

Warakom Suwanthai 2014: Optimization of Refined Bleached and Deodorized Palm Oil Biodiesel Production using Calcium Methoxide Catalyst by Response Surface Methodology. Master of Science (Chemistry),
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The calcium methoxide catalyst was prepared through calcining the quick lime and then the calcined quick lime was further reacted with methanol to yield calcium methoxide. The catalyst was characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), Attenuated total reflection fourier transform (ATR-FTIR) and Energy dispersive X-Ray spectroscopy (EDX) to evaluate its performance. The results from characterization showed that calcium methoxide was successful synthesized. In the investigation of catalyst activity, the preliminary experiment of approximate condition for transesterification of refined palm oil before response surface methodology (RSM) was applied. The result obtained from this experiment were selected in five levels of each factor for RSM determination to optimize the process of biodiesel production. Design of experiment was performed by application of 5-levels-3-factors central composite design in order to study the effect of different factors on the methyl ester yield. These factors were catalyst concentration (0.82-4.18% wt/wt), methanol to oil ratio (6.64-13.36 mol/mol), and reaction time (19.09-220.91 min). A quadratic model was suggested for the prediction of methyl ester yield. An analysis of variance (ANOVA) revealed that 95.99% ($R^2 = 0.9599$) of the observed variation was explained by the model. The optimum conditions obtained from RSM were 2.71 %wt of catalyst concentration, 11.5:1 mol/mol of methanol to oil and 175 min of reaction time. At this optimum condition, the experimental and predicted values of methyl ester were 98.34 and 96.70 %, respectively. The fuel properties of biodiesel production were determined and the results met well with ASTM 6751 and EN 14214 standard.

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Thesis Advisor's signature

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