

## The effect of exchangeable cation on diffusive behaviour of HTO, I<sup>-</sup>, Sr<sup>2+</sup> in compacted bentonite

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The nature of exchangeable cation of bentonite (or, more properly, montmorillonite, the principal component of bentonite) greatly affects swelling, permeability and diffusivity properties [1]. Available diffusion data on compacted bentonite are mainly obtained from experiments with bentonite samples saturated by solution of sodium salt. However, within the long-term evolution of the deep geological repository, the bentonite barrier will be saturated by the host formation groundwater whose chemistry may be furthermore altered by the presence of cementitious materials and corrosion products. As a consequence, conversion into Ca-bentonite by cation exchange might be expected.

This work aims to characterize the effects of the interlayer cation (Na<sup>+</sup> or Ca<sup>2+</sup>) on the diffusive properties of bentonite. We followed the concluding proposals in work [2] that it would have been more realistic to first compact the bentonite samples and then to saturate them with the different solutions. Czech commercial Ca/Mg bentonite, partially Na-activated on the production line, was compacted at 1300 and 1600 kg/m<sup>3</sup> and saturated with two solutions of equal ionic strength (0.1 M NaCl and 0.033 M CaCl<sub>2</sub>). HTO, I<sup>-</sup> and Sr<sup>2+</sup> through-diffusion experiments were performed. The conversion rate into the Na- or Ca-form using this procedure was investigated using XRD and Cu(II)-trien method. In addition, HTO diffusion experiments on fully converted samples into Na- or Ca-form were performed.

Ongoing results showed that effective diffusion coefficient for HTO appears to be higher in Na-bentonite. This observation corresponds with findings of [2], but is in contradiction to [1-3]. In case of iodide, one of the most critical radionuclides, diffusion in Ca-bentonite is much faster than in Na-bentonite. It indicates the significance of the aspect of the exchangeable cation on the clay barrier effectiveness.

[1] Choi and Oscarson (1996) *J. Contam. Hydrol.* **22**, 189. [2] Melkior *et al.* (2009) *J. Hydrol.* **370**, 9. [3] González Sánchez *et al.* (2008) *Appl. Geochem.* **23**, 3840.