

Journal of MATERIALS RESEARCH

VOLUME 35 • NO 18 SEPTEMBER 28, 2020

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

CAMBRIDGE UNIVERSITY PRESS

Journal of MATERIALS RESEARCH

JOURNAL OF MATERIALS RESEARCH (*JMR*) is an interdisciplinary journal serving the materials research community through publication of original research articles and invited reviews encompassing the synthesis, processing, characterization, properties, and theoretical description of materials.

JMR publishes advances in new materials and novel functionalities and development of performance improvements relative to state of the art. Engineering studies and applications to commercial products are beyond the scope of *JMR* and should be submitted elsewhere. Manuscripts that report data without giving an analysis, interpretation, or discussion are only acceptable if the data are sufficiently important that publication is expected to lead to significant new studies or advancements in science or technology.

Manuscripts must be submitted to the *Journal of Materials Research* electronically via ScholarOne manuscripts, at the following website address: http://mc.manuscriptcentral.com/jmr. Electronic submission expedites the review process and also allows authors to track the status of their manuscripts at any time. Complete instructions are available on the ScholarOne site and authors will be prompted to provide all necessary information.

Manuscripts must be prepared in English, using a word processing program, formatted to fit $8\frac{1}{2} \times 11$ in. paper, and saved as .doc or .pdf files. Separate graphics files (.eps and .tif) must be uploaded for each figure. Authors may also upload .xls or .ppt supplemental files as part of the manuscript submission process. All of these files will be converted to .pdf format. Detailed instructions are available on the submission web site. During submission, authors must enter all coauthor names and e-mail addresses. Manuscripts will not be considered for peer review until this information is provided. Authors must also enter manuscript keywords using the *JMR* keyword list (located on the submission web site). Authors who are not fluent in English must have their manuscript edited for correct English grammar and sentence structure before submission.

Authors are expected to follow the conventional writing, notation, and illustration style prescribed in *Scientific Style and Format: the CSE Manual for Authors, Editors and Publishers, 7th edition, 2006.* Authors should also study the form and style of printed material in this journal. SI units should be used. Authors should use an identical format for their names in all publications to facilitate use of citations and author indexes.

Manuscripts are accepted with the understanding that they represent original research, except for review articles, and that they have not been copyrighted, published, or submitted for publication elsewhere. Authors submitting manuscripts to *JMR* who have related material under consideration or in press elsewhere should send a copy of the related material to *JMR* at the time of submission. While their manuscripts are under consideration at *JMR*, authors must disclose any such related material. To expedite the review process, authors may provide names and contact information for up to four possible reviewers.

Articles are original research reports that include complete, detailed, self-contained descriptions of research efforts. All articles must contain an abstract and section headings.

Commentaries and Reviews: *Journal of Materials Research* occasionally publishes commentaries on topics of current interest or reviews of the literature in a given area. If an author proposes a review, the title, abstract, and a brief outline should be submitted to the Editorial Office via e-mail for prior consultation on the appropriateness of the topic.

Color policy: It is not necessary for authors to indicate that a figure should be displayed in color online. *JMR* will assume that any author who submits figures in color wants and agrees to their being produced in color online. Figures may be printed in color at the author's request for an additional charge. Color figures must be submitted before the paper is accepted for publication, and cannot be received later in the process. Authors cannot submit two versions of the same figure, one for color and one for black and white; only one version can be submitted. Authors need to carefully consider the following when submitting figures in color that will

be published in color online only: 1) The colors chosen must reproduce effectively and the colors should be distinguishable when printed in black and white; 2) The descriptions of figures in text and captions must be suffi ciently clear for both online and print copy. When submitting figures to be in color online only, authors should include the phrase <<color online>> in the figure captions. This is the author's responsibility. Authors will see these color figures when viewing their author page proofs on screen. Authors should always print their page proofs in black and white to see how they will appear in print. Authors will NOT be allowed to submit color figures to replace black and white figures in the page proof stage. To maximize the probability that figures will be published in color online and also print as good quality black and white or grayscale graphics, authors are encouraged to follow these figure submission guidelines: 1) Submit a color graphic in Tagged Image File Format (.tif); 2) Submit color graphics with a resolution of at least 300 dpi (600 dpi if there is text or line art in the figure); 3) Submit color graphics in CMYK format; 4) Submit figures sized to fit the actual column or page width of the journal so that reduction or enlargement is not necessary; 5) Submit multipart figures in one single electronic file.

Copyright © 2020, Materials Research Society. All rights reserved. No part of this publication may be reproduced, in any form or by any means, electronic, photocopying, or otherwise, without permission in writing from Cambridge University Press. Policies, request forms and contacts are available at: http://www.cambridge.org/rights/permissions/permission. htm. Permission to copy (for users in the USA) is available from Copyright Clearance Center at: http://www.copyright.com, email: info@ copyright.com.

Journal of Materials Research Subscription Prices (2020) [includes on-line web access]				
[USA and Poss.	Non-USA	Online Only	
MRS Regular and Student Members	\$260.00	\$369.00	-	
Institutions	\$2378.00	\$2313.00	\$2146.00	

Journal of Materials Research (ISSN: 0884-2914) is published twenty-four times a year by Cambridge University Press, One Liberty Plaza, 20th Floor, New York, NY 10006 for the Materials Research Society. Periodical Postage Paid in New York, NY and additional mailing offices. **POSTMASTER:** Send address changes to Journal of Materials Research, c/o Journals Dept., Cambridge University Press, One Liberty Plaza, 20th Floor, New York, NY 10006, USA.

Subscriptions, renewals, address changes, and single-copy orders should be addressed to Subscription Fulfillment, *Journal of Materials Research*, Cambridge University Press, One Liberty Plaza, 20th Floor, New York, NY 10006, USA (for USA, Canada, and Mexico); or Cambridge University Press, University Printing House, Shaftesbury Road, Cambridge, CB2 8BS, England (for UK and elsewhere). Allow at least six weeks advance notice. For address changes, please send both old and new addresses and, it possible, include a mailing label from a recent issue. Requests from subscribers for missing journal issues will be honored without charge only if received within six months of the issue's actual date of publication; otherwise, the issue may be purchased at the single-copy price.

Reprints of individual articles in *Journal of Materials Research* may be ordered. For information on reprints, please contact Cambridge University Press. Reprints of complete back issues older than the prior volume year may be ordered on an individual basis via Cambridge Core. To determine availability, visit the appropriate page for the *JMR* back issue desired (cambridge.org/jmr).

Individual member subscriptions are for personal use only.



Editor-in-Chief: Gary L. Messing, Ceramic materials, The Pennsylvania State University, USA Associate Editor: Susmita Bose, Biomaterials, Washington State University, USA Associate Editor: Mathias Göken, Advanced metallic materials, Friedrich-Alexander-University Erlangen-Nürnberg, Germany Associate Editor: Sarah E. Morgan, Polymeric materials, The University of Southern Mississippi, USA

2020 Principal Editors:

Kantesh Balani, Biomaterials, high temperature ceramics Indian Institute of Technology, Kanpur

- Amit Bandyopadhyay, Hard biomaterials, Additive manufacturing, Washington State University, USA
- Ricardo H.R. Castro, Interfaces thermodynamics, Calorimetry, Ceramics, University of California, Davis, USA
- Jinju Chen, Soft materials/thin films, Nanoindentation, Newcastle University, United Kingdom
- Xiaobo Chen, Photocatalysis and batteries, University of Missouri-Kansas City, USA
- Sung-Yoon Chung, Energy, Electron microscopy, Interface science, KAIST, Korea
- Sylvain Deville, Ceramic materials, Processing, Bioinspired materials, CNRS, France
- Franz Faupel, Functional nanomaterials, VPD, Metallic glasses, University of Kiel, Germany
- Michael C. Gao, High entropy alloys, Computational materials science, National Energy Technology Laboratory/AECOM, USA
- Erik G. Herbert, Nanoindentation, Small-scale mechanical behavior Michigan Technological University, USA
- Jon Ihlefeld, Ferroelectrics, Thin films, Ionic conductors, University of Virginia, USA
- Quanxi Jia, Superconductors, Ferroelectric/magnetic materials, Thin films
 - University of Buffalo, USA
- C. Robert Kao, Metallic materials, Diffusion and joining, National Taiwan University, Taiwan
- Edson Roberto Leite, Materials chemistry, Nanocrystals, Synthesis, Brazilian Nanotechnology National Laboratory, Brazil
- Lei Liu, Semiconductors, Electronic structure, Spectroscopy, Changchun Institute of Optics, Fine Mechanics and Physics, China
- Michele Manuel, Phase transformations, Materials design, University of Florida, USA

- Michael E. McHenry, Magnetic materials, Carnegie Mellon University, USA
- Scott T. Misture, In-situ diffraction, Electrochemically active ceramics, Alfred University, USA
- Lakshmi S. Nair, Biomaterials, Tissue regeneration, Drug delivery, University of Connecticut, USA
- Takahito Ohmura, Nanomechanical characterization, Lattice defects, National Institute for Materials Science, Japan
- George M. Pharr, Mechanical behavior, Nanoindentation, Texas A&M University, USA
- Joshua A. Robinson, 2D material synthesis and properties, The Pennsylvania State University, USA
- Fabrice Rossignol, Ceramic processes, Additive manufacturing CNRS, France
- Don W. Shaw, Epitaxy, Vapor deposition, Semiconductors, The University of Texas at Dallas, USA
- Ralph Spolenak, Size effects in materials, Micro 3D printing, ETH Zurich, Switzerland
- Ziqi Sun, Energy nanomaterials, Wet chemical synthesis, Queensland University of Technology, Australia
- Peng Tao, Solar/thermal energy materials, polymer composites Shanghai Jiao Tong University, China
- Venu G. Varanasi, Amorphous materials, biomimetics, bioprinting University of Texas at Arlington, USA
- Chongmin Wang, Energy storage, Microscopy, In-situ/operando technique,

Pacific Northwest National Laboratory, USA

- Xingcheng Xiao, Energy storage materials, AFM, Nanoindentation, General Motors, USA
- Sam Zhang, Thin films/coatings, Nanyang Technological University, Singapore Yanchun Zhou, Structural ceramics, Electronic structure,
- Aerospace Research Institute of Materials and Processing Technology, China

Editorial Office: Ellen W. Kracht, Publications Manager, Materials Research Society, Warrendale, PA Leslie Truver, JMR Editorial Assistant, Materials Research Society, Warrendale, PA Kirby L. Morris, Editorial and Production Associate, Materials Research Society, Warrendale, PA Eileen M. Kiley, Director of Communications, Materials Research Society, Warrendale, PA

Cover: Morphology of the freeze-dried shape-memory cryogel observed by scanning electron microscopy (SEM). M. Behl, Q. Zhao, A. Lendlein: Glucose-responsive shape-memory cryogels. p. 2400.



Volume 35, Number 18, September 28, 2020

BIOMEDICAL MATERIALS, REGENERATIVE MEDICINE AND DRUG DELIVERY

ARTICLE		
2385–2395	Cytotoxic properties of graphene derivatives depending on origin and type of cell line	Agnieszka Zuchowska, Bartlomiej Dabrowski, Elzbieta Jastrzebska, Marta Mazurkiewicz-Pawlicka, Artur Malolepszy, Leszek Stobinski, Maciej Trzaskowski, Zbigniew Brzozka
INVITED FEAT	TURE PAPER	
2396–2404	Glucose-responsive shape-memory cryogels	Marc Behl, Qian Zhao, Andreas Lendlein
ARTICLES		
2405–2415	Molecular weight of polyethylenimine-dependent transfusion and selective antimicrobial activity of functional silver nanoparticles	Atul Kumar Tiwari, Munesh Kumar Gupta, Govind Pandey, Roger J. Narayan, Prem C. Pandey
2416–2426	Design and mechanical properties simulation of fish scale-like intracranial thrombectomy stent	Feng Zhao, Ya Yang, Yongjuan Zhao, Yanchun Wei, Li Quan, Changjiang Pan
2427–2440	Biomimetic synthesis of vaterite $CaCO_3$ microspheres under threonine for preparation of pH-responsive antibacterial biofilm	Tingyu Yang, Yu Wu, Xiaoqing Yue, Cuiyan Wang, Jianbin Zhang
2441–2450	A simple <i>in situ</i> synthesis of iron oxide magnetic nanoparticles embedded in thermosensitive polymer for DNA capture	Sadia Hossain, Mahbubor Rahman, Yeasmin Nahar, Abdur Rahman, Mostafa Kaiyum Sharafat, Motahar Hossain, Bungo Ochiai, Abdelhamid Elaissari, Hasan Ahmad
2451–2465	Hydroxyapatite-dextran methacrylate core/shell hybrid nanocarriers for combinatorial drug therapy	S. Ram Prasad, A. Jayakrishnan, T. S. Sampath Kumar
2466–2477	Synthesis and characterization of multilayer graphene oxide on yttria-zirconia ceramics for dental implant	Cheng Zhang, Zhaoliang Jiang, Li Zhao, Wenping Liu, Pengchao Si, Jing Lan
2478–2490	Tuning the electronic and magnetic properties of PEDOT-PSS-coated graphene oxide nanocomposites for biomedical applications	Elison S. Ganya, Sabata J. Moloi, Sekhar C. Ray, Way-Faung Pong

ENERGY CONVERSION AND STORAGE MATERIALS

INVITED FEATURE PAPER

2491–2505 **Preparation of TiO₂-(B)/SnO₂ nanostructured composites and its** performance as anodes for lithium-ion batteries

Nayely Pineda-Aguilar, Margarita Sánchez-Domínguez, Eduardo M. Sánchez-Cervantes, Lorena L. Garza-Tovar

ARTICLES

- 2506–2515 **Oxygen semi-permeation properties of** $La_{1-x}Sr_xFeO_{3-\delta}$ **perovskite membranes under high oxygen gradient**
- 2516–2527 In situ low-temperature hydrothermal synthesis of LiMn₂O₄ nanocomposites based on graphene oxide/carbon nanotubes hydrogel and its capacities

Eva Deronzier, Thierry Chartier, Pierre-Marie Geffroy

Kelei Wang, Lei Hua, Zhongbing Wang, Guanping Jin, Chunnian Chen