INTERNATIONAL NUCLEAR ENERGY RESEARCH INITIATIVE

Separation of Fission Products from Molten LiCl-KCl Salt Used for Electro-Refining of Metal Fuels

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Project Abstract

The objective of this project is to develop a process for selectively removing fission products from the lithium-chloride–potassium-chloride (LiCl-KCl) eutectic salts used in pyroprocessing. This process is critical for minimizing the waste generated from pyroprocessing of spent nuclear fuel. Because the current technology for disposing of these fission products is non-selective, it creates large quantities of high-level radioactive waste from discarding the LiCl-KCl along with the fission products. Since the LiCl-KCl does not need to be discarded, there is the potential to achieve a significant reduction in waste volume by developing and implementing a selective process.

Two basic approaches will be considered: 1) salt-zeolite ion exchange and 2) selective precipitation of fission products. Researchers have previously investigated both of these methods. However, a complete assessment and comparison of the options has not yet been accomplished. Additional data for each technology option is needed in order to assess the efficiency of fission product removal and associated processing costs.

For this project, each laboratory will perform different experiments and will then work together to make an unbiased assessment of which technology is more attractive. Initially, INL will focus on filling in data gaps for salt-zeolite ion exchange and KAERI will do the same for selective fission product precipitation. In the final year of the project, the two labs will perform an integrated demonstration using salt-containing fission products. A system analysis will determine if one or multiple technologies should be implemented into the reference pyroprocessing flowsheet.