



Gas permeability of bentonite-based barriers in nuclear waste repository: results from laboratory Mock-Up-CZ experiment

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Permeability is one of crucial physical properties influencing use of natural materials and engineering barriers in nuclear waste repositories. Bentonite – smectite-rich rocks are generally considered impermeable and thus excellent candidates for this task. During Mock-Up-CZ, a 44 months lasting laboratory experiment simulating conditions similar to those in repository, the bentonite-rich envelopes were subjected to increased thermal effect (centrally placed heater simulating canister containing spent fuel and capable to heat the barrier over 90°C) and hydration (synthetic granitic water). Various physical and physico-chemical properties of the barrier have been tested both before and after the test. Unstressed material shows generally high heterogeneous permeability (0.832-6.003 mD). The permeability significantly decreases after hydration but starts to recover when subjected to higher temperatures (up to 1.931 mD at about 90°C). Decrease of permeability can be explained by swelling of smectites, that is, however, obliterated by opening of mineral structure due to thermal effect.