

Factors influencing radionuclide migration in crystalline rock fracture

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Radionuclide migration in the fracture is influenced by different parameters, including fracture properties (surface properties, fracture wetted surface, constrictivity, transmissivity), radionuclide properties (radionuclide form/speciation, sorbing properties), groundwater properties (pH, Eh, O₂ content, chemical composition) etc.

In-situ experiments with non-active and radioactive tracers were carried out in the Josef underground laboratory (CZ) with a goal describe radionuclide transport under conditions that would resemble conditions in real rock massive alike to deep geology repository of radioactive waste.

In the Migration laboratory the tracer experiment instrumentation was developed in thoroughly characterized rock fracture system. Basically, wide number of tracer tests were performed using non active tracers (NaCl solutions - 0,1M, 0,05M, 0,01M, KI - 0,01M). The tests were focused to thoroughly test the rock environment, tracer behaviour, instrumentation and optimal setup of the test system for active experiments.

Finally, after the regulator approval, the active tests, using ³H were performed as the very first radioactive tracer test of such a kind in Czech Republic. Subsequently, evaluation of tracer tests and breakthrough curves was performed using Qtracer2. The transport model was based on MT3DMS on the basis of a verified hydraulic model, implemented in MODFLOW2000.

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