The adsorptive behaviour of Am and Tc on Fe-bearing minerals

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Understanding the migration behaviour of radioactive elements in geological environments is essential for the long-term safety assessment of nuclear waste repositories and in nuclear waste management. The potential of migration of radionuclide at contaminated sites and also from the waste repository depends on their environmental behaviour. In this work, we focuse on the investigation of the behaviour of redox sensitive radionuclides in the heterogeneous system containing well-defined amounts of Fe-bearing minerals under aerobic conditions.

To evaluate sorption of Am(III), as Pu(III) analogue, by geosorbents under aerobic conditions, the batch laboratory method and laboratory column method were carried out. ^{243}Am sorption to geosorbents from aqueous solution was determined being pH-dependent. ^{243}Am sorption onto wustite/magnetite showed negative linear relationship within pH values (pH 2.15; pH 4.00; pH 6.95; pH 9.01), while the adsorption of ^{243}Am ions onto hematite increased with increasing pH values (correlation coefficient R=0.83, R=0.92, R=0.90, respectively).

The tests of TcO^{-4} sorption onto iron oxides were performed under ambient conditions. The investigation of Tc sorption onto hematite under the acidic (pH 3-5) and neutral (pH 6-7) conditions suggested that pH of solution had a very slight influence on the technetium sorption Gradual sorption of technetium, added as TcO_4^-, in aquatic solution onto FeO/Fe_3O_4 mineral under aerobic conditions was observed. The sorption of Tc onto wustite under the acidic (pH 3,6 and 5,6) conditions was rapid - after the first 48 hours <1 % of Tc were left in solution.

Mineral hematite at neutral or slightly alkaline pH under aerobic conditions is devoted to minerals which do not sorb Tc (VII). The presence of biogenic Fe(II) as mineral wustite/magnetite can affect the removal of Tc(VII) from the aqueous solution (pH of 8-9). Results of our experiment with Tc(VII) and wustite/magnetite varies from the general assumption stating that under oxidizing conditions TcO_4^- is stable and consequently mobile [1].

[1] Lieser, *et al*.. (1987) Radiochim. Acta 42, 205-213.

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The modern hydrogeochemistry of small pools in Corchia Cave, Italy: implications for palaeoclimate reconstruction

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Several small lakes occupy a number of levels in the Galleria delle Stalattiti of Corchia Cave, Italy. An important feature of two such lakes is the presence of actively growing, subaqueous calcite mounds. Drill cores from these mounds have been the subject of investigations for several years. ^{234}U-^{238}U ages from the base of these cores, combined with stable isotope data from U-Pb-dated stalagmites collected metres away, suggest that some of the mounds have been growing since ~1 Ma. To provide baseline data for interpreting the geochemical variations of these cores, we commenced a study of modern lake-water chemistry, including stable isotopes of H, C and O, trace elements and organic matter content. Besides demonstrating the exceptionally stable state of these lake systems, the combining of core-top geochemistry with source-water chemistry allows us to explore water-calcite isotope and trace element partitioning, and to evaluate the suitability of this unusual speleothem-forming environment for clumped-isotope palaeothermometry. Preliminary results will be presented in this poster.