



Microscale PIE Tools for Expanding the Scientific Impact of the MIT Reactor

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ABSTRACT:

We propose to upgrade the Massachusetts Institute of Technology (MIT) Research Reactor (MITR) post-irradiation examination (PIE) facilities to better complement the irradiation capabilities and broaden our role as a Nuclear Science User Facilities (NSUF) partner. Our eventual goal is to enable the MITR to provide full irradiation and sample analysis capabilities, from the start to the end of NSUF projects. Currently, the irradiation capabilities are strong, while the PIE facilities and equipment are in need of expansion. Under this project, a state-of-the-art Flash Differential Scanning Calorimeter (FDSC) will be installed inside the reactor exclusion zone. This, combined with our existing, dedicated SEM/FIB approved for use with highly radioactive materials, will provide for preparation and characterization of activated materials at higher levels than is possible in other locations on the MIT campus. This critical upgrade is a major step in enhancing the ability to support the DOE-NE mission due to, and boost the scientific impact of, the MITR for NSUF and other DOE experiments. No such co-located reactor/calorimeter facility currently exists anywhere in the world to our knowledge.

The requested upgrades will simultaneously improve NSUF partner access to irradiation/PIE capabilities, increase the attractiveness and viability of neutron irradiation experiments at the MITR, and create a uniquely low-student-dose educational opportunity for hands-on research training and teaching of radiation materials science with the combined neutron (MITR) and ion beam irradiation facilities available at MIT. Both research and educational opportunities will be made available to the general scientific community, through a combination of NSUF irradiation proposals through the DOE-NE office, interdepartmental collaborations with MIT faculty & staff, and educational partnerships.