Teerayut Thamvijit 2008: Statistical Optimization for Biodiesel Production from Jatropha Curcas Oil Using Two-step Catalyzed Process. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Manop Charoenchaitrakool, Ph.D. 118 pages.

The aim of this research was to investigate the optimum conditions for biodiesel production from Jatropha curcas oil using two–step catalyzed process. In the first step, iron (III) sulfate pentahydrate was used as a acid catalyst while potassium hydroxide was chosen as a basic catalyst in the second step. In this research, One variable at a time technique was applied for the experimental design in the first step. In the second step, the experimental designs were carried out using One variable at a time technique and Box-Behnken design. The effects of temperature, methanol to oil molar ratio, reaction time and amount of catalyst on percentage methyl ester were studied. It was found that the optimum conditions based on the One variable at a time technique were when using 2 wt% of iron (III) sulfate pentahydrate, methanol to oil molar ratio of 6:1, at 50 °C and reaction time of 20 minutes in the first step, followed by using 1 wt% potassium hydroxide, methanol to oil molar ratio of 6:1, at 50 °C and reaction time of 30 minutes in the second step. The highest methyl ester content from this condition was found to be 96.4%. In the case of using the Box-Behnken design in the second step instead of the One variable at a time technique, the optimum conditions for biodiesel production were when using 1 wt% potassium hydroxide, methanol to oil molar ratio of 7.36:1, at 60 °C and reaction time of 30 minutes in the second step. The methyl ester obtained from the optimum conditions was 97.7 %. In addition, it was illustrated that a Full Quadratic model with the adjusted coefficient of determination (R^2adj) and Standard Error of 84% and 3.127 respectively was able to predict the methyl ester content. When considering the regression coefficient of each variables in the Full Quadratic model, it was found that molar ratio had the most significant effect on the %FAME in terms of the linear terms and the square terms, whereas the interaction terms had no effect on the %FAME. In addition, it was found that the viscosity, flash point, cloud point, pour point and acid value of the produced biodiesel were in the acceptable ranges according to the ASTM 6751 standard.

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