

SAWA – schwertmannite adsorbents in passive water treatment systems

Background of the project

Ferric hydroxide based sorption materials and iron(III)chloride have a very high affinity to oxo anions. In passive water treatment systems these materials are used for the removal of arsenate, antimonate and other oxo anions from mine water and industrial effluent. In recent studies and R&D-projects it was shown that the mineral schwertmannite has similar characteristics. Schwertmannite is produced at pilot scale by a new innovative microbial mine water treatment process developed by the G.E.O.S. GmbH, during treatment of ferrous iron containing lignite mine water. The high affinity of oxo anions was used to develop new filter stable sorption materials from schwertmannite (R&D project SURFTRAP) and implement a pilot process for the pilot scale production of the adsorbents (ProMine).



Figure 1: schwertmannite sorption materials produced at pilot scale in the EU-project ProMine

Laboratory results verifying the sorption capacity of schwertmannite adsorbents for arsenic and antimony are summarized in table 1.

Table 1: Maximum sorption capacities q_{\max} from batch tests with 0.1g adsorbent/L und 10 mg As(V)/L in mg As/g adsorbent and batch tests with 0.8 g adsorbent/L and 80 mg Sb(V)/L in mg Sb/g adsorbent

Adsorbent	SHM-sorpX	SHM-sorpP	Ferrosorp®Plus*	GEH®104*	BayoxideE33HC*
q_{\max} As(V) (pH q_{\max})	60,3 (pH 6,8)	37,6 (pH 6,8)	40,1 (pH 7,5-8,5)	21,0 (pH 7,5-8,5)	33,2 (pH 7,5-8,5)
q_{\max} Sb(V) (pH q_{\max})	97,7 (pH 4,0)	-	53,9 (pH 8,5)	-	-

* Ferrosorp®Plus (HeGo Biotec GmbH), GEH®104 (GEH Wasserchemie GmbH), Bayoxide® E33 HCF (Lanxcess GmbH)

Objectives

The aim of the project is the pilot scale test of the adsorbents and the optimization of the sorption process to achieve the market readiness for the new products. In cooperation with associated partners, technical scale tests for Arsenic and Antimony removal from original mine water and industrial effluents will be carried out and evaluated. The sorption potential and mechanisms for other oxo anions like vanadate, chromate or selenate will be investigated at laboratory scale and further applications of the adsorbents will be proved. In addition the utilization of the loaded materials will be verified by investigating the elution of the bound anions.

Projectpartner and major tasks

Projekt partner	Task
G.E.O.S. Ingenieurgesellschaft mbH (project coordinator)	project coordination and evaluation of results, synthesis of Schwertmannite, design and implementation of the pilot scale water

	treatment processes in cooperation with the UBT, TUD and the associated partners
UBIG mbH	Production of the Schwertmannite adsorbents at pilot scale and optimization of the products, Preparation of licensing
University Bayreuth, (Hydrology)	Further research of the sorption characteristics to support the optimization at laboratory and pilot scale
Technical University Dresden, Institute for water management	Laboratory tests for adsorption of further oxo anions, testing of the elution of metals from the loaded materials