

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.