Intermolecular Interaction in Montmorillonites: NH-CO Systems*

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Abstract: The mechanism of interaction between cationic organic molecules satisfying exchange sites in montmorillonite and organic molecules with carbonyl groups was investigated. Dialkyl amides adsorbed on trimethyl-ammonium- and tetramethylammonium-montmorillonite were studied by i.r. spectroscopy. The electronegativity or basicity of the amides, expressed as a summation of the Taft polar factors ($\Sigma\sigma^*$), was found to be linearly related to the C-O stretching frequency after adsorption on trimethyl-ammonium-montmorillonite. Furthermore, the changes in the C—O and N—H stretching frequencies of the amides and trimethylammonium ion respectively, exhibited a direct linear relationship. Thus, the dialkyl amides were shown to be hydrogen bonded through the oxygen of the carbonyl group to the hydrogen of the trimethylammonium. The (001) spacing of trimethyl-ammonium-montmorillonite was 12 · 9 Å. Only after the adsorption of amide molecules of the size of N,N-diethylacetamide or larger did this spacing change. Dialkyl amides were adsorbed on tetramethylammonium-montmorillonite, but less energetically than on trimethylammonium-clay. The (001) spacing of tetramethylammonium-montmorillonite was 13 · 8 Å and remained the same after adsorption of the dialkyl amides. Evidence of hydrogen bonding between the hydrogen of trimethylammonium-ion and some other carbonyl compounds was also noted.

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