
Cross-Linked Smectites. II. Flocculation and Microfabric Characteristics of Hydroxy-Aluminum-Montmorillonite

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Abstract: Cross-linking of Li-montmorillonite by hydroxy-aluminum oligomers was performed in a specially constructed mixing apparatus. Observations on flocculation and solution composition were carried out during and after the cross-linking reaction; the dry product was studied by scanning electron microscopy.

Flocculation was most pronounced at Al/montmorillonite ratios between 0.98 and 2.45 mM/g; below and above this range, flocculation was much less intensive. These observations can be explained by heterocoagulation and protecting colloid action. A complete neutralization of the montmorillonite charge was estimated at 1.9 mM adsorbed Al per g clay, and in order to account for the electrical charge of the hydroxy-Al, polymers with an average charge of 0.5 per Al atom must be assumed on the montmorillonite surface. Assuming that the hydroxy-aluminum form in the unreacted solution is $\text{Al}_6(\text{OH})_{12}^{3+}$, the adsorbed polymer will be $\text{Al}_{24}(\text{OH})_{60}^{12+}$. Alternatively, assuming $\text{Al}_6(\text{OH})_{15}^{3+}$ in the unreacted solution, this form will remain unchanged upon adsorption onto the montmorillonite surface.

Differences in the microfabric of dry Al-CLM as a function of Al/montmorillonite ratio can be explained along the lines of the interpretation of the flocculation studies.

Key Words: Aluminum • Flocculation • Heterocoagulation • Ligand • Lithium • Montmorillonite

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