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SCALE BRIDGING IN MATERIAL FAILURE : FROM MICRO- TO MACRO-SCALE MODELING AND EXPERIMENTATION

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ABSTRACT

In the past few decades, the available computational capacity has increased significantly. This phenomenon has triggered the appearance of novel modeling techniques that can take the material's structure into account. However, despite significant advancements in the field, large-scale simulations are limited and cannot include detailed microstructure. Therefore, various multi-scale homogenization techniques are used in practice.

This symposium focuses on recent advances in all methods bridging spatial and temporal scales in material failure. Both simulations and experiments are welcome, which help to understand macroscopic failure using micro- or mesoscale information.

This includes:

- Unit box methods with various simulation techniques (molecular dynamics, discrete elements, coarse-grained methods), data-driven approaches, machine, and deep learning, computational homogenization schemes.
- Micro-scale experimentation (nano-indentation, micro object testing, etc.).
- Macro-scale methods focusing on failure (micro-scale inspired yield criteria, phase-field models, finite fracture mechanics, TLS, XFEM, cohesive zones).
- Different materials with microstructure (amorphous materials, architected materials, beam structures, materials with different phases, granular materials).
- Various phenomena (localized plasticity, shear banding, crack initiation and propagation, void growth).