

Table of content

BREAKING NEWS

The second annual event was held in a hybrid format from 28th to 30th March at IRSN (Fontenay-aux-Roses, France).



About eighty people were physically present, as well as slightly over 200 attendees online over the three days.

The different plenary sessions gave the opportunity to better understand the context of EURAD work, to see and hear about the diversity of the different programmes and to have a broader perspective on the interaction between science and civil society. The event triggered new ideas for future work, provided a platform for interaction and integration, and once again demonstrated the importance of knowledge management.

Given the density of exchanges, follow-up meetings on the topics discussed in the parallel breakout sessions (Digital Twins, Knowledge Management and Work Package Impact Assessment) will be organized.

The video and audio recording of the event will be available soon on the EURAD website.

In memory of Radhim Blaheta – Pg 2

Focus – Pg2
Mobility for Ukrainian partners

Digest – Pg 3
Improved modelling of carbonation of cementitious material

A look back - Pg 4-5
EURAD-PREDIS joint webinar on digital twins

Digest – Pg 6
ROUTES CS Interactions

Focus – Pg 7
Roadmap explaining video

Upcoming events – Pg7

Digest – Pg 8
Swedish licence application process

Now published – Pg 9

PhD corner – Pg 10
Ananya Singh: The impact of microbial metabolism on cement properties during radioactive waste disposal

We are out there – Pg 11

IN MEMORY OF



Professor Radim Blaheta (April 1951 – January 2022) was a well-known researcher interested in numerical mathematics, computer sciences, geotechnical and environmental real-world problems and other scientific disciplines. He worked at the Institute of Geonics of the Czech Academy of Sciences (formerly the Mining Institute) since 1979. He was the Head of the Department of Applied Mathematics and Computer Science since 1993 and the Director of the Institute from 2006 to 2017.

His life's work contributed significantly to the Czech and international scientific community. He was an inspiration to many of us with his hard work, his passion for science and, not least, his warm social style.



Focus



EURAD decided to facilitate mobility actions for our Ukrainians partners to help them continue their R&D work in other partner institutes if such travels are possible for them.

You can contact WP13 for more information: euradwp13@sckcen.be

EURAD stands with its Ukrainian partners, thus do not hesitate to contact us (secretariat@ejp-eurad.eu) to understand what is needed and how we can help you or if you have any actions in place at your organisation that we could share within our Consortium.



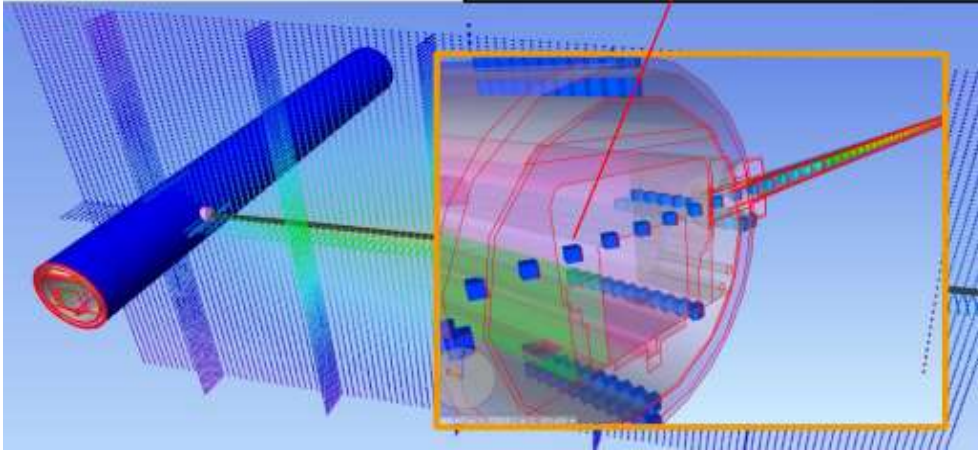
IMPROVED MODELLING OF CARBONATION OF CEMENTITIOUS MATERIAL

MAGIC workpackage (WP) aims to quantify the chemo-mechanical multi-scale evolution of cementitious materials under the chemical degradation expected in repository environments. Since the early 2000's, reactive transport models have been used to understand the durability of cementitious materials. However, an accurate description of the numerous parameters (and their evolution) which are required for a simulation is challenging. For this reason and up to the present moment, few attempts have been made on modelling unsaturated cementitious systems and a variety of simplifications, like neglecting the appearance of cracks associated with geochemical reactions have been normally considered. Very recently and within MAGIC WP, Nicolas Seigneur and Laurent De Windt from Mines Paris Tech in collaboration with Stephane Poyet from CEA and Alexandre Dauzeres from IRSN have been able to model the evolving contributions of gas transport, cracks and chemical kinetics during atmospheric carbonation of the hydrated tricalcium silicate (C3S) and a C-S-H paste with low Ca:Si ratio. Simulations were performed with Hytec, a reactive transport simulator. Recent experiments were used to validate the developed model for simplified materials which could be later extrapolate to concrete. Among others, porosity, gaseous and aqueous diffusion coefficients, permeability and sorption isotherm constitute the critical set of hydrodynamic parameters needed in the model. These simulations highlighted the importance of a coupled geochemistry - micromechanical approach and will serve as a basis to the work of Adrien Socié (PostDoc) who will study the coupling between Hytec and a geomechanical model (Cast3M).



EURAD-PREDIS JOINT WEBINAR ON DIGITAL TWINS

Last February, EURAD and PREDIS hosted their first joint webinar on the Theme of Digital Twins.



Projection of thermal results in 3D digital model – Presentation by Guillaume Pépin (ANDRA)

With around 150 participants this first joint webinar, aiming at presenting the different applications for digital twins and trying to identify connections between outcomes from EURAD, PREDIS and the digital twin technology, was definitely a success.

Among the various presentations (digital twins in construction, in support of dismantling projects, in support of the operational phase, in the nuclear back-end), five EURAD R&D WPs (ACED, DONUT, FUTURE, HITEC and MODATS) briefly presented their link and possible connections with digital twin technology.

The formal presentations, were followed by breakout discussions where all participants could exchange on the opportunities in the RWM domain, the challenges for the adoption of this technology and how EURAD and PREDIS can best assist the successful deployment of this technology.

The summary of this webinar as well as highlights from the breakout rooms can be found on EURAD website under the “Publications” section.



A look back

EURAD was presented last March at the Council of the European Union during the Research (Atomic Questions) Working Party meeting and at the EURATOM Programme Committee.

Main discussions were focused on the ways of joining EURAD for new organisations and lessons learned in view of the future EURAD-2.



A look back

EURAD Chief Scientific Officer represented EURAD at the 6th International Conference on Geological Repositories when chairing the session on “Elements for building and maintaining competence”.



Credits: Krystal Kenney



ROUTES CS INTERACTIONS

In EURAD, interactions with the Civil Society (CS) are organised in two ways, in the so-called “Double Wing model of interaction with Civil Society”.

In ROUTES, the Task 7 is devoted to Interactions with the CS. Its main objectives are to assure the collaboration with other ROUTES tasks and participate in the coordination of the WP, as well as the interactions with the CS larger group. Task 7 meetings with CS experts take place at least every two months for exchange of information, discussion of important questions raised in the other tasks and exchange of views arising from the work.

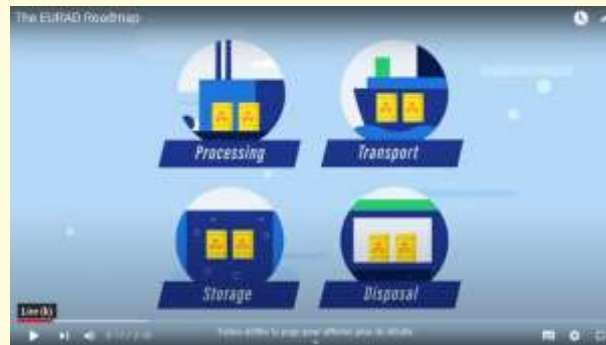
The CS experts involved in Task 7 form small teams, consisting of two CS experts, to closely follow the activities in the individual ROUTES tasks based on their experience, interest, education and also their locality in order to reduce travel costs. For each task, a CS expert is assigned as main contact person and another as stand-in. Both experts are also supposed to attend task meetings either in person or virtually and to take notes for better exchange with other Task 7 members.

The CS experts involved in ROUTES - Task 7 also participate and coordinate activities for ROUTES outcomes in the frame of EURAD PMO WP1 - Task 8, which coordinate globally the interaction of the CS larger group with other EURAD partners, in order to obtain feedback from other CS experts in EURAD and the CS larger group and adopt the viewpoints in the deliverables that Task 7 is responsible for. Examples of such collaboration will be included in Deliverable 9.16 which addresses good transparency of shared solutions for RWM. Larger CS group and other participants discussed several questions on transparency and shared solution in a dedicated workshop and were involved in an online questionnaire to collect the opinions on shared solutions or facilities for RWM. The questionnaire included some socio-demographic data and several questions related to various societal aspects (challenges and added value), conditions for establishing shared solutions and the concepts of a level playing field and governance. Similar approach is going to be implemented for the next Task 7 deliverable which deals with the transparency in the national repositories' establishment.



Focus

In EURAD we are often referring to the Roadmap, go find out more with this new explaining video available on the EURAD website and on Youtube!



Click on the picture to access the video
https://www.youtube.com/watch?v=B_VyoQ_BwrU

The EURAD Roadmap is a representation of a generic radioactive waste management programme that shall enable users and programmes to 'click-in', and access existing knowledge and active work or future plans in EURAD and elsewhere. The content is focused on what knowledge, and competencies (including infrastructure) is considered most critical for implementation of RWM, aligned to the EURAD Vision.



Upcoming events

APRIL

- 19-22: IAEA Young Generation Event
- 25-28: PREDIS workshop
- 27: L&L- KM in the German NWMO (BGE)

MAY

- 04-06: NUWCEM 2022
- 15-20: 19th Radiochemical conference
- 18-20: Nuclear 2022
- 19: L&L- Deep borehole repository of high-level radioactive waste

MAY - JUNE

- 30-03: EURADWASTE/FISA 2022

All previous Lunch-and-learn sessions recordings are accessible on the School of Radioactive Waste Management website (under section Webinar Archive)

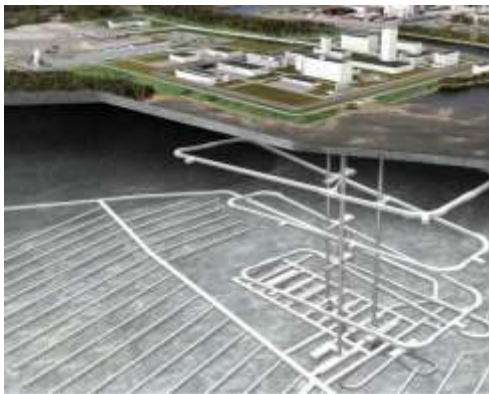




SWEDISH LICENCE APPLICATION PROCESS

In the end of January the Swedish Government decided to give SKB permissibility to build a final repository for spent nuclear fuel in Forsmark, in Östhammar municipality, and an encapsulation plant in Oskarshamn.

By Anders Sjöland and Petra Christensen, SKB.



Photomontage of the Nuclear Fuel Repository in Söderviken in Forsmark, above and below ground seen from a south-easterly direction. Copyright: SKB. Photographer: Lasse Modin

The method used, KBS-3, is based on three barriers – the copper capsules, the bentonite clay around them and the bedrock itself – together protecting people and the environment from harmful radiation. The Government supports the Swedish Radiation Safety Authority's (SSM) expert assessment that the technology for the final repository is the best possible and that the method with the three barrier functions is safe and meets the requirements of the legislation, even in a very long-time perspective.

The Government's decision on SKB's repository system is not the last step in the licensing process. The case will now return to the Land and Environment Court and the Swedish Radiation Safety Authority, SSM, which will set detailed conditions for the coming activities.

Following the Government's permissibility decision under the Environmental Code, the Land and Environment Court will impose conditions for the facilities. First, the terms and conditions are negotiated, after which they are established in a court ruling.

Similarly, the Swedish Radiation Safety Authority will decide on licensing conditions under the Nuclear Activities Act and the Radiation Protection Act following the government decision.

SSM will also continue to test whether SKB fulfils the radiation safety requirements in each phase. For this, SKB will need to prepare new safety analysis reports prior to the start of construction, trial operation, regular operation, decommissioning and closure. These must gain SSM approval before the next step can be initiated. During all phases of the facilities' life cycle, the Authority will also conduct inspections on radiation safety during operation and on long-term safety aspects.

For each facility, it is also necessary that the municipality in question decide on a detailed development plan and building permit. With the amendments made to the Nuclear Activities Act in 2020, the state will assume responsibility for final repositories after final closure. It was also introduced into the Act that a special government licence is required for closure.

SKB's construction projects will require substantial investments, especially in the municipalities and regions concerned. Altogether, SKB will be investing approximately SEK 19 billion, mainly in the construction sector, excavation and installations. Construction of the Spent Fuel Repository is estimated to take about ten years.

SKB has researched and developed technology for the final repository for more than 40 years in collaboration with experts from universities, research institutes and higher education institutions in Sweden and abroad. The final repository method was reviewed and assessed by the Swedish Radiation Safety Authority and the Land and Environment Court. The host municipalities, Östhammar and Oskarshamn, have also worked with these issues for a long time and have thereby taken considerable national responsibility for ensuring that Sweden has a functioning final repository system in place.



Now published

PROCESS FOR THE EXTENSIVE UPDATE OF THE EURAD SRA (D1.8)

Learn more about the process for the future update of the EURAD SRA :

The EURAD SRA will fundamentally serve two purposes, (i) to take stock and reflect on progress made since 2019 and capture emerging needs from across the Colleges and (ii) to prepare as an input for a potential future EC joint programme.

SFC INITIAL SOTA (D8.1)

The first task of WP8 Spent Fuel Characterization (SFC) is dedicated to the state-of-the-art (SOTA) report and related know-how transfer and distribution. The SOTA report is the first product of the SFC research programme, which offers an overview of the status of knowledge in the field of spent nuclear fuel characterisation and assessment during the pre-disposal phase. The document aims to focus on the current safety-significant gaps and related challenges, providing a direct link to the goals of the mandated actors of EURAD. The report is worth reading!

GUIDANCE ON COST ASSESSMENT AND FINANCING SCHEMES OF RWM PROGRAMMES (D12.4)

Cost estimations are needed for all projects, programmes and operations. In the guide the cost assessment of the disposal programme is described as a process consisting of several steps, starting with defining the purpose of the cost estimation, the scope of the work and the timing of activities included in the estimation, selecting the appropriate method for cost estimation, and preparing the Work Breakdown Structure as a framework for a detailed cost estimation. Possible mechanisms for financing disposal of radioactive waste are also addressed. The potential users may also find very useful several examples of cost estimations for various aspects of the disposal programme from different countries (e.g. Hungary, Slovenia, Czech Republic) that are included in Appendices as illustrations of how cost estimations are performed in practice.

MAGIC – SELECTED EXPERIMENTS FOR ASSESSING THE EVOLUTION OF CONCRETE, THEIR MECHANICAL SAFETY FUNCTIONS AND PERFORMANCE TARGETS (D16.3)

This deliverable is the first one delivered by MAGIC's work package. The report coordinated by COVRA is the result of contributions from fifteen task 2 partners from six member-states, dedicated to study the chemo-mechanical behaviour of cementitious materials in representative deep disposal environment. Organized per country, it focuses mainly on the safety functions associated to concrete, on the characteristics of samples studied in MAGIC, the experimental conditions and set-ups, and available characterizations. This report presents a roadmap of the experimental work with a timetable.



PhD Corner

Ananya Singh: 1st year PhD at University of Manchester

Title: The impact of microbial metabolism on cement properties during radioactive waste disposal



Ananya started her Ph.D. at the Department of Earth and Environmental Science at the University of Manchester in September 2021. She pursued her master's degree in Applied Geology from IIT Bombay, India, in 2021. Her thesis is a part of the EURAD MAGIC program contributing to task 3, which is about estimating the extent of the impact of microbial activity on concrete properties (low-pH and Portland cement) in partially or fully saturated media.

Ananya's Ph.D. work is dedicated to studying the interactions between microbes and cement under conditions relevant to a deep geological disposal facility (GDF). Microbial colonization in high pH environments is reported from the environment such as sewage pipes, wastewater treatment plants and marine structures, which is similar to GDF site conditions, resulting in the degradation of cementitious material. With the chemical evolution of a GDF over a geological time period, the pH of concrete used as backfill will decrease, enabling microbial activity. Microcracks developed in the cement system due to their rigidity give microbes an easy way to migrate and further deteriorate the cementitious material by producing acids and biofilms. On the other hand, microbial-induced calcite precipitation (MICP) is possible for concrete surface protection and crack remediation. It would decrease concrete permeability and penetration of corrosive substances and improve its durability.

Recent studies reported colonization of anaerobic bacteria, including biofilm-producing microbes, in a high pH experimental environment similar to a GDF. Some batch experiments conditions also showed a decrease in pH value from >12 to 10, locally or at the interface of the cement-bentonite layer in GDF. The expected heterogeneity of pH value in the cement system makes it essential to know about the possible microbial metabolic effect on low pH cements. Ananya's work will help provide definitive insights into the impact of microorganisms on the integrity of relatively low pH cement, under conditions similar to those of LLW/ILW GDFs, which are saturated with representatives groundwaters.

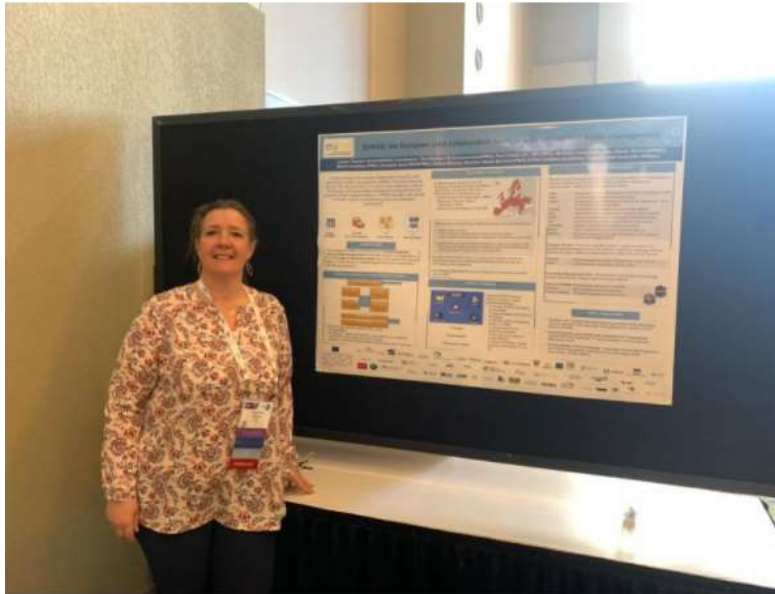


We are out there


European Joint Programme on Radioactive Waste Management
 638 abonnés
 1 sem. • 🌐

A warm thank you to [Virginie Wasselin](#) who presented the EURAD poster at the WM Symposia in Arizona. [#wmsym2022](#)

[Voir la traduction](#)



 Guillaume Cochard et 65 autres personnes

1 commentaire

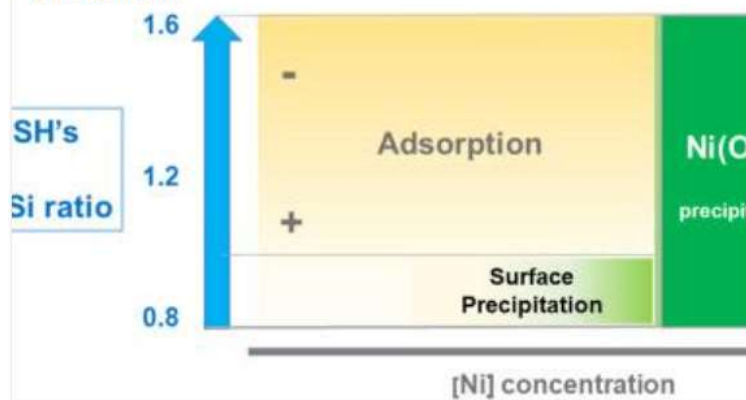

European Joint Programme on Radioactive Waste Management
 638 abonnés
 2 mois • 🌐



Tiziana Missana • 2e
 Senior Researcher at CIEMAT
 2 mois • Modifié • 🌐

Dear colleagues, this is our most recent publication in Applied Geochemistry related to our work in [#Eurad](#) (Wp3, Cori).

[Voir la traduction](#)



Nickel retention by calcium silicate hydrate phases: Evaluation of the role of the Ca/Si ratio on adsorption and precipitation processes

sciencedirect.com • Lecture de 2 min