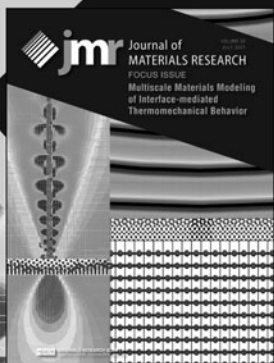




Submission Deadline—December 1, 2020



Multiscale Materials Modeling of Interface-mediated Thermomechanical Behavior

Advanced materials are usually comprised with a high density of interfaces such as grain boundaries (GBs), or phase boundaries (PBs). When exposed to extreme environments (stress, temperature, irradiation, corrosive), the performance of these materials can be largely dictated by dislocation-/twinning-mediated plastic flow, phase transformation (PT), phonon transport, and their reactions with the GBs or PBs. However, to date, a clear understanding on how such reactions control the materials' microstructure evolution and, in turn, their overall performance, is still lacking. It remains challenging to use single-scale techniques to simultaneously resolve the dislocation, twinning, PT, and phonon activation at the atomic scale together with the subsequent interface structure changes (fracture or damage) at the mesoscopic level.

To meet this challenge, this Focus Issue provides a forum for discussing recent developments in computational/experimental techniques and their applications to understand the heterogeneous materials' mechanical and transport behavior across a broad range of length scales. The knowledge gained may be used to support the development of new materials with desired strength, ductility, toughness, thermal-/corrosion-/irradiation-resistance, and even a combination of these resistances.

Contributing papers are solicited in the following areas:

- ♦ Atomic/meso/macro/multi-scale material modeling theories, methodologies, and algorithms
- ♦ Atomic/meso/macro/multi-scale experimental techniques for microstructure characterization
- ♦ Computer simulations of dislocations, twinning, PT, phonons, and their interactions with interfaces
- ♦ Experimental analysis of plasticity, thermal transport, failure, and damage in heterogeneous materials

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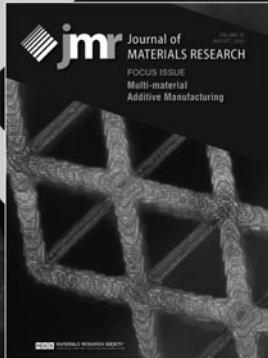
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CALL FOR PAPERS

Submission Deadline—January 8, 2021



Multi-material Additive Manufacturing

Additive Manufacturing has seen rapid growth in industrial, healthcare and defense applications. However, the lack of processable materials has stymied its further adoption. Most additive manufacturing approaches deal with single, homogenous materials, including plastics, metals and ceramics. Moving beyond homogenous materials, adding multi-materials, gradient, functional/responsive materials, and materials with heterogenous and graded properties is compelling. Expanding the material pallets and assembling of a variety of different materials may open up a new paradigm in product design, prototyping and manufacturing, significantly reducing the design-to-product cycle. Multi-material additive manufacturing is one enabler for 4D printing through the printing of tunable, responsive materials. It may also enable new materials, products and engineered systems with unprecedented functionalities and properties.

New challenges and opportunities arise in multi-material additive manufacturing, which calls for new research in the science of new additive manufacturing processes, material design and characterizations, computational design and optimization methodologies needed to advance the state of art of realizing multi-functional products composed of multiple- and stimuli-responsive materials.

Topics addressed in this focus issue will include (but not be limited to):

- ◆ Multi-material additive manufacturing processes and apparatus
- ◆ Hybrid Manufacturing
- ◆ 4D printing of responsive materials
- ◆ Mechanics and characterizations of dissimilar material interface and joining
- ◆ Multi-material topology optimizations and design automation methodologies for multi-material components
- ◆ Multi-material architected materials and metamaterials
- ◆ 3D printed soft robotics and responsive materials
- ◆ 4D printed structures, products and systems

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