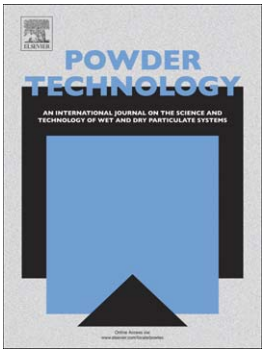

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Abstract

Synthesis and characterization of nano-sized activated alumina from kaolin using an innovative three-step method is presented. Adsorption study of the as-synthesized activated alumina using phenol solution as absorbate was carried out. The Brunauer-Emmett-Teller (BET) specific surface area, pore diameter and pore volume of the as-synthesized activated alumina were 202.3 m^2/g, 1.212 nm and 0.0613 cm^3/g respectively. Chemical, mineralogical, morphological and thermal analyses of the as-synthesized activated alumina were carried out using X-ray fluorescence (XRF), Fourier transform infrared (FTIR) spectroscopy, X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and thermogravimetric analysis (TGA). The as-synthesized activated alumina possessed 83.47 wt% Al_2O_3. Its XRD pattern possessed characteristic peaks gamma phase of alumina. The as-synthesized activated alumina possessed nano-size morphology; having crystal size value of 12.5 nm. It was thermally stable; the differential thermogravimetric (DTG) analysis showed that only 17 wt% mass depletion was observed for heating from 30 - 900°C. Adsorption isotherm of the as-synthesized activated alumina using Freundlich, Langmuir and Dubinin–Radushkevich (D–R) models, gave coefficients of determination of 0.948, 0.962 and 0.867 respectively. The K_f, b, and