Cutting-Edge Computational Design, Optimization, and Additive Manufacturing of Revolutionary Materials and Structures
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ABSTRACT

The importance of advanced computational models in developing revolutionary materials and structures cannot be overstated, especially in light of the transformative impact of additive manufacturing on the production of intricately detailed, precision-based small-scale features. This technological shift brings forth new design challenges for creating innovative materials and structures. The primary objective of this mini-symposium is to gather researchers from diverse disciplines to facilitate in-depth discussions on state-of-the-art analytical models, numerical tools, and experimental approaches for the design, optimization, characterization, and fabrication of advanced materials and structures. The ultimate goal is to seamlessly integrate materials design and digital manufacturing into a unified workflow, an endeavor of paramount significance for advancing the realms of digital twin technology and Integrated Computational Materials Engineering (ICME) during the fourth industrial revolution.

The potential topics for discussion in this symposium include, but are not limited to:
1. Design, simulation, and optimization of advanced materials:

Acoustic, mechanical, thermal, and electromagnetic metamaterials; Architecture materials; Hierarchical materials; Nano-materials; Soft materials; Bio-inspired materials; Composite materials;

2. Computational methods for materials and structures design:
Stochastic modeling and uncertainties; Isogeometric Analysis; Molecular dynamics; Artificial intelligence / Machine Learning; Homogenization Methods/Inverse Homogenization; Topology optimization; Multiscale algorithms

3. Additive manufacturing simulation and experimental studies related to materials and structures design:
Multi-scale and multi-physics modeling in additive manufacturing; Microstructure and defects analysis; Topology optimization considering manufacturing constraints; Uncertainty quantification and propagation in additive manufacturing; Combined experimental and numerical studies in additive manufacturing; Fracture and fatigue behavior of additively manufactured materials and structures; Machine learning techniques in additive manufacturing

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