

## Phase transformation in simulated acid mine drainage precipitates

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Metal ions released by oxidation of sulfide minerals in mine tailings may be immobilized from mine drainage by natural attenuation processes involving association to mineral phases. Secondary iron precipitates formed when the discharging drainage is exposed to the atmosphere have the potential to play a particularly important role in this context. However, the mineralogy of these precipitates changes over time, possibly affecting the attenuation.

The phase transformation of a mixture of schwertmannite and goethite, likely to be found in precipitates from acid mine drainage, was monitored over time. In order to investigate the possible influence of metal adsorbed to the mineral surfaces on this process, the precipitates were partially coated with copper or lead ions and compared to un-coated blanks run in parallel. As the formation of goethite from schwertmannite produces sulfuric acid, the amount of OH<sup>-</sup> required to maintain suspension pH at 6 and the release of sulfate ions into solution can be used to quantify the phase transformation. To further verify the phase transformation over time, we used the relative intensities of the peaks originating from goethite and schwertmannite in FT-IR spectra of the dried solids. X-ray powder diffractograms of the solids were used to confirm the mineralogy of the original material and reacted samples.

No copper or lead could be detected in the aqueous phase of the samples, suggesting fully adsorbed metal ions. However, in terms of rate of phase transformation, no significant distinction could be made between the coated and un-coated samples, which suggests that the transformation of schwertmannite into goethite is unaffected by adsorbed metal ions.

## Origin of hydrothermal fluids of uranium deposits hosted in granite: Constraints from redox conditions

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Based on experimental data and theoretic calculation results from the literatures, this paper has summarized the valences and geochemical behaviors of uranium in melts and redox and other conditions of uranium being dissolved into fluids. Then the cause for the large difference in ages of uranium deposits and host granites, the source of uranium and the origin of hydrothermal fluids have been elucidated in this paper.

The oxygen fugacity of either mantle-derived melts or granitic magma is below that of the magnetite-hematite (MH) buffer, while the oxygen fugacity for uranyl ion (U (VI)) stable in fluids is much higher than MH. This implies that neither mantle-derived melts nor granitic magma could reach the oxygen fugacity for U (VI). Uranium in magmas occurs predominately as uranous ion (U (IV)) which enters crystals of uraninite and/or other accessory minerals in late stage of magma evolution and hardly enters magma-derived fluids unless under F-rich alkaline magma condition. This is why there is almost no uranium deposit formed by granitic magma-derived fluids. As uranium in fluids occurs as uranyl complexes, it is the key process for forming granite-hosted hydrothermal uranium deposits that high oxygen fugacity fluids ultimately originated from meteoric water leach uranium from uranium-rich granitic rocks. As for the granite-hosted uranium deposits in South China, Indosinian uranium -rich prealuminous leucogranites were the uranium source rocks, and late Yanshanian tectonic extension and dike magmatism provided the heat and the fissure system in granites for meteoric water infiltrating and cycling to leach uranium from the granites. Such fluids became uranium -rich hydrothermal fluids and finally formed the uranium deposits hosted in granites, South China.