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TOWARDS HIGHLY-EFFICIENT SIMULATIONS OF MULTISCALE MATERIAL BEHAVIOR: METHODS AND APPLICATIONS

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ABSTRACT

The desire for increasingly better material designs and production processes has resulted in a heightened reliance on simulations of multiscale material behavior. However, the challenging nature of multiscale simulations places high demands on numerical methods, particularly with regard to computational efficiency.

This minisymposium focuses on multiscale approaches from the micro- to the macro-scale using continuum mechanics methods. It provides a forum for discussing (1) recent developments in computational methods that aim for the highly efficient solution of multiscale problems in mechanics and materials, and (2) complex problems which require highly efficient techniques for simulating multiscale behavior. The goal of this minisymposium is thus to bring together researchers with a variety of backgrounds to exchange ideas and initiate new lines of research aiming towards achieving optimization and highly-efficient simulation of multiscale material behavior.

In this context, topics of interest include:

- computational methods for simulation of multiscale behavior, particularly those that aim to achieve a high-level of computational efficiency
- model order reduction (e.g., PGD, POD, RB, hyper-reduction, etc.)
- dimension reduction for complex problems, such as nonlinear or stochastic problems

and the use of multiscale simulations in

- design and optimization of material designs or processes
- control of production processes
- parameter estimation
- uncertainty quantification
- inverse problems
- data assimilation
- optimal experimental design.