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FRACTURE IN POLYMERS AND POLYMER COMPOSITES

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ABSTRACT

Fracture of polymers could occur as a result of cavitation expansion. The cavitation and fracture of materials create new surfaces and are intrinsically discontinuous phenomena such that various difficulties arise when applying the classical continuum mechanical framework. To compensate for this, various extensions of continuum mechanics have been proposed and applied in the past decades, e.g., generalized finite element methods, cohesive zone models, phase field methods, and many more. In parallel, non-local continuum approaches such as peridynamics have been developed in recent years to describe fracture together with appropriate coupling strategies to classical continuum mechanics. In addition, links between continuum methods and atomistic as well as molecular descriptions have been introduced and mainly applied to fracture of crystalline materials. These methods have produced profound and promising results, but are not straightforward to be transferred to polymers. There, many further difficulties arise, among others due to their pronounced inelastic and time-dependent behavior as well as their complex structures.

In this invited session, we aim at providing a platform for intensive discussions of recent advances in the computational treatment of fracture and fracture-related behavior of polymers and their composites, which also covers contributions bridging multiple scales. In addition, links to experiments and current as well as future applications should be addressed.