Long-term As uptake behavior of schwertmannite

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In various parts of Asia, such as Bangladesh, China, Inner Mongol, India, Thailand, Nepal and Taiwan, contamination of the groundwater by arsenic (As) which exhibits toxicity for living organism has become serious problem. The pollution of As in the drainage produced by oxidative dissolution of As containing have been also widely reported at many abandoned As mine. However, there have been several reports that As concentration of the drainage decreases remarkably at the downstream by adsorbing with ferric mineral called schwertmannite (Carlson et al., 2002, Fukushi et al., 2003).

Schwertmannite is a low crystalline iron oxyhydroxysulfate mineral with the chemical formula of Fe8O8(OH)8-2x(SO4)x.

The structure of schwertmannite is the tunnel-like structure of iron with sulfate ion. It was reported that the formation is frequently observed in acid mine drainage environment which is characterized to acidic (pH 3-4) and high sulfate concentration (Bigham et al.,1990). Schwertmannite is known to be metastable mineral and transforms with time to goethite, which is crystalline iron hydroxide. Adsorption mechanism of As by schwertmannite is known to be ligand exchange of arsenate with solid phase sulfate. It was reported that the amount of the maximum adsorption capacity was 80mg (As) per 1g (schwertmannite) under the conditions of pH 3.3 - 3.4 (Fukushi et al.,2002). However, the kinetics of the adsorption was not discussed there. Moreover, the behavior of schwertmannite and arsenate with time was not revealed so far. Therefore, the purpose of this research is to evaluate the kinetics of As adsoption and sulfate desorption from schwertmannite and to reveal the behavior of long term behavior of schwertmannite and arsenate. The research may lead to evaluation of long-term stability of natural attenuation process of As by schwertmannite.