# MRS BULLETIN

### June 1997

A Publication of the Materials Research Society Volume 22, Number 6 ISSN: 0883-7694 CODEN: MRSBEA

### POLYMERIC AND Organic Electronic Materials and Applications

13 Polymeric and Organic Electronic Materials: From Scientific Curiosity to Applications

A.J. Epstein and Y. Yang, Guest Editors

- 16 Electrically Conducting Polymers: Science and Technology A.J. Epstein
- 24 Electrochemistry of Conjugated Polymers and Electrochemical Applications

A.G. MacDiarmid and W. Zheng

31 Polymer Electroluminescent Devices

Y. Yang

- 39 Progress in Electroluminescent Devices Using Molecular Thin Films T. Tsutsui
- 46 Conjugated Polymer Surfaces and Interfaces for Light-Emitting Devices W.R. Salaneck and J.L. Brédas
- 52 Tunneling at Organic/Metal Interfaces in Oligomer-Based Thin-Film Transistors F. Garnier, F. Kouki, R. Hajlaoui, and G. Horowitz

### MRS NEWS

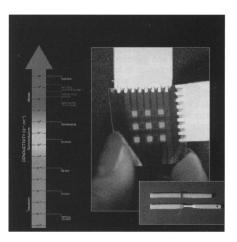
- 57 Materials Research Society Assesses the Quality of Meetings
- 59 Emerson, Gibala, Ross, and Schowalter to Chair 1998 MRS Spring Meeting

### <u>ABSTRACTS</u>

64 Abstracts for August 1997 Journal of Materials Research

### **DEPARTMENTS**

- 4 Research/Researchers
- 8 Washington News
- 9 Public Affairs Forum
- **10** Resources
- **12** Editor's Choice
- **60** Historical Note
- 62 Library
- 71 Classified
- 72 Advertisers in This Issue



ON THE COVER: The arrow on the left-hand side represents the range of conductivities achieved by conducting polymers. It compares this wide range of conductivities to those of inorganic materials (provided by A.G. MacDiarmid, University of Pennsylvania). TOP RIGHT: A flexible 5 x 7 single-layer-matrix, light-emitting-diode display made from dialkoxy poly(p-phenylene vinylene). Multiplexing at high brightness is easily done with these devices (provided by H. Schenk, Corporate Research & Technology, Hoechst Corporation). BOTTOM RIGHT: A demonstration of the strength of a weld between two pieces of highdensity polyethelene (HDPE) formed by exposure to microwave radiation of a polyaniline-HCI/HDPE gasket placed at the interface between the two HDPE pieces. The HDPE bar yields under tension before the weld shows an indication of failure (provided by A. Benatar, The Ohio State University). See the section that begins on page 13.

#### About the Materials **Research Society**

The Materials Research Society (MRS), a nonprofit scientific association founded in 1973, promotes interdisciplinary goal-oriented in 1976, pronotes interdisciplinary goal-oriented basic research on materials of technological importance. Membership in the Society includes over 12,000 scientists, engi-neers, and research managers from industrial, government, and university research laboratories in the United States and nearly 50 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 60 topical symposia, and also sponsors numerous sin-gle-topic scientific meetings. The Society recognizes 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 arena of mate-rials research through the International Union of Materials Research Societies (IUMRS). MRS is a member of the Federation of Materials Societies 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, 9800 McKnight Road, Pittsburgh, PA 15237. Application to mail at periodicals rates has been approved at Pittsburgh, PA and at additional mail-ing offices. POSTMASTER: Send address changes to MRS Bulletin in care of the Materials Research Society, at the address listed; phone (412) 367-3003; fax (412) 367-4373. Printed in the U.S.A.

Additional copies of articles in MRS Bulletin may be made at \$2.50 per article. This fee can be paid to the Materials Research Society through the Copy-right Clearance Center, Inc., 27 Congress Street, Salem, MA 01970.

Membership in MRS is \$75 annually for regular members, \$25 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 \$135 for one calendar year (12 issues) within the U.S.A. and \$185 elsewhere. Single copies may be purchased for \$16 each. Send subscription orders to Subscription Department, Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237.

MRS Bulletin is included in Current Contents\*/Engineering, Computing, and Technology; Current Contents<sup>®</sup>/Physical, Chemical, and Earth Sciences, the SciSearch® online database, Research Alert®, Science Citation Index®, and the Materials Science Citation Index<sup>™</sup>. Back volumes of MRS Bulletin are available in 16 mm microfilm, 35 mm microfilm, or 105 mm microfiche through University Microfilms Inc., 300 North Zeeb Road, Ann Arbor, Michigan 48106.

Materials Research Society 9800 McKnight Road Pittsburgh, PA 15237-6006 Tel. (412) 367-3003; Fax (412) 367-4373 http://www.mrs.org/

**Vice President** 

H-D. Li

## MRS BULLETIN

#### Editorial Office • 9800 McKnight Road • Pittsburgh, PA 15237-6006 Tel. (412) 367-3004 x522; fax (412) 367-4373; http://www.mrs.org/

Advertising

M.E. Kaufold

Circulation

B.J. Alcorn

**Guest Editors** 

A.J. Epstein and Y. Yang

**Special Contributors** 

**Special Consultant** 

M. Goodway

E.J. Kramer

Ithaca, NY

G.G. Long

S.C. Moss

W.D. Nix

Stanford, CA

R.J. Composto

Philadelphia, PA

University of Pennsylvania

Cornell University

National Institute of Standards

Aerospace Corporation

Los Angeles, CA

Stanford University

and Technology, Gaithersburg, MD

R.M. Ehrenreich, J.M.E. Harper,

V. Narayanamurti, and L.A. Snyder

E.N. Kaufmann, V. Kiernan,

Editor E.L. Fleischer

Managing Editor J. Meiksin

Assistant Editor L.R. Gallagher

Art Director E. Stiller

Design/Production T. Aiello and S. Franklin

#### **Editorial Assistants**

J. Dininny and M. Wilmoth

#### EDITORIAL BOARD -

M.A. Nastasi, Chair Los Alamos National Laboratory Los Alamos, NM W.L. Brown Bell Laboratories, Lucent Technologies

Murray Hill, NJ R.W. Cahn (1997 Visiting Scientist) Cambridge University Cambridge, UK

D.J. Eaglesham Bell Laboratories, Lucent Technologies Murray Hill, NJ

#### VOLUME ORGANIZERS

O. Auciello Argonne National Laboratory Argonne, IL

#### MRS BULLETIN PUBLICATIONS SUBCOMMITTEE R.L. Fleischer (1995 Visiting Scientist)

M.A. Nastasi, Chair Los Alamos National Laboratory Los Alamos, NM

F.W. Clinard (1996 Visiting Scientist) Los Alamos National Laboratory Los Alamos, NM R.C. Ewing

University of New Mexico Albuquerque, NM

President R. Hull

University of Virginia Vice President and President-Elect R.J. Nemanich

A. Hurd Sandia National Laboratories **Immediate Past President** C.V. Thompson North Carolina State University Massachusetts Institute of Technology

Treasurer

Rensselaer Polytechnic Institute Troy, NY A.I. Hurd Sandia National Laboratories Albuquerque, NM

M. Libera Stevens Institute of Technology Hoboken, NJ

**1997 MRS EXECUTIVE COMMITTEE** 

#### Associate Editor—Europe

I.W. Boyd, University College London Dept. of Electronic and Electrical Engineering Torrington Place London WCI E7 JE, U.K. Tel. 44-171-380-7300 or 7302

**Book Review Editor** C.J. McHargue University of Tennessee Knoxville, Tennessee

**MRS Office of Public Affairs** 601 13th Street, NW, Suite 1000 South Washington, DC 20005-3807 Tel. 202-661-2285, Fax 202-661-2299

S.J. Pearton University of Florida Gainesville, FL

S.T. Picraux Sandia National Laboratories Albuquerque, NM

Y. Shiohara ISTEC Tokyo, Japan

C.C. Tsai Xerox PARC Palo Alto, CA

P.M. Fauchet University of Rochester Rochester, NY

C.W. White Oak Ridge National Laboratory Oak Ridge, TN

Councillors R. Gibala University of Michigan

A.I. Taub Ford Research Laboratory

**Executive Director Materials Research Society** John B. Ballance

**INTERNATIONAL UNION OF MATERIALS RESEARCH SOCIETIES** 

President **BC** Ewina University of New Mexico Albuquerque, NM, USA

Tsinghua University Beiiing, China

**IUMRS ADHERING BODIES** Australian Materials Research Society (A-MRS)

J.S. Williams, Australian National University

Chinese Materials Research Society (C-MRS) H-D. Li, Tsinghua University

European Materials Research Society (E-MRS) I.W. Boyd, University College London, UK

Materials Research Society (MRS)

R. Hull, University of Virginia https://doi.org/10.1557/S0883769400033510 Published online by Cambridge University Press

Secretary C. Li Aviation Industries of China Beijing, China

Secretary

K.S. Jones

University of Florida

Treasurer G.M. Crean **University College** Cork, Ireland

Materials Research Society of India (MRS-I) S.K. Joshi, JNCASR, New Delhi

Materials Research Society of Japan (MRS-J) R-I. Yamamoto, University of Tokyo

Materials Research Society of Korea (MRS-Korea) S-J. Park, Seoul National University

**Immediate Past President** M. Doyama Nishi-Tokyo University Tokyo, Japan

**General Secretary** R.P.H. Chang Northwestern University Evanston, Illinois, USA

Materials Research Society of Russia (MRS-Russia) I.V. Gorynin, Prometey Institute

Materials Research Society of Taiwan (MRS-T) L.J. Chen, National Tsing Hua University

Mexican Materials Research Society (Mexican-MRS) L.M. Gomez, Instituto de Fisica-Cuernavaca, UNAM



#### **crystal**lographica

Introducing the ideal software toolkit for chemists, physicists, biotechnologists, mineralogists, and all material scientists with an interest in crystal properties. CRYSTALLOGRAPHICA combines the ease of use of a Microsoft Windows interface with the power of a programming language, allowing simple and complex problems to be tackled with ease.

**ryst** 

 $\bigcirc$ 

crystallograph

**CRYSTALLOGRAPHICA** I DE TRIGERE incorporates a Pascal interpreter extended with hundreds of crystallographic 'building Lavers .. Set View block' routines. This is a\* b\* C\* integrated with many cedure Oscillate(n:integer, k,x0,x,y,z:real; attractive graphical var i:integer: begin
{ oscillation amplitude and mate }
k:=2\*9I/n; tools to make **CRYSTALLOGRAPHICA** ena; end; { End of procedure definition } the perfect research true do Oscillate(10,8.02) and teaching aid. mile Reciprocal Lattice Editor: OSCILLATX - line 16, col 33 IN त्र अन्यलान् अम् जिल्लान LOX SetPowderShape(PEARSON7 AbsorptionFactor; og: 7 Autiplicity(3,0,1); SetCell(4.9133,5.4053); LOX E Calculater

For more information contact: OXFORD CRYOSYSTEMS 28

3 Blenheim Office Park Lower Road Long Hanborough • Oxford OX8 8LN • UK Tel. +44 (0)1993 883488 Fax. +44 (0)1993 883988

email: sales@cgraph.demon.co.uk http://www.demon.co.uk/oxcryo (includes free demo version) Credit cards accepted Pascal interpreter with extensive library of crystallographic routines

quartz

- Integrated crystal structure drawing plus new VRML export
   New reciprocal lattice viewer with a variety of plotting styles
- X-ray and neutron powder pattern simulation
  - Installation includes numerous example scripts and crystal structures
- Comprehensive printed and on-line help, plus technical support