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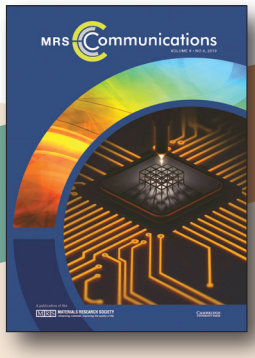

The growing field of materials informatics: Databases and artificial intelligence

Alejandro Lopez-Bezanilla, Peter B. Littlewood

Data and metadata for materials science archives are becoming a valuable resource not only for data mining and artificial intelligence (AI) but as a platform for discovery. Together with new computational methods and simulation, the ability to predict structure–composition–property relationships has never been better.
doi.org/10.1557/mrc.2020.2

Flexible, stretchable, conformal electronics, and smart textiles: Environmental life-cycle considerations for emerging applications

Karsten Schischke, Nils F. Nissen, Martin Schneider-Ramelow

Flexible materials and electronics are a driving force to putting sensing and monitoring at the heart of physical activity and the environment. The ability to develop new wearable electronics for society will rely on the development of new materials and signal-digital interfacing with sensory capabilities.
doi.org/10.1557/mrc.2019.157

Response of neuroglia to hypoxia-induced oxidative stress using enzymatically cross-linked hydrogels

Samantha G. Zambuto, Julio F. Serrano, Avery C. Vilbert, Yi Lu, Brendan A.C. Harley, Sara Pedron

The platform for investigating disease markers and physiological conditions closer to *in vivo* conditions relies on soft materials such as hydrogels. The oxidative stresses in animal models can be better quantitatively measured using these types of materials-design platforms. doi.org/10.1557/mrc.2019.159

Rare earths: A review of the landscape

Rajive Ganguli, Douglas R. Cook

Rare earths are critical components to many technologies that drive the modern world. Can recycling and substitution make a dent in the demand for rare-earth elements (REEs) in the near future? Though present in most parts of the world, they are produced mostly in China. The authors review various aspects of rare earths, including extraction, geopolitics, and challenges. doi.org/10.1557/mre.2018.7

High-voltage applications of the triboelectric nanogenerator—Opportunities brought by the unique energy technology

Jiaqi Wang, Yunlong Zi, Shuyao Li, Xiangyu Chen

Self-powered smart systems utilizing the high voltages generated by triboelectric nanogenerators (TENGs) have been developed since 2012 for high-efficiency mechanical energy harvesting from the ambient environment. In this review, the authors highlight several featured applications, including electrospray, optical devices, microplasma, and microfluidic. doi.org/10.1557/mre.2020.2

Environment versus sustainable energy: The case of lead halide perovskite-based solar cells

Aslihan Babayigit, Hans-Gerd Boyen, Bert Conings

Lead halide perovskites have brought a paradigm shift in state-of-the-art photovoltaic technology since 2013, and have gained tremendous momentum ever since. Given their seemingly imminent commercialization, rigorous scrutiny regarding their potential environmental impact is becoming increasingly relevant. This review focuses on creating awareness and caution toward lead halide perovskite commercialization while concurrently pointing out considerations and ambiguity in policies and regulations.
doi.org/10.1557/mre.2017.17

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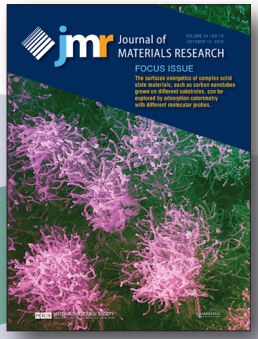

Selective-area growth and transport properties of MnAs/InAs heterojunction nanowires

Shinjiro Hara, Matthias T. Elm, Peter J. Klar

The authors present the selective-area growth of vertical MnAs/InAs heterojunction nanowire (NW) arrays. MnAs nanoclusters (NCs) orient with ⟨0001⟩ parallel to the ⟨111⟩ InAs host NWs. InAs host NWs have a large positive ordinary magnetoresistance (MR) effect between 7 and 280 K. Single MnAs/InAs heterojunction NWs exhibit only a negative MR effect.

doi.org/10.1557/jmr.2019.333

General strategy for doping rare-earth metals into Au–ZnO core–shell nanospheres

René Zeto, Daniel Cummins, Arynn Gallegos, Mike Shao, Andrea M. Armani

A method for doping the shell of Au–ZnO nanospheres with Cu, Ce, Er, Nd, Tm, and Yb is presented. The ZnO shell is nucleated on the gold nanosphere core via an ascorbic acid–assisted growth, and the dopant is intercalated uniformly into the shell. This multi-material synthesis strategy opens the door for applications in sensing, photocatalysis, and bioimaging.

doi.org/10.1557/jmr.2019.352

Scale-dependent pop-ins in nanoindentation and scale-free plastic fluctuations in microcompression

John Shimanek, Quentin Rizzardi, Gregory Sparks, Peter M. Derlet, Robert Maaß

Nanoindentation and microcrystal deformation exhibit fundamentally different event-size statistics obtained from plastic instabilities. Nanoindentation results in scale-dependent intermittent microplasticity as described by Weibull statistics (stress and magnitude of the first pop-in) and log normal statistics (magnitude of higher-order pop-ins). Finite-volume microcrystal deformation of the same material exhibits microplastic event-size intermittency of truncated power-law type even when the same plastic volume is probed.

doi.org/10.1557/jmr.2019.386

Recent advances and demonstrated potentials for clean hydrogen via overall solar water splitting

Faqrul A. Chowdhury

In this snapshot review, the author addresses chemical and structure/morphology issues in materials developed for splitting hydrogen and oxygen from water using solar energy as a method of generating hydrogen gas. Specific structures (from nanoparticles to textured films) are noted and the implications for engineering applications of these forms of materials are addressed. doi.org/10.1557/adv.2019.444

The discharge mechanism for solid-state lithium-sulfur batteries

Erika Nagai, Timothy S. Arthur, Patrick Bonnick, Koji Suto, John Muldoon

This research group at Toyota provides examples of the mechanisms for discharge in Li_3PS_4 in the presence of carbon fiber and sulfur/carbon fiber composites. Chemical changes identified with a range of spectroscopy tools were used to note additional capacity over sulfur alone due to the active solid electrolyte, and issues regarding lithium dendrite growth are noted for future study.

doi.org/10.1557/adv.2019.255

Inhibition of BMP9 induced bone formation by salicylic-acid polymer capping

Timothy M. Acri, Noah Z. Laird, Liu Hong, Jaidev L. Chakka, Kyungsup Shin, Satheesh Elangovan, Aliasger K. Salem

Bone tissue engineering wrestles with the need for enhancing bone growth in specific locations and at certain times in a patient in the appropriate amount. Here the authors address using a polymer containing salicylic acid (SA) to regulate bone formation, balancing the formation of the bone morphogenetic protein with the slowing ability of SA. Material morphologies are characterized, and cell growth histology related to the process conditions is addressed.

doi.org/10.1557/adv.2020.61

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