Joint Activities update
EF preparation

EG Meeting N°8

Joint Activity N°10

TEP

BELBaR: **Bentonite erosion effects on the long term performance of the engineered barrier and radionuclide transport**

SRA	Key Topic : N°3	Topic : 9	Topic priority : high

Leader	EG Members:	EF	End-user group:
Patrik Sellin, SKB	SKB NDA Posiva	Participants: next slide	SSM (SE) STUK (Fi)

grant agreement no 295487 , budget 5,087,574 € EU contrib. 2,581,476

No.	Acronym	Name	Country
1	SKB	Svensk Kärnbränslehantering	SE
2	CIEMAT	Centro de Investigatigaciones Energeticas, Medioambientales y Technologicas	ES
3	NRI	Nuclear Research institute Rez plc	CZ
4	KIT	Karlsruhe Institut of Technology	DE
5	POSIVA	Posiva OY	FI
6	VTT	Technical Research Instuitute of Finland	FI
7	ClayTech	Clay Technology	SE
8	JYU	University of Jyväskylä	FI
9	KTH	Kungliga Tekniska Högskolan	SE
10	NDA	Nuclear Decommissioning Authority	UK
11	B+Tech	B+Tech	FI
12	UNIMAN	University of Manchester	UK
13	HU	Helsinki University	FI
14	MSU	Lomonosov Moscow State University	RU

Joint Activity N° 10

TEP

Objectives and Expected Results of the Joint Activity

The main aim of BELBaR is to increase knowledge of the processes that control clay colloid stability, generation and its ability to transport radionuclides.
The overall purpose of the project is to come up with a new way of treating issues in long-term safety/performance assessment.

Expected results: Colloid stability in dilute groundwater

Schedule and Milestones March 2012 – March 2016

BELBaR - Structure

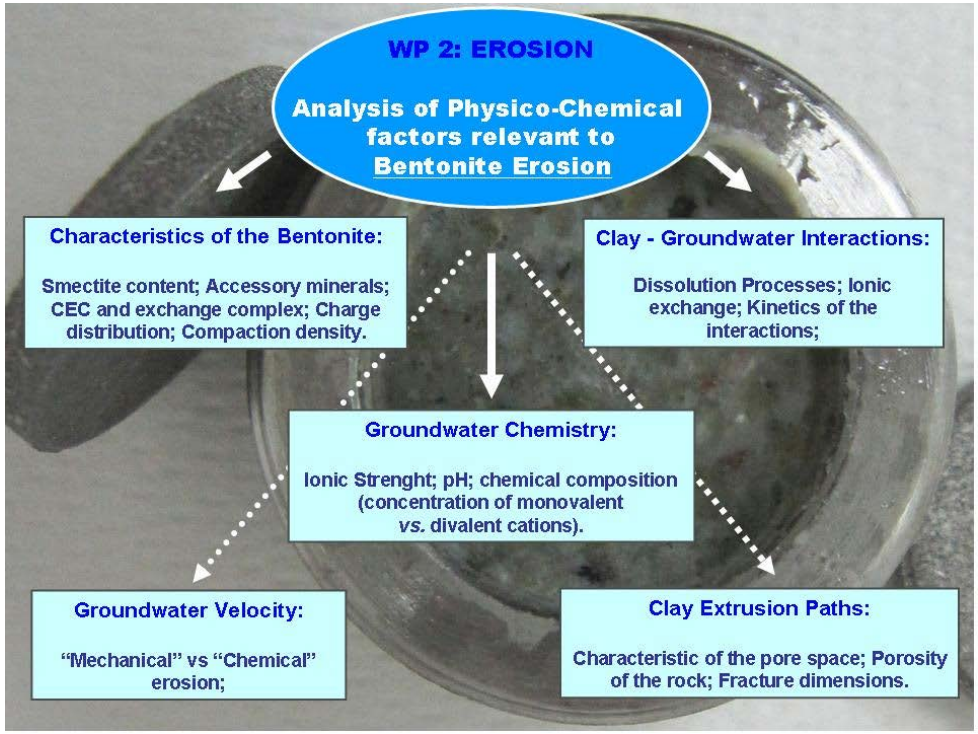
- WP1: Safety Assessment
  - Lucy Bailey, NDA
- WP2: Erosion
  - Tiziana Missana, Ciemat
- WP3: Radionuclide and host rock interactions
  - Thorsten Schäfer, KIT
- WP4: Colloid stability
  - Radek Červinka, NRI
- WP5: Conceptual and mathematical models
  - Kari Koskinen, Posiva
- *WP6: Dissemination*
  - *Patrik Sellin, SKB*
- *WP7: Project management*
  - *Desirée Comstedt, SKB*

WP1: Safety Assessment

- Collect and present the current treatment of the relevant processes in safety assessments
- Ensure that the type and values of the parameters selected for experimental and modelling work are relevant
- To consider how colloids and related phenomena can be considered in the long term safety case
- Make recommendations on the quantitative and qualitative approaches that a safety case could pursue

WP2: Erosion

- To understand the main mechanisms of clay particle erosion from the bentonite surface and to quantify the (maximum) extent of the possible erosion under different physico-chemical conditions



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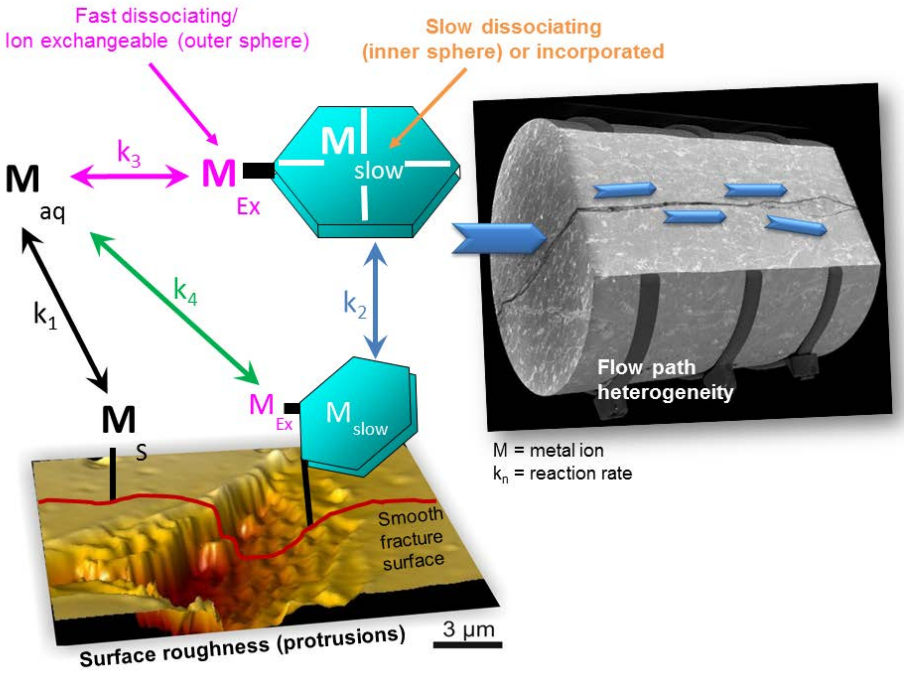
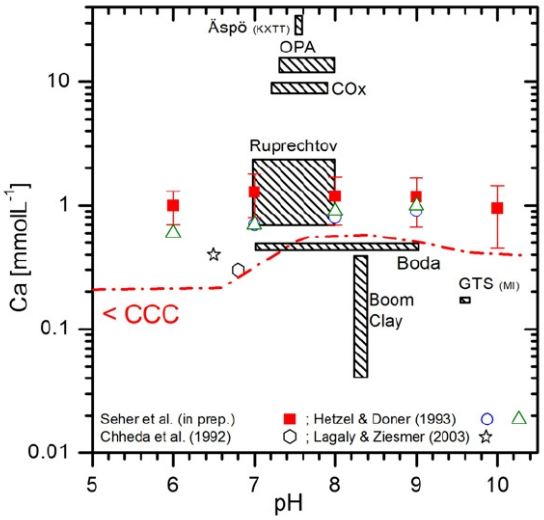
WP3: Radionuclide and host rock interactions

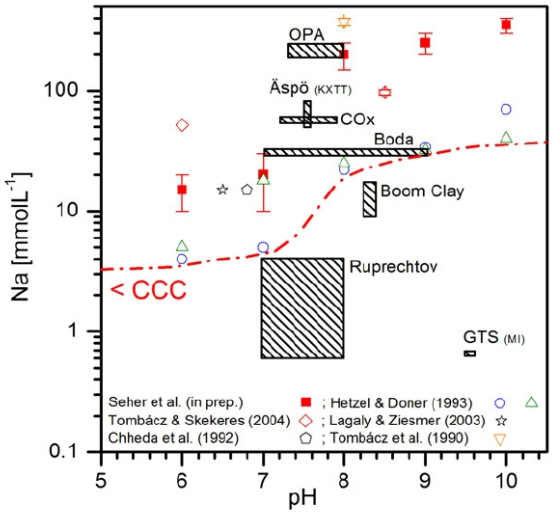
- The process understanding of colloid mobility controlling processes and their appropriate description.
- Strong radionuclide clay colloid sorption reversibility kinetics have frequently been observed, but the reasoning for the observed kinetics is still pending and detailed species determination is needed in order to implement these reactions in thermodynamic models.
- Identifying additional retention processes. Colloid transport and natural occurring colloid concentrations in fractured rocks are frequently correlated to the water chemistry found in the water conducting features.



WP4: Colloid stability

- Clay colloid stability studies under different geochemical conditions with respect to ionic strength and pH.
  - Effects of removing colloidal particles from the liquid phase (such as reaching critical coagulation concentration, the effect of surfactants, coagulation).
  - Understanding the influence of complexing agents





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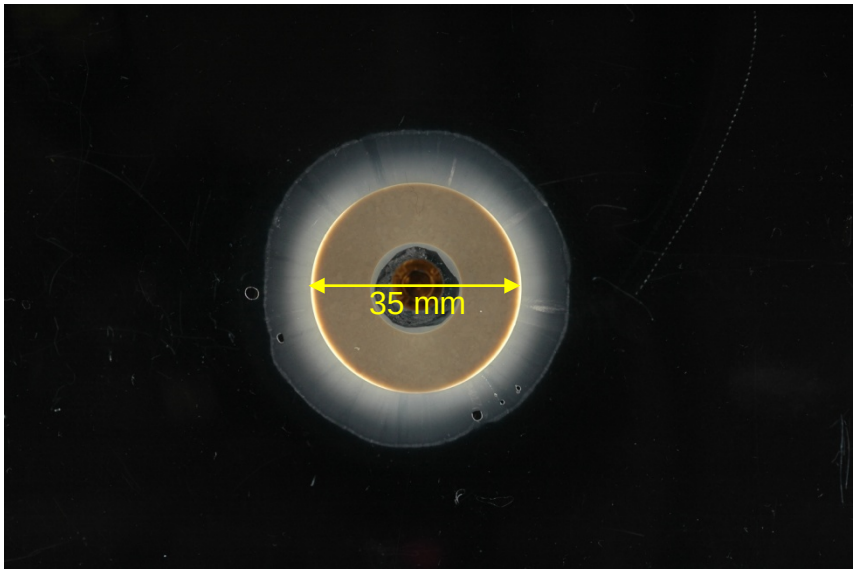
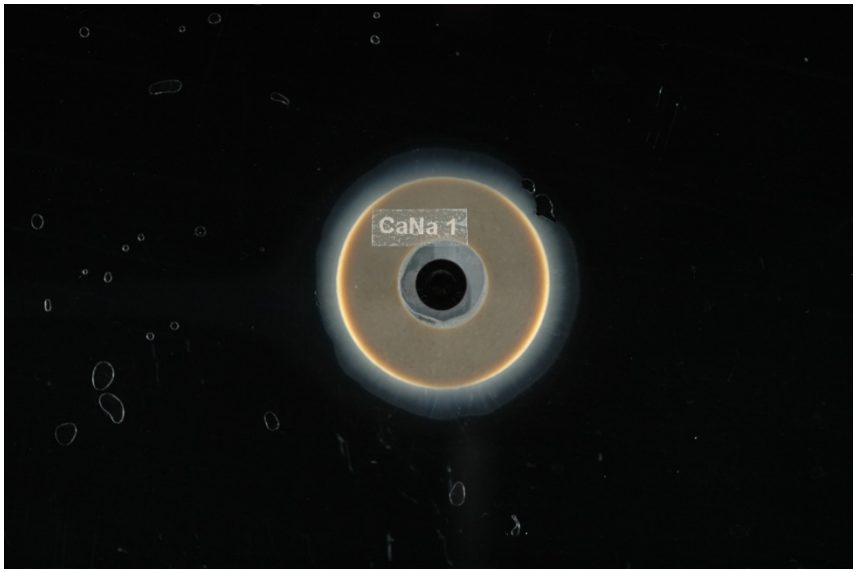
WP4: Colloid stability



Wyoming Na-montmorillonite
swelling in deionized water
Picture taken after 18h of swelling in
0.1 mm slit



Wyoming Ca/Na-montmorillonite
(50%Ca, 50%Na).
Picture taken after 18h of swelling in
0.1 mm slit

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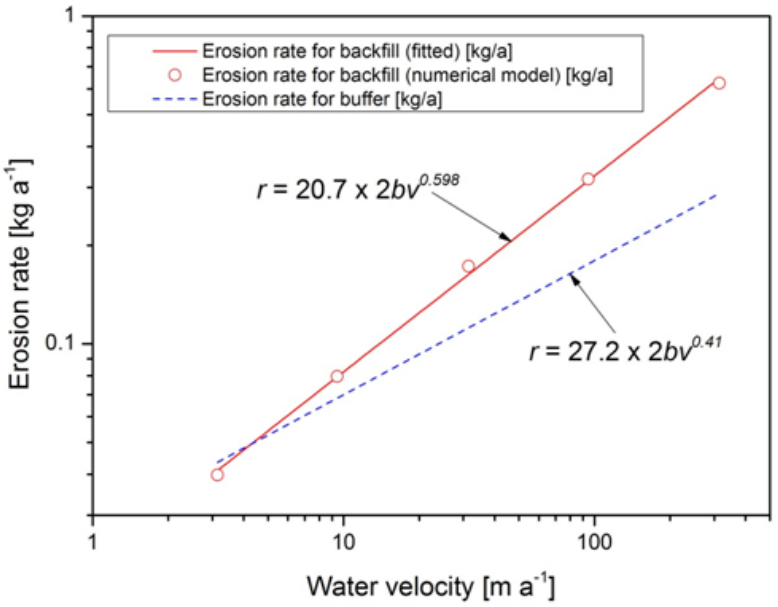
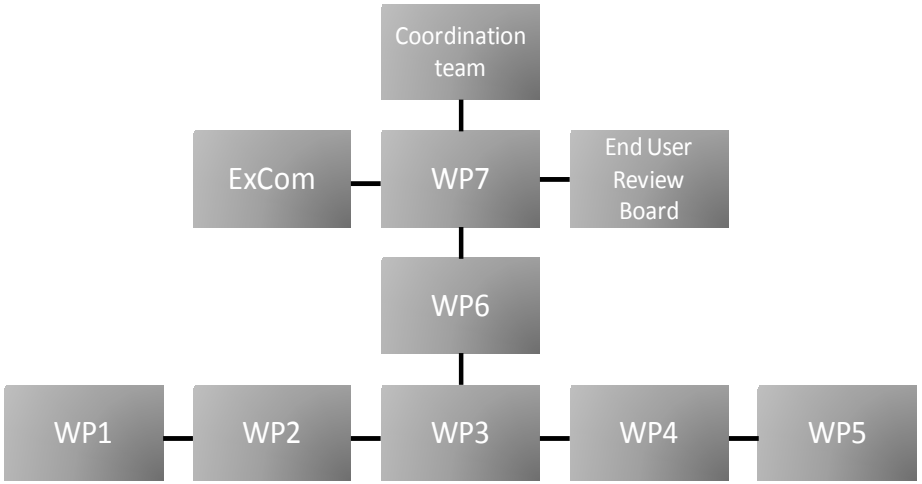
WP5: Conceptual and mathematical models

- To validate and advance the conceptual and mathematical models used to predict mass loss and clay colloids generation as well as clay colloids facilitated radionuclide transport relevant to geological disposal of high level nuclear waste
- The outline of the overall work flow is
  - Numerical modelling of selected test cases not limited to but including at least most of WP2-4 tests,
  - Planning of development work,
  - Model development, and
  - Validation of resulting model development, and
  - Feedback to WP1 safety assessment formulations.



WP6: Dissemination



- Website and Internet presence
  - www.belbar.eu
  - Most deliverables
- Communication materials
- Ways of communication
  - Reports
  - Workshops
  - Journal publications
  - Conferences
- Publication of the final results

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