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Simultaneous Esterification and Transesterification of High FFA Jatropha Oil Using Reactive Distillation for Biodiesel Production

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Abstract : Reactive Distillation (RD) is a multifunctional reactor which integrates chemical reaction with in situ separation to shift the equilibrium towards the product formation. Thus, it is suitable for equilibrium limited reaction such as esterification and transesterification to enhance the reaction conversion. In this work, the application of RD for high FFA oil esterification-transterification for biodiesel production using sulphuric acid catalyst has been studied. Crude Jatropha Oil with FFA content of 30.57% was utilized as the feedstock. Effects of the catalyst concentration and molar ratio of the alcohol to oils were also investigated. It was revealed that best result was obtained with sulphuric acid catalyst (reaction conversion of 94.71% and FFA content of 1.62%) at 60□C, molar ratio of methanol to FFA of 30:1, and catalyst loading of 3%. After undergoing esterification reaction, jatropha oil was then transesterified to produce biodiesel. Transesterification reaction was performed in the presence of NaOH catalyst in RD column at 60□C, molar ratio of methanol to oil of 6:1, and catalyst concentration of 1%. It demonstrated that biodiesel produced in this work agreed with the Indonesian National and ASTM standard of fuel.

Keywords : reactive distillation, biodiesel, esterification, transesterification
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