PREDIS

Decontamination & Supporting Waste Hierarchy principles

DR TOM CAREY

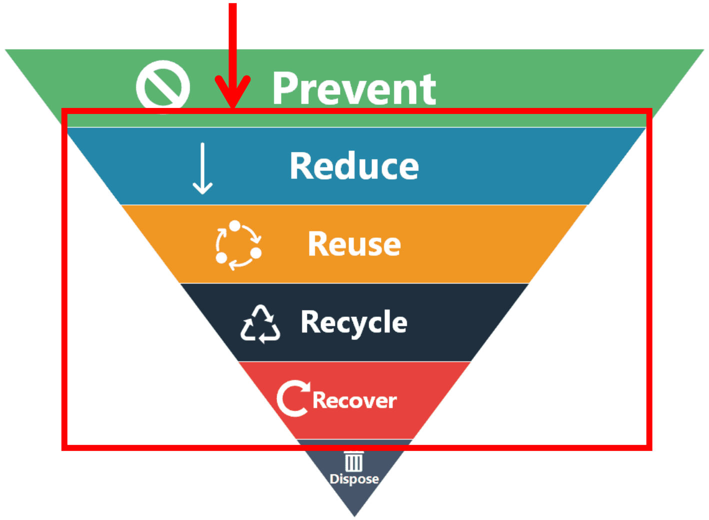
This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 945098.

PREDIS WP4 – Metallic Waste

Contaminated metal and lots of it…

Metallic plant infrastructure can be become contaminated when it is exposed to nuclear process streams, e.g., pipework transporting radioactive liquor or glove box operations.

Project has developed new skills, knowledge, and technologies to minimise waste for disposal



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New Skills and Collaborations

8 PhD researchers have benefited from task 4

Project overview

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NATIONAL NUCLEAR LABORATORY

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

ÚJV

Social Organization for Radioecological Cleanliness

Project phases:

1. Preparation of contaminated metallic samples
2. Testing in innovative decontamination techniques

Collaborative stakeholders


Guest seminar presentations

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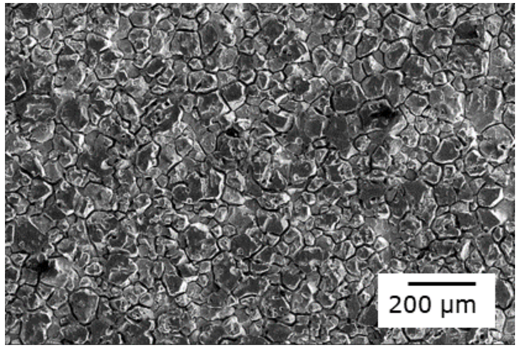
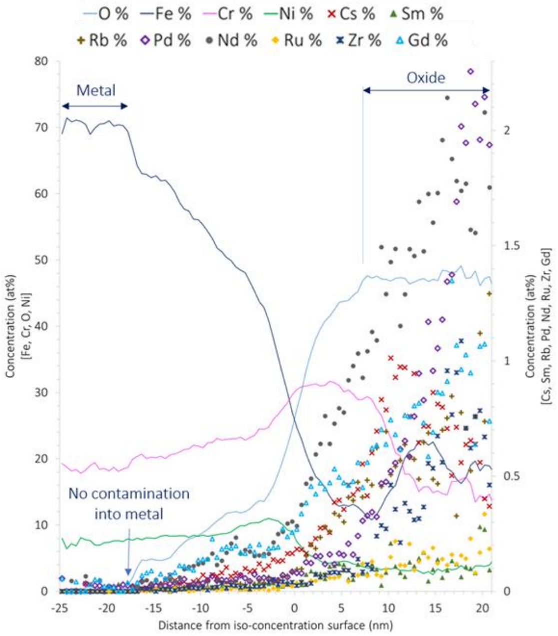
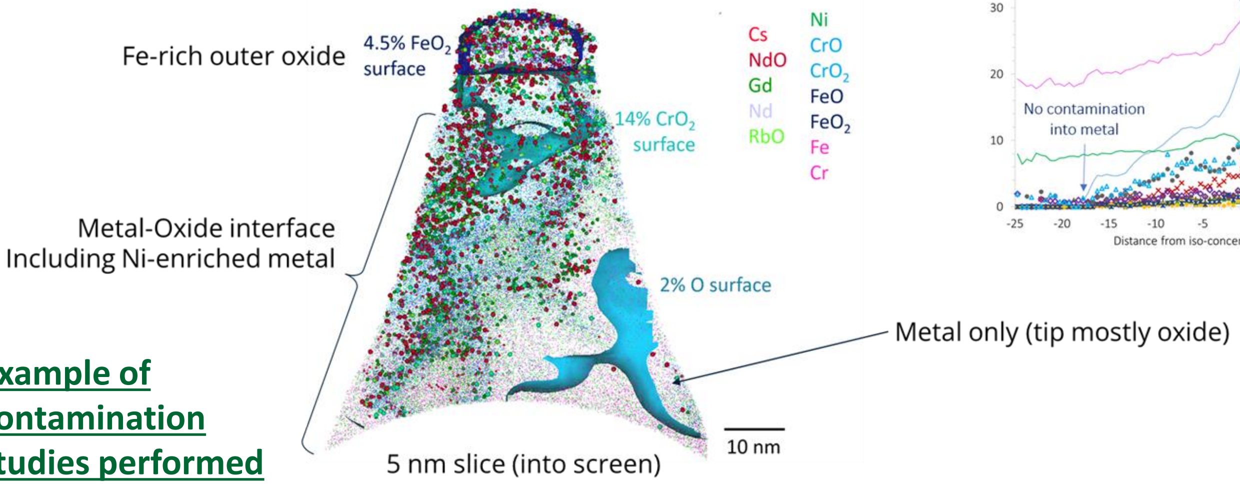
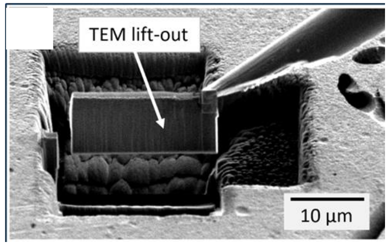
New Scientific Knowledge

>15 journal publications









Example of contamination studies performed

Examples of journal publications

Methods for the destruction of oxalic acid decontamination effluents

Jessica Blenkinsop[1]*, Aditya Rivonkar[2], Mathurin Robin[2], Thomas Carey[1], Barbara Dunnett[1], Tomo Suzuki-Muresan[2], Cavit Percin[2], Abdesselam Abdelouas[2], Jonathan Street[3]

[1] National Nuclear Laboratory (NNL), Cumbria, United Kingdom
[2] Subatech Laboratory, IMT Atlantique CNRS/N2P3 Nantes University, Nantes, France
[3] Sellafield Ltd., Cumbria, United Kingdom

Oxalic acid is encountered within industrial processes, spanning from the nuclear sector to various chemical applications. The persistence and potential environmental risks associated with this compound underscore the need for effective management strategies. This article presents an overview of different approaches for the destruction of oxalic acid. The study explores an array of degradation methodologies and delves into the mechanistic insights of these techniques. Significant attention is channeled towards the nuclear industry,

https://doi.org/10.3389/fnuen.2024.1347322

ELSEVIER

Progress in Nuclear Energy
Volume 159, May 2023, 104637

Review

A review of contamination of metallic surfaces within aqueous nuclear waste streams

Daniel N.T. Barton [a], Thomas Johnson [a], Anne Callow [b], Thomas Carey [b], Sarah E. Bibby [c], Simon Watson [a], Dirk L. Engelberg [d], Clint A. Sharrad [a]

https://doi.org/10.1016/j.pnucene.2023.104637

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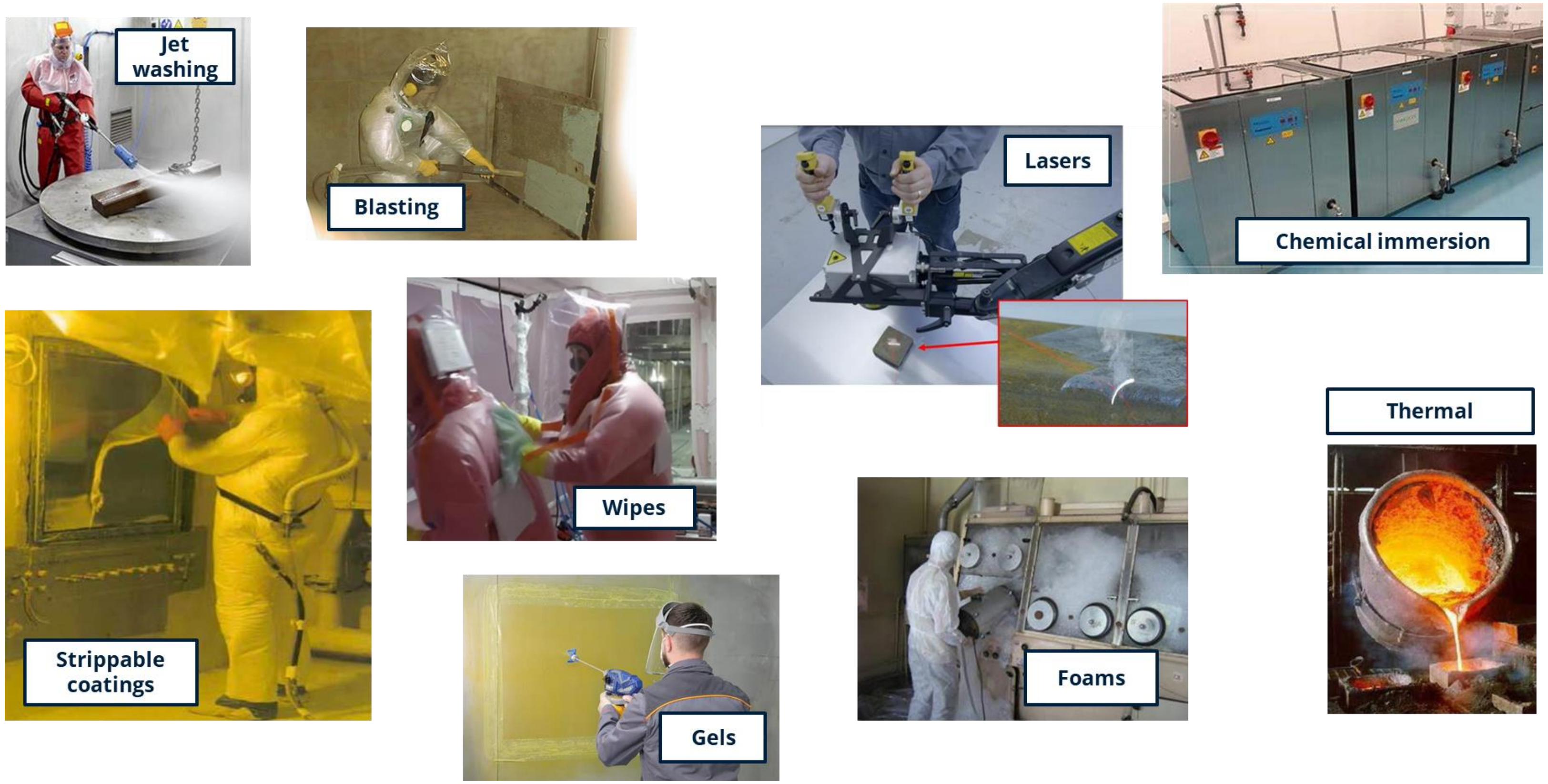
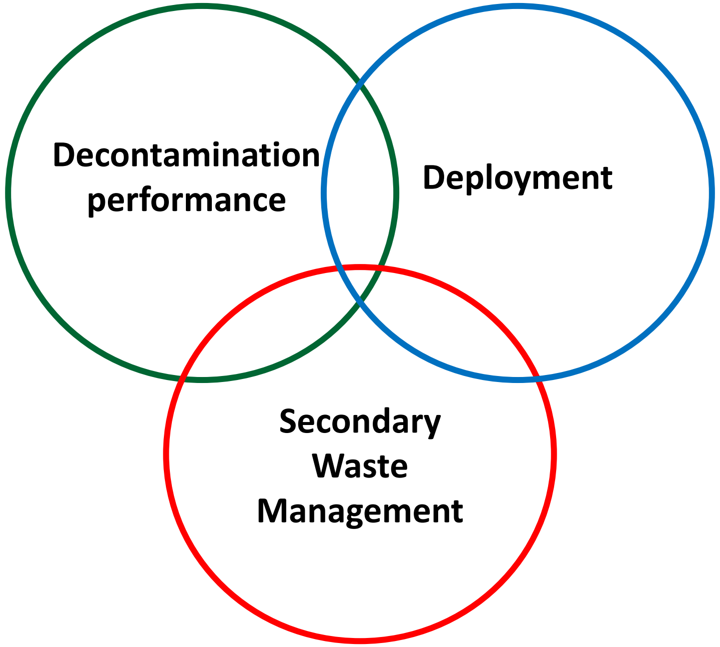
Current decontamination options





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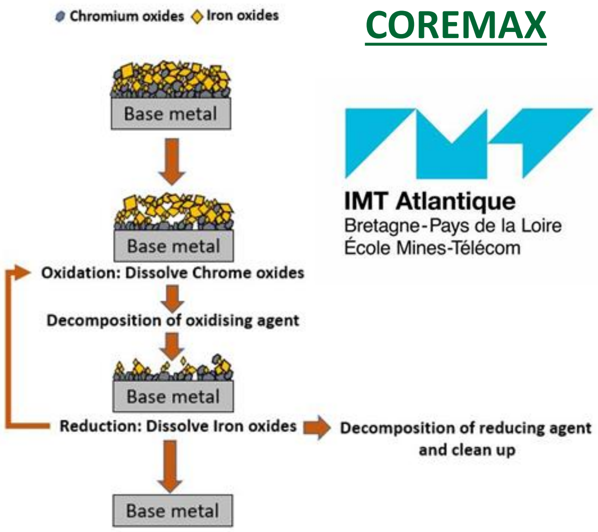
Technology Development

https://predis-h2020.eu/wp-content/uploads/2024/05/PREDIS_D4.4-Decontamination_Final-30.4.2024.pdf

https://predis-h2020.eu/wp-content/uploads/2024/03/PREDIS_D4.3-Gel-decontamination_vF-29.2.2024.pdf

COREMAX



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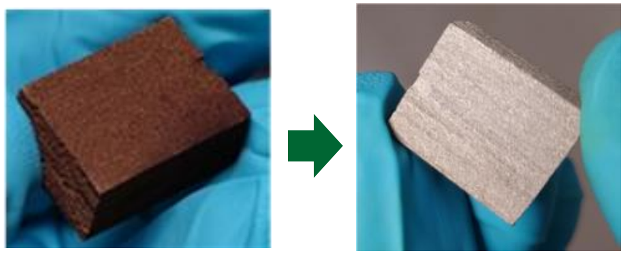
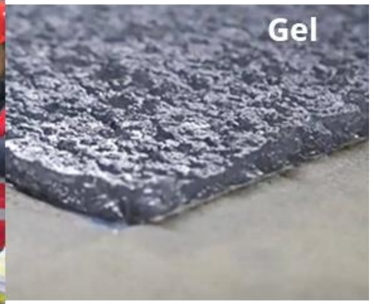
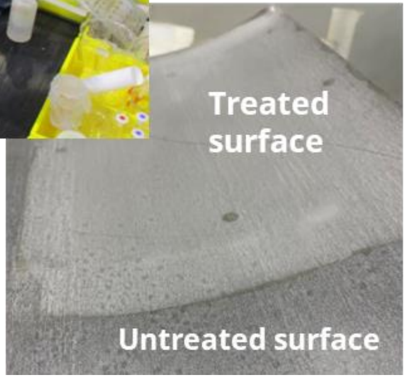


Before

After

Electrochemical gel decontamination (EASD)





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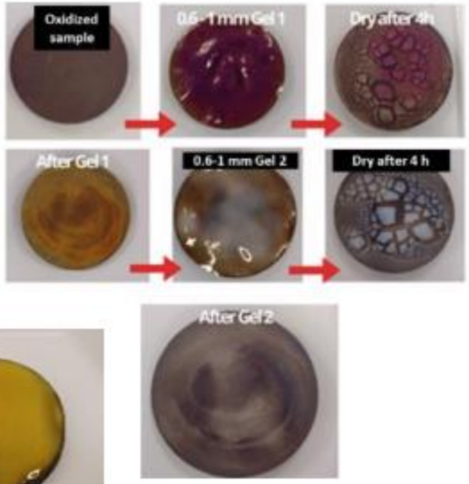
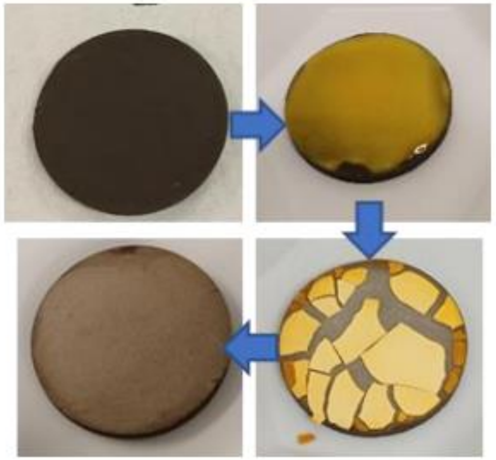
Vacuumable decontamination gels





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Final Conference Impact workshop 6.6.2024

KATERINA CUBOVA, CTU

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 945098.

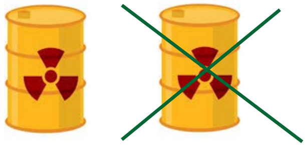
PREDIS

Sub-task T4.4.3 Optimization of treatment of secondary waste streams - Liquid waste minimization process based on application of Ionic Liquids

D&D → **decontamination processes** → **secondary liquid radioactive waste**

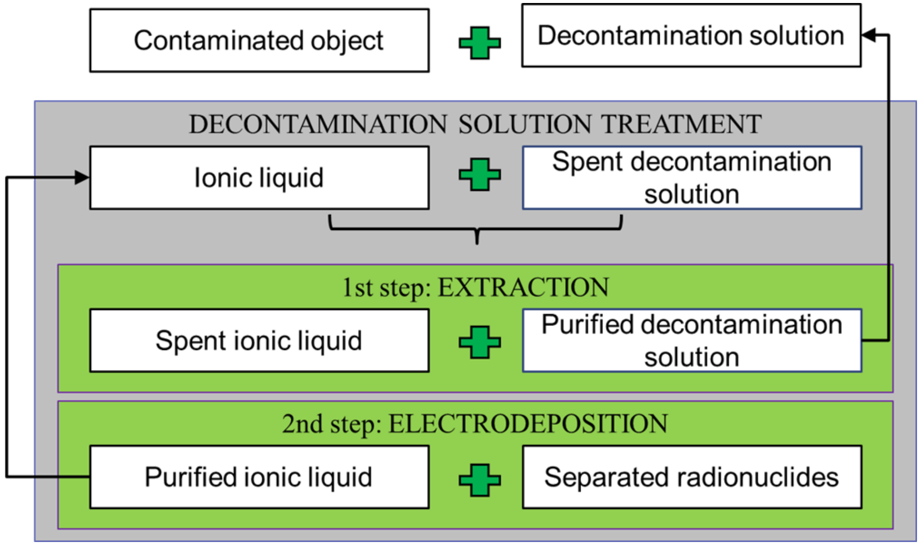
→

→ **new technologies for their minimization (recycling, regeneration)**



Method for the separation of radionuclides with emphasis on **recycling of chemicals and media used** and potentially also possible **returning of radionuclides for other use is generally required.**

Two-step separation method consisting of **extraction of radionuclides** from the decontamination solutions by using the ionic liquids, followed by the **separation of radionuclides from ionic liquids by electrodeposition** was proposed and tested.



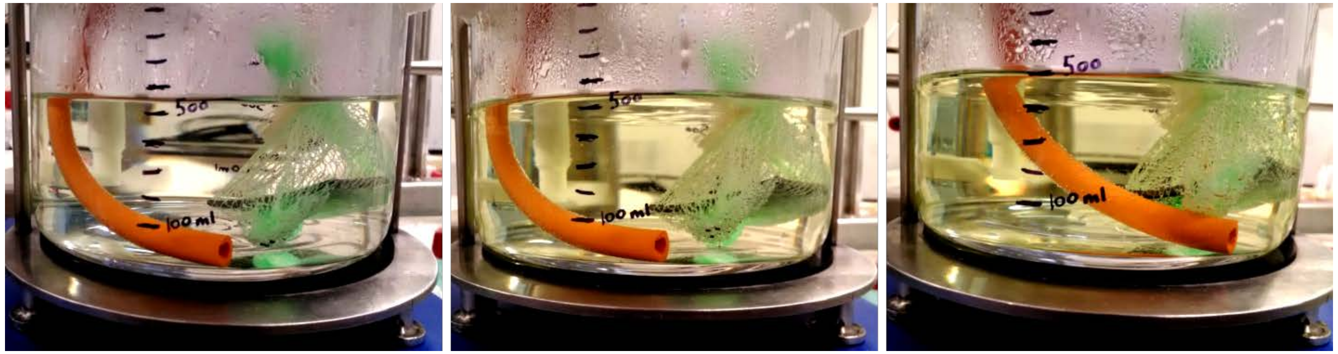
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 945098.

Sub-task T4.4.1 Optimization of decontamination of Ni-alloys Optimization of known decontamination process

A chemical decontamination system using redox chemistry or prospective chemical system **based on oxidative dissolution of corrosion layers** – developed for the process of decommissioning.

Decontamination loop was tested and optimised, demonstrating the principles of the APOX chemical decontamination method applied to corroded steel.

Steel sheets used in the experiment may be corroded again and reused, producing reproducible results.



Before and after the decontamination

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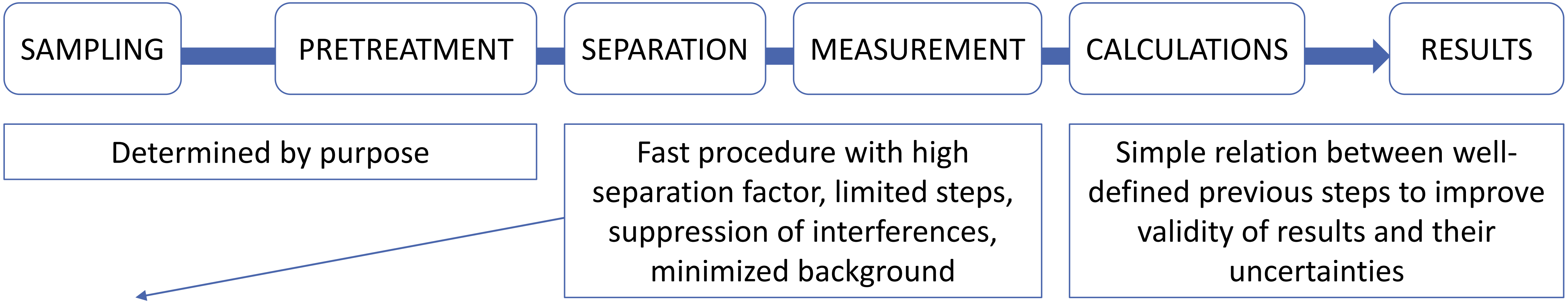
Sub-task T4.5.3 Development of new radiochemical procedures for DTM radionuclides

DTM radionuclides – problematic part of radioactive waste – knowledge about their activites requires time consuming and costly analyses.

Requirements – lowering detection limits and duration of the analysis to reach them



- CTU: Development of alternative $^{59,63}Ni$ sample preparation procedure for measurement, testing of interferences suppression for trace measurement using AMS for ^{41}Ca (^{59}Ni, ^{79}Se, ^{107}Pd)
- Research continues to finalize the whole procedures with model and real samples.

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Final Conference Impact workshop 6.6.2024

JOSE LUIS LEGANES NIETO, ENRESA

EUG WP4 ANALYSIS

This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 945098.

WP4
Innovations in metallic radioactive waste management

- Decontamination techniques
  - Chemical Oxidation Reduction, optimization of recovery process.
  - Solid gel for dry decontamination.
  - Release, Recycling, Waste Volume Minimization (melting process).

Regulator

- Waste minimization.
- Stable final products.
- Safe handling.

Industry

- Future, feasible technics, when final TRL.
- New market.

Partners

- Research for industrial purposes.
- Research for safety.
- Research for waste minimization.

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WP4
Innovations in metallic radioactive waste management

- Characterization techniques
  - Gamma Spectrometry on large metallic boxes. Activation vs Contamination. Involved uncertainty.
  - DTM development optimization, Ni-59, Zr-93, Ni-63, Ca-41.

Regulator

- Controlled Uncertainty.
- Activity distribution – non dilution.
- Inventory improvement.

Industry

- Development of devices for Boxes in addition to drums.
- Characterization Industrialization.

Partners

- Research for industrial purposes.
- Research for waste classification.
- Research for safety.

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WP4
Innovations in metallic radioactive waste management

- Reactive metals conditioning
  - OPC vs MPC.
  - MPC with aggregates to reduces the clinker.
  - Low-cost formulation.

Regulator

- Safe storage/disposal.
- Controlled Radionuclide Release.
- Mechanical stability.

Industry

- Development of new cements.
- Reduce the costs of manufacturing
- Alternative products.

Partners

- Research for industrial purposes.
- Research for waste stability.
- Research for safety.

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