

ASSESSMENT OF ARSENIC RETENTION PROPERTIES OF APTIAN SANDS HAVING DIFFERENT OXIDATION- REDUCTION CAPACITY

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A sound understanding of trace elements (e.g. transition metals, metalloids, etc.) mobility in the environment is a prerequisite to our capacity to model and hence predict their long-term fate. Especially, ensuring the long-term safety of industrial facilities requires quantitative prediction of the migration of trace elements that are potentially chemo-toxic to the surrounding environment. This necessitates determining the mechanisms of interaction with geological near-field formation and their migration to the far field.

The “Aube Storage Center” (CSA) is a radioactive waste disposal facility in France where low and intermediate-level short-lived wastes and non-nuclear wastes are stored. In the context of scientific studies conducted on the CSA, the evaluation of arsenic retention by Aptian sand samples taken from an in situ soil profile was performed using laboratory experiments. Two sand samples were selected. The first one was collected in a zone of reddish color, presumably at the top of a (fossil) groundwater table. The second was collected below, and is more representative of reducing redox conditions and undisturbed by the surface environment. Rietveld refinement of XRD data of the Aptian sand samples revealed that quartz is the predominant phase (91-92% respectively in medium and bottom profiles). It was associated to microcline (3%), glauconite (4-2%), kaolinite (<2%) and muscovite (<2%) with trace amount of smectite clays. Organic matter content of the samples was low (<0.1 %). Groundwater samples collected from two different piezometers located on site in the Aptian sands aquifer have low alkalinity (0.69-0.95 mM) and a pH near 6 ± 0.3 . Synthetic groundwater was prepared and used in the sorption experiments, that aimed at determining the sorption of As (III) and As(V) by the two solid samples. It was observed that retention of arsenic species depended on the soil sample and on arsenic oxidation degree. Here, we will discuss arsenic retention mechanisms as a function of arsenic oxidation number and as a function of soil mineralogy, including Fe oxidation number. The nature of the arsenic-bearing phases was also elucidated, allowing for a sound quantitative understanding of arsenic retention and thus its potential mobility in the natural environment.