

Exergy: An Effective Tool to Quantify Sustainable Development of Biodiesel Production

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Abstract : This study focuses on the exergy flow analysis in the transesterification of waste cooking oil with methanol to decrease the consumption of materials and energy and promote the use of renewable resources. The exergy analysis performed is based on the thermodynamic performance parameters namely exergy destruction and exergy efficiency to investigate the effects of variable parameters on renewability of transesterification. The experiment variables were methanol to WCO ratio, catalyst concentration and reaction temperature in the transesterification reaction. The optimum condition with yield of 90.2% and exergy efficiency of 95.2% was obtained at methanol to oil molar ratio of 8:1, 1 wt.% of KOH, at 55 °C. In this condition, the total waste exergy was found to be 45.4 MJ for 1 kg biodiesel production. However high yield in the optimal condition resulted high exergy efficiency in the transesterification of WCO with methanol.

Keywords : biodiesel, exergy, thermodynamic analysis, transesterification, waste cooking oil

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