

Synthesis procedure and physico-chemical characterization of alumina supported thoria and potassium-ion modified catalysts

Abstract

A series of alumina and K-ion modified supported thoria oxide catalysts were prepared using thorium nitrate hexahydrate, at different loading levels (3–20 wt% of thoria oxide) by the impregnating method. For a better understanding the catalytic behavior of the catalysts, the catalysts were characterized using different techniques such as N₂ adsorption (BET-SA), Pore volume, X-ray diffraction and Fourier Transform Infrared Spectrophotometry. The total pore volume and average pore diameter were observed to be decreased with increasing the loading level of thoria and modifier K-ion, which can be attributed to the filling of the small pores and to narrow the pore diameter of the larger pores as a result of deposition of the thorium on the porous surface of the support. XRD results of alumina supported thoria catalysts (xThAl) show the formation of crystalline thoria and dispersed thoria on alumina with increasing the loading level of thoria up to 20 wt%. IR spectra of alumina supported thorium oxide catalysts show that the formation of carbonate on the surface increased by increasing the loading level of thorium oxide. However, the modified catalyst displays higher formation of surface carbonate species, which indicated that the modified catalysts by using K-ion increase the basicity of alumina and the supported thoria catalysts.