# Novel Miniature Creep Tester for Virgin and Neutron Irradiated Clad Alloys with Benchmarked Multiscale Modeling and Simulations

**PI**: K. L. Murty,
NC State University

**Collaborators**: Tasnim Hassam, NC State University
Jacob Eapen, NC State University
Tarik A. Saleh, Los Alamos National Laboratory

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**ABSTRACT:**

Fast and accurate measurements of creep deformation are essential for qualifying new alloys for long term use in current and next generation reactors. The assessment becomes more critical for irradiated samples. To test samples of smaller volumes, miniature test systems are increasingly becoming more attractive. In this project, we will design and develop a novel miniature creep testing system for performing creep tests at multiple scales. The primary objectives of the proposal are:

***(i)*** Collect rapid thermal creep data (1000 to 5000 hours) for two ferritic alloys: FeCrAl and oxide dispersed strengthened (14YWT-NFA1) alloys under uniaxial and biaxial loading conditions across a temperature range of 500ºC to 750ºC,

***(ii)*** Benchmark select data from miniature specimens against data from conventional creep and stress relaxation tests with larger standard specimens,

***(iii)*** Extract deformation mechanisms using an in-situ SEM,

***(iv)*** Perform mesoscale discrete dislocation dynamics (DD) simulations using information derived from microstructure experiments, and

***(v)*** Develop macroscopic constitutive models for predicting long-time creep response.