Transesterification of palm oil using KF and NaNO3 catalysts supported on spherical millimetric γ-Al2O3

ABSTRACT

The use of spherical millimetric gamma-alumina (γ-Al2O3) as a catalyst support for the production of biodiesel from palm oil is demonstrated. The catalyst support was produced using a dripping method, and KF and NaNO3 catalysts were loaded on the support using the impregnation method. X-ray diffraction (XRD) analysis showed the formation of Na2O and NaAlO2 phases on the NaNO3/γ-Al2O3 catalyst and the formation of K2O and KAlF4 on the KF/γ-Al2O3 catalyst, which were possibly the active sites for the transesterification reaction. The highest number and strength of basic sites generated from the solid phase reaction of the KF/γ-Al2O3 catalyst loaded with 0.24 g kF/g γ-Al2O3 and the NaNO3/γ-Al2O3 catalyst loaded with 0.30 g NaNO3/g γ-Al2O3 were confirmed by temperature programmed desorption of CO2 (CO2-TPD) analysis. The nitrogen adsorption–desorption isotherms also revealed a mesoporous structure of the catalysts. The biodiesel yield was comparable to that produced from smaller catalysts, and this result indicated the potential of the macrospherical catalysts.

Keyword: Gamma-alumina;Transesterification; Biodiesel; Heterogenous catalyst; Potassium fluoride; Sodium nitrate.