RESPONSE SURFACE METHODOLOGY FOR OPTIMIZATION PRODUCTION BIODIESEL FROM COCONUT OIL BY MICROWAVE-ASSISTED TRANSESTERIFICATION USING A LOW CONCENTRATION NaOH CATALYST

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ABSTRACT. The use of homogeneous NaOH catalysts in the production of biodiesel through a transesterification reaction is very well known with a concentration of about 1-3%, the transesterification reaction running relatively quickly requires a reaction time of about 30 minutes. If using microwave irradiation, the transesterification reaction is much faster (less than 5 minutes) so we can reduce the use of catalysts with lower levels (less than 1%). Therefore, we studied the production of methyl ester from coconut oil using a low concentration of microwave assisted NaOH catalyst, by varying the catalyst concentration smaller than 1%, microwave power and reaction time lower than 5 minutes. The experimental equipment consisted of a batch reactor placed in a microwave oven equipped with a condenser, stirrer and temperature controller. The optimal conditions for microwaveassisted transesterification reactions are determined by the response surface methodology. Faced-centered Central Composite Design (FCCD) design was applied to evaluate the effects of three independent variables: microwave power (100-400 W), NaOH catalyst concentration (0.1-0.3%) and extraction time (1-3 minutes) Correlation analysis the mathematical-regression model shows that the squared polynomial model can be used to optimize the microwave-assisted Transesterification reaction with a low concentration NaOH catalyst. Under the operating conditions applied, experimental values match the results predicted by variance analysis. This result shows the high compatibility of the model used and the success of the response surface methodology to optimize and reflect the expected conditions of the Transesterification Reaction.

Keywords: Microwave-assisted Transesterification; biodiesel; coconut oil; NaOH catalyst, Response Surface Methodology