January 2017 Vol. 42 No. 1
www.mrs.org/bulletin

MRS Bulletin

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

Material functionalities from molecular rigidity

ALSO IN THIS ISSUE

Music and materials: Art and science of organ pipe metal

CAMBRIDGE UNIVERSITY PRESS

https://doi.org/10.1557/mrs.2016.323 Published online by Cambridge University Press

https://doi.org/10.1557/mrs.2016.323

Protect your sensitive samples

for opto-electrical applications

NEW – The **Optistat**™Dry **Cryofree®** 3 K cryostat is now available with our unique **Sample**Protect measurement system:

- Protects your sample from electrostatic discharge (ESD) damage throughout your experiment
- Integrated with the Zurich Instruments **MFLI** Lock-in Amplifier providing the best-in-class characterisation solution
- Patent pending puck style sample mounting

nanoscience@oxinst.com
www.oxinst.com/mrs-sampleprotect

Zurich Instruments
www.zhinst.com/products/mfli

OXFORD INSTRUMENTS
The Business of Science®

4146
https://doi.org/10.1557/mrs.2016.323 Published online by Cambridge University Press

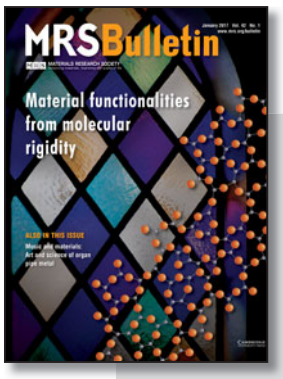
MRS Bulletin January 2017 Volume 42 Number 1 ISSN: 0883-7694 CODEN: MRSBEA

CONTENTS

MATERIAL FUNCTIONALITIES FROM MOLECULAR RIGIDITY

TECHNICAL FEATURE

DEPARTMENTS



ON THE COVER

Material functionalities from molecular rigidity. This issue of *MRS Bulletin* provides an overview of the field of rigidity theory applied at the atomic scale, addressing the relationship between functionality and molecular rigidity. Basic phenomena associated with the onset of rigidity have been discovered, which has led to "smart glasses" with multiple functionalities and mechanical performances. Topological prediction and engineering of physical properties are enabling intelligent design of new disordered materials. Guidance from molecular rigidity is particularly helpful for developing improved and new functionality in the fields of glass science, civil engineering, electrical engineering, optoelectronics, and biology. The cover shows a stained glass window and a stressed-rigid network of connectivity. See the technical theme that appears on page **18**.

https://doi.org/10.1557/mrs.2016.323 Published online by Cambridge University Press

NEWS & ANALYSIS

62 SOCIETY NEWS

76 CAREER CENTRAL

FEATURES

www.mrs.org/bulletin
www.mrs.org/energy-quarterly
www.mrs.org/mymrs
http://journals.cambridge.org
mrsbulletin-rss
@mrsbulletin

https://doi.org/10.1557/mrs.2016.323 Published online by Cambridge University Press

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

MRS Bulletin

EDITORIAL OFFICE 506 Keystone Drive, Warrendale, PA 15086-7573 USA
Bulletin@mrs.org tel 724.779.2747 fax 724.779.8313 www.mrs.org

About the Materials Research Society

The Materials Research Society (MRS), a not-for-profit scientific association founded in 1973 and headquartered in Warrendale, Pennsylvania, USA, promotes interdisciplinary materials research. Today, MRS is a growing, vibrant, member-driven organization of over 16,000 materials researchers spanning over 80 countries, from academia, industry, and government, and a recognized leader in the advancement of interdisciplinary materials research.

The Society's interdisciplinary approach differs from that of single-discipline professional societies because it promotes information exchange across many scientific and technical fields touching materials development. MRS conducts three major international annual meetings and also sponsors numerous single-topic scientific meetings. The Society recognizes professional and technical excellence and fosters technical interaction through University Chapters. In the international arena, MRS implements bilateral projects with partner organizations to benefit the worldwide materials community. The Materials Research Society Foundation helps the Society advance its mission by supporting various projects and initiatives.

Editor
Gopal R. Rao, rao@mrs.org

Managing Editor
Lori A. Wilson, lwilson@mrs.org

News Editor
Judy Meiksin, meiksin@mrs.org

Technical Editor
Lisa C. Oldham, oldham@mrs.org

Editorial Assistants
Michelle S. Raley, raley@mrs.org
Mary Wilmoth

Associate Technical Editor
Tim Palucka

Production/Design
Andrea Pekelnicky-Frye, Rebecca Tokarczyk, Felicia Turano, and TNQ

Associate Production Editor
Niki Rokicki

Principal Development Editor
Elizabeth L. Fleischer

Director of Communications
Eileen M. Kiley

Guest Editors
Matthieu Micoulaut and Yuanzheng Yue

Special Consultant
Angelika Veziridis

Energy Quarterly
George Crabtree (Co-Chair), Elizabeth A. Kócs (Co-Chair), Andrea Ambrosini, Monika Backhaus, David Cahen, Russell R. Chianelli, Shirley Meng, Sabrina Sartori, Anke Weidenkaff, M. Stanley Whittingham, and Steve M. Yalisove

Advertising/Sponsorship
Mary E. Kaufold, kaufold@mrs.org
Donna L. Watterson, watterson@mrs.org

Member Subscriptions
Michelle Judt, judt@mrs.org

Non-Member Subscriptions
subscriptions_newyork@cambridge.org

MRS Bulletin (ISSN: 0883-7694, print; ISSN 1938-1425, online) is published monthly by the Materials Research Society, 506 Keystone Drive, Warrendale, PA 15086-7573. Permission required to reproduce content. Periodical postage paid at New York, NY, and at additional mailing offices. POSTMASTER: Send address changes to *MRS Bulletin* in care of the Journals Department, Cambridge University Press, 100 Brook Hill Drive, West Nyack, NY 10994-2113, USA. Printed in the U.S.A.

Membership in MRS is $130 annually for regular members, $32 for students, and includes an electronic subscription to *MRS Bulletin.* Print subscriptions are available to MRS members for an additional $25. Individual member subscriptions are for personal use only. Non-member subscription rates are $533 (USD) for one calendar year (12 issues). 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.

MRS Bulletin is included in Current Contents®/Engineering, Computing, and Technology; Current Contents®/Physical, Chemical, and Earth Sciences, the SciSearch® online database, Research Alert®, Science Citation Index®, and the Materials Science Citation Index™. Back volumes of *MRS Bulletin* are available on microfiche through University Microfilms Inc., 300 North Zeeb Road, Ann Arbor, MI 48106, USA.

Authors of each technical article appearing in *MRS Bulletin* are solely responsible for all content in their article(s), including accuracy of the facts, statements, and citing resources. Facts and opinions are solely the personal statements of the respective authors and do not necessarily represent the views of the editors, the Materials Research Society, or Cambridge University Press.

Send Letters to the Editor to **Bulletin@mrs.org**. Include your name, affiliation, and full contact information.

https://doi.org/10.1557/mrs.2016.323 Published online by Cambridge University Press