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Examination of Some Commercial Sorptive Organobentonites

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Abstract: For controlling organophilic partition nanophase (OPN) formation in some commercial sorptive organobentonites (OBs), 4 sample were selected randomly and examined by X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, differential thermal analysis (DTA), thermal gravimetric analysis (TGA), element analysis (EA), and nitrogen adsorption/desorption (N_2-AD) techniques. Since the d(001) values of the OB samples are between 1.94 and 3.36 nm, the pseudotrilayer or paraffin-type alkylammonium configuration located between the 2:1 layers of smectites is dominant. The bending and stretching type FTIR bands of the smectite surface and alkylammonium cations (AACs) are evidence of the formation of the OPN in the OBs. The DTA and TGA curves show that the thermal degradation of the intercalated AACs is completed between 250 and 550 °C as H_2O, CO_2, and charcoal are formed. The number of C atoms in the AACs used during the preparation of the OBs is between 30 and 42, according to EA. Oxidation of charcoal to CO_2 takes place between 550 and 800 °C. In the same temperature range, smectite is dehydroxylated to release H_2O. Decrystallization of smectite occurs near 1000 °C by an exothermic reaction and without any mass loss. It was observed that the intercalated AACs are flameproof at all temperature ranges applied. The shapes of the N_2 adsorption and desorption isotherms show that the OBs are mesoporous solids. The specific surface area (S) and specific mesopore volume (V) for each OB were determined by using the adsorption and desorption isotherms, respectively. The S and V values range between 33 and 50 m^2g^{-1}, and 0.095 and 0.191 cm^3g^{-1}, respectively. These values are virtually the same as those of natural bentonites. Since the S and V values do not approach zero, OPN formation in the commercial samples is far from completion.

Key Words: Infrared spectra, organobentonites, porosity, surface area, thermal analysis, X-ray diffraction

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