



MIND: Microbiology In Nuclear waste Disposal NEWSLETTER 3 – March 2017

*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.

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For more information please contact: mind15@skb.se

or visit our webpage: www.mind15.eu

Follow us on Twitter: @mindh2020

Visit to Mont Terri

The MIND project was invited to present the work within MIND at the joint BN, GD, HT, MA Meeting in Saint Ursanne, Switzerland on February 7. There were more than 10 representatives from the project participating and presenting.

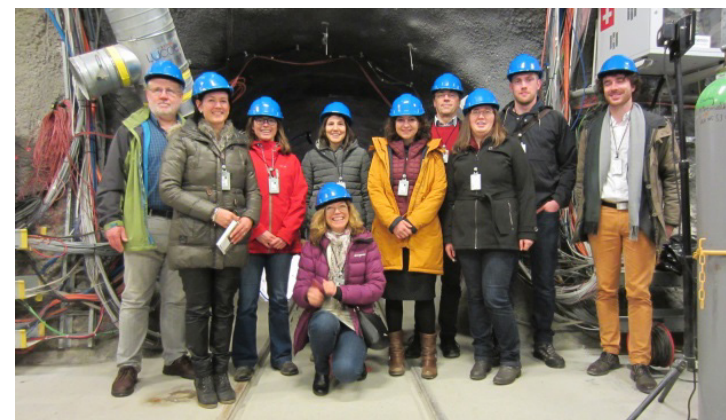


Joint meeting – Mind session

We got a two hour time slot to present the MIND project. Jantine Schröder (SCK*CEN) working with one of the tasks within WP3 got the chance to introduce herself and to start the discussion with Stakeholders about including microbes or not in the safety assessment. What impact would the inclusion or exclusion have. The discussion will continue at the Project Annual Meeting where a number of Stakeholders will be attending. In addition, we also got time after the meeting to visit the HRL and look at some of the ongoing MIND-experiments.



The progress of the MIND project was presented and discussed with approximately 40 participants on the TD-315 Joint meeting in the Mont Terri visitors centre.

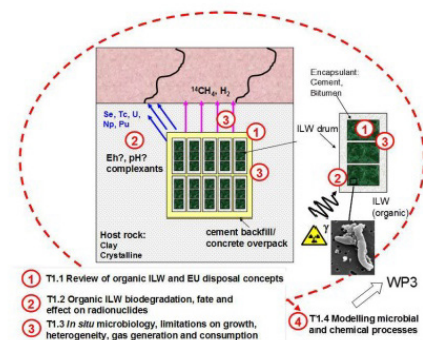


This project has received funding from the Euratom research and training programme 2014–2018 under grant agreement No. 661880

Work Package 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.



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

Progress

Five planned milestones have been achieved to date concerning irradiation studies, exchange of novel microbial inocula and the progress of URL experiments. Deliverables are thus on target to present new research findings concerning organic polymer degradation and processes of gas consumption and generation as detailed in the website. In addition, first results from the MIND project have been published in peer reviewed journals (see opposite) and further papers have been submitted for publication including results and modelling of 18 years operation of the gas generation experiment and studies of Se bioreduction.

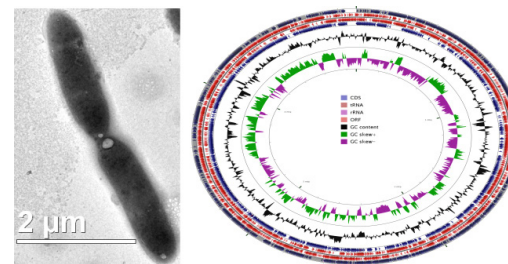
A number of student exchange visits have been undertaken between partners within the Work Package. This has facilitated our multidisciplinary approach that includes expertise in geomicrobiology, radiochemistry, spectroscopy and microscopy.

An overview of WP1 along with more detailed results from work on PVC degradation, complexation studies and gas generation was presented at the recent Mont Terri meeting.

Research Highlight

It is well known that the cellulose degradation product isosaccharinic acid (ISA) can form strong aqueous complexes with metals and thus has the potential to increase radionuclide release from ILW. ISA is formed under alkaline conditions buffered by the cementitious materials used in ILW disposal. Recent research has shown that ISA can be biodegraded under these extreme chemical conditions and thus may reduce the effect of ISA complexation.

Within the MIND project the genome of a novel ISA-degrading bacterium has been sequenced and was published in GenBank, and reported in Genome Announcements, doi: 10.1128/genomeA.01493-16



Anaerobacillus alkalisosaccharinicus

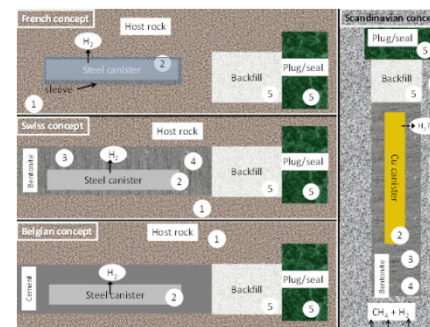


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Work Package 2:

HLW: Waste Form Degradation

The metal, concrete and clay barriers in High Level Waste (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.



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

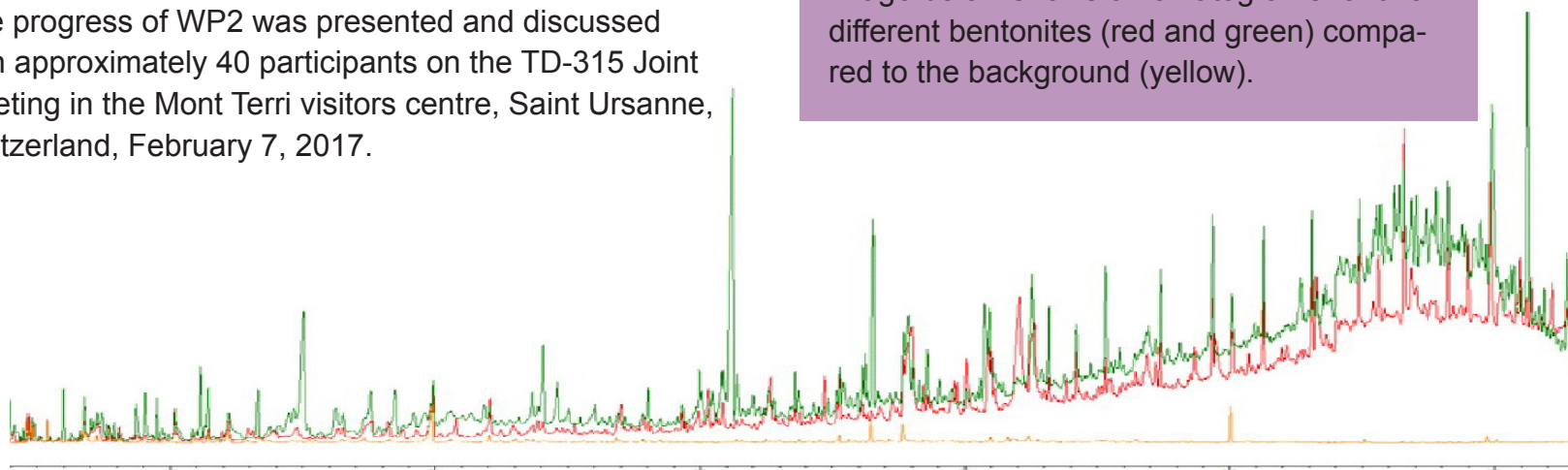
Progress

Milestones (MS) and deliverables (D) are coming out as planned and MS can be found on the MIND web-page. Inventory of reducing gases in groundwater, mainly in Finland and to some extent also in Sweden, has been compiled (D2.1/MS14). Experimental equipment for the study of effects of microbial activity on bentonites are designed and ready for the planned experiments (D2.2). An experimental system for monitoring microbial corrosion of metal within clays has been constructed (MS1) and a borehole for experiments was drilled in Mont Terri (MS7). Molecular pipelines for partners have been compiled (MS8).

The progress of WP2 was presented and discussed with approximately 40 participants on the TD-315 Joint meeting in the Mont Terri visitors centre, Saint Ursanne, Switzerland, February 7, 2017.

Research Highlight

A high resolution method for analysis of organic carbon speciation in bentonites has been developed using a gas chromatograph mass spectrometer with ion trap detector. The ion trap detects $\geq 10^{-12}$ g of separate carbon compounds. A large diversity of organic matter that can be utilised by microorganisms were present in the investigated bentonite clays in small concentrations. There were alcohols, esters, ketones, aldehydes, fatty acids, alkanes and much more. The image below shows chromatograms for two different bentonites (red and green) compared to the background (yellow).



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Work Package 3:

Evaluating and Sharing the Knowledge

Results obtained from work package 1 and 2 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.



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

Progress

The pilot session of the **primer course in microbiology and disposal of radioactive waste** was organised on 24-28 October 2016 by MICANS in Mölnlycke in Sweden. This unique training course was attended by 6 representatives from Finland, the Czech Republic, France and Switzerland, all of which are working with, or do research on the issues of geomicrobiology or radioactive waste disposal attended this training course. Feedback showed that the training course was well perceived, and the majority of participants would recommend this training course to other persons. Meanwhile the preparations for an advanced training course in geomicrobiology have started.

In 2016, an **exchange programme** was set up for Master and PhD students, as well as professionals. Carefully selected internship topics are made available by the MIND partners. Check out the different exchange opportunities on the MIND website and send your students and colleagues abroad to take their knowledge, skills and competences in geomicrobiology to the next level!

MIND reference	Title	Exchange opportunity for a	Host	Country	More information
MIND01	Customized DNA-extraction from clay materials	PhD or Professional	SCK-CEN	Belgium	Read more about MIND01
MIND02	Microscopic characterization of different samples (clays, radionuclide/bacteria samples, radionuclide/bacteria/organic samples, etc.)	Master, PhD or Professional	University of Granada-Department of Microbiology	Spain	Read more about MIND02
MIND03	Flow cytometry characterization of the radionuclide toxicity towards microbial cells	Master, PhD or Professional	University of Granada-Department of Microbiology	Spain	Read more about MIND03
MIND04	Excursion and sample collection at Bukov Underground Research Facility	Master, PhD or Professional	Technical University of Liberec	Czech Republic	Read more about MIND04
MIND05	DNA extraction from Czech bentonite samples	PhD or Professional	Technical University of Liberec	Czech Republic	Read more about MIND05
MIND06	In-house DNA extraction protocol for bentonite, clay samples	PhD or Professional	HZDR/IRE	Germany	Read more about MIND06
MIND07	Rn/Ln speciation studies using spectroscopic techniques	PhD or Professional	HZDR/IRE	Germany	Read more about MIND07

Screenshot of the available MIND exchange opportunities for Master and PhD students, as well as professionals.

http://www.mind15.eu/exchange_table



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

Progress

The pipeline that is used to analyse microbial communities is highly diverse between different MIND partners. To compare the outcome of these pipelines, DNA of a mock community is dispersed among 8 partners. A preworkshop of the PAM meeting will be devoted to the discussion of gathered data.

To study the impact of the inclusion of microbiology on expert conceptualization and public perception of geological disposal, interviews and group discussions have been started. Two key experts were interviewed and a group discussion was organized during the joint BN, GD, HT, MA Meeting. More will follow during the next PAM meeting.

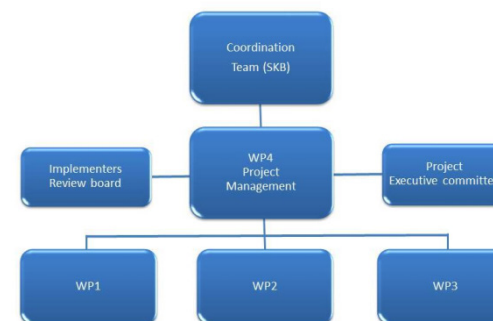


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Work Package 4:

Project Management

The principal task for this work package is the compliance of the project with the provisions of the European Commission (EC) as defined in the Grant Agreement and the Consortium Agreement by ensuring that the consortium complies with the rules on decision-making as defined in the Consortium Agreement.



<http://www.mind15.eu/work-packages/wp-4/>



Workshop

The MIND project will host a pre-meeting workshop in connection to the Project Annual Meeting in Prague.

May 3rd

09:00–10:00 Achim Albrecht, ANDRA, France. Stakeholder's views on microbial issues in MIND

10:00–12:30 Break up in two parallel workshops:

High pH and methanogenesis with focus on low- and intermediate level waste repositories.

Microbial effects on radionuclide migration.

14:00–15:00 Patrik Sellin, SKB, Sweden. Stakeholder's views on microbial issues in MIND

15:00–17:30 Break up in two parallel workshops

Bioinformatic work in MIND, mock sample and bioinformatic work.

Microbial life and effects on clays in natural and engineered barriers.



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Work Package 4:

Project Annual Meeting

The MIND project would hereby like to invite you and your colleagues to the second MIND Project Annual Meeting, Project Executive Committee meeting (PEC) and for the first time the Implementers' Review Board (IRB) which are scheduled to take place in Prague on May 3rd to 5th



<http://www.mind15.eu/work-packages/wp-4/>

Project Annual Meeting

May 3rd

19:00 Optional Icebreaker and Registration
(Prague, location not yet decided)

May 4th

08:30–09:00 Welcome and summary of the premeeting workshop

09:00–12:00 Theme session I (WP1: ILW)

13:30–16:30 Theme session II (WP2: HLW)

16:30–18:30 Poster session

20:00 Conference dinner

May 5th

08:30–11:00 Theme session III (WP3: Integration)

11:00–12:30 Summary and Closing of meeting
(Implementers Review Board, IRB)

13:30–16:15 Visit to CVRez (Walk to bus 13:15)

PEC

May 4th

16:30–17:30 Project Executive Committee meeting.
Only open to PEC members.

IRB

May 3rd

14:00–17:30 Implementers' review board

May 4th

16:30–17:30 Implementers' review board

May 5th

11:00–12:30 Message to MIND from IRB

12:30–13:15 Discussion group lead by WP3



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