Zn-labeled montmorillonite RN sorption reversibility studies

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Compacted bentonite will be used in the context of a deep geological high level nuclear waste disposal as geo-engineered barrier and might be eroded in contact with water conducting features having low salinity (glacial melt water intrusion scenario) forming colloidal/nanoparticular phases. The potential role of these generated colloids enhancing radionuclide (RN) mobility is *inter alia* depending on the RN sorption reversibility and the colloid attachment probability.

Former laboratory batch studies on the sorption/ desorption of RN in the ternary system RN–fracture filling material (FFM)–FEBEX bentonite revealed relative high uncertainties in the measured bentonite colloid concentrations based on the ICP-MS Al signal indicative for structural Al [1,2] and the Al concentrations found in the natural Grimsel Groundwater (GGW; pH 9.6; ionic strength 1.2 mM) used as background electrolyte. The use of Zn-labeled montmorillonite, where Zn occupies the Mg positions within the octahedral layers of the clay mineral [3] is considered as a good way to circumvent these analytical drawbacks. Detailed studies on the characteristics (size, morphology and stability) of Zn-montmorillonite colloids released into GGW using ICP-MS, PCS, AFM, AsFlFFF and LIBD showed a very good agreement of their properties compared to those of the FEBEX bentonite derived montmorillonite colloids. Therefore, Zn-montmorillonite was chosen to carry out compara-tive batch type studies. We will present results of the ongoing sorption/desorption laboratory experiments in the ternary system RN (^{243}Am(III), ^{232}Th(IV), ^{242}Pu(IV), ^{237}Np(V), ^{233}U(VI) and ^{99}Tc(VII))–FFM (1-2 mm size fraction from the Grimsel Test Site (GTS, Switzerland)–Zn-montmorillonite.

[1] Schäfer *et al.* (2004) *Radiochim. Acta* **92**, 731-737. [2] Huber *et al.* (2011) *Appl. Geochem.* (in review). [3] Reinholdt *et al.* (2001) *Eur. J. Inorg. Chem.* **2001**, 2831-2841.

Lithium isotope fractionation during extreme weathering of basalt in Hainan island, South China

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Many isotope systems are sensitive to weathering processes, including radiogenic isotopes like those of Sr and Nd and stable isotopes, such as those of Li and Mg. Lithium is a fluid-mobile, moderately incompatible trace element having two isotopes with ~16% relative mass difference. Like other alkali metals, lithium is present on the Earth only in the +1 valence state, so its isotopic composition is not influenced by redox reactions. Moreover, lithium is not a nutrient and does not participate in biologically mediated reactions. These characteristics make lithium isotopes potentially excellent tracers of near-surface fluid–rock reactions (Rudnick *et al.*, 2004).

Lithium and Lithium isotopes of the samples from from a laterite profile developed from Neogene basalts in the northern region of Hainan Island, South China were detail measured. The results show a trend of decreasing δ^7Li with increasing weathering intensity. These observations are consistent with leaching of Lithium via Rayleigh distillation during progressive weathering. The δ^7Li was extremely low in the middle (2-3m) profile, this may indicate there has an paleo-water profile.