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Abstract: The transesterification of soybean oil in solid KOH/γ-Al_2O_3 catalyst was investigated. Catalyst used in this study was synthesized using the sol-gel method. The effects of gelation temperature and nitric acid concentration were carefully examined. Moreover, the effect of reaction time, catalyst load, methanol to oil ratio, and temperature were investigated. The optimal point for synthesizing catalyst was achieved at a gelation temperature of 70 °C and nitric acid concentration of 0.050 mol/L. It was found that, the best reaction conditions to get the maximum biodiesel yield from soybean oil are: 25% KOH/γ-Al_2O_3 catalyst, reaction time of 4 hr, methanol to oil molar ratio 12:1, catalyst loading of 6 wt%. At this condition, the maximum biodiesel yield of 78.6% was achieved. Moreover, 25 % KOH/γ-Al_2O_3 catalyst was synthesized using the impregnation method and the same reaction conditions were used. The catalyst synthesized by the sol-gel method and by impregnation method both were reused five times at their optimal condition. Catalyst reuse reduces the yield of the biodiesel production due to extraction of KOH in each usage by methanol. It was found that, the leaching rate of KOH in the catalyst synthesized by the impregnation method was greater than that of the catalyst synthesized by the sol-gel method; consequently there is more reduction the activity of the catalyst synthesized by impregnation method. The results are compared with literature for transesterification of different oils in KOH/γ-Al_2O_3 solid catalyst. It was found that, sol-gel method results in having a more stable catalyst and could be one of the best ways to have a catalyst with mixture of different mineral oxides.

Keywords: Biodiesel, Transesterification, KOH/γ-Al_2O_3, Sol-gel

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