

Tassanee Sawatpanid 2007: Statistical Optimization of Biodiesel Production from Jatropha Oil by Transesterification Process using Alkali Catalyst. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Manop Charoenchaitrakool, Ph.D. 108 pages.

This research investigated the optimum condition of biodiesel production from Jatropha oil by transesterification of alkali catalyst. Box-behnken technique was applied for the experimental design. There were 27 experiments and 4 investigated variables namely potassiumhydroxide concentration (0.5-1.5 %wt); mole of methanol and oil ratio (3:1-9:1); reaction temperature (30-60°C) and reaction time (60-120 min). The 27 experiments were carried out and the data was statistically analyzed by MINITAB program to find the suitable model of % fatty acid methyl ester (%FAME) as a function of the above four variables. Full quadratic model was suggested by the program using the response surface methodology with the adjusted coefficient of determination ( $R^2_{adj}$ ) and standard deviation of 92.1% and 2.226 respectively. Then response surface regression was run to get the individual regression coefficient of the variable in the full quadratic model. However, to test the significant of the individual regression coefficient, t - score and P - value had to take into account. It was found that individual variable and the square of variables are significant while the interaction of variable terms were non-significant. The next step was to find the optimum condition suggested by the program. To find the optimum condition, the 98.0 % maximum, 96.5 % minimum and 0.1 weight had to specify. The optimum condition was found 1.5 %wt potassium hydroxide, 6.9:1 mole of methanol and oil, 45°C reaction temperature and 90 min reaction time. Then the experiment was performed to validate the optimization condition and some properties of methyl ester were analyzed. It was found that 97.9 % of FAME, 4.53 mm<sup>2</sup>/s at 40°C of viscosity, 197°C of flash point and 0.388 mgKOH/g of acid value were obtained according to EN 14214 standard.

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