**DEVELOPMENT AND IMPROVEMENT OF THERMODYNAMIC UNDERSTANDING FOR USE IN NUCLEAR WASTE DISPOSAL SAFETY CASE**

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DITUSC, standing for Development and Improvement of Thermodynamic Understanding for use in nuclear waste disposal Safety Case, is one of the work packages of the EURAD-2 partnership. This work package has been drawn up as a 24-month strategic study and aims to consolidate and improve the scientific knowledge to predict safety-relevant long-term processes in critical aspects of the geological disposal of radioactive waste. In addition to the need to identify, critically evaluate, prioritize and ultimately define strategies to fill existing gaps in safety-related thermodynamic datasets and to maintain know-how in the field of thermodynamics, this work package is intended to support current and future capabilities for the reliable use of thermodynamics in the assessment of the performance of various radioactive waste disposal configurations, safety analysis and the preparation of a safety case. The program of work is focused on: 1) the identification of data gaps supporting the understanding of the transport behaviour of safety-relevant radionuclides and organics; 2) the thermodynamic description of a set of perturbations (i.e., the effect of temperature and high salinity plumes); 3) the thermodynamic description of solid-solutions and their importance/role in radioactive waste management and final disposal; 4) the interplay of thermodynamics and kinetics (including solid phases transformation, relevant redox phenomena and the illustrative case of spent fuel dissolution); and 5) documenting how thermodynamic approaches are currently implemented in the safety case and at identifying and assessing possible improvements in line with the end-user needs and priorities.

The final objective of this strategic study is to publish a white paper summarizing the current thermodynamic understanding and promoting new scientific strategies to further support the use of thermodynamics in the safety case of radioactive waste disposal facilities. This white paper will be developed on the basis of close interactions between key actors in the field of thermodynamics applied to such geochemical systems (among which the on-going thermodynamic projects, e.g., NEA-TDB, ThermoChimie, Thereda, PSI/Nagra TDB…) and end-users involved in the preparation of the safety case. Such interactions will be fostered by the discussions with the end-user group during three open workshops, by a survey to be sent to key stakeholders of the safety case and by the interaction with the other work packages within the EURAD-2 project.

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