Journal of MATERIALS RESEARCH

VOLUME 29 • NO 22 NOVEMBER 28, 2014

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 new research that demonstrates a significant impact or advance of scientific understanding of interest to the materials research community. 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 8½ ×11 in. paper, and saved as .doc, .pdf, .rtf, or .ps 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 we b 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 sufficiently 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 © 2014, 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 http://www.copyright.com, email: info@ copyright.com.

Journal of Materials Research Subscription Prices (2014) [includes on-line web access] USA and Online Poss. Non-US Only MRS Regular and Student Members \$267.00 \$303.00 \$100.00 Institutions \$1693.00 \$1683.00 \$1528.00

Journal of Materials Research (ISSN: 0884-2914) is published twenty-four times a year by Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013 – 2473 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, 100 Brook Hill Drive, West Nyack, NY 10994-2113, USA.

Subscriptions, renewals, address changes, and single-copy orders should be addressed to Subscription Fulfillment, *Journal of Materials Research*, Cambridge University Press, 100 Brook Hill Drive, West Nyack, NY 10994-2133, USA (for USA, Canada, and Mexico); or Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 8RU, England (for UK and elsewhere). Allow at least six weeks advance notice. For address changes, please send both old and new addresses and, if 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 singlecopy price.

Reprints of individual articles in *Journal of Materials Research* may be ordered. For information on reprints, please contact Cambridge University Press.

Individual member subscriptions are for personal use only.

Journal of MATERIALS RESEARCH

Editor-in-Chief: Gary L. Messing, The Pennsylvania State University, USA
Associate Editor, Biomaterials: Adrian Mann, Rutgers University, USA
Associate Editor, Metallic Materials: Jürgen Eckert, IFW Dresden, Germany
Associate Editor, Polymers and Organic Materials: Linda Schadler, Rensselaer Polytechnic Institute, USA
Editorial Office: Ellen W. Kracht, Publications Manager, Materials Research Society, Warrendale, PA Linda A. Baker, JMR Editorial Assistant, Materials Research Society, Warrendale, PA Sarah E. Ashlock, JMR Production Assistant, Materials Research Society, Warrendale, PA Eileen Kiley Novak, Director of Communications, Materials Research Society, Warrendale, PA

2014 Principal Editors:

Lennart Bergström, Stockholm University, Sweden

Robert C. Cammarata, Johns Hopkins University, USA

Edwin A. Chandross, MaterialsChemistry LLC, USA

Ping Chen, Dalian Institute of Chemical Physics, China

Xiaobo Chen, University of Missouri-Kansas City, USA

Yang-T. Cheng, University of Kentucky, USA

Paolo Colombo, University of Padova, Italy; The Pennsylvania State University, USA

Franz Faupel, Universitäet Kiel, Germany

David S. Ginley, National Renewable Energy Laboratory, USA

Amit Goyal, UT-Battelle/Oak Ridge National Laboratory, USA

Mikko P. Haataja, Princeton University, USA

Andrea M. Hodge, University of Southern California, USA

Himanshu Jain, Lehigh University, USA

- Suk-Joong L. Kang, Korean Advanced Institute of Science and Technology, Republic of Korea
- C. Robert Kao, National Taiwan University, Taiwan

Koichi Kugimiya, Osaka University, Japan

- Edson Roberto Leite, Universidade Federal de São Carlos, Brazil
- Yadong Li, Tsinghua University, China
- Jörg Löffler, ETH Zurich, Switzerland
- Sanjay Mathur, University of Cologne, Germany

Michael E. McHenry, Carnegie Mellon University, USA

Scott T. Misture, Alfred University, USA

Paul Muralt, Ecole Polytechnique Federale de Lausanne, Switzerland
Akira Nakajima, Tokyo Institute of Technology, Japan
Cewen Nan, Tsinghua University, China
George M. Pharr, University of Tennessee, USA
Ian M. Reaney, The University of Sheffield, United Kingdom
Joan M. Redwing, The Pennsylvania State University, USA

Clifford L. Renschler, Sandia National Laboratories, USA

Edward M. Sabolsky, West Virginia University, USA

Winston Schoenfeld, University of Central Florida, USA

Don W. Shaw, The University of Texas at Dallas, USA

Susan B. Sinnott, University of Florida, USA

Eric A. Stach, Brookhaven National Laboratory, USA

- Jay A. Switzer, *Missouri University of Science* and Technology, USA
- Mauricio Terrones, The Pennsylvania State University, USA; Shinshu University, Japan

Terry M. Tritt, Clemson University, USA

José Arana Varela, University of Sao Paulo State, Brazil

- William J. Weber, University of Tennessee; Oak Ridge National Laboratory, USA
- Sam Zhang, Nanyang Technological University, Singapore
- Yanchun Zhou, Aerospace Research Institute of Materials and Processing Technology, China

Cover: FIG. 4(g). SEM picture for the crack propagation regions of the specimens under the rotary bending tests. [D. Shi, J. Huang, Y. Luo, X. Yang, H. Yu, and P. Zhao: Experimental investigation on HCF strength affected by predamage from LCF of a near alpha titanium alloy. p. 2748].

Journal of MATERIALS RESEARCH

Volume 29, Number 22, November 28, 2014

INVITED FEATURE PAPERS

2605–2614	a-Si:H/µc-Si:H tandem junction based photocathodes with high open-circuit voltage for efficient hydrogen production	Félix Urbain, Vladimir Smirnov, Jan-Philipp Becker, Uwe Rau, Friedhelm Finger, Jürgen Ziegler, Bernhard Kaiser, Wolfram Jaegermann
2615–2624	Selective solution shearing deposition of high performance TIPS-pentacene polymorphs through chemical patterning	Gaurav Giri, Eric Miller, Zhenan Bao
ARTICLES		
2625–2633	The effects of surface modifications of multiwalled carbon nanotubes on their dispersibility in different solvents and poly (ether ether ketone)	Zongshuang Cao, Li Qiu, Yongzhen Yang, Yongkang Chen, Xuguang Liu
2634–2643	Supramolecular functionalization of single-walled carbon nanotubes with poly(2,5-dihexyl-1,4-phenylene-alt-2-amino-4, 6-pyrimidine) and their electrochemical performance	Sayyare Sidik, Xirali Mamtimin
2644–2656	Low temperature synthesis of carbon nanotube-reinforced aluminum metal composite powders using cryogenic milling	Dong Jin Woo, Joseph P. Hooper, Sebastian Osswald, Brent A. Bottolfson, Luke N. Brewer
2657–2666	Reinforced solder joint performance by incorporation of ZrO ₂ nanoparticles in electroless Ni–P composite layer	Xiao Hu, Y.C. Chan
2667–2672	Structural analysis and electrochemical properties of cobalt-doped $Sr_{0.9}Ce_{0.1}MnO_{3-\delta}$ cathode for IT-SOFCs	Jiseung Ryu, Ryan O'Hayre, Heesoo Lee
2673–2681	Thermal properties of a prospective thermal barrier material: $Yb_{3}Al_{5}O_{12}$	Xiaofei Wang, Huimin Xiang, Xin Sun, Jiachen Liu, Feng Hou, Yanchun Zhou
2682–2693	Engineering of porous bacterial cellulose toward human fibroblasts ingrowth for tissue engineering	Yang Hu, Jeffrey M. Catchmark, Yongjun Zhu, Noureddine Abidi, Xin Zhou, Jinhui Wang, Nuanyi Liang
2694–2706	Metal-ions directed self-assembly of hybrid diblock copolymers	Birong Zeng, Yueguang Wu, Qilong Kang, Ying Chang, Conghui Yuan, Yiting Xu, Feng-Chih Chang, Lizong Dai
2707–2716	Preparation of TiNi films by diffusion technology and the study of the formation sequence of the intermetallics in Ti–Ni systems	Xi Shao, Xianglong Guo, Yuanfei Han, Zhengjie Lin, Jining Qin, Weijie Lu, Di Zhang
2717–2726	Superelasticity of TiNi-based shape memory alloys at micro/nanoscale	Chiao-Yin Nien, Hsin-Kai Wang, Chih-Hsuan Chen, Seiichiro Ii, Shyi-Kaan Wu, Chun-Hway Hsueh
2727–2737	Effect of electric-current pulses on grain-structure evolution in cryogenically rolled copper	Tatyana Konkova, Irshat Valeev, Sergey Mironov, Alexander Korznikov, Michail Myshlyaev, S. Lee Semiatin

- 2738–2747 Effects of current densities on creep behaviors of Sn–3.0Ag–0.5Cu solder joint
- 2748–2755 Experimental investigation on HCF strength affected by predamage from LCF of a near alpha titanium alloy

Limin Ma, Yong Zuo, Fu Guo, Yutian Shu

Huang Jia, Luo Yinyin, Shi Duoqi, Yang Xiaoguang, Yu Huichen, Zhao Pengtao