

Mechanistic modeling of As(V) uptake by schwertmannite

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The mechanism of arsenate sorption on schwertmannite was investigated by a batch sorption experiment as a function of solution arsenate concentration under acidic conditions (pH 3.3 - 3.4) at 25C. The reacted solution chemistry and mineralogy showed that the mechanism of arsenate sorption was ligand exchange with solid phase sulfate in schwertmannite. Two processes presumably occur simultaneously within the reaction period. i.e., ligand exchange of arsenate with surface site sulfate and subsequent transfer of arsenate to the structure and ligand exchange with tunnel site sulfate. The exchange ratio between arsenate sorption and sulfate release, and the sulfate coordination environment in schwertmannite indicates that monodentate arsenate coordination occurs in surface sites while bidentate binuclear arsenate coordination occurs in tunnel sites. Sorption modeling that considers the different types of reactive sites successfully described the observed arsenate sorption behavior.