

INTRODUCTION to Topical Session 8: Coupled Chemical and THM processes

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Introduction to the Introduction

- Realistic complex coupled approaches versus simple individual process analyses
- Necessity of understanding coupled processes
- THM(C) in EBS, an outstanding example
- RTDC-2 and RTDC-3 cross involvement

THM(C)

- Term C → involves more complexity and uncertainties than THM
- Mainly for a formal incorporation of © into THMC coupled models
- Limited set of qualified data
- Availability of FEBEX set of data at different scales, laboratory, mock up and in situ.

“a conceptual image:

A continuum among.....

water content

swelling pressure

chemical porosity

water salinity

Time and Space

- **TIME:** Short and long term processes
 - laboratory data and NA information
- **SPACE:** Intra-component and **interfaces**
 - Bentonite: THMC processes evolution
 - Interactions corrosion products - bentonite
 - Interactions bentonite – concrete degradation
- **Coordinates for this topical session**
 - Short term (up to 8 years)
 - Clay barrier THMC evolution
- **Interface** processes are treated within RTDC2

The Presentations

1. Effects of microstructure and pore water chemistry on THM processes
(Ana María Fernández – CIEMAT)
3. Interaction between THM behaviour and geochemical variables: experimental evidence
(A. LLoret - UPC & M. Victoria Villar –CIEMAT)
5. Integration of THM-geochemical phenomena: Numerical and constitutive aspects.
(Antonio Gens – UPC)

Effects of microstructure and pore water chemistry on THM processes (Ana Maria Fernández-CIEMAT)

- Accent on theoretical and conceptual aspects
- State of the pore water in the microstructure
- Its influence in understanding relationships between geochemistry and THM processes
- Particular emphasis on swelling pressure

- Experimental accent
- **Effect of water chemistry on THM properties;** fabric, pore structure, permeability, swelling pressure and swelling potential under load.
- **Influence of the exchangeable complex on the hydro-mechanical behaviour,** comparing MX-80 (sodic) and FEBEX (calcic) bentonites.
- **Effects of chemical changes associated with heating /hydration** *experiments on subsequent THM behaviour of bentonite.*

- Modelling aspects
- integrating the observed coupled behaviour in a consistent framework
- A general coupled formulation, capable of integrating many of the observed phenomena
- It demonstrates the capability of the formulations and the associated numerical code to simulate THMC situations.

Questions to be addressed

Legitimate questions from final users

- Can it be inferred after the observed behaviour (which is limited in space and time) that the long term progression will follow the laws derived from the performed experiments?
- Such a inferred behaviour and laws are coherent with the results obtained from natural analogues and natural systems?
- Are we capable of identifying and quantify existing uncertainties