

The effects of time, temperature, and concentration on Sr²⁺ exchange in clinoptilolite in aqueous solutions

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ABSTRACT

Four grams of a clinoptilolite-rich rock, crushed to –180 mesh, were exchanged in deionized water (DI), and in 0.1, 0.01, and 0.001 *M* solutions of SrCl₂·6H₂O at 5, 21, 50, and 90 °C for 0.5, 5, 24, and 240 h yielding 64 sample solutions, which were vacuum-filtered to remove solids. The solutions were analyzed by ICP-AES for the outgoing cations (i.e., Na⁺, K⁺, Ca²⁺, and Mg²⁺). The higher molarity solutions were expected to contain greater concentrations of the outgoing cations than the DI or lower molarity concentration solutions. This trend was exhibited by the monovalent and divalent cations in samples of all concentrations. Outgoing monovalent cations exchanged to greater extents with increasing time and temperature. Outgoing divalent cations of 0.01 and 0.001 *M* concentrations exchanged at low temperatures contained greater concentrations of outgoing divalent cations than solutions exchanged at high temperatures. The concentrations of the monovalent cations were slightly greater in the 0.001 *M* sample than in DI, whereas divalent cations had a similar concentration between the 0.001 *M* and DI treatments. Overall exchange of cations out of the clinoptilolite was favored at higher temperatures.