Deformation and Failure of Amorphous, Glassy Polymers

Sumit Basu
Professor
Department of Mechanical Engineering
Indian Institute of Technology Kanpur

Brief Biographical Sketch

Dr. Sumit Basu is a Professor of Mechanical Engineering at the Indian Institute of Technology Kanpur. He completed his PhD from the Indian Institute of Science Bangalore in 1999. His research focuses on understanding deformation and failure of solids, with an emphasis on computational approaches.

Abstract

Amorphous polymers are technologically significant synthetic materials constituted of very long, microscopically disordered and entangled macromolecules. Though much progress has been made in architecting macromolecules, establishing useful structure-property relationships for these materials--especially those that connect macroscopic mechanical properties to macromolecular architecture--remains challenging. In this talk, I will present a micromechanical perspective on elasto-plastic and fracture behaviour of these materials obtained through continuum and atomistic simulations as well as experiments. It emerges that controlling the entanglement network formed by the macromolecules is key to modulating their mechanical behaviour. It seems that the entanglement network can indeed be tuned in idealised coarse-grained macromolecular systems which, despite their simplicity, can be systematically constructed from detailed architectures.