

NUCLEAR ENERGY UNIVERSITY PROGRAMS

Fission Product Sorptivity in Graphite

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None

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Abstract

Both adsorption and absorption (sorption) of fission product (FP) gases on graphite are issues of interest in very high-temperature reactors (VHTRs). This project will measure sorption in single graphite particles (a few μm in diameter) and graphite powder samples using an electrodynamic balance (EDB), with corroborating measurements on a microbalance such as a Cahn electrobalance or a thermogravimetric analyzer (TGA). In the EDB method, the team will suspend a single graphite particle or agglomerate them in the balance and measure the sorption of an FP gas of interest. The particle size, surface characteristics, morphology, purity, and composition can be varied. The team will use both an electron stepping technique and Raman spectroscopy to verify each sample's composition and mass. Specific objectives of this research are to:

- Experimentally obtain isotherms of several fission gases for reactor-grade samples of graphite particles over a range of temperatures and pressures using an EDB and a microbalance.
- Compare the EDB results with those obtained with the microbalance.
- Explore the effect of electrical charge on the adsorption isotherms of these materials by varying the charges and the voltages used to suspend the microscopic particles in the EDB.
- Interpret these results in terms of the existing models (Langmuir, BET, Freundlich, and others), modified as necessary to include charge-related effects.