

Synthesis and characterization of metal oxide promoted alumina catalyst for biofuel production

Abstract

Alumina has been widely used as a support in catalysis process which owing to its extremely thermal and mechanical stability, high surface area, large pore size and pore volume. The aim of this study was to synthesize calcium oxide-supported basic alumina catalysts (CaO/Al₂O₃) by impregnation method and to characterize the properties of the catalyst based on its surface area and porosity, functional group, surface morphology and particle size. Impregnation method was chosen for the synthesis of catalyst which involved contacting the support with the impregnating solution for a particular period of time, drying the support to remove the imbibed liquid and calcination process. In the preparation of catalyst, catalytic performance of CaO/Al₂O₃ catalyst was measured at different calcined temperatures (650°C, 750°C and 800°C). Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), Mercury intrusion porosimetry (MIP), and particle size analyzer (Zetasizer) was used to characterize the catalyst. The highest total specific area and the total porosity of the catalyst was obtained at 750°C. FTIR analysis basically studied on the functional groups present in each catalyst synthesized, while SEM analysis was observed to have pores on its surface. Moreover, CaO/Al₂O₃ catalysts at 650°C produced the smallest particle size (396.1 nm), while at 750°C produced the largest particle size (712.4 nm). Thus it can be concluded that CaO/Al₂O₃ catalysts has great potential commercialization since CaO has attracted many attentions compared to other alkali earth metal oxides especially on the transesterification reaction.