

UDC contribution to EF6 Working Group 2: bentonite homogenization

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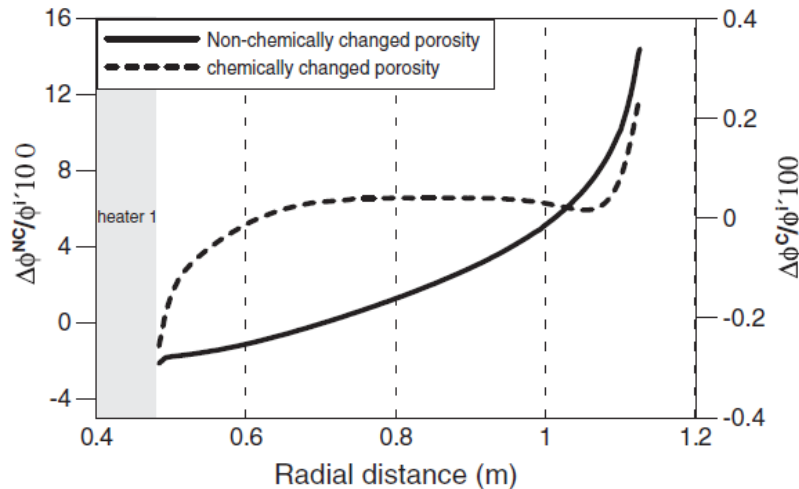
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- **Background**

- Process understanding and model capabilities have been developed from previous EU Projects (FEBEX, NFPRO, PEBS, CEBAMA) on the couplings of THMC processes for bentonite
 - THM processes are linked to geochemical reactions
 - Coupled THC(m) models & codes have been developed



Example: Computed changes in porosity due to mechanical and chemical processes in the FEBEX in situ test

- THM experiments and models often disregard the changes in the chemical composition

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- **Motivation & Purpose**

- Analyze the relevance of hydrodynamic and hydrogeochemical reactions on buffer homogenization
- Potential links of geochemistry with bentonite homogenization include:
 - The dependence of hydrodynamic parameters (K and Φ) on bentonite chemistry
 - Bentonite swelling depends on the bentonite porewater composition and the composition of the interlayer water due to cation exchange reactions
 - Bentonite porosity may change due to mineral dissolution/precipitation within the bentonite buffer and at the bentonite interfaces with canister, host rock and concrete

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- **Issues that should be resolved**
 - Quantify the changes in porosity due to mechanical and chemical processes
 - The changes in porosity due to dissolution/precipitation reactions
 - Dissolution of accessory minerals and the precipitation of secondary mineral phases within the bentonite buffer
 - Precipitation of mineral phases at the interfaces of bentonite with the canister, the host rock and concrete plugs
 - Changes in porosity may affect flow and mass transport parameters
- **Work that could be done in a joint project**
 - Analyze the relevance of the hydrogeochemical reactions for bentonite homogenization using state-of-the-art coupled THMC models
 - Improve the understanding of the fundamental processes that lead to homogenization

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- **Work that could be done in a joint project**
 - Analyze the relevance of geochemistry at several space-time scales
 - Laboratory and in situ tests
 - Long-term performance of the bentonite barrier
 - Evaluate the relevance of the lack of bentonite homogeneity on the geochemical performance of the bentonite barrier
 - Integrate with other partners to provide support on the analysis of the geochemical aspects
- **Resources needed**
 - PhD Student (3 years)
 - Traveling
 - PhD advisor (6 months)
 - Indirect Costs (25%)

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- **Final remarks**

- T-H-M processes are probably the most relevant processes for bentonite homogenization
- Geochemical reactions are not among the most relevant processes, but they are be a potential source of bentonite heterogeneities:
- The consideration of the relevance of the hydrogeochemical reactions for bentonite homogenization in the “HOMOBENTO” proposal will contribute to make it stronger and more sound