Journal of
MATERIALS RESEARCH
FOCUS ISSUE · APRIL 2019

Submission Deadline—September 1, 2018

CALL FOR PAPERS

Interconnects and Interfaces in Energy Conversion Materials

One major roadblock to the wide-scale commercialization of state-of-the-art energy materials (e.g., SOFC, high-temperature PV, and high-temperature thermoelectrics) is the great difficulty involved with interfacing these materials with electrical interconnects in a way that results in low parasitic electrical losses and low degradation rates. Many of these materials consist of reactive and sometimes volatile elements from the chalcogen (including oxygen), pnictogen, and halogen groups, which tend to react strongly with metallic interconnect and interface materials that are usually desired for low Ohmic losses at the device level.

This *JMR* Focus Issue will cover advances in the synthesis, processing, and performance of both conventional alloys and unconventional compounds designed for use as electrical interconnects and interfacing materials for these high-temperature energy conversion technologies. Special attention may be given to work relating to experimental and theoretical assessment of the reaction and diffusion kinetics of these interface materials and the volatile, reactive species of energy materials.

Manuscripts are solicited in the following areas:

- Development and performance of *in-situ*-formed diffusion barriers
- Modeling of high-temperature interface evolution (kinetics and properties evolution)
- Reaction kinetics of volatile “p-block” elements with transition metals and alloys
- Mechanical properties of interconnect-energy material interfaces
- Interface degradation mechanisms and mitigation
- Characterization and improvement of electrical and thermal contact/interface resistance

GUEST EDITORS

Tim C. Holgate, Teledyne Energy Systems, Inc., USA
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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To be considered for this issue, new and previously unpublished results significant to the development of this field should be presented.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 **September 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: *Interconnects and Interfaces in Energy Conversion 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 must be pre-approved by proposal to Guest Editors above. 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*.

jmr@mrs.org
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FOCUS ISSUE • MARCH 2019

Submission Deadline—August 1, 2018

CALL FOR PAPERS

Nanocrystalline High Entropy Materials: Processing Challenges and Properties

High entropy material (HEMs) as a materials science research field has matured in recent years. HEMs include multicomponent and multiprinciple metallic alloys and entropy stabilized multicomponent oxides and borides. The inherent nature of the process of preparing nanostructured HEMs via the liquid state route is extremely difficult. Solid state processing methods, mechanical alloying followed by sintering and severe plastic deformation, are more attractive for obtaining nanostructured HEMs in the bulk form. However, the processing of these materials possesses many challenges. The properties of the bulk materials strongly depend on the microstructural length scale; thus, retaining nano-sized grains is required by inhibiting grain growth during processing. Powder metallurgical processing using advanced sintering techniques is considered an apt approach to obtain nanostructured HEMs and composites, but it opens up many challenges of incorporation of a variety of second phase particles such as soft dispersoids, oxides, harder particles, etc. Likewise, the processing methodology involving severe plastic deformation using high pressure torsion requires an understanding of the deformation behavior of HEMs at very high strain and strain rates. In order to take stock of the advancement on processing and properties of nanostructured HEMs, this Focus Issue will provide the researchers in this rapidly advancing field the present status and future directions.

Contributing papers are solicited in the following areas:

- Processing challenges using P/M methods
- Bulk nanostructured HEAs by high pressure torsion
- Nanostructured high entropy composite produced by high-pressure torsion
- Severe plastic deformation induced multiphase high entropy alloys
- Microstructure and mechanical properties of nanocrystalline HEAs
- Low density nanocrystalline high entropy alloys
- Nanostructured entropy stabilized oxides and borides and their properties
- Nanostructured high entropy alloy coatings

GUEST EDITORS

Krishanu Biswas, Indian Institute of Technology Kanpur, INDIA
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FOCUS ISSUE · MAY 2019

Submission Deadline—October 1, 2018

CALL FOR PAPERS

Plasticity and Fracture at the Nanoscales – Advances in *In Situ* Experimentation Techniques Enabling Novel and Extreme Materials/Nanocomposite Design

Plasticity and fracture of materials at the nanoscales can deviate significantly from the same phenomena in bulk properties, which may have important implications if the materials are to be used in real world engineering systems. Nanoscale materials and composites have been known to have important effects related to size, but today many other emerging materials – due to or enabled by novel manufacturing routes – combine nanoscale effects with 3D microarchitecturing to approach extreme limits of materials properties.

This Focus Issue will look at recent advances in the in situ experimentation of plasticity and fracture, especially those that enable the development and design of materials and nanocomposites with enhanced mechanical properties reaching or approaching the extreme limits of materials properties. All fundamental studies on mechanical properties of nanoscale/extreme materials and nanocomposites including *ex situ* and *in situ* SEM/TEM, synchrotron X-ray experiments, as well as modeling and simulations on relevant length scales will be addressed. Nanomaterials/nanocomposites of interest include metals, ceramics, polymers, amorphous materials and their derivatives containing carbon-based materials.

This JMR Focus Issue will provide readers up-to-date information on the impact of these recent experimentation capabilities – the ability to observe directly how plasticity and fracture events interact with microstructures at the nanoscale – and how it could affect and enable novel and extreme materials and nanocomposite design.

Contributing papers are solicited in the following areas:

- *In situ* SEM/TEM analysis of deformation behavior
- *In situ* synchrotron-based experimentation work focusing on deformation behavior
- Other *in situ* experimentation techniques (Raman, EBSD, etc.)
- Effects of interfaces on the mechanical properties of metal-matrix nanocomposites
- Deformation and fracture mechanisms of metals, ceramics, crystalline-amorphous composites
- Graphene or CNT containing composites for high strength applications
- Nanocomposites based on lightweight metals, such as Magnesium
- Hierarchical biocomposite and its fracture/deformation mechanisms
- Fabrication and analysis of 3D or 4D nanocomposites
- Simulation and modeling of mechanical behavior

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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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