slow pyrolysis, pyroligneous acid, antioxidants, fractionation and GCMS

INTRODUCTION

Biomass waste is ubiquitously abundant in the world. One of the major producers of these wastes is the oil palm industry. In the oil palm industry, only 10% of the oil palm is used for the production of palm oil, while 90% is ended up as biomass waste (Stichnothe and Schuchardt 2011). Empty fruit bunches (EFB), palm kernel shells (PKS), oil palm fronds (OPF), mesocarp fibers (MF), oil palm trunks (OPT) and palm oil mill effluents (POME) are the main types of oil palm biomass (Board, 2011). Waste management is thus an important and challenging job in the industry.

Biomass is now generally regarded as an important, sustainable and renewable energy source. It is a promising alternative to fossil fuels with potential in various applications (Omer, 2012). It is considered as the only renewable alternative to fossil fuels in the production of sustainable chemicals (Oh *et al.*, 2016). Despite its abundance, there are ~~is~~ limited means and knowledge for suitable technology to convert biomass to other forms of renewable energy (Nie *et al.*, 2008). Thermochemical conversion using pyrolysis is an efficient mean of waste utilization in bulk quantities (Asadullah *et al.*, 2013). One of the major products of pyrolysis is the liquid bio-oil (Ahmad *et al.*, 2014) which is a potential source of many chemicals that can be utilized productively (Oh *et al.*, 2016). The yield and composition of pyrolysis products are determined by the composition of oil palm biomass (Brebu and Vasile, 2010). Lignin, one of the important constituents of oil-palm biomass is considered as a potential source of chemicals and energy (Kim *et al.*, 2010). The major chemicals of lignin pyrolysis are phenolic compounds and several separation techniques have been utilized in extracting these special compounds (Oh *et al.*, 2016; Kim, 2015). Palm kernel shell, which is one of the major waste products in the industry has higher lignin content when compared to other oil palm wastes (Goh *et al.*, 2010). This can be exploited in the production of value-added products including phenols. Productive utilization of palm kernel shell biomass is possible through pyrolysis to yield pyroligneous acids, which can then be used to extract potentially viable compounds for use in various applications. These compounds need to be extracted at high concentration, which is sufficient for productive utilization. This can be achieved by separating the samples into component fractions using column chromatography. Column chromatography, previously used in separation of coloured components has now being extended to effective separation of highly sensitive compounds (Coskun, 2016).

This study was investigated on the productive utilization of palm kernel shell through pyrolysis to produce high concentration of