

EURAD ACED – CHEMICAL EVOLUTION AT THE DISPOSAL CELL SCALE

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Webinar EURAD/PREDIS – Digital Twins in Radioactive Waste Management

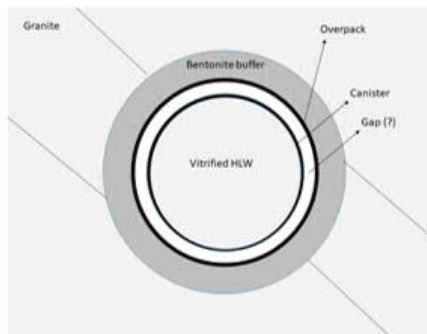
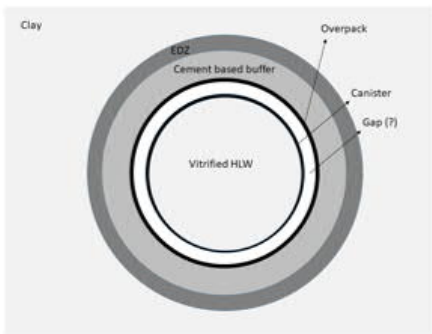


BACKGROUND

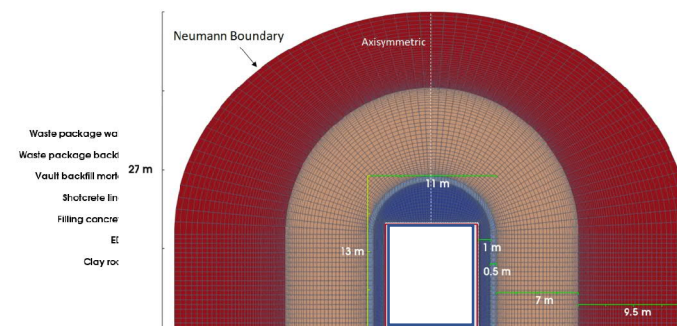
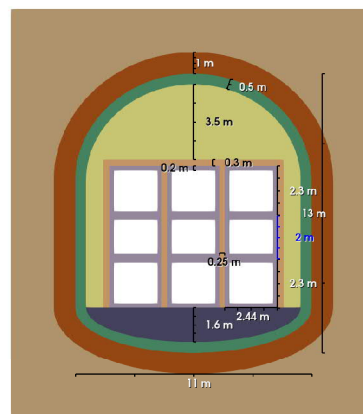
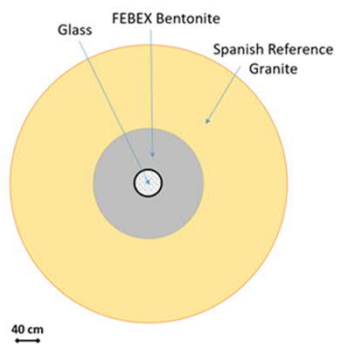
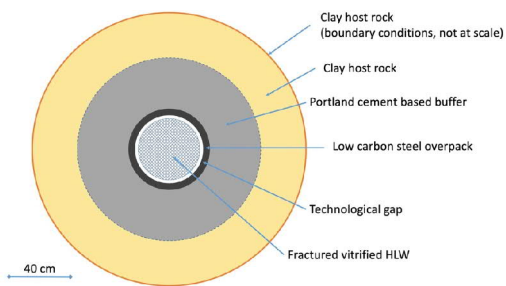
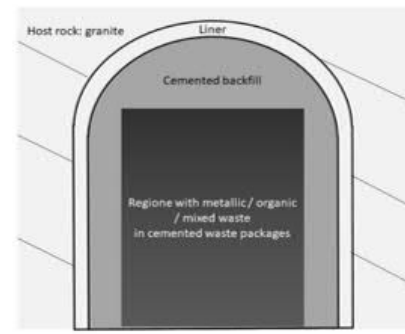
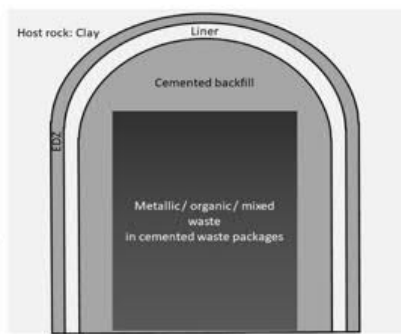
- OBJECTIVE
 - Chemical evolution of ILW and HLW disposal cells (and waste packages in disposal conditions)
 - Based on integration of process-knowledge & subsequent model complexity reduction

SCALE

HIGH LEVEL ACTIVITY DISPOSAL CELLS



INTERMEDIATE LEVEL ACTIVITY DISPOSAL CELLS





BACKGROUND

- OBJECTIVE
 - Chemical evolution of ILW and HLW disposal cells (and waste packages in disposal conditions)
 - Based on integration of process-knowledge & subsequent model complexity reduction
- SCALE
 - Few meters
 - 2D
 - Different materials interacting with each other
- COMPETENCES
 - Coupled Chemical-Flow-Temperature Models
 - Understanding of processes at interfaces between different materials



TOOLS

- Use existing geochemical and reactive transport codes
- Relevant activities for digital twins
 - Integrate scientific knowledge on chemical evolution between interphases (+new knowledge on steel-cement & steel-clay)
 - Develop conceptual and mathematical models for chemical processes in waste packages and disposal cells
 - Document thermodynamic data and input parameters for mathematical models
 - Integrated reactive transport models of different materials
 - Identify key processes to accurately assess chemical evolution at these scales (e.g, transient T in case of HLW)



IMPACT & CHALLENGES

- Impact
 - Chemical evolution as input to
 - Performance of barriers – optimization of design
 - Radionuclide migration
 - To
 - Comprehensive integrated models for chemical evolution
 - Model simplification for “time saving” in view of SA/IA
- Challenges
 - Lacking some important processes
 - E.g. consequences of chemical evolution on mechanical durability
 - Limited part of the system (2D)
 - Abstraction/simplification needed for complex flow patterns, gas flow, ...
 - Computational expensive
 - Relevance for shorter time management – link with monitoring activities
 - Including of shorter transients, microbes, ..