

## Dedicated Infrastructure for In Situ Characterization of Structural Materials

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**Program:** Infrastructure

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### ABSTRACT:

The requested instrumentation described here will provide new in situ capabilities to quantify microstructural changes during elevated temperature annealing and mechanical deformation of hazardous and radioactive materials. Additional goals of this project are to support educational efforts *and* to provide new capabilities to support ongoing DOE Nuclear Energy sustainability and R&D efforts. In situ heating and mechanical deformation experiments of neutron irradiated materials will allow the identification of degradation and recovery pathways, including kinetics, in disordered and defect rich materials. These new capabilities could prove to be revolutionary in uncovering the origins of degradation in numerous nuclear structural materials including metallic and ceramic structures.

The proposed equipment represents a unique capability and will leverage significant existing equipment and expertise at the host and partner institutions and will represent a novel addition to the NSUF suite of characterization tools. The heating and mechanical units will also allow NSUF users to access experiments not currently supported at advanced synchrotron facilities, and thus provide greater access to advanced crystallographic and microstructural tools to the NSUF user community. Moreover, this request represents a set of equipment that will be excellent teaching instruments, with which simple, small-group laboratory sessions can be organized around.