

MEASUREMENT OF FISSION PRODUCT DIFFUSION IN VHTR MATERIALS

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ABSTRACT

Measuring and quantifying the diffusion of fission products in reactor materials is a critical element of the future success of Very High Temperature Reactors (VHTRs). While the extreme temperatures, which may be in excess of 1000 °C, allow for a potentially very high efficiency, they also can be problematic due to the increase in fission product transport. The aim of this work was to explore a repeatable, accurate, and cost effective process to measure the diffusion coefficients of fission products in VHTR materials. This work focuses on the diffusion of silver in graphite.

We constructed graphite cells which could be filled with a silver diffusant. This diffusant may take the form of silver flakes, silver powder, or a silver-laden graphite powder. The cells were hermetically sealed and heated to temperatures comparable to those found in VHTRs. These cells were imaged using microtomography and electron microscopy. Neutron Activation Analysis (NAA) was used to determine actual diffusion profiles in the cells.