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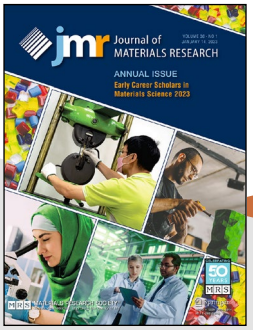

Review on magnetocaloric high-entropy alloys: Design and analysis methods

Jia Yan Law, Victorino Franco

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The authors focus on magnetocaloric high-entropy alloys (HEAs), the design approaches, and the appropriate analysis methods for their performance. They highlight the efficient strategic search within the vast HEA space, which has been instrumental for significantly enhancing magnetocaloric effect performance, closing the preexisting gap between magnetocaloric HEAs and high-performance conventional magnetocaloric materials. https://doi.org/10.1557/s43578-022-00712-0

A review on chemical bath deposition of metal chalcogenide thin films for heterojunction solar cells

Sucheta Sengupta, Rinki Aggarwal, Manoj Raula

Open Access

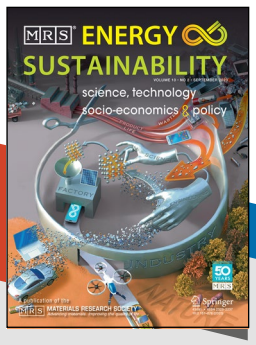
The authors provide an overview of the different combinations of metal chalcogenide/chalcopyrite thin-film layers for heterojunction solar cells by chemical bath deposition and achieving control over the resultant morphology, particularly focusing on the interfacial epitaxial relationship that is found to have substantial influence on the efficiency of the resultant cell. https://doi.org/10.1557/s43578-022-00539-9

Accurate measurement of thin film mechanical properties using nanoindentation

S. Zak, C.O.W. Trost, P. Kreiml, M.J. Cordill

Open Access

The authors examine two known material systems of Mo and MoTa thin films on Si substrates with nanoindentation and numerical modeling to show the limitations in measuring elastic moduli. An assessment of the hardness and elastic modulus as a function of contact depth and accurate modeling of the film/substrate deformation confirms the long-held 10% rule for hardness measurements. For elastic modulus, the indentation depths should be much smaller. https://doi.org/10.1557/s43578-022-00541-1



Recycling routes of lithium-ion batteries: A critical review of the development status, the process performance, and life-cycle environmental impacts

Ronja Wagner-Wenz, Albert-Jan van Zuilichem, Laura Göllner-Völker, Katrin Berberich, Anke Weidenkaff, Liselotte Schebek

Open Access

The authors showcase an evaluation of the various battery recycling technologies for stakeholders in politics, industry, and research. They evaluate over 200 publications and compare three major recycling routes, which contribute to an understanding of the tradeoffs for various technologies and initiate a meaningful discussion as to what is the "best" recycling route when targets conflict. https://doi.org/10.1557/s43581-022-00053-9

Perspective: Design of cathode materials for sustainable sodium-ion batteries

Baharak Sayahpour, Hayley Hirsh, Saurabh Parab, Long Hoang Bao Nguyen, Minghao Zhang, Ying Shirley Meng

Open Access

The authors summarize the most important design metrics in sodium-ion batteries with an emphasis on cathode materials and outline a transparent data reporting approach based on common metrics for performance evaluation of future technologies. They highlight that manufacturing sustainable sodium-ion batteries with high energy density and cyclability requires a uniquely tailored technology and close attention to economic and environmental factors. https://doi.org/10.1557/s43581-022-00029-9

Opportunities and challenges for integrating the development of sustainable polymer materials within an international circular (bio)economy concept

Natalia A. Tarazona, Rainhard Machatschek, Jennifer Balcucho, Jinneth Lorena Castro-Mayorga, Juan F. Saldarriaga, Andreas Lendlein

Open Access

Leading-edge polymer-based materials for consumer and advanced applications are necessary to achieve sustainable development. The authors focus on tools to measure and reduce the negative impacts of plastics throughout their life cycle, the use of renewable sources, the design of biodegradable and/or recyclable materials, and biotechnological strategies for enzymatic recycling that fit into a circular bioeconomy. https://doi.org/10.1557/s43581-021-00015-7

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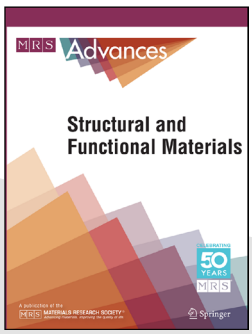

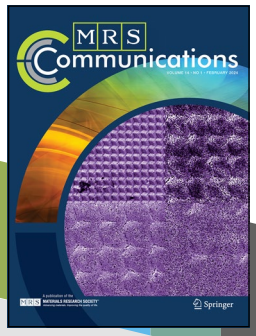

Increasing performance of soft dielectric elastomer artificial muscles via nanomaterial composite electrical insulators

Maduran Palaniswamy, Max Herzog, Shardul Panwar, Michael Jones, Michael Rowe

Compact and efficient actuators are critical components in next-generation soft robotic systems. The authors present a simple and effective method to increase the maximum force output of a soft elastomeric artificial muscle by 72% by integrating a specific concentration of electrically insulating TiO_2 nanoparticles in a soft composite. https://doi.org/10.1557/s43580-022-00297-0

Role of heterostacking of 2D lead chloride perovskites on photoluminescence

David R. Graupner, Dmitri S. Kilin

Heterostructures are junctions between dissimilar materials that can result in new functionalities not present in the individual components themselves. The authors use density functional theory to predict the photoluminescence properties of two-dimensional halide perovskites of different thicknesses, revealing that the optoelectronic properties are highly tunable by controlling the layered design and optical properties. https://doi.org/10.1557/s43580-022-00358-4

IMPHEAT-II, a novel high temperature ion implanter for mass production of SiC power devices

Yusuke Kuwata, Shiro Shiojiri, Akihito Nakanishi, Shinsuke Inoue, Masakazu Adachi, Yuya Hirai, Koyu Ueno, Jian Wang, Nobuhiro Uji, Hideo Nagamori, Johnny Masa, Hiroshi Shirakawa, Kensuke Yuasa, Yoshiyuki Nakazawa, Ryosuke Goto, Sami Hahto, George Sacco, Shigehisa Tamura, Koichi Orihira, Masatoshi Onoda, Yoshinobu Hayashi, Takashi Sakamoto, Weijiang Zhao

Ion implantation is a critical tool in manufacturing wide-bandgap power electronics. The authors reveal properties of a novel high temperature ion implanter for silicon carbide devices, crucial for applications in autonomous vehicles, generators, and power stations. The new IMPHEAT-II enables three times higher mechanical throughput and two times higher effective throughput than previous generations. https://doi.org/10.1557/s43580-022-00428-7

Formability of low-molecular weight polyethylene oxide reinforced by tempo-oxidized nanocellulose for lithium-ion battery solid polymer electrolyte

Qolby Sabrina, Riyani Tri Yulianti, Khusnul Khotimah, Achmad Subhan, Nurhalis Majid, Nanang Masruchin, Akihide Sugawara, Yu-I. Hsu, Rike Yudianti, Hiroshi Uyama

The authors present an interesting method to prepare solid polyelectrolytes for Li-ion batteries based on nanocellulosic composites with polyethylene oxide. The TEMPO-oxidized nanocellulose serves as a reinforcing agent that eventually allows efficient Li^+ ion transport and provides stability. The ion-transport mechanism was elucidated, which led to improved ionic conductivity. https://doi.org/10.1557/s43579-024-00514-x

Optimal indent spacing for instrumented nanoindentation of nanoporous gold

Kerry A. Baker, T. John Balk

Nanoindentation facilitates local mapping of nanomechanical properties. The authors largely developed a protocol for creating accurate mapping via optimal ratios of indent spacing to indent depth (s/h_c) specifically for materials with nanoscale porosity. The protocol was demonstrated with nanoporous gold but can also be applied to denser materials. https://doi.org/10.1557/s43579-023-00505-4

Stable operating windows for polythiophene organic electrochemical transistors

Scott T. Keene, Luke W. Gatecliff, Sophia L. Bidinger, Maximilian Moser, Iain McCulloch, George G. Malliaras

Open Access

The authors focus on optimizing the operating range of organic electrochemical transistors (OECTs) with improved stability of the channel materials. The OECT materials can be operated with high stability when the voltage range is reduced. In the future, it should be possible to design these devices with the potential to use machine learning to focus on materials, fabrication, and operation parameters. https://doi.org/10.1557/s43579-023-00511-6