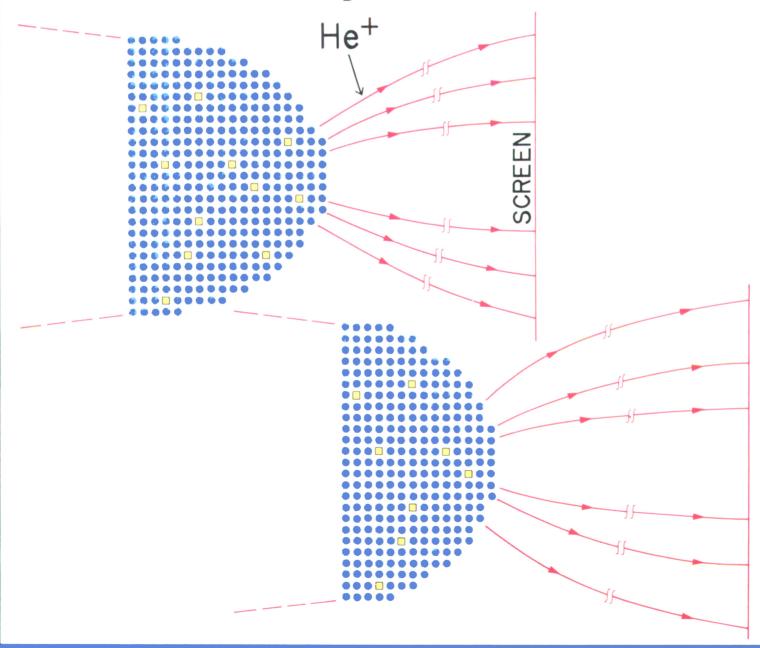
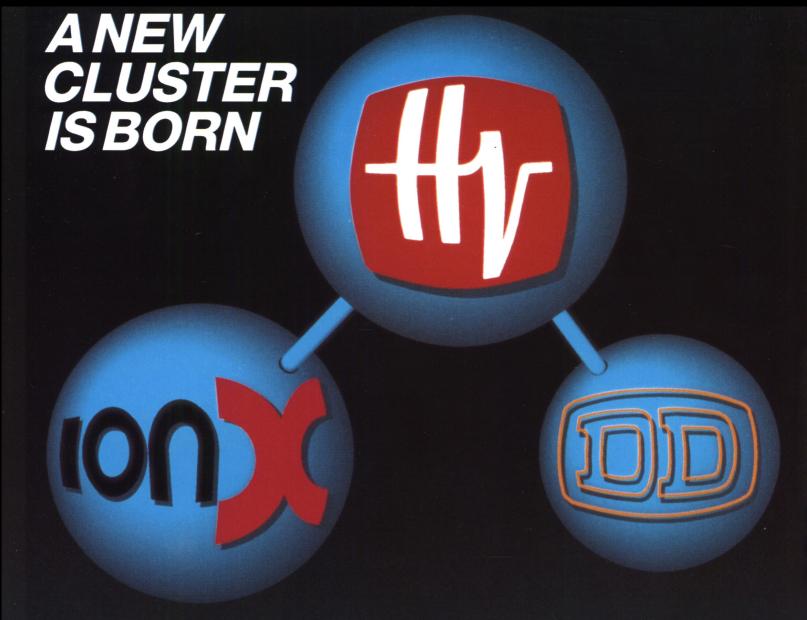
February 1991

Volume XVI, Number 2

Serving the International Materials Research Community

In Pursuit of the Lattice Vacancy





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.

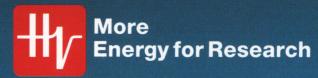
World wide marketing of all products from HVEE, DD and GI will originate from HVEE Amersfoort with sales and service offices in the USA, Europe and Japan.

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.

Circle No. 1 on Reader Service Card.



HIGH VOLTAGE ENGINEERING EUROPA B.V.

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 • The Schräff Center, Suite 602, 529 Main Street, Boston, MA 02129 Phone: (617) 241-5000 Fax: (617) 241-5005



February 1991

A Publication of the Materials Research Society Volume XVI, Number 2 ISSN: 0883-7694 CODEN: MRSBEA

TECHNICAL FEATURES

16 **Computer Applications in Plasma Materials Processing**

D.B. Graves and R.A. Gottscho

23 In Pursuit of the Lattice Vacancy 1990 MRS Fall Meeting Von Hippel Award Presentation R.W. Balluffi

INTERNATIONAL

- 30 Strasbourg Hosts 950 at **E-MRS Spring Meeting**
- 33 **International Union of Materials Research** Societies Established
- **34** AMSES Becomes Materials **Research Society of Japan**
- **Principal Editors of** *Journal* of Materials Research Meet in Tokyo

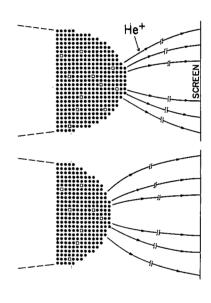
MRS NEWS

- 36 1990 MRS Fall Meeting **Mixes New Science with Traditional Materials**
- **Roberto to Lead MRS** in 1991

DEPARTMENTS

- 5 **Material Matters**
- 7 Research/Researchers
- 13 Resources
- 14 **Editor's Choice**
- 15 From Washington
- 35 **Journal of Materials** Research
- **52 Upcoming Conferences**
- 53 **Chapter News**
- 54 **Historical Note**
- 56 **Book Reviews**
- **59** Calendar
- 63 Classified
- 64 Advertisers in This Issue

ON THE COVER: Schematic shows how 1990 Von Hippel Award recipient Robert W. Balluffi and Dave Seidman, with the help of then graduate student Arnie Berger, used field ion microscopy to study lattice defects. For more information, see "In Pursuit of the Lattice Vacancy" on p. 23.



RISI BULLE

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

MRS BULLETIN

Publisher G. A. Oare

Technical Editor E. L. Fleischer

Assistant Editor F. M. Wieloch

Copy Editor D. M. Varner

Design/Production C. Love, W. Appman, J. Probert

Editorial Assistants J. Dininny, M. M. Costello

Advertising and Circulation M. E. Kaufold

Editorial and Advertising Offices 9800 McKnight Road Pittsburgh, PA 15237 Telephone (412) 367-3036 Fax (412) 367-4373

Associate Editor—Europe

I. W. Boyd University College London Dept. of Electronic and Electrical Engineering Torrington Place London WCI E7 JE United Kingdom 71-387-7050

ext. 3956 or 7304

MRS Office of Public Affairs 2000 Florida Ave. NW. Third Floor Washington, DC 20009 Telephone (202) 483-6771

Special Contributors K. J. Anderson, C.D. Chaffee, R. L. Park

Chairman—Editorial Boards

E. N. Kaufmann Argonne National Laboratory Argonne, Illinois

International Advisory Board

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

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. Rov 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

1991 MRS EXECUTIVE COMMITTEE

First Vice President and President-Elect S. Cargill, IBM T.J. Watson Research Center

Second Vice President

S. T. Picraux, Sandia National Laboratories

Secretary

C. M. Jantzen, Westinghouse Savannah River Co.

C. B. Duke, Xerox Research Laboratories

R. R. Chianelli, Exxon Research and Engineering

Executive Director Materials Research Society John B. Ballance

President

J. B. Roberto, Oak Ridge National Laboratory

Immediate Past President

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. Liedi **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

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

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

J. M. Phillips AT&T Bell Laboratories Murray Hill, New Jersey P. Sliva **Battelle Pacific Northwest** Laboratories Richland, Washington

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 10,000 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.

Rapid Thermal Processing - LPCVD

The new modular RX Series, lets you configure precisely the system you need to perform or develop virtually any application demanding a thermal process - from the most basic annealing process to the most complex LPCVD environment. Ask for the price, you will be surprised!

The RX series for RTP.

The RX is a fully automated integrated processor featuring:

- Fast heating rates with ramp-up rates up to 400°C/sec and fast cooling rate to get abrupt junctions with a unique cooling system.
- Temperature uniformity computer controlled in real time, with multizone furnace.
- Cleanliness with a quartz chamber designed for medium or high vacuum options with automatic vacuum cycles and pressure programming.
- Gas control/mixing.
- Unique graphics software. The environment is entirely computer controlled, including complete process data storage and retreival, hardware calibrations and maintenance.

The RX series for LPCVD.

With its many years of experience in Rapid Thermal Processing, AET Addax has developed proprietary features for LPCVD, and has addressed major concerns regarding the application of RTP to LPCVD:

- The ultra high vacuum (10-9 torr) quartz chamber offers an extremely clean environment to generate ultra pure films.
- The combination of a very small volume processing chamber and fast gas switching system produces a low memory effect for sharp transitions.
- The advanced cooling system provides "cold wall quartz" capabilities. A specfic module is available for installation on UHV stainless steel chambers.
- Removable chamber for cleaning or to avoid cross contamination between processes.
- Safety features with interlocks, leak tight double enclosure for toxic gases, automatic reset procedures.





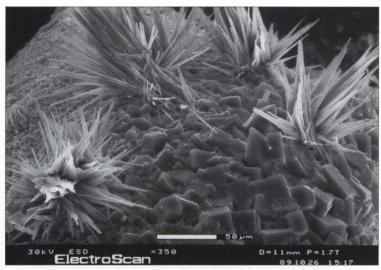
Problem: HIGH-TEMPERATURE CRYSTALLIZATION

How do you evaluate the microscopic dynamics of liquid-solid or gas-solid phase changes and reactions in catalysts, minerals, polymers and ceramics? Are you unable to use the SEM due to its rigid vacuum requirements? Are you forced to rely on before-and-after inspection because there is no way to observe the process as it occurs?



KCl crystal spires condensed from gas at 550°C.

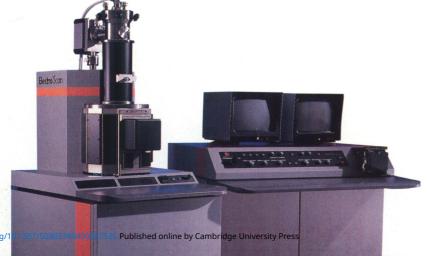
Lead salts growing on molten lead surface, 500°C



Solution: **ESEM**

The revolutionary Environmental Scanning Electron Microscope from ElectroScan is changing the traditional rules, rewriting the book on high-resolution imaging. For the first time, it is easily possible to view virtually any material directly, at temperatures up to 1,000° C, in a variety of gases, at pressures thousands of times higher than those permissible in a conventional SEM. No special coating or preparation is necessary to obtain clear images, regardless of specimen conductivity.

Could this capability make a difference in your work? If so, call ElectroScan today and enter a new world of discovery. We can guarantee you'll see something you've never seen before.





ElectroScan Corporation 66 Concord Street Wilmington, MA 01887 (508) 988-0055