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temperature, the catalyst concentration and the molar ratio of methanol to oil on fatty acid methyl ester (FAME) yields were investigated. The FAME yield for transesterification of SFO indicated the maximum value at a molar ratio of 9:1 at 120 °C. The water content of WCO activated the CaO catalyst for transesterification. Therefore, the FAME yield for transesterification of WCO decreased as the molar ratio increased, due to the dilution of water by methanol. The FAME yields of SFO was higher than that of WCO under the same conditions, due to the presence of free fatty acids in WCO. At a reaction temperature of 80 °C for 120 min with 3 wt% CaO catalyst, the FAME yields of SFO and WCO reached more than 92 and 84%, respectively. The fuel properties of the biodiesel fuel (BDF) produced from SFO at 120 °C with 5 wt% CaO catalyst satisfied the values required in the EU standard for BDF (EN-14214).

PEAO2_GTR_3

Hydrolysis of Sorghum Starch for Ethanol Production

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The conversion of starch to sugar can be achieved by hydrolysis process. The two-step enzymatic hydrolysis of sweet sorghum was performed by commercially available α-amylase and glucoamylase. In order to attain a higher sugar yield, a study was carried out to investigate the effect of main factors of the hydrolysis process, namely, amount of substrate, liquefaction and saccharification temperature, liquefaction and saccharification time, and amount of α-amylase and glucoamylase enzymes. As shown in the analysis of variance (ANOVA) result, the amount of substrate, liquefaction and saccharification temperature, and amount of glucoamylase enzyme have contributed more significant effect on hydrolysis process of sweet sorghum for sugar production. Also, glucose was found to be the main product obtained from the hydrolysis of sweet sorghum starch.

PEAO2_GTR_4

Targeting for Maximum Syngas Production of Biomass Gasification Based on Thermodynamic Equilibrium Optimisation

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Gasification is a partial combustion process that converts solid, carbonaceous fuels (i.e. coal, biomass, municipal solid waste, etc.) at high temperature into synthesis gas (which as also known as syngas). Syngas consists of a mixture of hydrogen (H_2), carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4), steam (H_2O) as well as nitrogen (N_2) if air is to be used as a source of oxygen. However, determining the optimum type and amount of oxidants and optimum temperature for a specific biomass is a challenge without a systemic approach during the initial design stage of the gasification process. Therefore, this remains the scope of this paper. An optimisation model for gasification process is developed to target for maximum production of syngas for a given biomass. Besides, the composition of the produced syngas per unit biomass, optimum temperature and amount of oxidant(s) (either from steam, air, O_2 or mixture of two or more components) are determined from the proposed model.

PEAO2_GTR_5

Continuous Biosynthesis of Farnesyl Laurate in Packed Bed Reactor: Optimization Using Response Surface Methodology (RSM)

Nazira Khabibor Rahman (Universiti Sains Malaysia, Malaysia); Azlina Harun @ Kamaruddin (Universiti Sains Malaysia, Malaysia); Mohamad Hekarl Uzir (Universiti Sains Malaysia, Malaysia)

This study is aimed to develop an optimal continuous procedure of lipase-catalyzed esterification for farnesol with lauric acid in a packed bed reactor in order to investigate the possibility of large scale production. Response surface methodology (RSM) based on central composite rotatable design (CCRD) was used to optimize the two important reaction variables which are packed bed height (cm) and substrate flow rate (ml/min) for the esterification of farnesol with lauric acid in a continuous packed bed reactor. The optimum conditions for the esterification of farnesol with lauric acid were found as the following: 18.18 cm packed bed height and 0.9 ml/min substrate flow rate. The optimum molar conversion of lauric acid to farnesyl laurate was 98.07±0.82%.

PEAO2_PSE_1

Selection of RGP Optimization Variables Using Taguchi Method

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This paper presents a procedure for selecting optimization variables in a refrigerated gas plant (RGP) using Taguchi method with L27 (39) orthogonal arrays. A dynamic RGP model developed under HYSYS environment is utilized as a test bed. This model comprises 762 variables and 21 regulatory control loops. However, only 9 variables or factors with three level each are studied to determine their relative significance in maximizing RGP profit. These factors are prudently selected due to their relevance in maintaining product qualities. Feed gas (FG) flow rate is found dominant with 97.3% contribution in the first case study. Two additional case studies are performed to magnify the contributions of other factors. FG costs and temperature of FG after coldbox E-101, refrigeration cooler duty and demethanizer reboiler duty are found to be significant factors.