

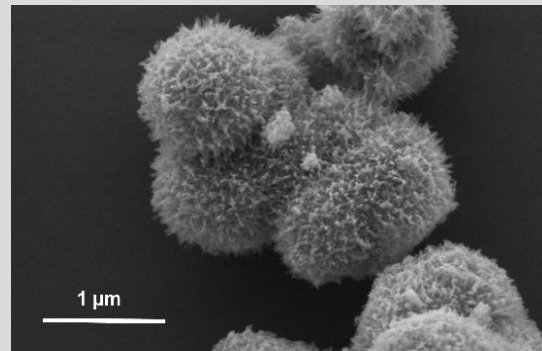
MSc thesis position

in the Group of Hydrology

“Schwertmannite: A novel sorbent for sustainable phosphate management”



Photo of the schwertmannite synthesized in our lab.



Schwertmannite has a “sea-urchin”- like surface morphology that results in a very high specific surface.

Motivation: The demand of phosphate fertilizers is growing as a result of a rising population, while global mineral reserves of this essential nutrient are limited. On the other hand, our current use of phosphate is inefficient and leaky, with excess phosphate from fertilized croplands polluting our environment. An estimated 30 – 40 million tonnes of phosphate is released to freshwaters each year globally, most of which is lost from agriculture.

A potential solution to this problem lies in recapturing and recycling phosphorus, moving it from where there is too much to where there is too little. Technically, this can be achieved by installing regenerative sorbent materials into agricultural drainage systems which retain dissolved phosphate. A low-cost sorbent that is an ideal candidate to remove phosphate from water is schwertmannite, a by-product from acid-mine water treatment.

Schwertmannite is a poorly-ordered iron mineral with an especially high sorption capacity for phosphate. However, schwertmannite is unstable and transforms to more crystalline iron oxides with lower sorption capacities. As a further complication, the stability and sorption efficiency of schwertmannite is strongly impacted by dissolved organic matter – a common component of seepage water from agriculture.

Aim: Despite schwertmannite’s potential to serve as an excellent sorbent for phosphate, studies on phosphate interaction with schwertmannite in the presence of organic matter are still missing. Using controlled laboratory experiments and innovative analytical techniques, this project will therefore investigate the impact of phosphate and organic matter on schwertmannite stability, and elucidate the resulting fate of phosphate.

If you need any further information, feel free to contact me at kerstin.hockmann@uni-bayreuth.de or visit www.kerstinhockmann.com.