Synthesis and characterization of Fe2O3/CaO derived from Anadara Granosa for methyl ester production

ABSTRACT

In this study, the iron (III) oxide (Fe_2O_3) doped on natural CaO catalyst (Fe_2O_3/CaO) was prepared and utilized in biodiesel production from used frying oil by a single-step reaction process. The heterogeneous Fe_2O_3/CaO catalyst was synthesized using impregnation method; followed by calcination at 500 °C. The catalyst was characterized in detail by both qualitative and quantitative methods such as X-ray fluorescence (XRF), X-ray diffraction (XRD), scanning electron microscope (SEM), thermal gravimetric analysis (TGA), ammonia and carbon dioxide-temperature programmed desorption (NH_3-TPD and CO_2-TPD), and Brunauer-Emmett-Teller (BET) analyses. The operating parameters such as molar ratio of methanol, catalyst amount and reaction time were investigated in order to optimize the reaction condition for the biodiesel production. As a result, the optimum reaction parameters found were 15:1 methanol-to-oil molar ratio, 65 °C reaction temperature, 3 h of reaction time and 1 wt.% of the Fe_2O_3/CaO. The reported results revealed suggestively high potential of the heterogeneous Fe_2O_3/CaO catalyst for direct conversion of used frying oil to biodiesel-with the possibility to reuse at least 5 reaction cycles without any reactivation process.

Keyword: Fe_2O_3/CaO catalyst; Used frying oil; Biodiesel; Characterization; Transesterification

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