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ADVANCED CONSTITUTIVE MODELS FOR POLYMERS

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ABSTRACT

Advanced constitutive models for polymeric materials, thin films, and interlayers in laminated systems have been developed by research groups for several decades. A key challenge in applying such models in engineering practice is the complex interplay of physical mechanisms governing the mechanical response of polymers under varying stress states, strain rates, and temperature conditions. Furthermore, experimental data often exhibit limited resolution, significant scatter, and strong sensitivity to microstructure, processing conditions, and loading history.

In recent years, non-local and peridynamic constitutive formulations have emerged as promising approaches for modeling deformation, damage, and failure in polymeric materials. At the same time, advances in artificial intelligence (AI) and machine learning are increasingly supporting the development, calibration, and validation of constitutive models.

This session aims to bring together recent developments in constitutive modeling of polymers, with particular focus on inelastic deformation, viscoelasticity, viscoplasticity, and damage evolution. Contributions addressing hybrid physics-machine learning approaches, uncertainty quantification, data-driven model discovery, and experimental-computational integration are especially encouraged.