



International Conference on Radioactive Waste Management: Solutions for a Sustainable Future

1-5 November 2021, Vienna, Austria

Contribution ID: 69

Type: POSTER

Characterization and Preliminary Study for Solidification of Organic Alpha-Contaminated Liquid Waste

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Organic Alpha Contaminated Liquid Waste because of their dual nature of organic and radioactive compounds can affect nuclear safety and have harmful effects on health and environment. These kinds of contaminated liquid must be immobilized into a waste forms that can prevent their long-term release avoiding the contact with water and any loss of containment. There are very few official analytical methods that may be directly used to design reliable solidification protocols of radioactive waste organic liquids especially when their volume is too small to perform complex treatments.

A correct management of radioactive waste, which takes into account the necessary health protection and environmental protection safeguards, makes it necessary the definition and classification of radioactive waste. The characterization of radioactive waste is one of the fundamental keys of waste management for the safety assessments during transport or storage and for the determination of waste treatment and conditioning methods. From a radiological point of view, waste characterization can be performed through different methods, destructive and non-destructive.

Destructive techniques are used to analyse samples that need to be chemically processed before appropriate measurements are carried out. They are more accurate and sensitive than non-destructive techniques, but they are time consuming and highly linked both to the quality (e.g. homogeneity) and the representativeness of the material. Non-destructive techniques identify and quantify the intensity of sample emitted radiation, spontaneous or induced. These methods don't require any physical and chemical modifications, but, show lower accuracy and a strong influence of the matrix composition.

Different samples of organic alpha contaminated liquid waste, which have been produced in the past activities of the plant IPU (Plutonium fuel experimental facility), a Sogin facility in Rome, have been fully characterized by physical and radiochemical analyses. The results of the characterization activities can be used to simulate the radioactive organic liquid waste in order to perform laboratory trials for the study of a direct solidification process and experimental tests to evaluate the properties of the solidified waste form (in terms of stability and durability, with reference to its physical-chemical behaviour and, if available, the waste acceptance criteria).

This paper summarise the results of the characterisation activities and the very preliminary trials carried out for the solidification study.

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Session Classification: Solutions for Specific Wastes

Track Classification: 3. Solutions for Specific Wastes