About the Materials Research Society

The Materials Research Society (MRS), a not-forprofit scientific association founded in 1973, promotes interdisciplinary goal-oriented basic research on materials of technological importance. Membership in the Society includes over 14,000 scientists, engineers, and research managers from industrial, government, and university research labo-ratories in the United States and close to 70 countries.

The Society's interdisciplinary approach differs from that of single-discipline professional societies because it promotes information exchange across the many technical fields touching materials development. MRS sponsors two major international annual meetings encompassing approximately 70 topical symposia, and also sponsors numerous single-topic scientific meetings. The Society recog-nizes professional and technical excellence and fosters technical interaction in local geographic regions through Sections and University Chapters.

MRS participates in the international arena of materials research through the International Union of Materials Research Societies (IUMRS). MRS is a member of ASTRA and is an affiliate of the American Institute of Physics.

MRS publishes symposium proceedings, MRS Bulletin, Journal of Materials Research, and other publications related to current research activities.

MRS Bulletin (ISSN: 0883-7694) is published 12 times a year by the Materials Research Society, 506 Keystone Drive, Warrendale, PA 15086-7573. Copyright ©2007, Materials Research Society. Permission required to reproduce content. Periodical postage paid at Warrendale, PA, and at additional mailing offices. POSTMASTER: Send address changes to *MRS Bulletin* in care of the Materials Research Society, at the address listed; tel. 724-779-3003: fax 724-779-8313. Printed in the U.S.A.

Membership in MRS is \$105 annually for regular members, \$30 for students. Dues include an allocation of \$29 (\$17 for students) to a subscription to MRS Bulletin. Individual member subscriptions are for personal use only. Non-member subscription rates are \$245 for one calendar year (12 issues) within the U.S.A. and \$305 elsewhere. Single copies may be purchased for \$40 each. Requests from sub-scribers 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.

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.

> Send Letters to the Editor to: **MRS Bulletin** Materials Research Society 506 Keystone Drive Warrendale, PA 15086-7573 USA Fax 724-779-8313 Bulletin@mrs.org

Letters must include your name, affiliation, and full contact information.

mrs BULLETI

Editorial Office • 506 Keystone Drive • Warrendale, PA 15086-7573 USA Tel. 724-779-3004 ext. 522; fax 724-779-8313; Bulletin@mrs.org; http://www.mrs.org/

Book Review Board

Visiting Scientist

V.S. Arunachalam

Bangalore, India

F Werwa

Washington, DC

J.H. Westbrook

Ballston Spa, NY

S.M. Yalisove

Ann Arbor, MI

Brookline Technologies

University of Michigan

J.-C. Zhao

GE Global

R.A. Register

Research Center

Princeton University

Technology & Policy

Washington, DC 20003

Center for Study of Science,

MRS Office of Public Affairs

499 South Capitol Street SW, Suite 600

J.-C. Zhao

J.H. Westbrook (Chair), C. Batich,

R.J. Matyi, L. Olafsen, S. Sant, and

Editor

E.L. Fleischer Managing Editor J. Meiksin

Technical Editor A. Bertram Wilson

Editorial Assistants E.L. Ellison, J. Guenther, and B. Moriarty

Associate Technical Editor T. Palucka

Circulation S. Forrest

EDITORIAL BOARD .

P.S. Drzaic, Chair Unidym Corp. Menlo Park, CA

V.S. Arunachalam Center for Study of Science, Technology & Policy Bangalore, India

M.-I. Baraton University of Limoges Limoges, France

R.C. Cammarata Johns Hopkins University Baltimore, MD

VOLUME ORGANIZERS .

2006 P.A. Midgley University of Cambridge UK

2007

T.F. Kuech University of Wisconsin-Madison

2008

President

A.J. Hurd

Y.-T. Cheng GM R&D Center C.A. Orme Lawrence Livermore National Laboratory

T.E. Mallouk Pennsylvania State University

R.S. Goldman University of Michigan J.A. Rogers

J.A. Nucci Cornell University

R. Krishnamoorti

A. Sellinger Institute of Materials Research and Engineering Singapore

2007 MRS OFFICERS

Secretary D.S. Ginley National Renewable Energy Laboratory

Vice President and President-Elect C.A. Volkert University of Göttingen

Los Alamos National Laboratory

Treasurer J.W.P. Hsu Sandia National Laboratories

P.F. Green University of Michigan

Executive Director

INTERNATIONAL UNION OF MATERIALS RESEARCH SOCIETIES

First Vice President Second Vice President Secretary Treasurer Immediate Past President **General Secretary** President J.E.E. Baglin R.P.H. Chang G M Crean H Katz **BVB** Chowdari H Yamamoto I 7hou Johns Hopkins University IBM Almaden Research Center Tyndall Natl. Inst. National University of Singapore Nihon Univ. NIN Cork, Ireland Baltimore, MD, USA Singapore San Jose, CA, USA Chiba, Japan Xian, Shaanxi, China **IUMRS ADHERING BODIES** Materials Research Society of Singapore (MRS-S) B.V.R. Chowdari, National University of Singapore Australian Materials Research Society (A-MRS) Materials Research Society of Argentina (MRS-Argentina) J.S. Williams, Australian National University J. Ovejero García, CNEA Brazil Materials Research Society (B-MRS) Materials Research Society of India (MRS-I) R.A. Mashelkar, Council of Scientific & Industrial Research Materials Research Society of Taiwan (MRS-T) E. Longo, UFSCar J.-M. Liu. ITRI Materials Research Society of Japan (MRS-J) O. Takai, Nagoya University

Chinese Materials Research Society (C-MRS) L. Zhou, NW Institute for Nonferrous Metal Research European Materials Research Society (E-MRS) A. Slaoui, CNRS Materials Research Society (MRS) A.J. Hurd, Los Alamos National Laboratory

Materials Research Society of Korea (MRS-K) J.-W. Park, Hanyang University Materials Research Society of Russia (MRS-Russia) N.Z. Lyakhov, Russian Academy of Sciences

https://doi.org/10.1557/mrs2007.155 Published online by Cambridge University Press

Guest Editors S. Schnittger and M. Sinha

Special Contributors J.J. Carvajal, M.M. Doeff, R. Gaska, G.Liu, S. Sosa, and S. Trohalaki

Special Consultants R.L. Fleischer, R.G. Ford, M. Goodway, and L. Merhari

Design/Production K. Bruniany and S. Franklin

Advertising M.E. Kaufold and D.L. Watterson

> L. Fornaro University of Uruguay Montevideo, Uruguay

S.C. Moss Aerospace Corporation Los Angeles, CA

D.N. Seidman Northwestern University Evanston, IL

J.R. Weertman Northwestern University Evanston, IL

> University of Illinois at Urbana-Champaign

University of Houston

Immediate Past President

Materials Research Society J.B. Ballance

> Northwestern University Evanston, IL, USA

Mexican Materials Research Society (Mexican-MRS) P.H. Hernández Tejeda, Benemérita Universidad Autónoma de Puebla