Retention of the Anionic Radionuclides Iodine and Selenium in the Repository Near Field

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> Background and objectives

Host rocks like clay or rock salt show little performance in retarding anionic radioactive species ^{129}I- or $^{79}SeO_3^{2-}$ or $^{79}SeO_4^{2-}$. Therefore negatively charged radionuclide species strongly contribute to the long-term dose rate of a final repository for radioactive waste. In this study an experimental screening has been performed in order to identify backfill materials with high retention potentials towards the elements iodine and selenium.

> Sorption experiments

In batch experiments aqueous and saline solutions doped with alkali selenites, selenates, iodides or iodates were equilibrated with different potential sorbents. Double distilled water, a saturated sodium chloride solution and the brine IP21 were used as aqueous media. The volumetric solid/solution ratio was set to 1:5. Some experiments were performed with radioactive tracers (^{129}I- or $^{79}SeO_3^{2-}$) in order to measure very low concentrations gammaspectroscopically. Otherwise concentrations were determined using mass spectroscopy (ICP-MS).

> Main results

Confirming earlier results almost no retention for iodide was observed in the experiments with MX-80 clay (Fig. 2). In the contrary clay from the Bure site showed a good performance at least when equilibrated with pure water (Fig. 1). A component of Bure clay is Pyrite that quite well retards iodide and selenite but not selenate. MX-80 showed a better sorption performance in experiments with saline solutions (Fig. 2,3). This may be attributed to the co-precipitation of radionuclides with colloids unstable in brines. The opposite behaviour of Bure clay (Fig. 1) clearly indicates a different retention mechanism. Other sorbents with a high retention potential that should be further investigated: hematite, salt concrete, fly ash (all I^-,SeO_3^{2-}), magnetite (I^-,SeO_4^{2-}).

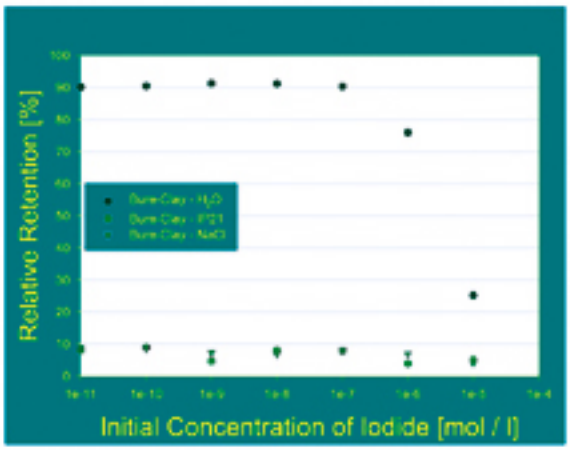

Fig. 1: Retention of Iodide by Bure Clay

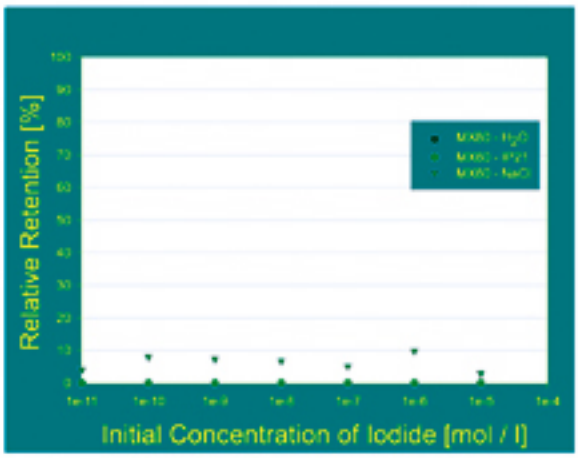

Fig. 2: Retention of Iodide by MX80

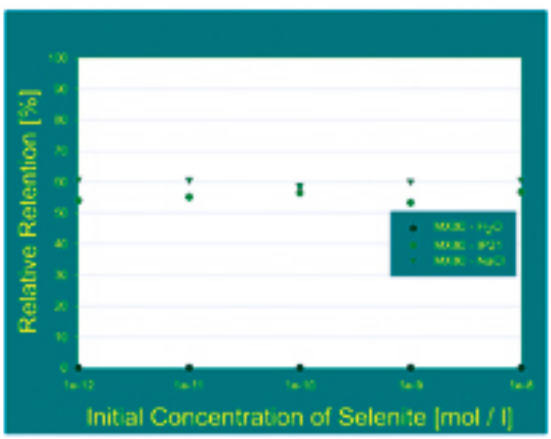

Fig. 3: Retention of Selenite by MX80

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