
Sorption of Trace Constituents from Aqueous Solutions onto Secondary Minerals. I. Uranium

L. L. Ames, J. E. McGarrah and B. A. Walker

Battelle, Pacific Northwest Laboratories, P.O. Box 999, Richland, Washington 99352

Abstract: Well-characterized American Petroleum Institute clay standards, source clays from The Clay Minerals Society, and other secondary minerals were used to determine the effects of U concentration, temperature, and solution composition on U-sorption properties. Uranium concentrations ranged from about 1.00×10^{-4} M to 4.00×10^{-7} M, temperatures from 5° to 65° C and solution compositions containing 0.01 M NaCl and 0.01 M NaHCO₃. Silica gel efficiently sorbed uranyl carbonate anion complexes. The higher cation-exchange capacity materials most readily sorbed uranyl ions from the 0.01 M NaCl solution. Temperature increases tended to affect uranyl ion sorption adversely except when the U was present as carbonate complexes. Noncrystalline ferric oxyhydroxides sorbed uranyl ions much more efficiently than any of the secondary crystalline minerals studied. A method for accurately extrapolating U-sorption efficiencies between experimental points based on the Freundlich equation is presented.

Key Words: Cation exchange • Clinoptilolite • Freundlich isotherm • Glauconite • Illite • Montmorillonite • Opal • Sorption • Uranium

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