

Adsorption mechanism of Selenite and Selenate on Schwertmannite

B. MAROUANE¹, N. CHEN³, M. OBST², S. PEIFFER¹

¹Department of Hydrology, BayCEER, Univ. Bayreuth, Germany

²Experimen. Biogeochemistry, BayCEER, Univ. Bayreuth, Germany

³Canadian Light Source, Saskatoon, Canada

Selenium (Se) is attracting increasing attention due to its toxicity towards aquatic systems, particularly, selenite (Se(IV)) and selenate (Se(VI)). In this study, XANES and EXAFS spectroscopic analyses were used to identify the adsorption mechanism of Se(IV) and Se(VI) at pH 3. Experiments were performed both as single-species and as mixed-species experiments and accompanied by wet-chemistry analysis of the distribution between the aqueous and solid phase. The experiments were conducted on three types of SHM (Oxidative synthesis SHM, Biogenic synthesis SHM and High-pressure compaction SHM) under different conditions (mixing ratio, aging time). EXAFS results indicated that both Se(IV) and Se(VI) formed bidentate binuclear inner-sphere complexes on the surface of all SHM types [1, 2]. Se(IV) adsorbs preferentially as compared to Se(VI). XANES results showed that in mixed-species experiments the intensity of Se(VI) signal decreased with increasing amount of Se(IV) and with time. Analogously, the wet-chemistry experiments point to a competitive sorption of Se(IV) at the expense of adsorbed Se(VI). The general outcome indicated that aging as well as the mixing ratio appear to impact the partitioning of Se(VI) between the solid and aquatic phase, but do not impact the bidentate binuclear adsorption mechanism of both oxyanions on SHM.

[1] Missana et al. (2009) *Geochim. Cosmochim. Acta* 73, 6205-6217

[2] Das et al. (2013) *Appl. Geochem.* 28, 185-193