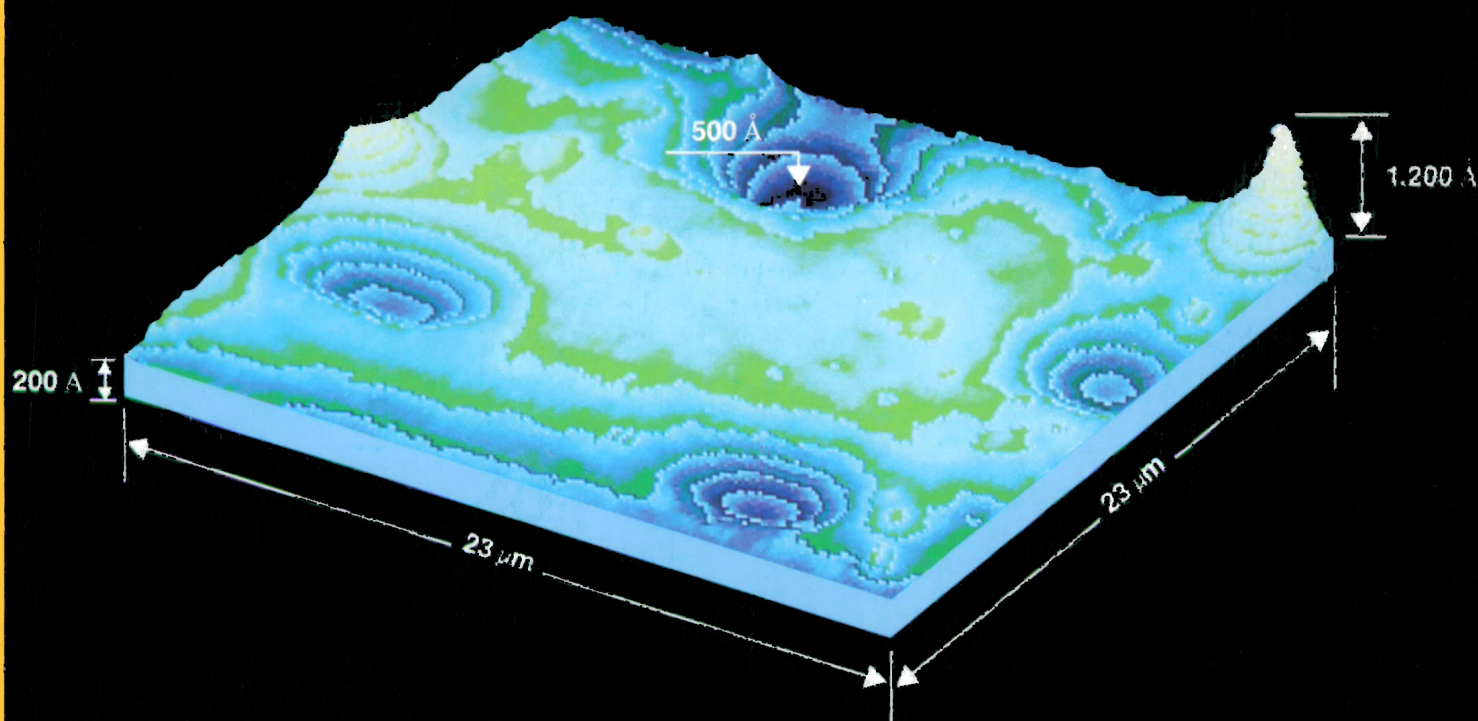
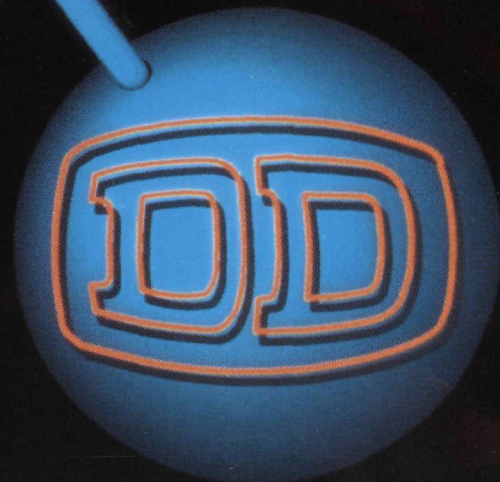


Magnetic Recording Materials



A NEW CLUSTER IS BORN



General Ionex acquired by High Voltage Engineering Europa B.V.

In December 1987 High Voltage Engineering Europa B.V. (HVEE) acquired Dowlish Developments Ltd (DD), an accelerator tube manufacturer located in the United Kingdom.

On April 10, 1989, HVEE purchased the General Ionex Analytical Product Group from Genus Inc. based in the United States.

Through this acquisition HVEE positions itself as the largest and most diverse manufacturer of particle accelerators for the scientific and industrial research communities.

The acquired General Ionex (GI) product lines, which include the Tandetron accelerator systems and Model 4175 RBS Analyser, will be manufactured in HVEE's new, well-equipped facility in Amersfoort, The Netherlands.

World wide marketing of all products from HVEE, DD and GI will originate from HVEE Amersfoort with sales and service offices in the USA, Europe and Japan.

After addition of the newly acquired products HVEE's product lines include:

– *Ion Accelerator Systems*

- Air insulated accelerators up to 500 kV
- Single ended Van de Graaff accelerators up to 4 MV
- Tandem Tandetron accelerators up to 3 MV/TV

– *Research ion implanters*

- Beam energies 10 keV-9 MeV and higher

– *Systems for ion beam analysis*

- Systems for RBS, PIXE, PIGE, NRA, ERD, MACS and MEIS

– *Components*

- HV power supplies, electron and ion accelerator tubes, ion sources beamline components, beam monitoring equipment, UHV sample manipulators, etc.

For further information on this transaction and product literature please contact HVEE in Amersfoort/NL.



**More
Energy for Research**

HIGH VOLTAGE ENGINEERING EUROPA B.V.

Published online by Cambridge University Press
P.O. Box 99, 3800 AB Amersfoort, The Netherlands. Phone: (+31) 33 - 619741. Fax: (+31) 33 - 615291. Telex: 79100 HIVEC NL
Sales Office for USA & CANADA: Peabody Scientific, P.O. Box 2009, Peabody, MA 01960, USA Phone: (508) 535-0444, Fax: (508) 535-5827

MRS BULLETIN

March 1990

A Publication of the Materials Research Society

Volume XV, Number 3 ISSN: 0883-7694 CODEN: MRSBEA

MAGNETIC RECORDING MATERIALS

- 23** **Magnetic Recording Materials: Present and Future**
A. Berkowitz, Guest Editor
- 31** **Magnetic Storage: Principles and Trends**
J.U. Lemke
- 36** **Materials for Future High Performance Magnetic Recording Heads**
T. Jagielinski
- 45** **Overcoats and Lubrication for Thin Film Disks**
A.M. Homola, C.M. Mate, and G.B. Street
- 53** **Particulate Recording Media**
M.P. Sharrock
- 63** **Thin Film Recording Media**
J.H. Judy

INTERNATIONAL

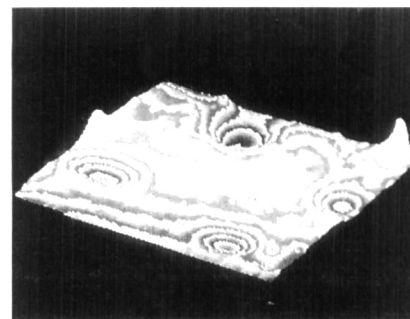
- 73** **International Materials Research Committee Holds Inaugural Meeting**

MRS NEWS

- 77** **Plans Launched for Establishing MRS Washington, DC Office**
- 81** **Spring Meeting Plenary Questions Earthquake Prediction Theories**
- 82** **1990 Von Hippel Award Nominations Sought**
- 82** **MRS Offers Major New Awards**
- 84** **Fall '89 Meeting Features Broad Mix of Topics**

DEPARTMENTS

- 4** **Letter from the President**
- 7** **Material Matters**
- 8** **Research/Researchers**
- 18** **Research Resources**
- 26** **Journal of Materials Research**
- 88** **Historical Note**
- 92** **Upcoming Conferences**
- 94** **Book Reviews**
- 95** **Calendar**
- 100** **Classified**
- 104** **Advertisers in this Issue**
- 104** **Postterminaries**



ON THE COVER: The cover shows a three-dimensional micrograph obtained by atomic force microscopy (AFM) of the surface of a liquid, perfluoropolyether polymer spread on a substrate patterned with micron-sized holes. The color contours in the micrograph highlight the menisci of the liquid in the hole openings of the substrate. From the work of C.M. Mate. For more information, see "Overcoats and Lubrication for Thin Film Disks" by A.M. Homola, C.M. Mate, and G.B. Street on p. 45.

MRS BULLETIN

Materials Research Society • 9800 McKnight Road • Pittsburgh, PA 15237

MRS BULLETIN

Editor

G. A. Oare
(412) 367-3036

Assistant Editor

F. M. Wieloch
(412) 367-3036

Copy Editor

S. W. Morelli

Design/Production

C. Love, W. Appman
(412) 367-3003

Editorial Assistant

J. Dininny
(412) 367-3036

Advertising and Circulation

M. E. Kaufold
(412) 367-3036

Associate Editor—Europe

I. W. Boyd
University College London
Dept. of Electronic and
Electrical Engineering
Torrington Place
London WC1 E7 JE
United Kingdom
01-387-7050
ext. 3956 or 7304

Contributor

K. J. Anderson

Guest Editor

A. Berkowitz

Chairman—Editorial Boards

E. N. Kaufmann
Argonne National Laboratory
Argonne, Illinois

International Advisory Board

M. Balkanski
University of Pierre and Marie Curie
Paris, France

S. Hsu
Chung Shan Institute of Science
and Technology
Taiwan, China

R. Krishnan
Defense Research and
Development Organization
New Delhi, India

H. D. Li
Tsinghua University
Beijing, China

R. Roy
Pennsylvania State University
University Park, Pennsylvania

G. D. W. Smith
University of Oxford
Oxford, United Kingdom

T. Sugano
University of Tokyo
Tokyo, Japan

J. S. Williams
Royal Melbourne Institute of
Technology
Melbourne, Australia

1990 MRS EXECUTIVE COMMITTEE

President

R. R. Chianelli
*Exxon Research
and Engineering*

First Vice President and President-Elect

J. B. Roberto
*Oak Ridge National
Laboratory*

Second Vice President

S. Cargill
*IBM T.J. Watson
Research Center*

Secretary

C.M. Jantzen
*Westinghouse Savannah
River Co.*

Treasurer

S. M. Kelso
Therma-Wave, Inc.

Immediate Past President

R. P. H. Chang
Northwestern University

Executive Director
Materials Research Society
John B. Ballance

EUROPEAN MRS

P. Siffert

Centre de Recherches Nucléaires
Laboratoire PHASE
67037 Strasbourg, Cedex, France
Telephone: (88) 28 65 43
Fax: (88) 28 09 90

Technical Editorial Board

J. C. C. Fan
Kopin Corporation
Taunton, Massachusetts

F. Y. Fradin
Argonne National Laboratory
Argonne, Illinois

G. L. Liedl
Purdue University
West Lafayette, Indiana

S. Namba
Osaka University
Osaka, Japan

R. L. Schwoebel
Sandia National Laboratories
Albuquerque, New Mexico

R. C. Sundahl
Intel Corporation
Chandler, Arizona

K. C. Taylor
General Motors
Warren, Michigan

MRS BULLETIN Publications Subcommittee

M. H. Bennett-Lilley
Texas Instruments
Dallas, Texas

R. R. Chianelli
Exxon Research and Engineering
Annandale, New Jersey

R. J. Eagan
Sandia National Laboratories
Albuquerque, New Mexico

P. Sliva
General Electric
Largo, Florida

J. M. Phillips
AT&T Bell Laboratories
Murray Hill, New Jersey

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

ABOUT THE MATERIALS RESEARCH SOCIETY

The Materials Research Society (MRS) is a nonprofit scientific association founded in 1973 to promote interdisciplinary goal-oriented basic research on materials of technological importance. Membership in the Society includes more than 9,500 scientists from industrial, government, and university research laboratories in the United States and more than 25 countries.

The Society's interdisciplinary approach to the exchange of technical information is qualitatively different from that provided by single-discipline professional societies because it promotes technical exchange across the various fields of science affecting materials development. MRS sponsors two major international annual meetings encompassing approximately 40 topical symposia, as well as numerous single-topic scientific meetings each year. It recognizes professional and technical excellence, conducts short courses, and fosters technical exchange in various local geographic regions through Section activities and University Chapters.

MRS is an Affiliated Society of the American Institute of Physics and participates in the international arena of materials research through associations with professional organizations such as European MRS.

MRS publishes symposium proceedings, the *MRS BULLETIN*, *Journal of Materials Research*, and other current scientific developments.

MRS BULLETIN (ISSN: 0883-7694) is published 12 times a year by the Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237. Membership in MRS includes \$25.00 (\$15.00 for students) from membership dues to be applied to a subscription to the *MRS BULLETIN*. Application to mail at second class rates is pending at Pittsburgh, PA and at additional mailing offices. POSTMASTER: Send address changes to *MRS BULLETIN* in care of the Materials Research Society, 9800 McKnight Road, Pittsburgh, PA 15237; telephone (412) 367-3003; fax (412) 367-4373.

Back volumes of this publication are available in 16mm microfilm, 35mm microfilm, or 105mm microfiche through University Microfilms Inc., 300 North Zeeb Road, Ann Arbor, Michigan 48106.

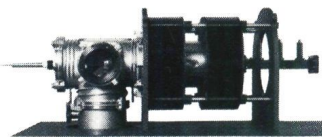
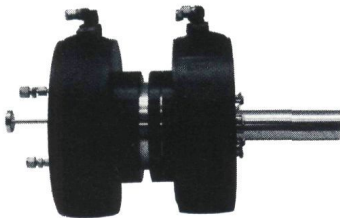


UHV ECR Source

The Microscience 904 ECR source is designed for retrofitting to UHV chambers. The source comes complete with microwave circuitry, magnets and power supplies. Details from Microscience, 41 Accord Park Dr., Norwell, MA 02061. Tel. (617) 871-0308.

1000 Degree C Heater

The MICRO1000 range of heaters operate up to 1000 degrees C. even in an oxygen environment. Available in a number of configurations to fit any vacuum system. Comes with a range of optional accessories including shutter, cooling shroud and DC and RF biasing. For more information call Microscience, 41 Accord Park Dr., Norwell, MA 02061. Tel. (617) 871-0308.

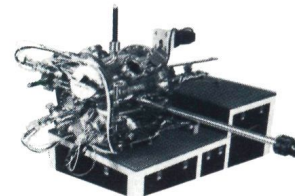


ECR Ion Source with extraction grids

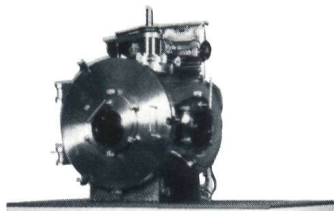
The ECR 908G is a high efficiency ECR plasma stream source fitted with extraction grids for energies in the range 50-5000 eV. The 908G produces beam densities up to 100 mA/cms. Applications include ion beam enhanced deposition, ion etching and RIBE. Contact Microscience, 41 Accord Park Dr., Norwell, MA 02061. Tel. (617) 871-0308.

MBE Sputter System

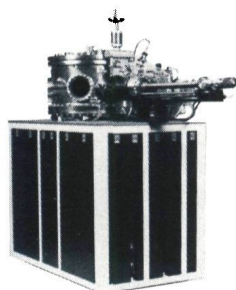
The Microscience 401 sputtering system is designed for interfacing to MBE systems. Features include a transfer system, load lock, rotating heated biasable sample holder, magnetron cluster and an LN cryo-shroud. This is a CAD based design that can be adapted for most MBE systems. Contact Microscience, 41 Accord Park Dr., Norwell, MA 02061. Tel. (617) 871-0308.



Small Batch Sputter Production Systems



The Microscience MicroProd sputter system is suitable for prototype and batch production work with small substrates. Features a 24 inch dia. barrel chamber, loading door, carousel sample holder, and a variety of ports and feed throughs for magnetron sputter guns and ion sources. The MicroProd is a CAD design that can be easily adapted for a wide range of uses. Contact Microscience, 41 Accord Park Dr., Norwell, MA 02061. Tel. (617) 871-0308.



Researcher 101

Microscience introduces the researcher 101. An integrated UHV thin film system for advanced R&D applications. Originally designed for research on HTC films, the 101 incorporates many specialized features including transportable 1000 degree heater substrate carrier, stepper motor controlled, substrate positioning system and optional surface science module. The 101 is offered in HV and UHV configurations and can be fitted with a wide range of tools including planar magnetrons, ion sources and an ECR plasma stream source. From Microscience, 41 Accord Park Dr., Norwell, MA 02061. Tel. (617) 871-0308.

Please visit Booth No. 613 at the MRS Show in San Francisco, April 17-19, 1990.

Winners work with Microscience Systems

We can't guarantee you'll win a Nobel prize using our thin film systems, but we can promise you innovative, cost effective designs for state of the art systems. Whether your interest is a small research system, a production tool or comprehensive thin film laboratory, our CAD department can tailor a system to suit your needs. You can choose from a wide range of industry standard components and take advantage of our innovative technical advances in plasma sources, heaters, substrate handling, computer control and information managers. So, if you want to win in thin films, give Microscience a call.

MICROSCIENCE

Microscience, Inc. 41 Accord Park Dr., Norwell Massachusetts 02061 Tel (617) 871-0308 Fax (617) 871-0972