
Expanding mechanical testing and characterization capabilities for irradiated materials research at University of Florida

Applicant Name: University of Florida

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ABSTRACT:

The proposal aims to enhance the capabilities of the Integrated Nuclear Fuel and Structural Materials (INFSM) research center, a partner of Nuclear Science User Facilities (NSUF), at the University of Florida (UF). We will address the needs of nuclear materials community by adding a mechanical testing facility through upgrading MTS 100 kN Landmark Test System for radiological work and expanding existing microstructural characterization capabilities through installing an EDAX electron backscattering diffraction/energy dispersive spectroscopy (EBSD/EDS) unit on the focused ion beam (FIB) tool. In line with DOE-Nuclear Energy (NE) mission, the proposal has the following specific aims:

1. Establish the capability to conduct mechanical testing of neutron irradiated structural materials (including toughness, tension, and compression), and fill the nationally recognized need for additional mechanical testing facilities, which are needed for accelerating the materials selection and qualification.
2. Expand the microstructural characterization by adding a high-resolution EBSD and EDS capabilities to dual beam FIB instrument for use on radioactive materials and make these capabilities available to nuclear materials community.
3. Support the on-going, under-review, and near future nuclear materials research at the University of Florida.
4. Train the next generation of work force for nuclear engineering R&D sector with hands-on experience radioactive materials.

The UF INFSM research center provides a suite of equipment for nuclear materials research and is available to all institutions across the U.S. including but not limited to universities, national laboratories, and industry. Strategic development plan established for UF INFSM is in good agreement with annual NE Research and Development (R&D) capabilities gap analysis study conducted by NSUF. The mechanical testing and related characterization capabilities were identified as needing the upgrade. In line with this plan, INFSM will expand its capabilities to include large scale mechanical testing equipment in addition to existing small scale mechanical testing capabilities. To increase visibility to the nuclear community INFSM's subsidiary facility – Nuclear Fuels and Materials Characterization (NFMC) facility joined NSUF as a partner facility in July 2017. Currently, the equipment at NFMC can accommodate work with radioactive and irradiated materials (300 mR/hr at 30cm), which will be increased in the future when additional engineering and administrative controls are in place. The mechanical testing equipment proposed in this work will be able to accommodate highly radioactive nuclear materials (>1 R/hr at 30cm). Once established, mechanical testing equipment will be made available to user community, pending NSUF review of the capability.