Adsorption of Alkylphosphoric Acid on Kaolinite and Smectite in an Organic Medium (Decane)

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Abstract: Di-ethyl 2-hexylphosphoric acid (di-2 EHPA) was chemisorbed on kaolinite and smectite in decane solution. The resultant isotherms were of the Langmuir type and made possible the determination of limiting adsorption values of 12 mg/g and 23.8 mg/g on H^+-kaolinite and H^+-montmorillonite, respectively. The acidic phosphoric group of the di-2 EHPA molecule reacted in the anionic form $(RO)_2PO_2^-$ with the surface cations of the clay structures. Theoretical calculations, based on structural considerations, are in agreement with the experimental data and show that adsorption took place at the rate of one alkylphosphate anion per surface cation if the phyllosilicate was dioctahedral (e.g., montmorillonite and kaolinite). If the phyllosilicate was trioctahedral (e.g., hectorite), adsorption took place at the rate of two di-2 EHPA molecules for three surface cations. Spectroscopic investigations performed with visible, ultraviolet, and infrared radiation confirmed the formation of salts or surface complexes.

Key Words: Adsorption • Alkylphosphoric acid • Hectorite • Infrared spectroscopy • Kaolinite • Smectite • Surface reactions

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