

Transesterification of waste cooking oil to biodiesel fuel using K_3PO_4 catalyst

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Biodiesel fuel (BDF) is a renewable alternative fuel and reduces the consumption of crude oil and the production of CO_2 emissions. It has been generally obtained by transesterification of triglycerides in vegetable oils and animal fats with an excess of methanol in the presence of a homogeneous catalyst. However, the use of a heterogeneous catalyst for BDF synthesis has many potential advantages: it is environmentally benign, noncorrosive to the reactor, creates no soap byproducts by reacting with free fatty acid (FFAs), and is easily separated from the reaction mixture. In this study, tri-potassium phosphate was used for the transesterification of waste cooking oil with methanol. It is found that tri-potassium phosphate shows high catalytic properties for the transesterification reaction, compared to CaO and tri-sodium phosphate. Transesterification of waste cooking oil required approximately two times more solid catalyst than transesterification of sunflower oil. The fatty acid methyl ester (FAME) yield reached 97.3% when the transesterification was performed with a catalyst concentration of 4 wt% at 60 °C for 120 min.