
Chromate Adsorption by Kaolinite

J. M. Zachara, C. E. Cowan, R. L. Schmidt and C. C. Ainsworth

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

Abstract: Chromate (CrO_4^{2-}) adsorption was investigated on kaolinite (0.2– 2 μm) saturated with NaClO_4 over a range of pH. Adsorption increased with decreasing pH because of protonation of chromate and/or variable charge sites on kaolinite. Chemical pretreatment to remove noncrystalline and crystalline oxide contaminants affected the magnitude of CrO_4^{2-} adsorption, but not the pH range over which CrO_4^{2-} adsorbed. Chromate adsorption at different sorbate and sorbent concentrations increased below the pH_{zpc} for the kaolinite edge, suggesting the formation of weak surface complexes. If CrO_4^{2-} and SO_4^{2-} were present at equal concentration (5.0×10^{-7} M), the two solutes sorbed independently, suggesting binding to separate sites. The presence of excess SO_4^{2-} (5.0×10^{-4} M), however, unexplainably enhanced CrO_4^{2-} adsorption. The adsorption of both chromate and sulfate can be described in terms of a site-binding model of the kaolinite edge, in which the edge is viewed as composite layers of Al and Si oxide. Surface complexation constants for CrO_4^{2-} on kaolinite were similar to those for alumina, pointing to the importance of Al-OH edge sites in chromate adsorption.

Key Words: Adsorption • Chromate • Kaolinite • Sulfate • Surface complex

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