



Study on Optimization of Cottonseed oil Transesterification Process

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Abstract:In this work, optimization of the parameters that affects the cottonseed oil transesterification process with methanol and Potassium Hydroxide (KOH) catalyst is studied. The impacts of three factors (molar ratio, amount of catalyst and reaction time) on the percentage of biodiesel yield produced from the cottonseed oil were considered. The process of transesterification was optimized by using the box-behnken design approach of response surface methodology (RSM). The seventeen experimental runs were generated by box-behnken design. With methanol, each experimental run was performed in 1000ml batch reactor. The results attained from the experimental runs were modelled and analyzed by choosing a quadratic model. The results obtained from the analysis of variance (ANOVA) of the model developed for the percentage yield of biodiesel as a function of molar ratio, amount of catalyst and reaction time. From the ANOVA, it was found that the polynomial model and the three linear terms, (A, B, C), one cross product (AB), and one quadratic term (A^2) are more significant because of their probability values (p-value) were identified to be less than 0.05 that was chosen based on the 95% confidence level. From statistical summary of quadratic model, it was observed that the predicted R-squared of 0.9331 is in feasible range with the adjusted R-squared value of 0.9835. The impacts of molar ratio, catalyst concentration, and reaction time in relation to yield of biodiesel at constant reaction temperature of 65°C were investigated and optimized. Finally, the optimization results indicated 92.37% of biodiesel yield at molar ratio of 5:1 catalyst concentration of 0.7 (wt%), and reaction time of 2 hrs. The optimized condition was verified with the actual yield of 91.5%. Thus, it can be presumed that RSM under Box-Behnken design has been used successfully in optimization of cottonseed oil transesterification process.

Keywords:Optimization, Transesterification, Catalyst, Biodiesel, RSM, Box-Behnken Design etc.