EURAD2-L'OPERA: ASSESSMENT OF THE LONG-TERM PERFORMANCE OF INNOVATIVE WASTE MATRICES FOR THE IMMOBILIZATION OF LOW- AND INTERMEDIATE-LEVEL RADIOACTIVE WASTE

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In many (European) countries, waste producers and waste management organisations need to manage a highly diverse variety of radioactive waste streams coming from different nuclear sectors (e.g., nuclear power plants, medical applications, research activities, etc.). Focusing on the low- and intermediate-level radioactive waste (LL-ILW), the Work Package L'OPERA (EURAD2-WP7 Long term Performance of waste matrices) aims to expand the knowledge base on the durability of innovative matrices under representative disposal conditions, in particular geopolymer, magnesium potassium phosphate cement (MKPC), nochar polymers and alkali-activated materials, which are considered as possible alternatives for traditional matrices (e.g., cement-based materials). Initiated in previous European projects (e.g., PREDIS, THERAMIN), immobilisation of Radioactive Liquid Organic Waste (RLOW), like oil, or Radioactive Solid Organic Waste (RSOW), mostly, spent Ion Exchange Resin (IER) or reactive metals have been investigated using processes based on their direct immobilisation in conditioning matrices or an indirect immobilisation relying on thermal treatment prior to immobilisation. L'OPERA will provide information about long-term performance of these innovative matrices (e.g., chemical composition, leachability index, irradiation effect), allowing an increase of the Technology Readiness Level (TRL) of the selected processes, and to define the most suitable routes for the long-term management of LL-ILW. To complete the proposed work, several tasks have been identified. Expected boundary conditions will be defined on the basis of the characteristics of national disposal facilities according to Waste Management Organizations (WMOs) specifications and based on findings from previous projects. Major effort will be devoted to the determination of key parameters influencing the durability and leaching behaviour of the different waste forms as well as the most relevant long-term degradation pathways. Waste forms will be aged in order to mimic expected long-term conditions prevailing in disposal facilities mainly by means of irradiation, thermal cycling and chemical and mechanical ageing. Information gathered from these tests will be a valuable input for the calibration and validation of numerical models, that will be applied to extrapolate lab results to time scales representative of the lifetime of disposal facilities. L'OPERA will maintain a close collaboration with work package STREAM (EURAD2-WP6), including the delivery of different materials for durability tests as well as the definition of a common characterisation protocol of the waste forms to be provided. Additionally, it will also benefit from other EURAD2 work packages focused on LL-ILW management (e.g., WP6-ASTRA or WP14-SUDOKU).

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