
Adsorption of Ethylene Glycol on Amine-Substituted Montmorillonites

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Abstract: To determine the reason why the adsorption of ethylene glycol on organo-smectites does not result in an expansion along the c-axis of the clays, smectites containing relatively small organo-ammonium ions (lauryl-, benzyl-, dibenzyl-, and dicyclohexylammonium), larger organic cations (dimethylbenzyl-octadecyl- and methylbenzyl-dioctadecylammonium), and the heterocyclic organo-ammonium ion 1,4a-dimethyl-7-isopropyl-1,2,3,4,4a,9,10,10a-octahydro-1-phenanthrenemethylammonium and the corresponding ethoxylated compound were exposed to ethylene glycol vapor for up to several months and examined by X-ray powder diffraction (XRD), surface area, and thermogravimetric methods. Weight loss data showed that all samples adsorbed ethylene glycol. XRD data for oriented samples indicated that lauryl-, benzyl-, dicyclohexyl-, and ethoxylated heterocyclic ammonium clays expanded by one layer of ethylene glycol and that methylbenzyl-dioctadecylammonium smectite expanded by two layers. Dibenzyl-, dimethylbenzyl-octadecyl-, and heterocyclic smectites did not expand because the clay oriented in such a manner as to leave free clay surface between the organo-ammonium cations.

Key Words: Adsorption • Amine • Ethylene glycol • Expansion • Montmorillonite

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