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Reactive transport modeling of concrete-clay interaction: The DM borehole at Tournemire.

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Concrete and cement paste were in contact with a clay-rich rock during 15 years in a borehole at the Tournemire Underground Rock Laboratory in France. Overcoring of the borehole and mineralogical analyses have shown a reduction of porosity at the interface due to the precipitation of ettringite, C-S-H/C-A-S-H and calcium carbonate, together with dissolution of portlandite in the cement (De Windt et al., 2008; Gaboreau et al., 2011).

In the framework of the GTS-LCS project (POSIVA, Finland; JAEA, Japan; NDA, UK; SKB, Sweden; NAGRA, Switzerland), new reactive transport modeling (solute diffusion + mineral reaction) has been performed. Results using the CrunchFlow code (Steefel, 2008) show sealing of porosity at the rock side of the interface (mm scale) due to the precipitation of C-A-S-H (calcium aluminum silicate hydrate), calcite and ettringite, together with some clay dissolution. The location of sealing is influenced by cation exchange. Inclusion of cation exchange results in sealing at the rock side of the interface. Without cation exchange, sealing is at the concrete side of the interface. Recent results (Gaboreau et al., 2011) confirm the sealing on the rock side of the interface and the increase in porosity on the concrete side (portlandite dissolution).

References

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