

Microclusters

Edited by S. Sugano, Y. Nishina, and S. Ohnishi
(Springer-Verlag, 1987)

Microclusters is a collection of papers presented at the First NEC Symposium on Fundamental Approaches to New Material Phases, held October 20-22, 1986 in Hakone and October 23, 1986 in Kawasaki, Japan. The papers have been organized into seven sections: shell model, electronic structure, new experiments, dynamical processes, structural fluctuations, larger microclusters, and semiconductor clusters. Of the 37 papers presented, 24 are from Japanese groups; however, the United States and Europe are well represented by seven and six contributions, respectively.

In a surprising departure from recent cluster meetings, 26 contributions emphasize theoretical rather than experimental treatments. These include electronic structure, geometry, and dynamics, the latter a newly emerging aspect of cluster research. The electronic structure papers describe different *ab initio* techniques and also model approaches to extract information on cohesion, bonding, and relative stability that can be compared with experimentally determined abundances. A few papers address the important problem of determining adequate potential energy surfaces, which is needed for finding equilibrium geometries and carrying out dynamical calculations.

Most of the experimental papers describe gas phase or molecular beam cluster studies. Cluster generation techniques described include ion sputtering, laser vaporization, inert gas condensation, and adiabatic nozzle expansion. Results are presented on clusters of metal and semiconductor atoms, and molecular (van der Waals) clusters. The experiments described include mass spectral determination of abundances and magic numbers, optical spectra, multiphoton ionization probes of cluster dynamics, and collisional ionization studies. A particularly intriguing paper describes structural instability of small metal particles and includes a series of dramatic high resolution electron micrographs showing the time-dependence of the structure of gold clusters deposited on SiO₂-covered Si.

The study of isolated clusters of metal and semiconductor systems is a rapidly advancing field, with several major international meetings held each year. (For example, the week following the Japanese meeting, the International Symposium on the Physics and Chemistry of Small Clusters was held in Richmond, Virginia.) It is difficult for publications requiring a year's preparation to keep up with this fast pace.

Yet this is still a timely book, especially because it provides to the international audience an exposure to Japanese efforts in this area and also fairly up-to-date coverage of theoretical advances in the cluster field.

Reviewers: S. J. Riley is group leader, and J. Jellinek is a member, of the Metal Cluster Chemistry Group, Chemistry Division, Argonne National Laboratory.

Glasses and Glass-Ceramics for Nuclear Waste Management

Edited by J. Ma. Rincon
(Instituto de Ceramica y Vidrio, CSIC, Madrid, Spain, 1987)

This small volume, 212 pages, documents a seminar held in Madrid in May 1985 on the use of glasses and glass-ceramics as nuclear waste forms. The meeting was sponsored by Spanish research organizations (CIEMAT and CSIC) and the Hispano-USA Joint Committee for Scientific and Technical Cooperation. According to the editor, J. Ma. Rincon Lopez, this is the first book of this type published in Spain with major contributions from Spanish scientists. There are also contributions from scientists at the University of California-Davis and Lawrence Berkeley Laboratory.

The volume consists of nine contributed chapters. There are introductory chapters on the nature of high level nuclear wastes and the properties of the glassy state. Chapters on specific topics cover a wide range of subjects from heat transfer in vitri-

fied radioactive waste to the use of sodium zirconium phosphate, NZP, as a single-phase, radionuclide waste form. In general, little new material is included in these chapters. Most of the information can be found in papers which appear in the proceedings volumes of the Materials Research Society or the American Ceramic Society, often by the same authors. Two of the chapters were, however, unique. Dr. S. Martinez and co-workers presented a summary of glass ceramic materials that might be made from Spanish basalts. Dr. John Apps summarized what is known concerning the major differences in the alteration of basaltic and rhyolitic glasses. While this chapter is an interesting summary, considerable work and progress has been made on this topic since the seminar in 1985.

The volume is paperbound and consists of camera-ready copy of mixed typographical lineage. I expect this volume will only find itself on the shelves of those rare libraries which pride themselves on completeness or in the personal libraries of the contributing authors. In the absence of a preponderance of new materials, I cannot recommend this volume to scientists involved in research on nuclear waste disposal.

Rodney C. Ewing is a professor of Geology at the University of New Mexico. For the past 12 years he has been an active participant in the MRS symposium on "The Scientific Basis for Nuclear Waste Management."

Materials Research Society

PUBLICATIONS CATALOGUE

Complete list of all available MRS publications

- Symposium Proceedings of MRS-sponsored symposia conducted since 1980
- Conference Proceedings of other meetings of interest to MRS members
- Extended Abstracts
- Journals
- High T_c Superconductor Videotapes
- Other books and journals available at special prices to MRS members
- Upcoming titles
- Information on back orders
- Standing Order Discount Program

Order a copy of the MRS Publications Catalogue for yourself and one for a colleague from: Publications Department, Materials Research Society, 9800 McKnight Road, Suite 327, Pittsburgh, PA 15237; telephone (412) 367-3036; fax (412) 367-4373

MRS CORPORATE AFFILIATES

Abbott Laboratories
Advanced Control Systems Corporation
Advanced Micro Devices
Aerospace Corporation
AET-ADDAX Inc.
AG Associates
Air Products and Chemicals
ALCOA
Allied-Signal, Inc.
American Fly Ash Company
Ametex AG
AMGEN, Inc.
Amoco
Anderson Physics Laboratories, Inc.
Applied Electron Corporation
Applied Materials
ARCO Solar, Inc.
AT&T Bell Laboratories
AT&T Technologies, Inc.
Bell Communications Research
Biomet Inc.
BP America, Inc.
Brimrose Corporation of America
Brookhaven Instruments Corporation
Brush Wellman, Inc.
Cabot Corporation
Cameca Instruments, Inc.
Chevron Research Company
Coherent
Corning Glass Works
Crystallume
CVC Products, Inc.
Denton Vacuum, Inc.
Diamond Materials Institute
Dow Chemical U.S.A.
E.I. du Pont de Nemours & Company
Eaton Corporation
EG&G Idaho, Inc.
EG&G ORTEC
EG&G Princeton Applied Research
Electric Power Research Institute
Elektroschmelzwerk Kempten
EM Industries, Inc.
EMCORE Corporation
Engelhard Corporation
Charles Evans & Associates
Exxon Chemical Company
Exxon Research and Engineering Company
Fibermesh Company
Ford Motor Company
Fuji Electric Company Ltd.
Fuji Xerox
Gas Research Institute
General Electric Company
General Ionex Corporation
General Motors Research Laboratories
Getty Conservation Institute
Glasstech Solar, Inc.
W.R. Grace & Company
GTE Laboratories
High Voltage Engineering Europa B.V.
Hitachi Ltd.
Howmedica
Hoya Optics, Inc.
HTR Sciences
Hughes Aircraft Company
Huntington Mechanical Laboratories, Inc.
IBM Corporation
Imperial Chemical Industries, plc
Instruments SA, Inc./Riber Division
International Zeolite Association
Interpore International
Ion Tech, Inc.
Iowa Fly Ash Affiliates
JEOL USA
Johnson & Johnson Products, Inc.
Komatsu, Ltd.
Kopin Corporation
Leonard J. Kroko Company
Lake Shore Cryotronics, Inc.
Lambda Physik, Inc.
Lawrence Livermore National Laboratory
R. J. Lee Group, Inc.
Kurt J. Lesker Company
Leybold Corporation
Leybold-Heraeus Technologies, Inc.
Logical Digits
Lumonics
Martin Marietta Laboratories
Master Builders, Inc.
Materials Research Corporation
Matsushita Electronics Company, Ltd.
Microelectronics and Computer Technology Corporation
Microscience, Inc.
Mitsubishi Electric Company, Ltd.
MKS Instruments, Inc.
Mobil Research and Development Corporation
Mobil Solar Energy Corporation
Molycorp, Inc.
Monsanto
National Electrostatics Corporation
Newport Corporation
Nicolet
Nippon Electric Company, Ltd.
Nissei Sangyo America, Ltd.
North Eastern Analytical Corporation
Oak Ridge National Laboratory
Oki Electric Industry Company, Ltd.
Ontario Research Foundation
Ovonic Synthetic Materials Company, Inc.
Peak Systems
Perkin-Elmer
Philips and DuPont Optical Company
Philips Electronic Instruments, Inc.
Philips Research Laboratories
PQ Corporation
Process Products Corporation
Prometrix Corporation
Questek Inc.
Raytheon Company
Rockwell International
Sandia National Laboratories
Sanyo Electric Company, Ltd.
Schlumberger-Doll Research
Shimadzu Corporation
Siemens A.G.
Solar Energy Research Institute
Solarex
Solecon Laboratories, Inc.
Solid State Technology
South Bay Technology, Inc.
Spectrum Technology, Inc.
Spire Corporation
Springer-Verlag New York, Inc.
Sumitomo Electric Industries, Inc.
Surface Science Laboratories, Inc.
Superconductor Week, AIS
Tamarack Scientific Company, Inc.
Temescal
Texas Instruments Inc.
3M
Toshiba Corporation
TRW
United Technologies Research Center
Universal Energy Systems Inc.
USG Corporation
Varian Associates
Varian/Extron
VCR Group Inc.
VG Instruments, Inc.
VG Ionex Limited
Wacker Siltronic Corporation
Westinghouse Electric Corporation
Xerox Corporation
Carl Zeiss, Inc.

Explore the Frontiers of Your Science with the **MS** Springer Series in Materials Science

Springer Series in Materials Science presents single- and multi-authored graduate-level monographs and textbooks on a broad range of materials science subjects, including semiconductor materials, growth and processing, ceramics, high T_c materials, metal physics, and clusters. Proceedings of selected topical meetings likely to influence the direction of research are also included. The series emphasizes basic physics, yet engineering applications of materials are also discussed.

Vol. 1

Chemical Processing with Lasers

D. Bäuerle

"Anyone concerned to keep abreast of developments in material processing will find few books more informative or stimulating than this..."

— *Chemistry in Britain*

Provides the first comprehensive survey of the mechanisms and applications of maskless single-step patterning of materials with lasers.

1986/245 pp./88 illus./hardcover \$49.00
ISBN 0-387-17147-9

Vol. 2

Laser-Beam Interactions with Materials

Principles and Applications

M. von Allmen

"It provides, at a very readable level, a good foundation for extended, in-depth reading in related fields...highly recommended to both graduate students and materials scientists and engineers."

— *MRS Bulletin*

Examines a wide variety of processes that lasers can induce in materials with applications in such diverse fields as semiconductor annealing, hole drilling, and fusion-plasma production. The emphasis is on physical insights rather than specific processes.

1987/232 pp./71 illus./hardcover \$52.00
ISBN 0-387-17568-7

Vol. 3

Laser Processing of Thin Films and Microstructures

Oxidation, Deposition, and Etching of Insulators

I.W. Boyd

Describes fundamental aspects and practical details of laser processing of thin dielectric films, including deposition, nucleation and growth,

etching, and ablation as applied to direct formation of localized patterns and structures on micro- and opto-electronics devices.

1987/320 pp./77 illus./hardcover \$59.00
ISBN 0-387-17951-8

Vol. 4

Microclusters

Proceedings of the First NEC Symposium, Tokyo, Japan, October 20-23, 1986

Edited by S. Sugano, Y. Nishina and S. Ohnishi

Presents recent advances in experimental and theoretical clusters consisting of a few to a few hundred atoms of metallic and semiconducting elements. The topics covered include both static and dynamic aspects of the atomic and electronic structure of these microclusters.

1987/289 pp./187 illus./hardcover \$56.00
ISBN 0-387-17675-6

Vol. 5

Graphite Fibers and Filaments

(With contributions by G. Dresselhaus)

M.S. Dresselhaus, H.A. Goldberg, I.L. Spain, and K. Sugihara

Describes the preparation, microstructure and defects, and lattice, thermal, mechanical, magnetic, electrical, and high-temperature properties of carbon fibers, as well as modification introduced by intercalation and ion implantation. Particular attention is given to the newly developed vapor-grown fibers. The book concludes with a brief discussion of applications.

1988/214 pp./226 illus./hardcover \$74.00
ISBN 0-387-18938-6

Vol. 6

Elemental and Molecular Clusters

Proceedings of the Workshop, International School of Materials Science and Technology, Majorana Center, Erice, Italy, July 1-15, 1987

Edited by G. Benedek, T.P. Martin, and G. Pacchioni

Examines experimental and theoretical techniques for the study of clusters, a new state of condensed matter. Each chapter reviews basic concepts and applies these to problems of current interest. Ideal for those new to the field, this book covers cluster sources, the evolution of electronic properties of condensed matter, the microscopic view of crystal growth, the chemical reactivity of clusters, and cluster stability and fragmentation.

1988/approx. 395 pp./217 illus./hardcover \$54.50 (tent.)
ISBN 0-387-19048-1

Vol. 7

Molecular Beam Epitaxy

Crystallization of Semiconductor Films from Atomic and Molecular Beams

H. Sitter and M.A. Herman

1988/hardcover ISBN 0-387-19075-9

Vol. 8

Physical Chemistry of, in and on Silicon

G.F. Cerofolini and L. Meda

Featuring a critical, current collection of data, this volume explores the physical chemical properties of silicon and its newly developed phases. It also reports on a new approach to III Group acceptor structure and contains precise information on gettering techniques.

1988/hardcover ISBN 0-387-19049-X

Vol. 9

Tritium and Helium-3 in Metals

R. Lässer

From the contents: General Aspects of Tritium. Preparation of Metal Tritides. Analysis of Tritium in Metals. Properties of Protium, Deuterium and Tritium in Selected Metals. Properties of Helium-3 in Selected Metals.

1988/hardcover ISBN 0-387-19056-2

Vol. 10

Computer Simulation of Ion-Solid Interaction

W. Eckstein

Addresses the investigation of ion bombardment of solids via computer simulation and demonstrates the usefulness of computer simulation for understanding the interaction of ions and solids. Supplying the basic physics behind the simulation programs, the volume stresses backscattering, sputtering, and implantation.

1988/hardcover ISBN 0-387-19057-0

Vol. 11

Elastic Strain in Single and Layered Epitaxial Films

E.J. Fantner

1988/hardcover ISBN 0-387-18189-X

To Order: please visit your local scientific/academic bookstore, call our **TOLL FREE NUMBER: 1-800-526-7254** (in NJ, **201-348-4033**), or send payment, including \$2.50 for postage and handling, to the address below. Residents of NY, NJ, and CA please add sales tax for books. Personal checks, money orders, and American Express, MasterCard, and VISA are acceptable.

For More Information: please call or write Springer-Verlag New York, Inc.

Attn: Ken Quinn, Dept. S865
175 Fifth Avenue, New York, NY 10010



Springer-Verlag

New York Berlin Heidelberg Vienna London Paris Tokyo