

Radioisotope retention in graphite and graphitic materials
Technical Work Scope Identification: RC-2

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ABSTRACT

This project focuses on measurements of fission product (FP) retention, diffusion and transport properties in graphite and graphitic materials. In the past few years we have explored measurements of diffusion and transport of several FPs in several types of graphite (using both infusion and release techniques). We have also explored several methods for adsorption measurements. We have concluded that good data can be obtained by using a combination of Instrumental Neutron Activation Analysis (INAA) with Inductively Coupled Plasma Mass Spectroscopy (ICP-MS), Laser Ablation Mass Spectroscopy (LA-ICPMS), and a Knudsen Effusion Mass Spectrometer (KEMS). Additionally, we have utilized and have access to Scanning Electron Microscopy (SEM), BET, and Energy Dispersive X-ray Spectroscopy (EDS) for pre- and post-experimental analyses. While our measurements will be on non-irradiated materials (graphites) using FP surrogates, we will acquire fundamental understandings through detailed analyses of both adsorption and transport of FP as dependent on the specific FPs and the surface conditions, microstructures, inter-atomic interactions and pore structures of the graphites. We will also obtain data on oxidized graphites. We will compare our data with those obtained elsewhere on irradiated graphites and with actual FPs to the extent that those become available. We will use the fundamental understandings from our work to elucidate the role of various parameters on FP retention and transport in graphites irradiated to various levels. We do note that our facilities permit use of radioactive materials and we will be prepared to conduct experiments on irradiated graphite (but only with surrogate FP) if this becomes available to us either through irradiations at our own facilities or through DOE.