

INTERNATIONAL NUCLEAR ENERGY RESEARCH INITIATIVE

Performance Evaluation of TRU-Bearing Metal Fuel for Sodium Fast Reactors to Achieve High Burnup Goal

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Project Abstract

This project will evaluate the high burnup performance of transuranic (TRU)-bearing metal fuel for the Sodium-Cooled Fast Reactor (SFR). A potential factor limiting alloy fuel burnup is fuel/cladding chemical interaction (FCCI), which causes cladding wall thinning and increased stress. One method proposed to solve this issue is the use of a barrier on the cladding's inner surface. Researchers will evaluate two types of barriers: 1) a metal liner and 2) an inert compound coating the inner surface.

Specifically, this project will involve the fabrication and performance testing of the barrier and cladding materials against the metal fuel. Current fuel performance codes do not address the performance of fuels with high TRU and rare earth element content. Therefore, the project also includes development of models and benchmarking of the fuel performance codes to enable a comprehensive analysis of the metallic fuel performance.

The scope of the proposed work consists of three major tasks: 1) benchmarking of fuel performance codes, 2) fabrication of barrier cladding, and 3) diffusion testing of metal fuel against barrier cladding. The proposed work forms the basis for establishing key technologies that will enable the development of higher burnup TRU-bearing fuel and contribute to a more complete understanding of the behavior of metal fuel for very high burnup applications.