Sorption behavior of As on iron phases at a migrating redox front

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Increasing As intrusion in previously safe aquifers

In many Asian groundwater systems, previously As free aquifers are subject to intrusion of As-contaminated groundwater caused by extensive groundwater pumping [1,2,3]. This is for example observed in the vicinity of Hanoi, Vietnam, where As-enriched and highly reducing groundwater is laterally intruding into an As-free Pleistocene aquifer, thereby forming a migrating redox front [4]. The Pleistocene sediments are rich in Fe(III)-minerals that may determine the As mobility by microbially mediated processes [5], and/or competitive sorption processes [6].

In-situ experiments along redox gradient

We studied in-situ As adsorption processes by exposing defined synthetic Fe minerals as well as original sediment material to high As groundwater of various redox characteristics. Using a tailor-made device, the samples were exposed directly to the aquifer in nine monitoring boreholes of the study site in Van Phuc (Hanoi) for seven days, four weeks, and for six months.

SEM imaging showed clear alterations of the exposed Fe-minerals with time (Fig. 1), which were accompanied by pronounced changes in the As adsorption capacity of the Fe-minerals. Results will be presented, corroborating that alteration of Fe-phases could be a decisive factor in controlling the migration of As.

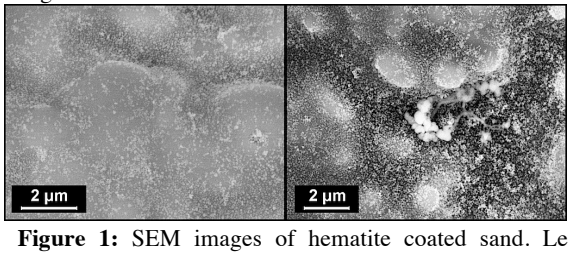

Figure 1: SEM images of hematite coated sand. Left: unaltered hematite crystals on quartz. Right: alterations after 6 months indicating microbial colonization and Fe-mineral transformation.

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