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Classification of the metallic radioactive waste streams of the different types of reactors in PREDIS

The radioactive waste management and disposal strategy are the major issues, which are important for each member state having operating nuclear power plants (NPP) or NPP under decommissioning. Metallic radioactive waste (MRW) in different reactors usually has a wide list of radionuclides of different concentrations. General estimations suggest that the majority of the NPP waste resulting from decommissioning and dismantling is radiologically unrestricted material i.e. exempt waste. The remaining one-third is the radioactive material with different activity levels. The MRW has to be collected, segregated, characterized, treated, stored and finally disposed of in special disposal facilities.

The main aim of the 4.5.1 subtask of PREDIS is to provide a scheme for the classification of the reactor materials regarding the level of activation: highly activated, intermediate, low activation metal constructions and non-activated materials in order to facilitate the procedure of decontamination and clearance or declassification. The methodology for characterization of the metallic waste is similar to all reactors and is based on nuclide vector (NV) determination. An essential part of the characterization is the separate determination of activation activity and contamination activity to identify the best way of management.

The main steps include:

- Pre-dismantling: classification of MRW using (MCNP6/SCALE6.2) modelling obtaining neutron activation map in the 3D of reactor core and peripheral hardware (experience in RBMK, PWR reactors).
- Detailed characterization of MRW during dismantling via experimental measurements applying nondestructive and destructive measurement techniques (analysis of samples of surface contamination and activation).
- Optimized characterization: determination of Nuclide Vectors (NV) for MRW stream. Together modeling and experimental measurements allows separating waste streams to homogeneously activated MRW, mixed (activated and surface contaminated) MRW and surface contaminated metallic waste.

Optimized NV is obtained by analyzing and systemizing the information about radioactive metallic waste streams, identifying the optimal list of relevant radionuclides (e.g., selection of Co-60 and Nb-94 for zirconium-niobium alloys), describing inter-correlations between key nuclides and difficult to measure nuclides (Ni-59, Ni-63, actinides) including multivariate analysis of the already measured data at the sites and numerical analysis of activation and contamination parts for the waste streams.

Do you wish to participate as a Young Professional?

No

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Do you wish to be considered for a Young Professional grant?

No

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