
Segregation and Exchange Properties of Alkylammonium Ions in a Smectite and Vermiculite*

M. B. McBride and M.M. Mortland†

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† Graduate Research Assistant and Professor, respectively, Department of Crop and Soil Sciences, Michigan State University, East Lansing, Michigan, U.S.A.

Abstract: X-ray diffraction analysis of mixed alkylammonium-exchanged smectite revealed segregation of different ion species into randomly ordered layers. Vermiculite, however, showed segregation into crystallites, a behavior attributed to clay inhomogeneity. Ion segregation is explained by the hydration properties of cations as well as the energy requirements of layer expansion. Quaternary ammonium ions of different size were used to exchange ethylammonium-clays, and the effectiveness, as well as steric hindrance, of cation size in ion exchange was demonstrated. Layer charge density was related to the degree of ease of large cation adsorption. Basal spacing in suspension was found to be important in determining the preference of vermiculite for certain cations, while more freely-expanding, lower layer charge smectite did not demonstrate this phenomenon.

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