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MULTISCALE METHODS FOR ADVANCED MANUFACTURED MATERIALS

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MINISYMPOSIUM

Advances in material and component manufacture are accelerating the need for microstructure aware simulation capabilities. Disparity of length scales between material microstructures and engineering components continues to be a challenge — especially for additively manufactured materials. Microstructure heterogeneity at component scale is also a challenge. Relatedly, problems which exhibit a lack of length scale separation are quite common and go beyond microstructures — one example here is 3D printed lattice structures, where representive cell dimensions may be on the order of the structural component. In finite element simulations at component scale, the question of what properties to use, where to use them, and over what length scale, persists. This minisymposium is focused on the development of novel methods to tackle these challenges. While there is a focus on additively manufactured metals, polymer systems are welcome since many strategies may have overlap. Continuum scale mechanical, electrical and thermal properties are of interest.

We seek talks which describe methods of computational data analytics and/or work flows that address these challenges. Methods using FFT, RVE and spatial statistics to characterize length scales and properties for use in finite element simulations are of interest as are methods to translate inhomogeneous texture information from laboratory scale to component scale. We consider methods for identifying relevant length scales, homogenization, machine learning of constitutive models, and analytics applied to laboratory data (such as CT or EBSD) or simulated data; all with a focus towards facilitating component scale simulation reflecting important microstructural aspects.

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