
Hydrophobic Nature of Organo-Clays as a Lewis Acid/Base Phenomenon

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Abstract: The surface thermodynamic properties of a series of *n*-alkylammonium and quaternary ammonium treated clay films were determined by contact angle measurement of drops of test liquids using the Young equation for polar materials. The two clays were a Wyoming montmorillonite (SWy-1) and Laponite RD. For a series of primary *n*-alkyl ($6 \leq n \leq 15$) and several quaternary organic cations, the organo-clay (both SWy-1 and Laponite RD) showed very little change in the value of γ^{LW} compared to the equivalent ammonium-saturated clay. Also, γ^{\oplus} remained small or increased slightly compared to the ammonium-saturated clay. For SWy-1 exchanged by both quaternary ammonium and primary *n*-alkylammonium cations, the value of γ^{\ominus} was smaller ($0.1 \leq \gamma^{\ominus} \leq 15.8 \text{ mJ/m}^2$) than for the ammonium-saturated clay ($\gamma^{\ominus} = 36.2 \text{ mJ/m}^2$) and decreased linearly with the number of carbon atoms. The γ^{\ominus} values for the organic cation-exchanged Laponite RD samples ($24.2 \leq \gamma^{\ominus} \leq 31.2 \text{ mJ/m}^2$) were smaller than or comparable to the ammonium saturated clay ($\gamma^{\ominus} = 30.7 \text{ mJ/m}^2$), and were relatively insensitive to the number of carbon atoms in the organic cation. Thus, for both clays the increased adsorption of organic molecules resulting from replacement of inorganic cations by organic cations is due primarily to the decrease in the value of the Lewis base parameter, γ^{\ominus} .

Key Words: Organo-clay • Surface tension • Lewis acid/base

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