

Characterization of different metal oxide promoted alumina catalyst

ABSTRACT

In this study, different metal oxide alumina promoted catalysts were prepared and characterized. All the catalysts (CaO/Al₂O₃, CuO/Al₂O₃, FeO/Al₂O₃, MnO/Al₂O₃, NiO/Al₂O₃ and ZnO/Al₂O₃) were prepared using the incipient wetness impregnation method followed by drying and calcination. The characterization of all six samples of catalysts was done to determine the surface morphology, porosity, functional group, thermal stability, metal content and particle size distribution. Scanning electron microscope (SEM) analysis of samples showed that there were pores on the surface of the alumina. Mercury intrusion porosimetry (MIP) showed that copper oxide alumina promoted (CuO/Al₂O₃) had the high porosity which is 36.77 m² /g followed by zinc oxide (ZnO/Al₂O₃), calcium oxide (CaO/Al₂O₃) nickel oxide (NiO/Al₂O₃) manganese oxide (MnO/Al₂O₃) and ferric oxide alumina promoted (FeO/Al₂O₃) catalysts. Fourier transform infrared spectroscopy (FTIR) analysis showed the presence of by-product existed in all catalysts. Atomic absorption spectroscopy (AAS) analysis showed the presence of Cu, Fe and Zn in the CuO/Al₂O₃, FeO/Al₂O₃ and ZnO/Al₂O₃, while Ca was absent in CaO/Al₂O₃. Besides, through thermo-gravimetric analyzer (TGA) and differential thermal analysis (DTA), all the catalysts showed a slight decrease in weight which can be considered as a stable catalyst. The particle size distribution analysis using the Zetasizer showed the particle size mean based on the intensity of CaO/Al₂O₃, CuO/Al₂O₃, FeO/Al₂O₃, MnO/Al₂O₃, NiO/Al₂O₃ and ZnO/Al₂O₃ were 2305 nm, 5560 nm, 5560 nm, 1281 nm, 1281 nm and 3580 nm, respectively.