Journal of MATERIALS RESEARCH
FOCUS ISSUE · JULY 2019

Submission Deadline—December 1, 2018

CALL FOR PAPERS

Intrinsic and extrinsic size effects in materials

Size effects in materials due to both microstructural (intrinsic) and dimensional (extrinsic) constraints are actively pursued by researchers in all areas of materials science. Collectively these two types of size effects, along with the chemical composition, govern a variety of properties of materials. While much insight has been provided into the origins of these length-dependent materials properties, debates within the materials science community are ongoing. For example, the well-known Hall-Petch effect that a polycrystal with a smaller average grain size is stronger may be rationalized by the dislocation pile-up model, the grain boundary ledge model, or the geometrically necessary dislocation model, among others. Another example is the diameter dependence of yield/flow in micro and nanopillars, whose mechanism may significantly vary in different materials. Moreover, advancing knowledge of the combined intrinsic and extrinsic size effects can open up new avenues for designing materials with superior properties.

This *JMR* Focus Issue will cover advances in exploring intrinsic and extrinsic size effects in all types of materials by theories, experiments, simulations, and modeling. Material systems will range from metallic, porous, granular, polymeric, and amorphous materials, with relevant size scales from microns to the nanoscale. Properties under investigation will be diverse, as well, from mechanical, electrical, optical, acoustic, to thermal properties. Review and original research articles concerning interactions between intrinsic and extrinsic size effects in materials as well as size dependence of multiphysics phenomena are encouraged.

Manuscripts are solicited in the following areas:

- Discoveries of new size effects in materials
- New theories and models to rationalize, explain, and predict size effects in materials
- Novel experimental and modeling techniques that enable exploration of materials across length scales
- Applications of the size effects to designing materials with unprecedented properties

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MANUSCRIPT SUBMISSION

To be considered for this issue, new and previously unpublished results significant to the development of this field should be presented. The manuscripts must be submitted via the *JMR* electronic submission system by **December 1, 2018.** Manuscripts submitted after this deadline will not be considered for the issue due to time constraints on the review process. Please select "Focus issue: *Intrinsic and extrinsic size effects in materials*" as the manuscript type. **Note our manuscript submission minimum length of 3250 words, excluding figures, captions, and references, with at least 6 and no more than 10 figures and tables combined. Review articles may be longer but must be pre-approved by proposal to the Guest Editors via jmr@mrs.org. The proposal form and author instructions may be found at www.mrs.org/jmr-instructions.** All manuscripts will be reviewed in a normal but expedited fashion. Papers submitted by the deadline and subsequently accepted will be published in the Focus Issue. Other manuscripts that are acceptable but cannot be included in the issue will be scheduled for publication in a subsequent issue of *JMR*.

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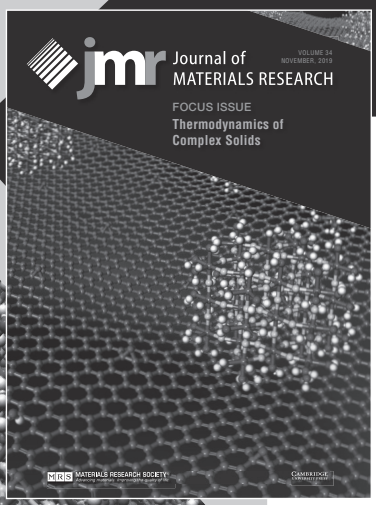
Journal of MATERIALS RESEARCH
FOCUS ISSUE · NOVEMBER 2019

Submission Deadline—April 1, 2019



CALL FOR PAPERS

Thermodynamics of Complex Solids

Thermodynamics forms the fundamental underpinning of reactivity, transformation, and stability, which places controls on processes such as synthesis, corrosion and degradation, environmental transport, catalysis, and biological reactivity. Rapid developments in industry have resulted in an increasing need to develop and study the properties of improved and new materials, and for better ways to understand a series of phenomena and process failure on a large scale.

Substantial improvements in the range, accuracy, and convenience of thermal analysis equipment, the development of a commercial calorimeter, and the ability to make accurate cryogenic heat capacity measurements, have renewed interest for thermodynamic measurements. Developments in experimental thermochemistry are paralleled by rapid progress in computational methods, integrating calculations based on density functional theory (DFT) and new molecular dynamics simulation methods for characterizing energy and free energy landscapes. There are strategies for coupling DFT results and experimental data within the framework of free energy modeling of phase diagrams and thermochemistry in complex multicomponent systems (e.g., the CalPhaD approach).

This Focus Issue will bring together experimentalists in thermodynamics and their interactions with a wider circle of computational and structural scientists to understand the fundamental science of complex materials, and apply this understanding to a rich variety of scientific and technological problems.

Manuscripts are solicited in the following areas:

- Catalysts
- Functional materials
- Soft and hybrid materials
- High temperature refractories
- Environmental and geological materials

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FOCUS ISSUE · OCTOBER 2019

Submission Deadline—March 1, 2019

CALL FOR PAPERS

Building Hierarchical Materials via Particle Aggregation

Hierarchical materials have attracted increasing attention due to their unique physical and chemical properties, which strongly depend on their morphologies and size. Particle aggregation is an important methodology to synthesize hierarchical materials of complex regular architectures. To date, numerous hierarchical materials have been built by particle aggregation, including metals, alloys, metal oxides, metal sulfides, carbonates, organic clusters, and others, and applied in fields such as energy conversion, energy storage, catalysis, optics, water purification, CO2 sequestration, and many more.

Unlike either a classical crystal growth pathway via monomer-by-monomer addition or Ostwald ripening where larger crystals are grown at the expense of smaller through dissolution and reprecipitation, crystal growth through particle aggregation is particle-by-particle addition to form larger crystals. In addition, self-assembly of nanoparticles or organic clusters can be used to build hierarchical materials. For instance, advanced luminescent materials have been prepared by aggregation-induced emission (AIE) of intrinsically non-emissive organic clusters. One of the fundamental challenges facing this fast growing field is the fundamental understanding of the process that involves interaction of particles in a growing media and the resulting response dynamics.

This *JMR* Focus Issue will provide a platform for interdisciplinary researchers from physics, chemistry, geology, biology, engineering, and materials science to share their approaches to understanding and controlling particle-based mechanisms of hierarchical material formation and design to synthesize novel hierarchical materials.

Contributing papers are solicited in the following areas:

- Building hierarchical materials (such as 1 D wires, 2 D plates, and 3 D networks) by oriented attachments
- Self-assembly of hierarchical materials, such as nanoparticle superlattices, nano-flowers, and branched nanocrystals
- Colloidal interactions and crystallization
- Particle aggregation-induced emission (AIE)
- Crystallization through particle-based assembly in biomolecular systems
- Interfacial structure between particle surfaces
- Morphologies and size controlled synthesis of hierarchical materials
- Mechanism study of growth of hierarchical materials via particle aggregation
- Modeling of particle aggregation
- Applications of hierarchical materials prepared via particle-based crystallization and self-assembly in areas including, but not limited to, catalysis, energy storage, solar cells, microelectronics, and optical devices

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The Society's interdisciplinary approach to the exchange of technical information is qualitatively different from that provided by single-discipline professional societies because it promotes technical exchange across the various fields of science affecting materials development. MRS sponsors two major international annual meetings encompassing many topical symposia, as well as numerous single-topic scientific meetings each year. It recognizes professional and technical excellence, conducts tutorials, and fosters technical exchange in various local geographical regions through Section activities and Student Chapters on university campuses.

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