7- 8th March 2012

BELBaR Project
Start-up Meeting
WP2: EROSION

T. Missana (CIEMAT)

WP2 OVERVIEW

Work Package 2: PARTICIPANTS and PMs

Work package number	2	Start date or starting event:	Project Month 1

	Erosion										
Activity Type	RTD										
Participant	CIEMAT	MSU	KIT-INE	NRI-REZ	SKB	B+Tech	ClayTech	VTT	JYU	NDA	KTH
Person-months for the participant	18	6	6	10	1	28.5	9	16	11	1	1

11 participants, 7 countries

WP2 OVERVIEW

Work Package 2: MAIN OBJECTIVES

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

1. Analysis of bentonite erosion is important for establishing the functionality of the bentonite barrier at the long-term, which could be compromised if a significant clay loss occurs.

2. The "eroded" colloids might interact with RN and affect their transport of towards the far-field of the repository.

WP 3

Quantification & evaluation needed ⟵ BELBaR ⟶ **So far not clear how to deal with these interactions.**

WP2 OVERVIEW

Potentially relevant factors to bentonite erosion:

1. Characteristics of the bentonite clay: smectite content; presence of certain accessory minerals (calcite, gypsum); nature of the cations present in the interlayer; total charge and charge distribution between the tetrahedral and octahedral sheets; compaction density;
2. Chemistry of the groundwater: ionic strength, pH, chemical composition (concentration of monovalent *vs.* divalent cations, potassium content);
3. Clay – groundwater interactions: dissolution processes and ionic exchange; kinetics of the interactions; effects of the solid to-liquid ratio; effects of hydrodynamic conditions;
4. Groundwater velocity at the bentonite surface: the presence of a hydraulically active fracture may play a role in bentonite erosion and has to be accounted for.
5. Characteristic of clay extrusion paths: porosity of the rock, fracture dimensions.

WP2 OVERVIEW

Potentially relevant factors to bentonite erosion: organised in three groups

1. Effects of the water chemistry, clay chemistry and water/clay interactions on erosion processes: CIEMAT, KIT-INE, Clay-Tech, B-Tech, NRI-Rez, MSU

2. Erosion processes under water flowing conditions: Clay-Tech, CIEMAT, KIT-INE, B+Tech, NRI-Rez.

3. Analysis of bentonite gel and colloid obtained in erosion tests: KIT-INE, MSU, VTT , JyU

Laboratory Work will benefit of different experimental approaches in the different organisations

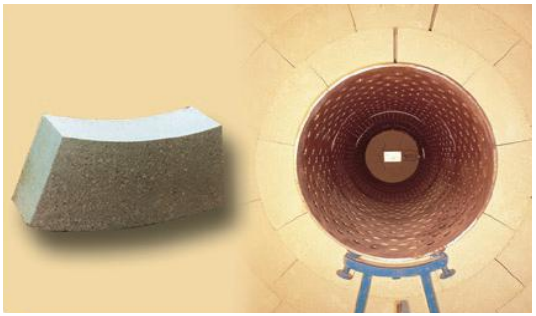
BELBaR

WP2 OVERVIEW

EURATOM

Study of a real – case : FEBEX gallery at GTS

1996-1997: mounting and swithing on.



2002: first heater dismantled

A real-scale experiment, simulating a HLRW repository in granite, was installed 15 years ago. The compacted bentonite has been present in the FEBEX gallery for more than one decade, and colloid analysis to identify the presence of bentonite colloids in the groundwater near the bentonite surface are being carried out since 2006 (EC-FUNMIG Project).

Annual sampling foreseen

2012: 2nd heater and bentonite still emplaced. Experiment still running.

WP2 OVERVIEW

COLLABORATION WITHIN WPs

The joint analysis of laboratory studies from:

WP2 (Erosion);
WP3 (Colloid radionuclide & host rock interaction) and
WP4 (Colloid Stability)

as well as *in-situ* data

is fundamental for providing realistic inputs to the models used in the performance assessment (PA) of HLRW repositories and their conceptualisation in:

WP1 (Consideration of Colloids in the Safety Case) and
WP5 (Conceptual and mathematical models)

WP2 OVERVIEW

Deliverables
(following main topics)

- Effects of the water chemistry, clay chemistry and water/clay interactions on erosion processes: CIEMAT, KIT-INE, Clay-Tech, B-Tech, NRI-Rez, MSU

- Erosion processes under water flowing conditions: Clay-Tech, CIEMAT, KIT-INE, B+Tech, NRI-Rez

- Analysis of bentonite gel and colloid obtained in erosion tests: KIT-INE, MSU, VTT , JyU

- *In-situ* studies at FEBEX: CIEMAT

WP2 OVERVIEW

Deliverables

D2.1	WP2 partners state of the art on bentonite erosion processes	CIEMAT	R	**PU**	6
D.2.2	Progress Report on the effects of the water chemistry, clay chemistry and water/clay interactions on erosion processes:	**CIEMAT**, KIT-INE, Clay-Tech, B-Tech, NRI-Rez, MSU (KTH)	R	**PU**	15
D2.3	Progress Report on erosion processes under flowing water conditions	**Clay-Tech,** CIEMAT, KIT-INE, B+Tech NRI-Rez (KTH)	R	**RE**	15
D2.4	Progress Report on the analysis and characterization of the bentonite gel and colloids obtained in erosion tests:	**KIT-INE**, MSU, VTT, JyU (KTH)	R	**RE**	15
D.2.5	Progress Report on the effects of the water chemistry, clay chemistry and water/clay interactions on erosion processes:	**CIEMAT**, KIT-INE, Clay-Tech, B-Tech, NRI-Rez, MSU (KTH)	R	**PU**	27
D2.6	Progress Report on erosion processes under flowing water conditions	**Clay-Tech,** CIEMAT, KIT-INE, B+Tech NRI-Rez (KTH)	R	**RE**	27
D2.7	Progress Report on the analysis and characterization of the bentonite gel and colloids obtained in erosion tests:	**KIT-INE**, MSU, VTT, JyU (KTH)	R	**RE**	27

Deliverables

D.2.8	Final Report on the effects of the water chemistry, clay chemistry and water/clay interactions on erosion processes:	**CIEMAT**, KIT-INE, Clay-Tech, B-Tech, NRI-Rez, MSU (KTH)	R	**PU**	39
D2.9	Final Report on erosion processes under flowing water conditions	**Clay-Tech,** CIEMAT, KIT-INE, B+Tech NRI-Rez (KTH)	R	**RE**	39
D2.10	Final Report on the analysis and characterization of the bentonite gel and colloids obtained in erosion tests:	**KIT-INE**, MSU, VTT, JyU (KTH)	R	**RE**	39
D2.11	Analysis of bentonite colloid generation in-situ at the FEBEX gallery (GTS): global evaluation of experimental data obtained.	**CIEMAT**	R	RE	39
D2.12	WP3 partners final report. Evaluation of experimental results on bentonite erosion.	**CIEMAT**	R	**PU**	44