

Kinetic modeling of simultaneous esterification and transesterification from rapeseed oil for the biodiesel production

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Abstract

Biodiesel production is the process which produces biofuel, through the chemical reactions such as esterification and transesterification. Biodiesel (also known as FAME; fatty acid methyl ester) comprises of mono alkyl esters of long chain fatty acids, which is obtained from vegetable oils and animal fats by transesterification with methanol in the presence of suitable catalyst. The present work reports the kinetics of simultaneous esterification of myristic acid and transesterification of rapeseed oil with methanol at different temperatures (120⁰ C, 150⁰C, 170⁰C) and oil to methanol ratio (1:20) with 3 wt% of sulphated zirconia catalyst. The estimation of forward and backward kinetic constants is done by using real coded genetic algorithm (RCGA) from the experimental data available in open literature. The calculated kinetic parameters were cross validated with the other experimental oil to methanol ratio (1:10), which are not included in the kinetic parameter estimation exercise. The result from the cross validated values also fitted well with the experimental data from the open literature.

Keywords: biodiesel, Kinetic modeling, esterification, transesterification

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