

Characterisation Webinar Summary

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| Webinar Date | October 5, 2021 |
| Webinar Time | 09:00 to 12:00 CEST |
| Chair | Erika Holt |
| Prepared by | Tim Schatz |

Background

The PREDIS project hosted an informational webinar (*Radioactive Waste Characterisation*) on October 5, 2021. Characterisation was identified as an area of specific interest to the PREDIS community, and this webinar was aimed at reviewing the state of the art, showcasing innovative options and discussing the many connections the PREDIS project itself has with characterisation methods, techniques, strategies and developments. The content (see Appendix 1 for agenda) of this webinar is summarised below:

- The connections between radioactive waste characterisation and the work of the PREDIS technical work package and Task 2.3 were briefly reviewed. Lumír Nachmilner discussed how the work of Task 2.3 on waste acceptance systems is inherently connected to strategies and methodologies for waste characterisation as it involves providing guidance on which parameters should be determined and how best to measure them. Abdel Abdelouas summarised waste characterisation-related activities in WP4 which include radiological, structural, mechanical and chemical measurements. He also described how WP4 is developing innovative and optimised characterisation techniques for metallic wastes through MCNPX simulations of γ -ray spectra. Maxime Fournier explained that the work of WP5 will employ characterisation methods to assess the performance (e.g., leaching behaviour, radiation and thermal stability) of promising geopolymer matrices. Thierry Mennecart indicated that WP6 will establish appropriate solid organic waste treatment and conditioning processes through various characterisation steps. Ernst Niederleithinger described efforts in WP7 to develop novel NDT characterisation methods as well as the use of waste characterisation data in the development of digital twin simulations.
- Christophe Bruggeman (SCK CEN) reviewed outcomes from the CHANCE project on the state of the art and R&D needs for conditioned waste characterisation. The latest in imaging techniques, passive gamma radiation measurements, passive neutron assay, total inventory methods, active interrogation procedures and gaseous emissions detection were summarised. Better quantification of radiological inventories, specific quantification of chemical parameters relevant to WAC, identification of void volumes, development of mobile/in situ characterisation schemes, extended monitoring of waste drums, and development of statistical approaches to demonstrate representativeness of sampling were highlighted as the main R&D needs from end users.
- Massimo Morichi (CAEN) provided an overview of the development of the Radiological Characterisation & Monitoring System (RCMS) DigiWaste Platform in the MICADO project. This platform aims to facilitate and harmonize the methodology used for in-field waste management and dismantling & decommissioning operations. It includes a gamma characterisation station, a passive and active neutron measurement station, a photofission station, a waste monitoring grid, uncertainty assessment and a software infrastructure to collect, analyse and store data. The platform is scheduled to undergo feasibility and performance demonstrations in the field at four waste processing and storage locations around Europe.

Characterisation Webinar Summary

- Eric Simon (CEA) discussed an imaging tool for in situ radioactive waste characterisation (TOMIS) being developed by CEA. Before waste drums can be sent to the CIGEO final repository, some will be characterised to determine their actinide and fissile mass content. However, it is not practical to transfer waste packages to the CINPHONIE irradiation cell and, moreover, some waste packages cannot be transferred until they are first characterised. Therefore, the TOMIS (TOMography In Situ) transportable imaging system has been developed. This system is designed to provide easy transport and installation (and vice versa) from one site to another, wide applicability (characterisation of waste packages up to 5 tons and 1.8 m³), high levels of safety and similar radiographic, tomographic and actinide content measurement performance as are available in the CINPHONIE irradiation cell. Demonstration tests with a TOMIS system will be carried out during 2022 at CEA Cadarache.
- Martin Durr (AiNT) described the development of innovative technologies for the non-destructive characterisation of radioactive waste at AiNT. The QUANTOM project is developing and validating an inspection system for the material characterization and quality checking of radioactive waste drums using new methods for prompt and delayed gamma neutron activation analysis of large volume samples. The ASGS- γ -Scanner for Non-uniform Activity Distributions uses advanced sectorial gamma scanning to determine activity inventories in radioactive waste with spatial resolution. The Virtual Remote Robotics (VIRERO) is a robot-assisted sorting system for radioactive materials based on 3D laser and gamma scanning.
- Thierry Delvigne (Scannix) presented the SYSCADE system which is a mobile system for non-destructive X-ray inspection and γ -ray characterisation of nuclear waste drums. The system provides real-time digital radiography and is applicable to the characterisation of VLLWs and LLWs. It is equipped with a high-resolution gamma spectroscopy system involving three operating modes to determine which isotopes are present and evaluate activity levels. X-ray imaging is used to characterise waste matrices in terms of density distributions and heterogeneities. The SYSCADE system is designed to handle 80 and 200 L waste drums or large boxes and requires only a single operator.

The presentations are available on the PREDIS website (<https://predis-h2020.eu/radioactive-waste-characterization/>).

Following the formal presentation sessions, a set of small group discussions were held. Attendees were randomly assigned to 1 of 3 moderated breakout rooms. The aim of the 30-minute discussion session was to gather perspectives framed around the following questions (although discussions were not limited):

- Where can PREDIS further contribute (data, parameters, inter-laboratory comparisons, etc.) to current developments in characterisation?
- Can PREDIS serve as a test bed for technologies close to deployment?
- What game-changing technologies could transform waste characterisation?

In all, 120 participants registered to attend the webinar. Representation was divided between PREDIS end user group members + general stakeholders and consortium partners at 41% to 59%. A total of 106 people joined the webinar over its duration.

Outcomes

Some key takeaways from the deliberations of the discussion sessions were as follows:

Characterisation Webinar Summary

- ☐ Innovative imaging and characterisation technologies are of interest for legacy wastes. However,
 - ▶ results must be verifiable,
 - ▶ uncertainties must be sufficiently reduced.
- ☐ Characterisation of biological material in wastes is (still) an issue.
- ☐ Characterisation of hazardous chemicals in wastes is (still) an issue.
- ☐ For the introduction and implementation of any new technologies there will be concerns over costs, especially for low volume inventory holders.
- ☐ Is the answer always more technological sophistication?
- ☐ Mobile waste characterisation systems are a particularly attractive option in situations where transport of waste to a characterisation facility is problematic.

Live-polling indicated (see Appendix 2 for all live-polling results):

The majority of respondents registered for the characterisation webinar to increase their general knowledge.

The majority of respondents indicated that the greatest challenge in waste characterisation is uncertainty assessment.



Radioactive Waste Characterization

Free webinar on October 5, 2021 from 9-12 CEST (UTC+2)

Agenda

09:00 to 11:05 Presentations

- 09:00-09:15 Welcome & Introduction + feedback on Characterization needs from Gap Analysis (Erika Holt, VTT)
- 09:15-09:40 Direct PREDIS Connections to Characterization:
-WP2 WAC (Lumír Nachmilner, CV REZ)
-WP4 Metallic Waste (Abdesselam Abdelouas, IMT)
-WP5 Liquid Organic Waste (Maxime Fournier, CEA)
-WP6 Solid Organic Waste (Thierry Mennecart, SCK CEN)
-WP7 Cemented Waste Monitoring and Storage (Ernst Niederleithinger, BAM)
- 09:40-09:55 CHANCE project: State of the Art and R&D needs for Conditioned Waste Characterization (Christophe Bruggeman, SCK CEN)
- 09:55-10:10 MICADO project: Characterization Technology Overview (Massimo Morichi, CAEN)
- 10:10-10:15 break
- 10:15-10:35 TOMIS: An Imaging Tool for In Situ Radioactive Waste Characterization (Eric Simon, CEA)
- 10:35-10:55 Non-destructive Characterization of Radioactive Waste - Innovative Technologies (Martin Dürr, AiNT)
- 10:55-11:15 Syscade Project: Mobile System for Inspection and Characterization of Nuclear Wastes (Thierry Delvigne, Scannix)
- 11:15-11:20 break

11:20 to 11:50 Breakout Room Discussions

- where can PREDIS contribute (data, parameters, inter-laboratory comparisons, etc.) to current developments in characterization?
- can PREDIS serve as a test bed for for technologies close to deployment?
- what game-changing technologies could transform waste characterization?

11:50 to 12:00 Close

- 11:45-12:00 Feedback from breakout rooms / Summary and Conclusions
- 12:00 Adjourn

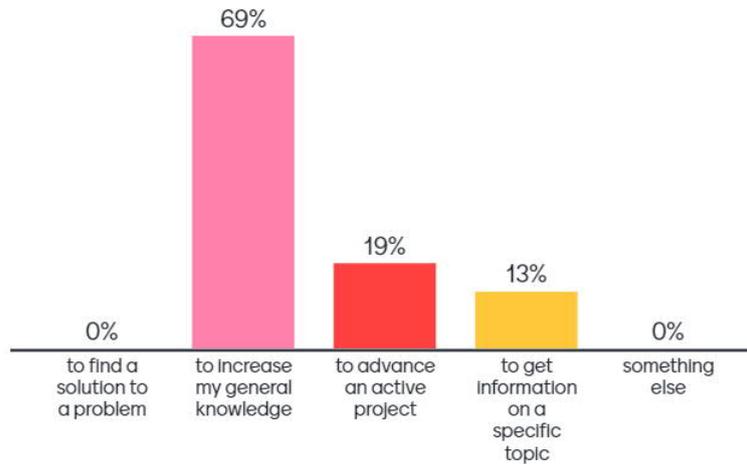


Characterisation Webinar Summary

Appendix 2. Live-Polling Results

Why did you register for this webinar?

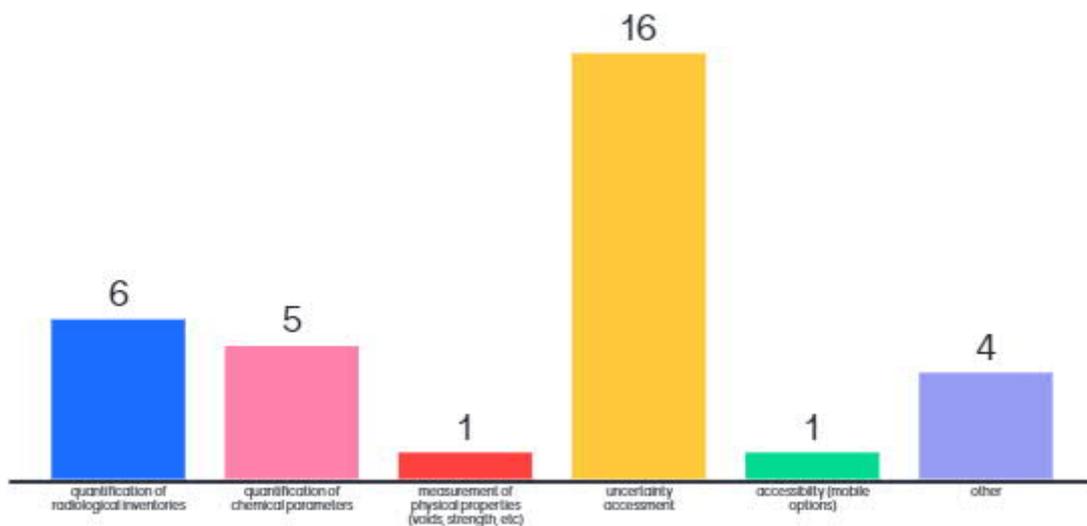
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What are the greatest challenges in waste characterization?

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33