

**VOLUME 27 • NO 10** MAY 28, 2012

A publication of the



FOCUSISSUE PROPESSES

INSTAINTAILOUT FOR Based Materials

**CAMBRIDGE** 

# 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 © 2012**, 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 (2012) [includes on-line web access] USA and Online Poss. Non-US Only MRS Regular and Student \$236.00 \$289.00 \$100.00

\$1445.00

\$1551.00

\$1373.00

Institutions

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

Associate Editor, Biomaterials: Adrian Mann, Rutgers University

Associate Editor, Metallic Materials: Jürgen Eckert, IFW Dresden, Germany

Associate Editor, Polymers and Organic Materials: Howard E. Katz, Johns Hopkins University

Guest Editor for Focus Issue: Crystallization Processes in Polymer-Based Materials Mircea Chipara, The University of Texas Pan American

#### Principal Editors for Focus Issue:

Pulickel M. Ajayan, *Rice University* Hendrik Meyer, *Institute Charles Sadron, France* Sanat K. Kumar, *Columbia University* Lei Zhu, *Case Western University* 

Editorial Office: Eileen Kiley Novak, Director of Communications, Materials Research Society, Warrendale, PA Ellen W. Kracht, Publications Manager, Materials Research Society, Warrendale, PA Linda A. Baker, JMR Editorial Assistant, Materials Research Society, Warrendale, PA Lorraine K. Wolf, JMR Publishing Assistant, Materials Research Society, Warrendale, PA

#### 2012 Principal Editors:

Robert C. Cammarata, Johns Hopkins University	Michelle Oyen, Cambridge University, United Kingdom	
Edwin A. Chandross, MaterialsChemistry LLC	Nitin P. Padture, Brown University	
Ping Chen, Dalian Institute of Chemical Physics, China	Ian M. Reaney, The University of Sheffield, United Kingdom	
Yang-T. Cheng, University of Kentucky	Joan M. Redwing, The Pennsylvania State University	
Franz Faupel, Universitäet Kiel, Germany	Clifford L. Renschler, Sandia National Laboratories	
David S. Ginley, National Renewable Energy Laboratory	Dale Schaefer, University of Cincinnati	
Amit Goyal, UT-Battelle/Oak Ridge National Laboratory	Winston Schoenfeld, University of Central Florida	
Mikko P. Haataja, Princeton University	Christopher A. Schuh, <i>Massachusetts Institute of Technology</i>	
Himanshu Jain, Lehigh University		
Suk-Joong L. Kang, Korean Advanced Institute of Science and Technology, Republic of Korea	Don W. Shaw, The University of Texas at Dallas	
	Jay A. Switzer, Missouri University of Science and Technology	
C. Robert Kao, National Taiwan University, Taiwan	Mauricio Terrones, The Pennsylvania State University: and Shinshu	
Koichi Kugimiya, Osaka University, Japan	University, Japan	
Sharvan Kumar, Brown University	Terry M. Tritt, Clemson University	
Edson Roberto Leite, Universidade Federal de São Carlos, Brazil	Yoshihisa Watanabe, National Defense Academy, Japan	
Yadong Li, Tsinghua University, China	William J. Weber, University of Tennessee/Oak Ridge National Laboratory	
Scott T. Misture, Alfred University		
Paul Muralt, Ecole Polytechnique Federale de Lausanne, Switzerland	Sam Zhang, Nanyang Technological University, Singapore	
Cewen Nan, Tsinghua University, China	Processing Technology, China	

Cover: Snapshot at the front surface of a cubic lattice with periodic boundary conditions for the copolymer sample in series B with the average comonomer mol fraction of 0.54 at the reduced temperature of 2, demonstrating the intermediate fraction (red) distributing at interfaces between crystallizable fraction (yellow) and non-crystallizable fraction (blue). [F. Yang, H. Gao, and W. Hu: Monte Carlo simulations of crystallization in heterogeneous copolymers: The role of copolymer fractions with intermediate comonomer content. p. 1383.]

## **Journal of MATERIALS RESEARCH**

### Volume 27, Number 10, May 28, 2012

#### **CRYSTALLIZATION PROCESSES IN POLYMER-BASED MATERIALS**

1325	Introduction	Mircea Chipara, Pulickel M. Ajayan, Hendrik Meyer, Sanat K. Kumar, Lei Zhu
REVIEW		
1326–1350	Confined crystallization in polymer nanolayered films: A review	Joel M. Carr, Deepak S. Langhe, Michael T. Ponting, Anne Hiltner, Eric Baer
ARTICLES		
1351–1359	Synchrotron small-angle x-ray scattering study of linear low-density polyethylene under uniaxial deformation	Angel Romo-Uribe, Angel Manzur, Roberto Olayo
1360–1371	Different crystallization mechanisms in polypropylene–nanoclay nanocomposite with different weight percentage of nanoclay additives	Raghavendra R. Hegde, Joseph E. Spruiell, Gajanan S. Bhat
1372–1378	Shear-induced crystallization and rheological behavior of syndiotactic polystyrene	Yunfeng Zhao, Go Matsuba, Hiroshi Ito
1379–1382	New approach to the double melting peak of poly(∟lactic acid) observed by DSC	Carlos A. Gracia-Fernández, Silvia Gómez-Barreiro, Jorge López-Beceiro, Salvador Naya, Ramón Artiaga
1383–1388	Monte Carlo simulations of crystallization in heterogeneous copolymers: The role of copolymer fractions with intermediate comonomer content	Feng Yang, Huanhuan Gao, Wenbing Hu
1389–1398	Polarity-induced ferroelectric crystalline phase in electrospun fibers of poly(vinylidene fluoride)/polyacrylonitrile blends	Run Su, Ganji Zhong, Qiang Fu, Lifeng Zhang, Hao Fong, Lei Zhu
1399–1409	Electrospun nylon fibers for the improvement of mechanical properties and for the control of degradation behavior of poly (lactide)-based composites	Ramesh Neppalli, Carla Marega, Antonio Marigo, Madhab P. Bajgai, Hak Y. Kim, Suprakas Sinha Ray, Valerio Causin
1410–1416	Study of bitumen crystallization by temperature-modulated differential scanning calorimetry and rheology	Jesús López-Paz, Carlos Gracia-Fernández, Silvia Gómez-Barreiro, Jorge López-Beceiro, Javier Nebreda, Ramón Artiaga
1417–1420	Synthesis and characterization of germanium-centered three-dimensional crystalline porous aromatic framework	Ye Yuan, Jia Liu, Hao Ren, Xiaofei Jing, Wei Wang, Heping Ma, Fuxing Sun,

Huijun Zhao