
Ca-K Exchange Reaction and Interstratification in Montmorillonite

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Abstract: Cation-exchange equilibrium for Ca-K-montmorillonite was studied at 35° , 50° , and 90° C and at three total normalities of the equilibrium solution (0.1, 0.05, and 0.01 N). Changes of the standard free energy for the exchange from K-montmorillonite to Ca-montmorillonite were determined to be -53, -270, and -393 cal/eq at 35° , 50° , and 90° C respectively. Changes of the standard enthalpy and entropy were 1.7 kcal/eq and 5.6 cal/eq/degree at 35° C, respectively. The sign of the change of the standard free energy was found to be determined mainly by the entropy change, in particular, by the hydration entropy of the cations.

The calculation of the excess functions indicates that the mixing model of Ca-K-montmorillonite approximates that of a regular solution. Montmorillonite having potassium equivalent ion fraction of 0.1 to 0.7 consists of a random interstratification of Ca-montmorillonite (15.6 Å) and K-montmorillonite (12.6 Å).

Key Words: Enthalpy • Entropy • Free energy • Interstratification • Ion exchange • Montmorillonite

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