

# Preview: 1989 MRS Spring Meeting

**Town & Country Hotel  
San Diego, California  
Events Scheduled April 22-29**

Chairs: Robin Farrow, IBM; Richard Siegel, Argonne National Laboratory; Angelica Stacy, University of California, Berkeley

flow visualization and modeling, etc.), *ex situ* nondestructive characterization; novel growth techniques—beam-assisted growth, atomic-layer epitaxy, submonolayer deposition, patterned growth, *in situ* processing (etching); and novel structures—quantum wires and boxes, graded structures. A poster session is planned as is a joint session on heteroepitaxy on Si with Symposium D. Invited speakers include A.Y. Cho, D.E. Aspnes, Y-M. Houn, H. Temkin, P.M. Petroff, L. Pfeiffer, T.H. Chiu, K.F. Jensen, G.B. Stringfellow, A.S. Jordan, Z. Liliental-Weber, A.E. Blakeslee, M. Yamaguchi, N. Chand, T.P. Humphreys, and R. Bhat.

## **Symposium B—Rapid Thermal Annealing/Chemical Vapor Deposition and Integrated Processing**

*Tuesday-Friday, April 25-28*

Chairs: David Hodul, Varian Research Center; Jeff Gelpy, Peak Systems; Thomas E. Seidel, Seidel Associates; Martin L. Green, AT&T Bell Laboratories.

This symposium has been expanded from a forum on RTP to include allied single wafer processing technologies. The emphasis will be on materials processing and also relevant equipment and device issues. A panel discussion and poster session will be used to define the key issues and future directions of these technologies. Approximately 74 papers will span: rapid thermal processing—rapid oxidation, silicide and nitride formation, compound semiconductors, and contacts, glass reflow, and implant activation; rapid thermal CVD—metal films, selective processes, dielectric deposition, plasma-assisted processes, and polysilicon and episilicon; integrated processing—*in situ* cleaning, wafer inspection, process monitoring (gas flow, temperature, end point); multistep fabrication schemes; and equipment issues. Invited speakers include K.C. Saraswat, J.R. Hauser, H. Temkin, C.A. King, M.M. Moslehi, K. Maex, I.D. Calder, M. Inoue, C.B. Yarling, and R. Kakoschke.

## **Symposium C—Ion Beam Processing of Advanced Electronic Materials**

*Tuesday-Thursday, April 25-27*

Chairs: Nathan Cheung, University of California; Alan Marwick, IBM T.J. Watson Research Center; Jim Roberto, Oak Ridge National Laboratory.

The 1989 Spring Meeting of the Materials Research Society will be held at the Town and County Hotel in San Diego, with events spanning April 22-29. Meeting Chairs Robin Farrow, Dick Siegel and Angelica Stacy have developed a program of 16 technical symposia that reflect the continuing key role of materials science in the development of both mature and emerging technologies.

Several new topics will reflect emerging areas, including materials for optical storage of information (Symposium F), ultrathin magnetic films (Symposium G), and materials problems of infrastructure (Symposium P). A special workshop will provide a technology update on diamond films (Symposium P) and will feature a joint session with Symposium H, Optical Materials: Processing and Science.

Plenary speaker Linus Pauling, research professor at the Linus Pauling Institute of Science and Medicine, will discuss quasicrystals, materials whose atomic structure displays perfect five-fold symmetry, but whose atomic pattern is never exactly repeated as it would be in conventional crystals. During the Plenary Session MRS will also recognize graduate students who have made outstanding contributions as authors or co-authors of papers presented at the 1989 Spring Meeting.

Also being offered are 15 MRS short courses specially selected to closely complement the symposia, and a major

equipment exhibit. The short courses and exhibitors are listed elsewhere in this issue.

*For details about the program and registration, see the 1989 MRS Spring Meeting Preliminary Program, which has been mailed to all MRS members. If you need a Preliminary Program or Short Course Brochure, call the MRS Meetings Department at (412) 367-3003; fax (412) 367-4373.*

## **Technical Symposia**

### **Symposium A—III-V Heterostructures for Electronic/Photonic Devices**

*Monday-Thursday, April 24-27*

Chairs: Charles W. Tu, University of California at San Diego; Chuck Mattera, AT&T Bell Laboratories; Arthur C. Gosard, University of California.

Approximately 117 papers will focus on the materials issues of epitaxial III-V compound semiconductor heterostructures for electronic, photonic, and optoelectronic applications. Topics include: epitaxial growth of device structures—MBE, MO-MBE/CBE, OMVPE, VPE; safety—arsine and phosphine substitutes, effluent gas scrubbing; heteroepitaxy—GaAs/Si, InP/GaAs, epitaxial insulators, metals, II-VI/III-V; techniques for improving the growth process—*in situ* monitoring (RHEED, ellipsometry, UV absorption spectroscopy,

## SPRING MEETING ACTIVITIES

	Saturday April 22	Sunday April 23	Monday April 24	Tuesday April 25	Wednesday April 26	Thursday April 27	Friday April 28	Saturday April 29
Meeting Registration		4:00 p.m.- 9:00 p.m.	7:00 a.m.- 7:00 p.m.	7:30 a.m.- 5:00 p.m.	7:30 a.m.- 5:00 p.m.	7:30 a.m.- 5:00 p.m.	7:30 a.m.- 12 noon	
Technical Symposia			Details in Final Program and Meeting Guide					
Short Course and Registration	Details in Short Course Brochure							
Manuscript Room			7:30 a.m.-5:30 p.m.					
Equipment Exhibit Reception				12 noon- 7:00 p.m. 5:00- 7:00 p.m.	9:30 a.m.- 5:00 p.m.	9:30 a.m.- 2:00 p.m.		
Poster Sessions				7:00 p.m.- 10:00 p.m.		7:00 p.m.- 10:00 p.m.		
Plenary Address- Linus Pauling					6:00 p.m. Reception Following			
Symposium X				12:05 p.m.-1:25 p.m.				
Graduate Student Mixer			5:00 p.m.					
Job Placement Bulletin Board			8:30 a.m.-5:00 p.m.					

Approximately 64 papers will explore the physical and technological basis for future ion beam processing of advanced semiconductor devices. The program will emphasize novel mechanisms, processing of new materials and structures, and new physical insights into long-standing problems, with sessions on: focused ion beams, III-V materials and multilayers, shallow implants, deep implants (MeV ion beams), high-dose implants and ion-deposited layers, and damage phenomena and dopant activation. Both fundamental aspects and applications of ion implantation and irradiation will be covered. Invited speakers includes M.I. Current, G.A. Rozgonyi, P. Fahey, J. Melngailis, O.W. Holland, W.L. Brown, T-M. Lu, and S.J. Pearton.

### Symposium D—Chemistry and Defects in Semiconductor Heterostructures

*Monday-Thursday, April 24-27*

Chairs: Mituo Kawabe, University of Tsukuba; Timothy D. Sands, Bell Communications Research; Eicke R. Weber, University of California; R. Stanley Williams, University of California.

This symposium will focus on the basic mechanisms of chemical interactions across the interfaces of het-

erostructures and their consequences for device performance. Approximately 93 papers will focus on: chemistry and defect formation at interfaces—metal/semiconductor heterostructures, semiconductor/semiconductor heterojunctions (lattice matched or strained), insulator/semiconductor heterostructures; phase diagrams relevant to interfacial and thin film reactions; experimental methods to study chemistry or defects at buried interfaces; and identification and cause of lattice defects. A poster session is planned as is a joint session on heteroepitaxy on Si with Symposium A. Invited speakers include Y.A. Chang, P.A. Bennett, C.J. Palmstrom, L.J. Brillson, N. Newman, J.H. Weaver, J.R. Waldrop, W. Walukiewicz, M. Murakami, G.P. Schwartz, A.S. Jordan, Z. Liliental-Weber, A.E. Blakeslee, M. Yamaguchi, and M. Aono.

### Symposium E—Amorphous Silicon Technology

*Tuesday-Friday, April 25-28*

Chairs: A. Madan, Glasstech Solar; P.C. Taylor, University of Utah; P.G. LeComber, University of Dundee; M.J. Thompson, Xerox PARC; Y. Hamakawa, Osaka University.

Approximately 121 papers will concentrate on materials issues related to

applications to amorphous semiconductors, including amorphous silicon-based alloys. Issues include structure, electronic and optical properties, defects, interfaces, contacts, heterostructures, nonequilibrium behavior, and stability. Applications include solar cells, electrophotography, switching electronic and optical memories, image sensors scanners, thin-film transistors, vidicons, large-area displays, portable computers, and new types of devices. Presentations will focus on the electronic density of states and its relationship to technological figures of merit for each application, fundamental and materials limitations, yield, reproducibility, reliability, and stability. A poster session is planned. Invited speakers include A. Gallagher, E.P. Raynes, H. Kurihara, J. Stone, K. Hanaki, S. Guha, G.H. Bauer, V. Perez-Mendez, and Y. Tawada.

### Symposium F—Materials for Magneto-Optic Data Storage

*Tuesday-Wednesday, April 25-26*

Chairs: Takao Suzuki, IBM Almaden Research Center; Clifford Robinson, IBM Almaden Research Center; Charles Falco, University of Arizona.

Approximately 33 papers will address the materials science related aspects of the rapidly emerging magneto-optic

data storage technology, covering all materials and materials processing issues. Topics include: magneto-optic materials—magnetism (including surface magnetism), magneto-optic phenomena, atomic structure, superlattice structure, new materials, stability; dielectric materials—optical properties, structure, chemical passivation; physics and chemistry of the dielectric/M-O interface; developments in processing techniques—thin film structures, sputtering and plasma processing, target materials; packaging and substrate materials; and advances in characterization techniques. Invited speakers include M.H. Kryder, C.-J. Lin, P.J. Grundy, D. Weller, D.J. Sellmyer, R. Krishnan, C.M. Falco, R.J. Gambino, H. Wakabayashi, M. Gomi, O. Ishii, Y. Togami, T. Yorozu, and S.D. Bader.

### **Symposium G—Growth, Characterization and Properties of Ultrathin Magnetic Films and Multilayers**

*Tuesday-Friday, April 25-28*

Chairs: Berry T. Jonker, Naval Research Laboratory; Joseph P. Heremans, GM Research Laboratories; Ernesto E. Marinero, IBM Almaden Research Center.

This new symposium will highlight recent experimental and theoretical advances, with emphasis on the rapidly growing fields of surface/interface magnetism, magnetic thin film and multilayer structures and diluted magnetic semiconductors. The range of low-dimensional solids to be considered extends from Fe monolayers to new metastable metal and semiconductor phases. Methods to evaluate the growth of these materials, lattice structure, and film integrity will be presented. Recent progress in characterizing these magnetic layers by spin-polarized electron spectroscopies will be discussed. Work on classical magnetic, optical and transport phenomena will also be presented, along with structural characterization techniques utilizing synchrotron x-ray studies. The symposium will also emphasize theoretical aspects of low-dimensional magnetism, spin-resolved band structure calculations and metastable phases. The properties of diluted magnetic semiconductors will be reviewed, and new developments in this area will be highlighted, particularly new materials and multilayer structures. More than 42 papers plus additional late news papers will be scheduled. Invited speakers include R.

Richter, D.T. Pierce, G. Guntherodt, E. Kay, T. Shinjo, J.K. Furdyna, R.L. Gunshor, B.T. Jonker, B. Heinrich, R.F.C. Farrow, and G.S. Cargill III.

### **Symposium H—Optical Materials: Processing and Science**

*Monday-Wednesday, April 24-26*

Chairs: Carmen Ortiz, IBM Almaden Research Center; David B. Poker, Oak Ridge National Laboratory.

Approximately 51 papers will review the fundamental aspects of characterization, modification, and application of insulating optical materials. Classes of materials to be discussed include: perovskites; diamondlike materials; oxides, halide, and chalcogenide glasses; and fiber materials. Topics include: electro-optical and acousto-optical effects; defect production, interaction and characterization; annealing mechanisms; structure-related optical properties; ion- and laser-beam processing, doping, and amorphization; processing and characterization of surfaces and coatings for optical purposes; processing and characterization of diamondlike films; waveguides, fibers, and integrated devices; and novel applications and processing of optical materials. Also planned are a poster session and a joint session on diamond films with Symposium Q. Invited speakers include N. Setaka, J. Lucas, F. Agulló-López, U.J. Gibson, K.M. Krishnan, D. Eimerl, I. Yamada, U. Ostgerberg, and P.K.L. Yu.

### **Symposium I—Space Compatible Materials and Processing**

*Tuesday-Wednesday, April 25-26*

Chairs: M. McCargo, Lockheed Palo Alto Research Laboratory; R.A. Banks, NASA-Lewis Research Center; A. Ignatiev, University of Houston; G.R. Cunningham, Palo Alto Research Laboratory.

Approximately 21 papers will discuss recent advances and practical problems associated with the compatibility of materials in the space environment and also aspects of the processing of materials in a low gravity environment. New materials concepts and manufacturing techniques will be discussed within the fields of thermal control materials, composites, thin films, and multilayer coatings. Topics include: space radiation effects on spacecraft surfaces, effects of the low earth orbit atomic oxygen environment on materials, application and physics of thin films, thermal control materials, multilayer coatings, metal-

matrix and organic matrix composites, and materials processing in space. Invited speakers include R.C. Tenynson, R.K. Clark, and S.K. Dey.

### **Symposium J—Interfaces Between Polymers, Metals, and Ceramics**

*Tuesday-Thursday, April 25-27*

Chairs: Benjamin M. Dekoven, Dow Chemical Company; Andrew J. Gellman, University of Illinois; Robert Rosenberg, IBM T.J. Watson Research Center.

This symposium will focus on recent advances in the microscopic understanding of properties of material interfaces involving polymers, metals, and ceramics. Topics emphasize mechanisms of interface growth and preparation, unique interface chemistry, interfacial mechanical properties involving adhesion and friction forces, and novel methods used in the high resolution characterization of such interfaces. Approximately 74 papers will report on: novel interface characterization techniques which could involve high resolution methods, nondestructive evaluation, and microstructural measurements; dynamic and *in situ* monitoring of interface growth; mechanical properties emphasizing adhesion and friction forces; preparation of interfaces; reliability and degradation of interfaces; grain boundary interfaces in ceramics, composites, and metals; and substrate effects on thin films and multilayer structures. A poster session is planned as are two joint sessions with Symposium K. Invited speakers include R.S. Averback, G.L. Richmond, T.F. Heinz, R.M. Tromp, R.W. Linton, R.A.L. Jones, P.S. Ho, S.F. Tead, W. Sachse, G. Neubauer, S. Granick, K. Miyoshi, M. Ruhle, and R.F. Cook.

### **Symposium K—Electronic Packaging Materials Science**

*Monday-Friday, April 24-28*

Chairs: Kenneth A. Jackson, AT&T Bell Laboratories; Ralph Jaccodine, Lehigh University; Robert C. Sundahl, Intel Corporation.

Approximately 68 papers will emphasize the fundamental material and processing problems encountered in the packaging of ULSI and VHSIC circuits, and their interconnection into large arrays. Problems of concern include: material factors that influence electromigration in conductors and the fragility of the dielectric passivation layers, and

their effects on packaging technology; materials and processes for the lead bonding and die attachment of large ULSIC dies; application of new polymeric materials to provide mechanical protection, encapsulation of ULSI circuits; and ceramic and ceramic composite structures designed to improve and power dissipation and performance of large, high speed ICs and IC arrays. Invited speakers include D.J. Lando, J.T. Pan, J.J. Reche, Y.S. Liu, A.D. Trigg, J.N. Arnold, A.J. Buehler, D.D. Denton, K.R. Kinsman, J.E. McGrath, J.K. Gillham, C.P. Wong, J.E. Anderson, M.A. van Andel, G. Smolinsky, R.W. Linton, R.A.L. Jones, P.S. Ho, S.F. Tead, W. Sachse, D.W. McCall, R.R. Tummalo, M. Teresawa, G.E. Wnek, J. Piche, R.M. Fisher, G.C. Harman, P.B. Hogerton, H.D. Solomon, D.J. Arthur, and G.S. Scott.

**Symposium L—Processing Science of Advanced Ceramics**

*Thursday-Friday, April 27-28*

Chairs: Ilhan Aksay, University of Washington; Don Ulrich, Bolling Air Force Base; Gary L. McVay, Battelle Pacific Northwest Laboratories.

Approximately 50 papers will address the critical issues in two fundamental fabrication technologies—liquid/solid and gas/solid processes. The first group will include sol-gel colloidal processing of powders, tapes, coatings, fibers, and monoliths. The second group will include laser-assisted synthesis of powders and plasma chemical vapor deposition processing of coatings. The main emphasis in both groups will be on structural design on a continuous scale from molecular dimensions to micro- and macro-meter levels. Invited speakers include S. Hori, A. Kato, J.D. Bolt, S-I. Hirano, D.A. Payne, H. Yanagida, J.H. Adair, M. Kuwabara, R.F. Davis, J.A. Eastman, A.S. Nagelberg, A.J. Pyzik, A.M. Glaeser, F.F. Lange, M.J. Cima, Y. Hirata, L.C. De Jonghe, and M.J. Hoffmann.

**Symposium M—High Temperature Superconductors: Relationships Between Properties, Structure and Solid-State Chemistry**

*Tuesday-Friday, April 25-28*

Chairs: Jerry B. Torrance, IBM Almaden Research Center; Jean Marie Tarascon, Bell Communications Research; Mark Thompson, Raychem Corporation; Koichi Kitazawa, University of Tokyo;

Jim Jorgensen, Argonne National Laboratory.

This symposium will feature interdisciplinary research on superconducting oxide compounds as well as related materials. It will emphasize the relationships between the superconducting properties and the materials parameters, e.g., structure, composition, valence, processing, microstructure, etc. In addition to the latest new materials with record breaking transition temperatures, it will encourage reports of understanding reached on "older" compounds, comprehensive studies of low  $T_c$  and nonsuperconducting compounds, and overviews of the solid state chemistry of related materials (e.g., tungsten bronzes). Reports of single-crystal growth, novel preparative routes, and preparation conditions will also be included. Additional topics beyond the above general guidelines will be determined by the latest developments in this rapidly changing field. Approximately 239 papers plus additional late-news papers will be scheduled. A poster session is planned. Invited speakers include A. Wold, M. Pouchard, J.B. Goodenough, J. Galy, J.M. Honig, B. Raveau, Y. Syono, M. Shafer, R.B. Beyers, M.A. Alario-Franco, A.M. Stacy, H. Kojima, L.F. Schneemeyer, P. Barboux, S.S.P. Parkin, H. Ihara, B. Morosin, A.W. Hewat, S. Matsuda, V. Endo, H.W. Zandbergen, A.W. Sleight, D.W. Murphy, L. Pauling, D. Scalapino, W.A. Goddard, R.J. Cava, C.C. Torardi, and D.G. Hinks.

**Symposium O—Insulator and Semiconductor Clusters**

*Monday-Tuesday, April 24-25*

Chairs: Louis Brus, AT&T Bell Laboratories; George McLendon, University of Rochester.

Approximately 15 papers will focus on the preparation, characterization and potential applications of a new class of materials. Ultrasmall (10-100Å) clusters of, for example, binary semiconductors show dramatic deviations from bulk properties in band structure due to quantum confinement of the electron hole pairs. These differences produce unique materials for linear and nonlinear optics, and are promising substitutes for low temperature bulk preparations. Invited speakers include A. Henglein, A.J. Nozik, M.L. Steigerwald, R.W. Siegel, A. Kaldor, J.L. Jewell, S.W. Koch, Y. Wang, A.P. Alivisatos, and M.P. O'Neil.

**Symposium P—Materials Problems of Infrastructure: How New Materials Technology Can Solve Them**

*Wednesday-Thursday, April 26-27*

Chairs: Brian Frost, Argonne National Laboratory; Douglas McKenzie, University of California, Los Angeles; Damien Kulash, Strategic Highway Research Program.

A recent National Academy report stated that the deterioration of highways, bridges, runways, etc., in the United States has reached the point where an annual expenditure of close to \$100 billion on public works is not solving the problem. It goes on to advocate the application of new materials technologies to ensure that when repairs, replacements or new structures are built, their deterioration rates are minimized. Materials of interest include concretes, asphalts, metals, and composites. Nondestructive evaluation and real-time monitoring with sensors are of importance. This symposium aims to encourage more research proposals on materials (such as polymer impregnated concretes and efforts to reduce the corrosion of steels used in rebars and bridge structures due especially to salt used for snow and ice removal) and to show that this is a fertile field of research on a nationally important problem which is likely to attract increased funding in the future. Approximately 15 papers have been scheduled. Invited speakers include R.F. Decker, D.J. Kulash, J.W. Fisher, C.M. Hansson, and J.R. Clifton.

**Symposium Q—Technology Update on Diamond Films**

*Monday-Tuesday, April 24-25*

Chairs: R.P.H. Chang, Northwestern University; A. Hiraki, Osaka University; D. Nelson, Office of Naval Research.

During this late-news workshop international diamond technology experts will speak on novel methods of diamond film synthesis and characterization, unique properties of diamond films, technological applications, and potential investment opportunities. Introductory remarks will be presented by Carmen Ortiz. A joint session will be held with Symposium H, and in addition to the scheduled two-day symposium, a panel discussion and poster session are now being planned. A list of papers will be available at the meeting.

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