jmr Journal of MATERIALS RESEARCH
FOCUS ISSUE · JUNE 2018

Submission Deadline—November 1, 2017

CALL FOR PAPERS

Wide Energy Gap Semiconductors: Material Issues and Device Implications

Wide energy gap semiconductors, as distinct from their more conventional counterparts, silicon and gallium arsenide, offer considerable promise for novel electronic and optoelectronic device applications. Due to their higher polar optical phonon energies, the saturation electron drift velocities exhibited by these materials tend to be higher. In addition, the dielectric constants, both static and high-frequency, associated with the wider energy gap semiconductors tend to be smaller than with conventional semiconductors. These factors favor improved electron device performance. Another benefit is their great tolerance to high applied electric field strengths, the breakdown field of a semiconductor material increasing with the magnitude of its energy gap. The high thermal conductivities and resistance to radiation offered by some of these materials further contribute to their appeal.

The past three decades have seen numerous developments in the wide energy gap semiconductor field, both at the materials level and in the range of device applications now offered. This Focus Issue will present results corresponding to both traditional wide energy gap semiconductors, and some of more recent interest. An emphasis will be placed on the material properties of these semiconductors, and the role that such properties play in defining the range of device applications possible. The range of materials considered will include, but is not limited to, silicon carbide and its polytypes, the III-V nitrides, oxide-based semiconductors, and some more recently developed wide energy gap semiconductor materials.

Contributed articles are sought in the following areas:

- Advances in the growth of the wide energy gap semiconductors
- Developments in the processing of the wide energy gap semiconductors
- New device applications possible as a result of the distinct material properties associated with newer wide energy gap semiconductors
- Material properties and how they are distinct from their more conventional counterparts
- Brief overviews of developments in the field over the past three decades
- Brief perspectives on future opportunities for the wide energy gap semiconductors

GUEST EDITORS

Stephen K. O'Leary, The University of British Columbia, Canada
Michael S. Shur, Rensselaer Polytechnic Institute, USA

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 **November 1, 2017.** Manuscripts submitted after this deadline will not be considered for the issue due to time constraints on the review process. Please select "Focus issue: *Wide Energy Gap Semiconductors: Material Issues and Device Implications"* as the manuscript type. **Note our manuscript submission minimum length of 6000 words, with a maximum of 6-8 figures. Review articles must be pre-approved by proposal to the Editor-in-Chief. 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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jmr Journal of MATERIALS RESEARCH
FOCUS ISSUE • JULY 2018

Submission Deadline—December 1, 2017

CALL FOR PAPERS

Stabilization of Organic Electronic Materials and Devices

The unique properties of organic semiconductors grant unrivaled potential for highly efficient, low-cost, and sustainable optoelectronic applications, e.g., in light and power generation, sensor technology, and electronic circuitry. Semiconducting polymers and small molecules can be scaled up to satisfy industrial needs and be processed onto plastic substrates using high throughput technologies. This makes a technological and economic breakthrough in the near future possible.

Despite the widespread potential, organic electronics face important challenges. A critical factor in the overall cost assessment is the lifetime of a final product. The current generation of organic electronics offers limited stability and need to be encapsulated using costly barrier materials. A fundamental understanding of the processes governing performance decay paired with innovative material approaches is essential for enhancing the longevity of organic optoelectronic devices and thus guaranteeing market readiness. This Focus Issue will address both mechanistic aspects that determine the lifetime of materials and devices as well as future strategies with practical relevance for increasing the lifespan and reliability of organic electronics.

Contributed articles are sought in the following areas:

- Fundamental degradation mechanisms in active materials and finished devices (photophysical and spectroscopic studies)
- Novel material concepts leading to enhanced intrinsic material stability (materials design, predictive simulations, materials synthesis, etc.)
- Extrinsic material concepts for stabilizing organic electronics materials (stabilizing additives, optimal microstructure, crystallinity, etc.)
- Realization of stabilization approaches in device structures with practical relevance

GUEST EDITORS

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jmr Journal of MATERIALS RESEARCH
FOCUS ISSUE • AUGUST 2018

Submission Deadline—January 1, 2018

CALL FOR PAPERS

Soft Magnetic Materials:
Synthesis, Characterization, and Applications

A push for greater efficiency and decreased size in power electronics and electrical machines demands higher performing soft magnetic materials. In order to be competitive, advanced soft magnetic materials must be affordable and their production volume needs to meet the anticipated demand. This drive for higher efficiency and diminished size, weight, and power (SWaP) is fueled in part by the development and adoption of wide bandgap (WBG) semiconductors. WBG devices enable very fast switching (1 kHz to as high as 10 MHz), high voltage operation, and high temperature operation in both power electronics and electrical machine drives. Researchers in the field of soft magnetics must rise to this challenge and create soft magnetic materials with high magnetic flux densities and low electrical losses, while also improving the theoretical assessment of magnetic behavior and energy losses, at these elevated switching frequencies.

This JMR Focus Issue will include the latest research on soft magnetic materials for next-generation power electronics, as well as in electrical machines, and coverage of advanced characterization techniques that will be vital to understanding both the nanostructure and dynamical properties in soft magnetic materials. This behavior of soft magnets on small length and short time scales will ultimately govern their behavior in inductors, transformers, motors, and generators.

Contributed articles are sought in the following areas:

- New bulk and composite soft magnetic materials
- Developments in the synthesis and fabrication of soft magnetic materials
- Advanced characterization techniques relevant to soft magnets
- Implementation of soft magnetic materials in power electronics and electrical machines
- Modeling and simulation of soft magnetic materials
- Overviews of the field of soft magnetic materials
- Perspectives on future opportunities in the field of soft magnetics

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https://doi.org/10.1557/jmr.2017.406 Published online by Cambridge University Press

jmr Journal of MATERIALS RESEARCH
FOCUS ISSUE · SEPTEMBER 2018

Submission Deadline—February 1, 2018

CALL FOR PAPERS

Interconnect and Interface Materials for High-Temperature Energy Conversion Technologies

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

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Neil Dasgupta, University of Michigan, USA

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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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jmr Journal of MATERIALS RESEARCH

A publication of the MRS MATERIALS RESEARCH SOCIETY
Advancing materials. Improving the quality of life.

Periodical Rate Postage Paid at New York, NY
and Additional Mailing Offices

Postmaster—Send change of address notice to:

Cambridge University Press
One Liberty Plaza, 20th Floor,
New York, NY 10006

ISSN: 0884-2914