Project Title

Measurements of Fission Gas Release from Nuclear Fuel in Support of BISON Fuel Performance Analysis

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ABSTRACT:

This project investigates the fission gas (xenon and krypton) release (FGR) phenomenon in nuclear fuel. A fuel irradiation and gas release loop that has been designed for implementation at the university research reactor will be used to conduct gas release experiments. Uranium dioxide fuel (UO_2) and Uranium silicide (U_3Si_2) samples will be characterized and supplied by the national laboratory to the university. These samples will be irradiated in the FGR loop to a given total thermal neutron fluence and under controlled temperature conditions. An innovative high resolution gamma-ray spectrometry approach will be used to monitor the loop's sweep gas and perform high accuracy measurements of the gas release rates relative to predicted birth rates to establish the release to birth ratio (R/B) for a given radionuclide. In addition, uncertainty minimization will be achieved through the formulation of the measurement observables into relative release-to-birth indicators for selected radionuclides. The experimental findings will be utilized to enhance and validate the fission gas release models that are currently implemented in the BISON fuel performance code. The experimentally deduced physical parameters will be incorporated in BISON's fission gas release models and simulations of fuel behavior will be performed to compare the predictions of the current and updated models to fuel performance experiments.