Pilot *in situ* diffusion experiment on compacted bentonite in the Czech Republic

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Diffusion experiments under relevant geochemical conditions are fundamental for the performance assessment of radioactive waste disposal in deep geological repositories. Laboratory diffusion experiments are primarily used for this purpose. To demonstrate that the results obtained from the laboratory investigations are valid, some *in situ* diffusion experiments were performed [1-3]. *In situ* experiments in compacted bentonite are more difficult to implement than in consolidated clayrocks, especially due to slow saturation of compacted bentonite, not easy removal of bentonite from the borehole, etc.

In our pilot *in situ* diffusion experiment, we attempt to overcome these difficulties by using rather a small-scale bentonite samples (d = 5 cm, L = 11 cm) compacted at low dry density (1350 kg/m^3). During compaction of bentonite, pellet of sodium iodide (d = 1 cm, L = 1 cm) was added and positioned approximately in the middle of the bentonite cylinder. The bentonite samples were covered with filtration fabric (minimizes the leaching of eroded bentonite particles) and placed in perforated tubes (allow saturation of bentonite by borehole groundwater). The tubes were inserted into the boreholes flooded by groundwater in Josef Underground Laboratory, CZ. After a certain time period, the bentonite samples were removed and cut into small pieces in order to obtain at least 2D distribution of water and iodide content.

The evaluation of experiments is challenging. There is an uncertainty for estimating the time when the bentonite surrounding iodide pellet starts to become water saturated. Therefore, the time needed for the full saturation was evaluated from a set of additional experiments. Diffusion coefficients were subsequently evaluated from the iodide concentration profile. The validity of results from *in situ* experiments were demonstrated by through-diffusion experiments performed under laboratory conditions as close as possible to *in situ* conditions.

[1] Jannson and Eriksen (2004) *J. Contam. Hydrol.* **68**, 183. [2] Palut *et al* (2003) *J. Contam. Hydrol.* **61**, 203. [3] Gimmi *et al* (2014), *Geochim. Cosmochim. Ac.* **125**, 373.