Journal of MATERIALS RESEARCH
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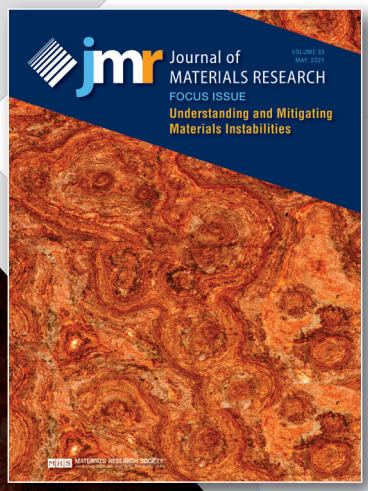
Submission Deadline—October 1, 2020



CALL FOR PAPERS

Understanding and Mitigating Materials Instabilities

Materials stability in the nonequilibrium environment of an electrochemical energy storage system is a critical issue for device operation and reliability. The shelf life of primary and rechargeable cell chemistries, together with the cycle life of rechargeable systems, are specifically dependent on the mechanical, crystallographic, morphological, and chemical stability of the electrodes and the separators. The acceleration of research and development activities into new battery chemistries to safely increase energy densities and operational lifetime has emphasized the need to understand the root cause of cell degradation over time and use. Examples of recent active research fronts include the chemical and crystallographic stability of lithium-nickel oxide electrode materials, the mechanical stability of lithium-silicon negative electrode materials, the chemical and mechanical stability of the solid electrolyte interface (SEI) layer, and the morphological stability of both metallic sodium and lithium, particularly with respect to dendrites and failure of the associated separator/electrolyte. This Focus Issue will highlight approaches to understanding and solving materials instability problems in battery systems utilizing characterization, modeling, or materials design.

Contributing manuscripts will be solicited in relation to chemical and structural instabilities and/or stabilization strategies for storage and electrochemical cycling of electrode materials. The expected areas of research are:

- Electrode phase stability, and stabilization during storage and cycling
- Electrode defect formation and structural degradation during cycling and remediation approaches
- SEI formation, stability and control methodologies
- Solid (ceramic or polymer) electrolyte material structural and chemical stability
- Characterization and control strategies for electrode-solid electrolyte interface interactions

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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To be considered for this issue, new and previously unpublished results significant to the development of this field should be presented.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 October 1, 2020. Manuscripts submitted after this deadline will not be considered for the issue due to time constraints on the review process. Please select *"Focus Issue: Materials Instabilities Limiting Performance of Electrochemical Systems"* as the Focus Issue designation. **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 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

Please direct questions to jmr@mrs.org

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MRS JOURNAL HIGHLIGHTS

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Heterogeneous deformation of two-dimensional materials for emerging functionalities

Jin Myung Kim, Chullhee Cho, Ezekiel Y. Hsieh, SungWoo Nam

The authors review mechanical characteristics, uncontrolled inherent deformation and extrinsic heterogeneity, and experimental strategies for controlled heterogeneous deformation of 2D materials, in addition to 3D structure-induced novel functionalities via crumple/wrinkle, or Kirigami, structures, and heterogeneous strain-induced functionalities in exciton and phase engineering. They also present programmable and controlled spatial tunability of 2D material interactions with photons, electrons, and molecules for electronic, optical, and optoelectronic applications. doi.org/10.1557/jmr.2020.34

Manufacturing strategies for wafer-scale two-dimensional transition metal dichalcogenide heterolayers

Mengjing Wang, Hao Li, Tae-Jun Ko, Mashiyat Sumaiya Shawkat, Emmanuel Okogbue, Changhyeon Yoo, Sang Sub Han, Md Ashraful Islam, Kyu Hwan Oh, Yeonwoong Jung

The authors review progress in manufacturing strategies for, and scientific working principles of, 2D TMD (transition metal dichalcogenide) heterolayers, material properties, and wafer-scale device applications. TMD semiconductors are highly promising because of their large mechanical resilience coupled with superior transport properties plus van der Waals attraction-enabled assembly. They discuss remaining challenges and prospects for improving quality of 2D TMD heterolayers in both material and manufacturing. doi.org/10.1557/jmr.2020.27

In situ measurement of bulk modulus and yield response of glassy thin films via confined layer compression

Owen Brazil, Johann P. de Silva, Mithun Chowdhury, Heedong Yoon, Gregory B. McKenna, Warren C. Oliver, Jason Kilpatrick, John B. Pethica, Graham L.W. Cross

A novel means to measure thin-film mechanical properties based on flat punch indentation of a supported film with punch diameter many times the initial film thickness allows direct access to the intrinsic stress versus strain response and measurement of elastic modulus, bulk modulus, Poisson's ratio, and yield stress in a single loading curve. The authors demonstrate confined plastic yield for 170–470 nm thick polystyrene (PS), polymethyl-methacrylate, and amorphous selenium films on silicon, and the PS yield stress above Tg. doi.org/10.1557/jmr.2020.42

High temperature organic electronics

Aristide Gumyusenge, Jianguo Mei

The authors address recent developments in organic semiconducting materials that can function at elevated temperatures using blends of semiconducting polymers with a thermally robust insulating matrix to form nanocomposites. doi.org/10.1557/adv.2020.31

Comparison of neutral and charged polyelectrolyte bottlebrush polymers in dilute salt-free conditions

Alexandros Chremos, Ferenc Horkay

A comparison between molecular dynamics simulations and small-angle neutron scattering (SANS) experimental studies of two conditions of polymeric structures demonstrates the importance of charges on the polymer. Charged structures have a significantly larger radius of gyration than the neutral species. doi.org/10.1557/adv.2020.9

Showerhead-assisted chemical vapor deposition of perovskite films for solar cell application

S. Sanders, D. Stümmler, J.D. Gerber, J.H. Seidel, G. Simkus, M. Heuken, A. Vescan, H. Kalisch

The authors describe a processing tool that allows for large-area deposition of thin films for solar cell applications that, by controlling the gas-phase chemistry, provide phase pure iodide films. doi.org/10.1557/adv.2020.126

Effect of production and curing conditions on the performance of stabilized compressed earth blocks: Kaolinite vs quartz-rich earthen material

Philbert Nshimiyimana, Hassan Seini Moussa, Adamah Messan, Luc Courard, *African MRS*

Construction materials using locally sourced materials provide a path to increased sustainability within emerging economies. The authors assess the properties of one such masonry material and compare the processing variables needed to provide suitable performance (and compressive strength properties) for a building application. doi.org/10.1557/adv.2020.155

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