**Determination of Decontamination Factor for Various Radioisotopes during the PUREX Process of Irradiated DUO2**

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Nuclear proliferation is a growing concern worldwide due to the increased availability of nuclear materials, knowledge of sensitive technologies, and the possibility of diverting nuclear materials such as uranium and plutonium away from peaceful uses. Due to this increasing risk of nuclear threats, nuclear forensics capabilities are being developed at Texas A&M University with sponsorship from the Department of Homeland Security. This nuclear forensics capability development will aid in improving deterrence capabilities and in educating the next generation of scientists and engineers. One of the nuclear forensics activities that we are currently pursuing is the use of computational and experimental methods to determine the isotopic characteristics of weapons-grade plutonium separated from low-burnup uranium that could be produced in different neutron spectral environments available in foreign nuclear reactors.

The uranium samples for this project were irradiated at the High Flux Isotope Reactor (HFIR) of Oak Ridge National Laboratory.

After chemical processing of the irradiated uranium samples,

the isotopic concentrations (and ratios) of selected fission products and actinides were measured

the burnup of nuclear material was determined

Our objective was to determine the differences in fission products and actinides characteristics for uranium samples irradiated in different type of nuclear reactors (thermal and fast reactors). This paper presents the experimental part of this research. These operations were performed inside a heavily shielded glove box.

The final goal of these experiments was to analyze trace elements and isotopes present in the residual matrix produced by each and every step of industrial PUREX chemical reprocess by alpha and gamma spectroscopy and other analytical tools.

The weapon grade plutonium separated from other actinides and fission products such as Cs, Ce and Sm was determined by ICP-MS with great precision to match the computational results.