NEUP Nuclear Energy University Program
U.S. Department of Energy

A Customized Creep Frame to Enable High-Throughput Characterization of Creep Mechanism Maps

Applicant Name: Utah State University

Project Director/Principal Investigator: Ryan Berke, Assistant Professor

ABSTRACT:

The goal of this project is to purchase key equipment to strengthen core capabilities in high temperature materials characterization at Utah State University (USU). Specifically, we will purchase a creep testing frame with an environmental chamber that has been modified with windows to support camera-based strain measurements. The equipment will fill a key infrastructure gap that will enhance research closely aligned with, yet complimentary to, DOE and INL programs. The measurements obtained using the equipment will be used to study heterogeneous creep strain accumulation in nuclear materials, with applications geared towards light water reactor sustainability, accident tolerant fuels, and other important materials-related challenges in nuclear science & engineering. The system will also enable the development of novel, high-throughput techniques to characterize creep, able to collect 5 tests worth of strain-vs-time data in the time it would otherwise take to perform just one test.

The PI is uniquely qualified to carry out the project, having been awarded a previous FY15 NEUP Infrastructure grant for an advanced multi-camera system which complements the proposed instrumentation and is potentially the highest-temperature strain measurement capability of its kind. He is also the director of USU's Thermal Hydraulics and Material Properties center (TMP), whose members have leading expertise in nuclear materials research, with current and prior funding through federal nuclear-related programs including VHTR (NGNP), FCR&D, ATR NSUF, NNSA, and NEUP. The equipment will also be instrumental in the PI's current and future NEUP projects, with new proposals beginning as early as next fiscal year.

Nuclear Science and Engineering (NS&E) is a major research thrust area at USU. USU is the nearest doctoral-granting institution in either Mechanical or Aerospace Engineering to INL. Many USU engineering faculty members are active in nuclear energy R&D in materials related topics, and their research will directly benefit from the proposed equipment. The equipment will also attract and train undergraduate and graduate students to NS&E research and training at USU. The equipment from this project will be part of an overall effort establishing a nuclear engineering emphasis area within the mechanical engineering curriculum at USU. The academic department, college, and university all support the endeavor and are committed to support the effort.