MULTISCALE COMPUTATIONAL AND DATA-DRIVEN APPROACH OF ADVANCED MATERIALS AND STRUCTURES

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MINISYMPOSIUM

This minisymposium provides communications and discussions on the recent developments and applications of novel multiscale computational and data-driven approaches for advanced materials and structures at a wide span of spatial and temporal scales.

Recent development and application of multiscale computational approaches have been focusing on the constitutive modeling and more comprehensive description of nonlinear deformation, physical failure, damage evolution, and environmental aging of advanced materials and structures (including nanoscale aggregates, mesoscale structures and segregations, and macroscale laminates). In particular, reactive nature of materials' behaviors is described at extreme scale to establish structure-to-property relationships of materials. On the one hand, the data-driven computational approach provides an innovative paradigm shift in the computational engineering with a rapid growth of the data-driven methodology (including proper orthogonal decomposition, deep learning, and machine learning). The recent achievements of the data-driven computational approach has been successfully showing the possibility to improve the performance of the multiscale computational modeling and simulations.

Topics of interests will be (but not limited to)

- Multiscale modeling and simulations of advanced materials and structures

- Mechanical and environmental degradation of materials and structures (including aging and damage)

- Reactive simulation on durability and stability of multifunctional structures

- Multiphysics constitutive modeling and homogenization of composites

- Reduced-order modeling in multiscale modeling and simulations

- Advanced molecular dynamics simulations (including coarse graining modeling)

- Data-driven multiscale modeling and simulation approach

- Multiscale fracture mechanics modeling of advanced materials and structures