



MIND: Microbiology in Nuclear waste Disposal NEWSLETTER March 2016

*The **Microbiology In Nuclear waste Disposal (MIND)** programme is a unique multidisciplinary project which brings together a broad range of leading research institutions and stakeholders in the field of radioactive waste disposal to address the Euratom 2014-2015 Work Programme topic NFRP 6 – 2014: Supporting the implementation of the first-of-the-kind geological repositories.*

The aim with the project is to contribute to a more complete and realistic safety case and to communicate the effects that microbiological processes will have on the geological disposal of intermediate and high level radioactive wastes.

Content of this Newsletter:

1. WP 1: ILW Organic Polymer Degradation
2. WP 2: HLW Waste Form Degradation
3. WP 3: Evaluating and Sharing the Knowledge
4. Project Annual Meeting

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This project has received funding from the Euratom research and training programme 2014 - 2018 under grant agreement No. 661880

1. WP 1: ILW Organic Polymer Degradation

Long-lived intermediate level waste (ILW) requiring geological disposal can include a variety of organic wastes or encapsulants. These organics provide an energy and carbon source with the potential to fuel microbiological processes in ILW waste packages and in the repository.

More info at:

<http://www.mind15.eu/work-packages/wp-1/>

WP1 Progress

By collating information concerning the **inventory and nature of organic materials** present in ILW and some LLW that requires geological disposal, **Deliverable 1.1** represents the start of Work Package 1 (WP1). Apart from this compilation, D1.1 also considers the physical and chemical conditions the organic compounds will be subjected to during storage and geological disposal. This way, the **boundary conditions** for microbial interaction with the organics are defined.

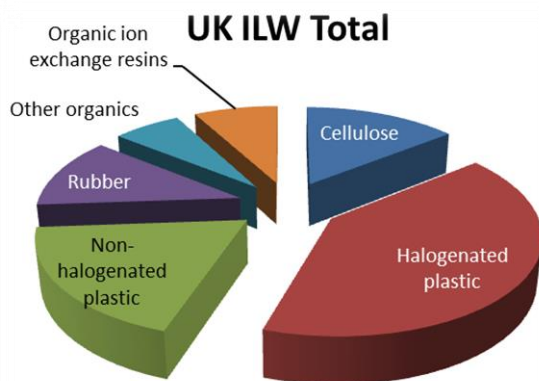


Fig. 1 Distribution (by mass) of the total UK ILW inventory or organic ILW (source 2013 National Inventory)

Bitumen, resins and **polyvinylchloride (PVC)** are found to be the prime sources of organic material in ILW and LLW. Together with **cellulose**, important for the radionuclide complexation effects of its hydrolysis products, these compounds provide a major source of organic carbon that has the potential, following initial chemical and radiolytic degradation, to **fuel anaerobic microbial processes** like methane gas generation in a geological repository. These processes also include consumption of H_2 gas, complexation reactions and biodegradation of organic complexants.

The information collated in this review is among others of prime importance to the design of experimental work undertaken in **Task 1.2** of WP1 of the MIND project. Indeed, **irradiation of resins, PVC, cellulose and bitumen** are already being conducted at the Dalton Cumbria facility (UK) and SCK•CEN (Belgium) and are yielding their first results!

2. WP 2: HLW Waste Form Degradation

The metal, concrete and clay barriers in HLW disposal concepts are engineered barrier systems (EBS) and are susceptible to deterioration processes. Possible microbial processes are metal corrosion, illitization of smectite clay minerals and degradation of concrete.

More info at:

<http://www.mind15.eu/work-packages/wp-2/>

WP2 Progress

Within WP2, some partners have strongly been focusing on **drill holes and cores**. In Sweden, Micans has performed its first gas analyses from drill-cores obtained from Olkiluoto with the cooperation of Posiva Oy, showing the release of typical groundwater gases. From about 35 other drill holes in Finland, GTK has been compiling (existing) geochemical data, revealing decreasing sulphate concentrations with depth in all locations. In Switzerland, a new borehole for in situ experiments has been established by EPFL, while another one is currently being monitored for water production, which is a crucial variable for the success of the planned experiments.



Fig. 2 Brass tubes with drillcores for analysis of gas in the rock matrix

In addition, quite some partners, including those from Germany (HZDR), UK (UNIMAN), Belgium (SCKCEN) and Sweden (Micans), have been **collecting bentonite samples**, including FEBEX samples from the Grimsel Test Site, and are steadily progressing in their (microbial and chemical) analyses of the bentonite.

Other partners have been busy **developing new analytical techniques and constructing experimental set-ups**. In Finland, VTT has been evaluating microbiology techniques suitable for geological groundwater samples, like the ones that will be obtained from Olkiluoto in a few months. The experimental rig at NERC (UK) for their experiment has been designed and built ahead of schedule and is currently undergoing a commissioning period. In Czech Republic, TUL and CV REZ also focused on the preparation of experimental cells, for high temperature and pressure tests.

3. WP 3: Evaluating and Sharing the Knowledge

Results obtained from WP1 and WP2 will be ensured of proper contextualization, while remaining key topics will be extracted by maintaining an active dialogue with stakeholders. The knowledge will be distributed to a broad audience, taking into account conceptualisation and perception issues.

More info at:

<http://www.mind15.eu/work-packages/wp-3/>

WP3 Progress

With the first results of the two experimental work packages, WP1 and WP2, coming up, WP3 is getting ready for their **proper contextualization, evaluation and communication**.

Early in the project, Micans (Sweden) already started to provide an **overview of the molecular protocols** used by all partners, in order to enable harmonization of techniques and outcomes later on. This initiative will be broadened and intensively discussed during the workshop preceding the Project Annual Meeting in May.

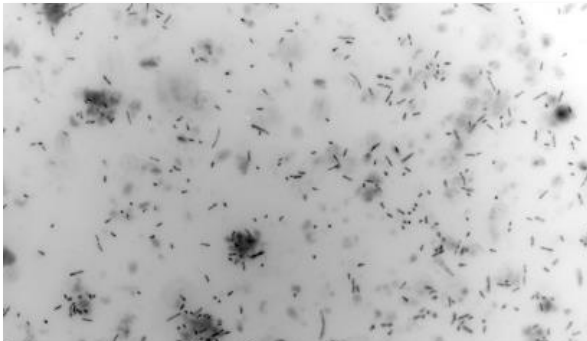


Fig. 3: Example of microbial protocol: an MX-80 clay (bentonite) spiked with *B. subtilis*, under a microscope.

Meanwhile in Finland, GTK sent around a questionnaire to all MIND partners, in order to compile the **state of the art knowledge base** on microbiology in radioactive waste disposal, needed to enable evaluation of new information gained during the project.

In Belgium, the SPS team at SCK•CEN drafted a methodological plan for the development of **guidelines for risk communication** in the context of microbiology in a nuclear waste disposal. Such guidelines will support future communication efforts about the MIND project to a broad audience.

In other words, the **MIND partners are getting prepared to publicize their results!**

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4. Project Annual Meeting (PAM)

*The MIND project would hereby like to invite you and your colleagues to the first MIND Project Annual Meeting and Project Executive Committee meeting (PEC) which are scheduled to take place in Granada on the **2nd to 4th of May at the University of Granada**. The meeting is divided into three separate activities: a pre-meeting workshop, the actual project meeting and the project executive committee meeting.*

WORKSHOP

May 2nd

The MIND-project will host a pre-meeting workshop focused on two of our key subjects:

- 09.00 – 12.30 Molecular protocols, metagenomics and bio-informatic pipelines for clays and groundwater.
- 14.00 – 17.30 Research design working with buffers and back-fill – incubation systems, densities and swelling properties, detection of microbial activity and diversity.

PROJECT ANNUAL MEETING

May 3rd

- 09:00 Welcome and Introduction to the MIND-project
- 09:20 Summary of the pre-meeting workshop
- 09:40 Theme session I: Improving the geological safety case knowledge of the behavior of organic containing long-lived ILW (incl. lunch and coffee breaks)
- 14:30 Theme session II: Evaluating and Sharing the Knowledge (incl. coffee breaks)
- 17:00 Poster session with snacks (until 19:00)
- 20:00 Conference dinner

May 4th

- 09:00 Theme session III: Improving the safety case knowledge base of HLW (incl. coffee brakes and continued poster session)
- 12:40 Summary and Closing of meeting
- 14:00 PEC meeting (PEC-members only)

Travel arrangements:

<http://www.mind15.eu/okategoriserade/project-annual-meeting/>

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