Glow Discharge - Optical Emission Spectrometer & Chemistry Controlled Recirculatory Loop for the Environmental Degradation of Nuclear Materials Laboratory

Program: General Scientific Infrastructure

ABSTRACT: The University of Wisconsin-Madison (UW) Nuclear Engineering program has unique strength in experimental programs to develop nuclear technology, currently performing advanced nuclear research in support of multiple advanced concepts, including high-temperature gas-cooled reactors, fluoride salt-cooled reactors, and sodium-cooled fast reactors, as well as constantly supporting the research and development of current LWR's technologies. Ongoing experimental programs include thermal hydraulics, safety and material science studies in water, sodium, helium, supercritical carbon dioxide, and molten salts, as well as radiation damage studies of both ceramics and metals for reactor service. To support these projects, the department has the following facilities: the Tantalus facility for testing in high stored-energy environments, the Extreme Environments Laboratory for conducting high-temperature corrosion testing, the Environmental Degradation of Nuclear Materials Laboratory for studying materials' corrosion and irradiation in-situ, the Heat and Mass Transport Laboratory for studying molten salts chemistry, the Wisconsin Ion Beam Facility for studying radiation damage and performing surface science, the Characterization Laboratory for Irradiated Materials for performing electron microscopy and other analyses on irradiated samples, and the University of Wisconsin Nuclear Reactor Laboratory. The proposed infrastructure project has two key components, which aim at developing new capabilities in the area of degradation of nuclear materials: - Develop and upgrade the capabilities of the Environmental Degradation of Nuclear Materials Laboratory to support on-going research projects focusing on the coupling between irradiation damage and corrosion in nuclear materials using state of the art in-situ techniques. This infrastructure will significantly augment the existing corrosion testing capabilities and allow expansion into new areas of corrosion testing that are of relevance to nuclear energy systems, especially in the domain of validating nuclear materials corrosion models under irradiation. - Increase the current capabilities in the domain of nuclear materials characterization to support ongoing research projects across all laboratories and obtain critical data on nuclear materials degradation in multiple environments (primary water, supercritical CO2, molten salts). The above proposed equipment additions will enhance our capabilities to train students in the important areas of nuclear materials science in nuclear systems and to couple our research with the national laboratory programs. The added infrastructure will significantly increase the quality and quantity of results that our different laboratories are currently capable of getting and help us to maintain the strict quality assurance of the data that we provide. These additions will also benefit to the NSUF community through NSUF access.