

Submission Deadline—December 1, 2018



## 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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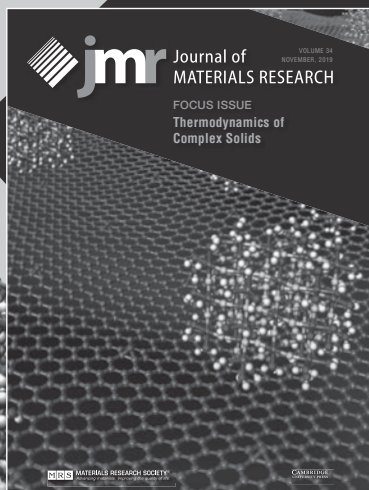
### MANUSCRIPT SUBMISSION

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](mailto:jmr@mrs.org). The proposal form and author instructions may be found at [www.mrs.org/jmr-instructions](http://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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Submission Deadline—April 1, 2019



## 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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Submission Deadline—June 1, 2019



## Early Career Scholars in Materials Science 2020

The Fifth Annual *JMR* Issue to promote outstanding research by future leaders in materials science

*JMR* invites research and review articles by materials researchers who have completed their Ph.D but not yet achieved full professorship, or equivalent position in non-academic organizations, at the time of submission, for peer review and publication in this special issue. The Annual Issue provides a unique opportunity to be highlighted and promoted early in one's research career. To increase attention, the issue will be published on an **open access** basis. Although papers may have multiple authors, only the Early Career Scholar submitting the paper will be identified with a photo and brief bio on publication.

*JMR* publishes the latest advances about the creation of new materials and materials with novel functionalities, fundamental understanding of processes that control the response of materials, and development of materials with significant performance improvements relative to state-of-the-art materials. *JMR* welcomes papers that highlight novel processing techniques, the application and development of new analytical tools, and interpretation of fundamental materials science to achieve enhanced materials properties and uses.

- ◆ Novel materials discovery
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**Papers must be accompanied by a photo (uploaded as a high resolution TIF or EPS file) and 200-300 word bio of the Early Career Scholar only.** (Bios should NOT include reference to one's publication record nor rationalization of the research area or paper submitted.) These materials must be submitted along with the original submission of the paper.

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