

Influence of metal concentration and the presence of competing cations on europium and gadolinium speciation with humic acid analysed by CE-ICP-MS

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Nowadays, there is a broad consensus on the technical merits of the disposal of high-level nuclear waste (HLW) in deep and stable geological formations. For the safety assessment of a waste disposal it is important to understand the radionuclide migration in the near- and far-field of a repository caused by an incident. In this environment, natural organic matter such as humic substances can play an important role by their complexation behaviour for metal ions.

Capillary electrophoresis hyphenated with inductively coupled plasma mass spectrometry (CE-ICP-MS) has been used to study the complexation behaviour of Eu and Gd (as homologues of the actinides americium and curium) with humic acid. The influences of lanthanide concentration as well as the presence of competing cations like Ca, Mg and Al on the HA-complexation have been analysed [1].

The lanthanide speciation by CE-ICP-MS reveals weak and strong HA binding sites for the used trivalent lanthanides subject to the given lanthanide concentration. The influence of the competing alkaline earth ions can be assumed as relevant at very high concentrations only while aluminium at already low concentration represents a strong competitor to Eu and Gd in HA-complexation, and may affect toxic metal speciation and thus metal mobility in the geological barrier of a future disposal.

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