
A Research Program for Fission Product/Dust Transport in HTGR's

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Collaborators: N/A

Program: Fuel Cycle

ABSTRACT

The Next Generation Nuclear Plant (NGNP) will be a Nuclear Regulatory Commission (NRC) licensed commercial high temperature gas-cooled reactor (HTGR or VHTR) plant (prismatic or pebble bed) capable of producing electricity and high temperature process heat. The DOE position on the NRC approval for HTGR licensing is described in a recent document, Mechanistic Source Terms White Paper, INL/EXT-10-17997, July 2010, and it will follow 10 CFR 52. Our objectives (tasks) in this research are to focus specifically on experiments and computations and to both identify phenomena of interest and model the fission product (FP) transport and adsorption, and dust/aerosol facilitated FP transport. We will 1) Undertake computations and measurements of fission product diffusion through graphite that will be encountered during operation of the HTGR (VHTR) at elevated temperatures and in radiation environments, 2) Obtain pure and binary mixture adsorption data for Sr, Cs, Ag, I, Pd on nuclear grade graphite-NBG-17, NBG-18, IG-110, and a matrix graphite at a temperature range of 773 to 1873 K and a concentration range of 10^{-10} Pa to 10^{-5} Pa, and develop isotherm models for both pure component and multi-component adsorption systems, and also sorption isotherms of these FPs with structural materials, 3) Advance computations and construct models for interactions of fission products with dust in suspension (aerosol) as well as on surfaces. This research will be of substantial value in mechanistic estimations of the source terms.