Engineering Mechanics Institute Conference Minisymposium
Baltimore, Maryland; May 31 – June 3, 2022

MS 216 - Quasibrittle Fracture of Heterogeneous Composites: Modeling and Characterization

Kedar Kirane, Stony Brook University

Marco Salviato, University of Washington

Jialiang Le, University of Minnesota

ABSTRACT

Many modern engineering structures are composed of heterogeneous composite materials, which typically fracture in a quasi-brittle fashion via a variety of multi-scale failure mechanisms. These materials can be man-made such as concrete, fiber composites, nanocomposites, tough ceramics, asphalt binders and mixtures (at low temperatures), or natural, such as rocks, ice, wood, bones. Further, many brittle materials also behave in a quasi-brittle fashion at the micro-scale.

A fundamental understanding of the failure of these heterogeneous materials is of paramount importance for assessing and/or improving the resilience and sustainability of various engineering structures. Some important examples include civil infrastructure, aircraft, ships, military armors, biomedical implants, and MEMS devices. Brittle and quasibrittle fracture mechanisms also play a key role in some large-scale geophysical processes of great societal relevance, such as ice shelf fracture and slow-slip earthquakes.

This MS is intended to provide a forum for researchers to share and discuss the recent advances in modeling and characterization of quasibrittle fracture of heterogenous composites at various length and time scales. Research topics related to micromechanics-based modeling of softening damage, probabilistic modeling, nonlocal and gradient models, phase-field models, high strain-rate behavior, dynamic fracture, fatigue, and advanced multiscale and multiphysics computational modeling are welcome. Novel experimental studies on characterization of brittle and quasibrittle fracture mechanisms and size effects across length-scales are also of great interest.