Development of Multi-Axial Failure Criteria for Nuclear Grade SiCf-SiCm Composites

**PI:** Xinyu Huang,
Department of Mechanical Engineering, Univ. of South Carolina

**Collaborators:** George Jacobsen, General Atomics;
Peng Xu and Yun Long, Westinghouse Electric Corp.

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**ABSTRACT:**
Silicon carbide fiber and silicon carbide matrix (SiCf-SiCm) composites are being considered as highly promising material for accident tolerant fuel cladding and other core structural materials for light water reactors. It is the objective of this program to establish multi-axial failure criteria for nuclear grade SiCf-SiCm composite. This will be achieved by a unique set of testing methods developed at Univ. of South Carolina. The tests place the SiCf-SiCm in various well-controlled uniform multi-axial stress states and measure their responses. Multi-axial failure criteria will be constructed based on these test results and then validated using samples tested under more complex state of stress. Material characterization and finite element modeling at multiple geometric scales will be utilized to help elucidate the complex deformation, progressive damage, and failure behavior of nuclear grade SiCf-SiCm Composites. The validated failure criteria will be incorporated in fuel modeling code of the industrial collaborators to support their accident tolerant fuel development effort.