INTERNATIONAL NUCLEAR ENERGY RESEARCH INITIATIVE

Development and Characterization of New High-Level Waste Forms for Achieving Waste Minimization from Pyroprocessing

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Project Abstract

The objective of this project is to develop new high-level waste (HLW) forms and fabrication processes to dispose of active metal fission products that are chemically separated from electrorefiner salts in the pyroprocessing-based fuel cycle. The current disposal technology involves discarding the fission product-loaded salts in a glass-bonded sodalite ceramic waste form. By selectively removing fission products from the molten salt, researchers would minimize the amount of HLW generated. Novel methods, such as chemical precipitation, are currently being developed to achieve this selective separation of fission products, but no investigation has yet to be performed regarding suitable waste forms for the separated fission products. The precipitates formed would likely consist of oxides, sulfates, and/or phosphates that are incompatible with the sodalite ceramic waste form. Thus, a completely novel approach to waste form synthesis is required.

During the first year, researchers will assess the characteristics of fission product waste streams and screen candidate solid matrices for waste forms. In preparation for producing transuranic (TRU)-contaminated waste forms, they will procure or build small-scale waste processing equipment, test its operation, and then install the equipment in a hot cell. In the second year, the team will conduct more rigorous testing of promising waste forms using non-radioactive surrogates and will test waste form fabrication techniques in a hot cell using TRU-contaminated radioactive salt. In the final year, researchers will characterize the TRU-contaminated waste forms and optimize the waste form fabrication process. The team will produce the final set of TRU-contaminated waste forms based on the optimized methods they have developed.