
An Interpretation of Cation Selectivity Variations in $M^+—M^+$ Exchange on Clays¹

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Abstract: The decreasing preference of montmorillonite for K^+ relative to Na^+ as the clay adsorbs increasing amounts of K^+ is shown to be the general rule for the exchange of strongly hydrating ions by weakly hydrating ions. Variability in the mass-action selectivity coefficient is interpreted in terms of a composition-dependent surface entropy, which is a function of the chemical properties of the exchanging ion as well as the nature of the adsorption sites. The generally used mass-action form of exchange equation may only be applicable to exchange systems in which both ions have solution-like mobility at the exchanger surface. It is suggested that experimental variables such as ionic strength can greatly influence the degree of fit of data to a given ion-exchange equation.

Key Words: Adsorption • Cation exchange • Montmorillonite • Selectivity • Statistical mechanics

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