

**Advanced Computational Design and Manufacturing Simulation of Novel
Materials and Structures**

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ABSTRACT

Advanced computational methodology provides a very important tool to develop novel materials and structures. At the same time, 3D printing has enabled us to

manufacture very sophisticated small-scale features with ultra-high resolution, which in turn makes the design of advanced materials and structures more demanding. The objective of this mini-symposium is to bring together Research scientists from different disciplines to discuss recent and new computational tools to design, optimise, characterise and fabricate advanced materials and structures, which aims to link materials design and digital manufacturing into a single workflow. This is very significant to advance the technology of Integrated Computational Materials Engineering and digital twin in the fourth industrial revolution.

The potential topics include, but are not limited to:

1. Design, simulation and optimisation of advanced materials
 - Acoustic /Mechanical /Thermal /Electromagnetic Metamaterials
 - Phononic Crystals / Photonic crystals
 - Architecture materials
 - Hierarchical materials
 - Nano-materials
 - Soft materials
 - Bio-inspired materials
 - Composite materials

2. Computational methods related to materials and structures design
 - Stochastic modeling and uncertainties
 - Isogeometric Analysis
 - Molecular dynamics
 - Artificial intelligence /Machine Learning /Deep learning
 - Homogenization Methods/ Inverse Homogenization
 - Topology optimisation
 - Meshfree methods
 - Multiscale algorithm
 - Phase field
 - Boundary element method
 - Extended Finite Element Method
 - First principles

3. Manufacturing Simulation and experiment related to materials and structures design
 - Fluid-structure interaction model in additive manufacturing
 - Microstructure and defects
 - Topology optimisation with manufacturing constraints
 - Uncertain 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 in additive manufacturing
 - Surrogate model for additive-manufactured materials