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PROJECT PRESENTATION (PP)

Bentonite Erosion: effects on the Long term performance of the engineered Barrier and Radionuclide transport

BELBaR

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Introductory paragraph

The main aim of the BELBaR project is to increase the knowledge of the processes that controls clay colloid stability, generation and ability to transport radionuclides. The overall purpose of the project will be to suggest a treatment of the issues in long-term safety/performance assessment.

1. Nature and scope of the project

The pan-European consortium has partners with many different skills and competences. They include national radioactive waste management organisations (WMOs) from a number of countries, research institutes, universities and commercial organisations working in the radioactive waste disposal field.
The Collaborative Project is based on the desire to improve the long-term safety assessments for repository concepts that combine a clay Engineered Barrier System (EBS) with a fractured rock. The formation and stability of colloids from the EBS may have a direct impact of assessed risk from the repository in two aspects:

- Generation of colloids may degrade the engineered barrier (Figure 1)
- Colloid transport of radionuclides may reduce the efficiency of the natural barrier

An increased understanding of processes will have an effect on the outcome of future assessments.

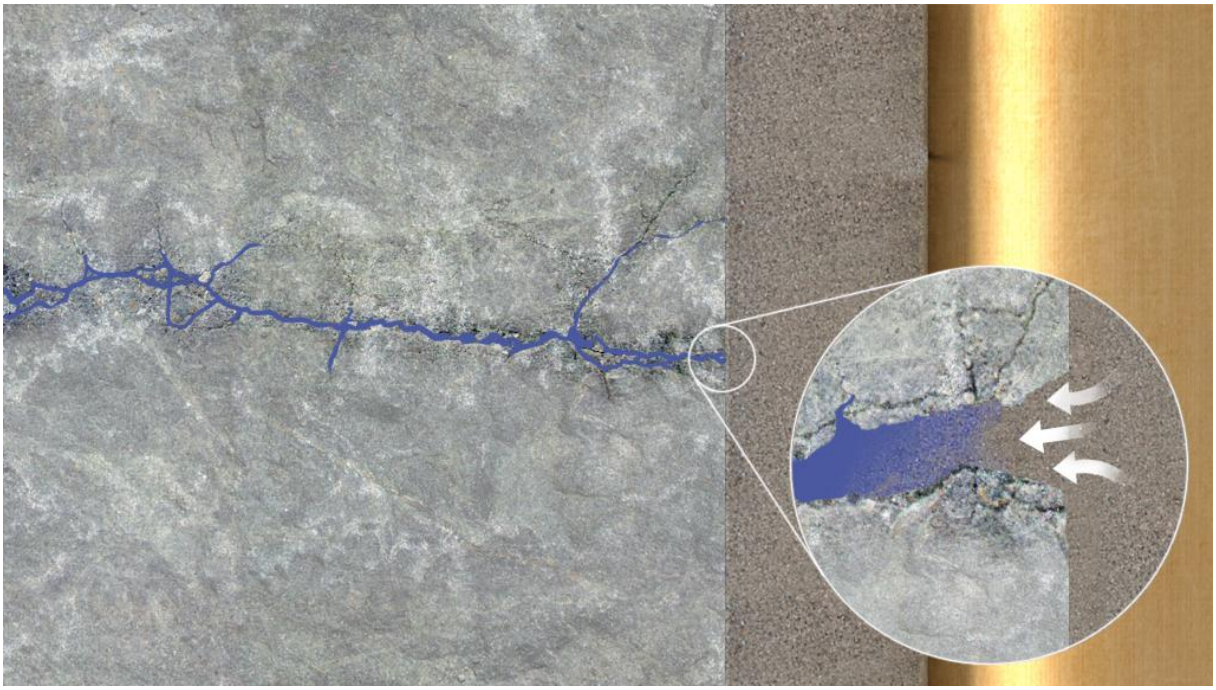

Figure 1 Colloid formation from a bentonite barrier

2. Activities

The main aim of BELBaR is to reduce the uncertainties in the description of the effect of clay colloids on the long term performance of the engineered barrier and on radionuclide transport. This is done by:

- Improving the understanding on when bentonite colloids are unstable. For a given site/site evolution, this is critical information, since it determines whether or not clay colloids need to be included in the long-term assessment.
- Improving the quantitative models for erosion on the bentonite barrier for the cases when the colloids are stable
- Improving the understanding of how radionuclides attach to clay colloids. This information will be used to formulate improved transport models for the assessment of radionuclide transport in the Geosphere.

To meet the main aim and number of experimental and modelling activities will be undertaken within the project. An example of a typical colloid generation experiment can be seen in

Another objective is to take full advantage of the collaborative project structure. Key issues in BELBaR are therefore interaction, communication and cooperation.

Since a large part of the work within project will be of interest for a more general community, the objective is to, as far as reasonably possible, publish the results in peer-reviewed journals.

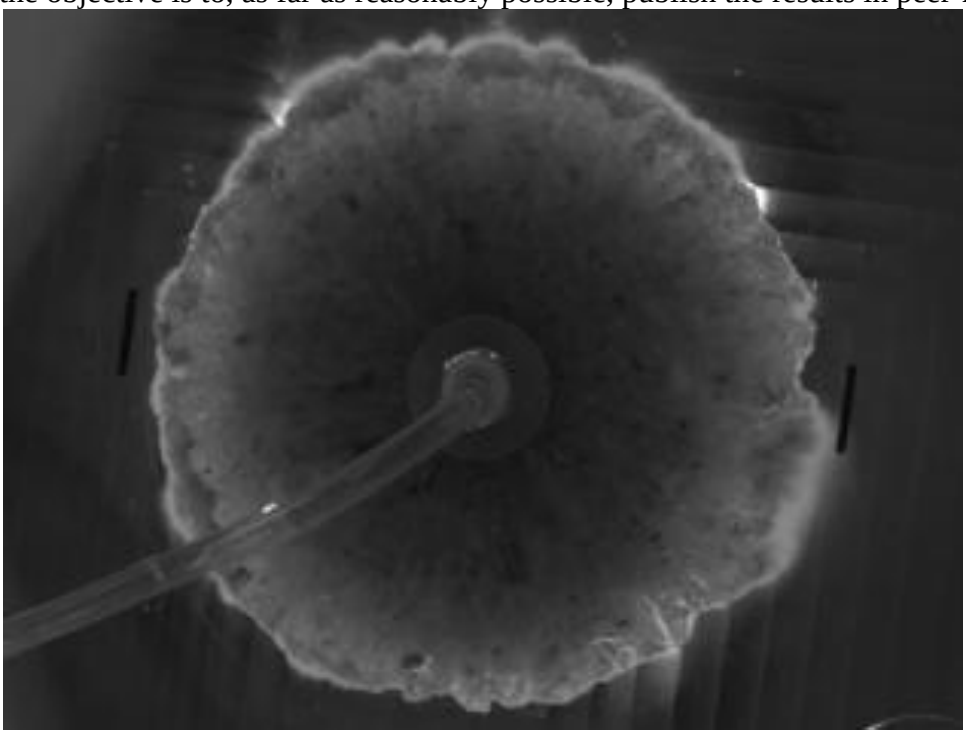

Figure 2 An expanding and eroding bentonite front in a flow field in a thin slot between two Plexiglas plates

3. Expected results

There is large pool of knowledge about colloid stability both from the general scientific literature and from national and international projects within the nuclear waste management community. However, there is still a large gap of knowledge in the ability to transfer the scientific understanding into a useful abstraction for long term performance assessment for real systems. The main contribution of BELBaR will be:

- Development of experimental programmes that are tailor-made to resolve the issues that are important in safety assessment
- Development of quantitative models, founded on sound science and verified by relevant experiments, for the assessment of erosion and radionuclide transport
- An increased knowledge about bentonite colloid stability in realistic systems that can be used in safety assessments as well as in the formulation of site investigation/site modelling programmes

Formulation of a joint understanding of the issues within and outside the project, which will aid future license applications and R&D programmes.

4. Societal impact

The primary target audience of the outcome of the project is the national waste management organisations. The key use will be reduction of uncertainties in the understanding of a process that have been shown to have a direct impact on the assessed dose/risk from a repository for high level nuclear waste. The reduction of uncertainties in the understanding may lead to:

- Reduction of the assessed overall risk from a repository
- The possibility to totally neglect the process in assessments under some circumstances
- Guidance to future site selection and site characterization programmes
- Aid in the selection of engineered barriers for a nuclear waste repository

A uniqueness of the project is that the step from fundamental science to "industrial application" is short. This means that many of the results from the project will be of significant value to the scientific community as a whole, especially for the fields of surface and colloid chemistry.

5. Information about important public events

The project, with EC support, will organise an international symposium towards the end of the project. This event will be aimed at the dissemination of BELBaR outcomes to both the radioactive waste stakeholder community and also to scientists and policy makers from other relevant sectors.

Project information

Website address: **www.belbar.org** or **www.belbar.eu** (will be announced at project initiation)

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