

MODERN SPENT FUEL DISSOLUTION IN FAILED CONTAINER CONDITIONS (DISCO)

L.Z. Evins¹, I. Farnan², D. Hambley³, E. Gonzalez Robles⁴, O. Roth⁵, D. Bosbach⁶, L. Duro⁷, E. Curti⁸, A. Valls⁷

¹ Svensk Kärnbränslehantering AB (SKB), SE; ² The Chancellor, Masters and Scholars of the University of Cambridge, UK; ³ National Nuclear Laboratory Limited (NNL), UK; ⁴ Karlsruhe Institut für Technologie (KIT-INE), DE; ⁵ Studsvik Nuclear AB, SE; ⁶ Forschungszentrum Jülich GmbH (FZJ), DE; ⁷ Amphos 21 Consulting S.L., ES; ⁸ Paul Scherrer Institute (PSI), CH

Background & Objectives

The development of robust safety cases for the geological disposal of spent nuclear fuel (SNF) requires a solid understanding of its dissolution mechanisms over very long timescales (up to a million years).

DISCO represents a logical follow-on from earlier Euratom projects (SFS, NF-PRO, MICADO, REDUPP and FIRST-Nuclides) This project aims to fill the knowledge gap on spent fuel dissolution arising from the development and use of novel types of fuel (Cr/Al- doped and MOX).

Specific objectives :

- To enhance our understanding of spent fuel matrix dissolution under conditions representative of failed containers in reducing repository environments;
- To assess if the dissolution behaviour of novel fuel types (MOX, doped) differs from the conventional ones.

Duration of the CP : 1 June 2017 to 31 June 2021

The Consortium

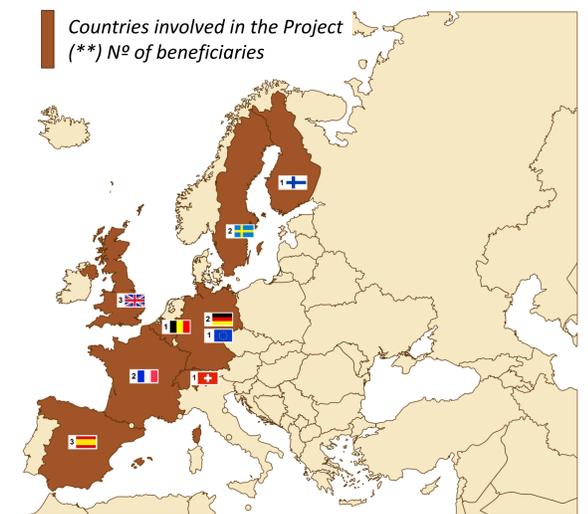
The project is implemented by a consortium of **16 Beneficiaries** from 8 countries and the European Joint Research Center.

The consortium will be advised by an **End User Group**:

- Waste Management Organizations from 7 countries: BE, FI, FR, ES, SE, CH, and UK
- Regulatory authorities in 5 countries: BE, DE, ES, SE, and CH

The **Associated Group**, organizations that are not members of the consortium interested in the project results, are mainly from countries with less advanced programs (LAPs).

Organizations from the following countries have already shown interest on DISCO: CZ, LT, HU, SI, PL, FR, UK



Project Organization & Work Plan

WP1: Management, Coordination and Dissemination

(WP leader and Project Coordinator: Lena Z. Evins, SKB)

Ensuring that the project runs according to expectations and that the knowledge generated is disseminated and communicated to all interested stakeholders.

WP2: Preparation and characterisation of samples and experimental systems

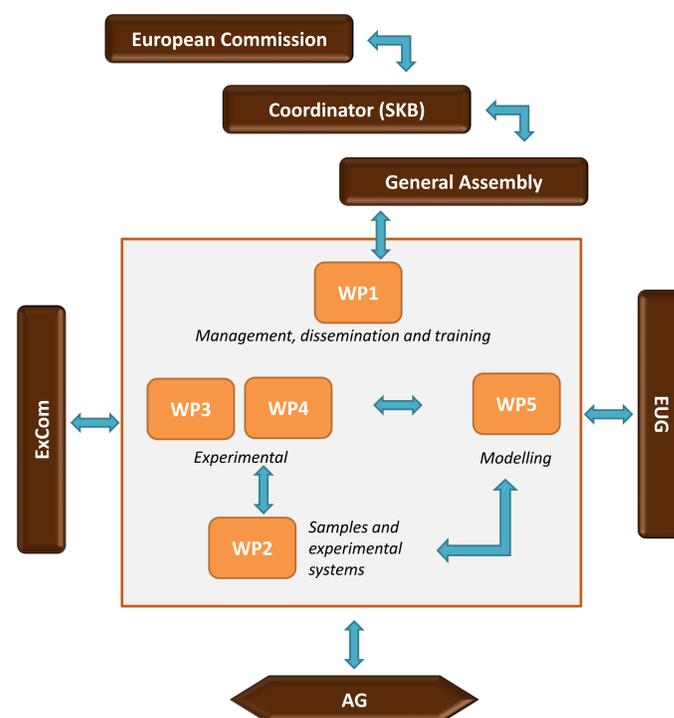
(WP leader: Ian Farnan, UCAM)

Preparation and characterisation of model spent fuel samples and spent fuel experimental systems before dissolution experiments are initiated.

WP3: Spent fuel dissolution experiments

(WP leader: Volker Metz, KIT-INE)

Spent fuel dissolution experiments determining both the matrix dissolution and the instant release fraction (IRF) of various fuel types under different relevant disposal conditions. Leaching experiments will be conducted with clad segments and fragments (without cladding) and will be performed under reducing (H₂), anoxic (N₂, Ar) and oxic conditions.



WP4: Model systems dissolution experiments

(WP leader: Dirk Bosbach, JUELICH)

Model material dissolution experiments, with the objective of understanding matrix corrosion of modern LWR fuels under deep geological repository relevant conditions. Examples of model materials: samples of natural or depleted UO₂ doped with ²³³U that will allow defining alpha activity of aged fuel or samples doped with Pd to simulate ε-particles, or with Cr₂O₃ to simulate modern fuels.

WP5: Chemical modelling

(WP leader: Lara Duro, A21)

Development and application of thermodynamic and kinetic models as well as reactive transport modeling. This will provide the basis for predicting and understanding the behavior of spent nuclear fuel in the near field.

Events

- The project kick-off meeting was held in Brussels 13 June 2017
- The first annual meeting was held Sheffield, May 2018.
- The second annual meeting will take place in Cologne, May 2019



Project Dissemination

Information related with the project can be found via:

- Webpage: www.disco-h2020.eu
- LinkedIn Group: <https://www.linkedin.com/groups/8613921>
- Hashtag: #discoH2020
- Annual Newsletters