

Preview

1990 MRS Spring Meeting

San Francisco, California

Events Scheduled

April 16 - 22, 1990

Meeting Chairs:

John C. Bravman, Stanford University

C. Jeffrey Brinker, Sandia National Laboratories

William H. Butler, Oak Ridge National Laboratory

The 1990 Spring Meeting of the Materials Research Society will be held at the Marriott Hotel in San Francisco, California, with events spanning April 16 through 22. Program Chairs John Bravman, Jeffrey Brinker, and William Butler have planned an extensive forum of interdisciplinary presentations on the latest directions and developments in materials science.

"With 24 different technical symposia and more than 1,900 papers, the 1990 Spring Meeting will be the largest MRS meeting ever, offering a comprehensive array of topics," said Bravman. "The topics not only cover forefront research in areas of long standing interest to MRS meeting attendees, they also reach out to the new needs and developing pursuits of the scientific community," he continued.

"You'll be able to find familiar topics with a new slant, like the symposium on superconductivity," said Co-chair Bill Butler. Superconductivity has been a topic at every MRS meeting since the 1986 Fall Meeting when Koichi Kitazawa confirmed Bednorz and Müller's findings. "This year's symposium, however, focuses on critical current," said Butler. Butler also identified the new topics added to the spring program: alloy phase stability and design (Symposium I), intermetallic matrix composites (Symposium R), materials interactions relevant to the pulp, paper and wood industries (Symposium U), and ferroelectric thin films (Symposium Y).

The 1990 Spring Meeting short course program will offer a selection of 18 courses that complement the meeting topics. The short course on Practical Transmission and

Analytical Electron Microscopy includes attendance at the Symposium W Workshop on Specimen Preparation for Transmission Electron Microscopy.

Two major poster sessions, Tuesday and Thursday evening, April 17 and 19, will offer attendees and authors a chance for in-depth personal discussions. Other opportunities for interaction are offered through smaller, focused poster sessions integrated into a symposium, a job placement bulletin board, and an exhibit of major analytical and processing equipment.

For detailed information about the meeting program and registration, see the 1990 MRS Spring Meeting Preliminary Program, which is mailed to all MRS members. If you need a Preliminary Program, call the MRS Meetings Department at (412) 367-3003; fax (412) 367-4373.

Symposia

Symposium A—Better Ceramics Through Chemistry IV

Monday-Friday, April 16-20

Chairs: C.J. Brinker, Sandia National Laboratories; D.E. Clark, University of Florida; Donald R. Ulrich, Air Force Office of Scientific Research; Brian J.J. Zelinski, Arizona Materials Laboratories.

This symposium will provide a forum for researchers from all areas of interest to present their latest findings on the synthesis, properties and implementation of sol-gel derived materials. Approximately 89

oral and 103 poster papers will describe research in the following areas: sol-gel chemistry (hydrolysis and condensation kinetics, reaction intermediates, solvation, complexation, precursor effects, aqueous versus non-aqueous chemistry); processing science (gelation, aging, drying, densification, crystallization); thin films (science of thin film synthesis, techniques for evaluating thin film properties, comparison of bulk and thin film properties); structure/property relationships (optical, electrical, mechanical/rheological, and superconducting properties of sol-gel materials); sol-gel processing in natural systems (low

temperature processing of inorganic materials via biological routes); and implementation of sol-gel technology (fibers, electronic circuits, planar waveguides and gratings, optical elements, abrasives, etc.).

Symposium B—Advanced Metallizations in Microelectronics

Monday-Friday, April 16-20

Chairs: Avishay Katz, AT&T Bell Laboratories; Shyam P. Murarka, Rensselaer Polytechnic Institute; Ami Appelbaum, Rockwell International Corporation.

This symposium will focus on discussions of recent advances and processes associated with the metallization of Si, InP and GaAs based electronic, optonic and optoelectronic devices and ICs. Microstructures, interfaces, inter-reactions and their influence on the electrical properties of devices will especially be emphasized. Approximately 80 oral and 31 poster presentations will consider: metal-metal, metal-semiconductor interactions; advanced technologies (e.g. RTP) and analysis; ohmic contacts to Si; ohmic contacts to III-V, such as InP and GaAs; gate metallization for GaAs, InP and Si; contacts to heterostructures; contacts to optoelectronic devices; interconnections; and diffusion barriers. Joint sessions are planned with Symposium C and Symposium F.

Symposium C—Polysilicon Thin Films and Interfaces

Tuesday-Thursday, April 17-19

Chairs: Bruha Raicu, *Integrated Technology Associates*; T. Kamins, *Hewlett-Packard*; Carl V. Thompson, *Massachusetts Institute of Technology*.

This symposium will address current theoretical and experimental work concerning polycrystalline silicon, bringing together those studying the material properties and application of polysilicon, and also those involved in the art of manufacturing using polysilicon (including advanced semiconductor equipment). An evening panel discussion will consider emerging technologies and their implications for the tradeoffs between polysilicon, poly-cides, and metals, and also between polysilicon and other device materials; the panel discussion will focus on materials and manufacturing issues. Approximately 57 oral and 66 poster papers will span: growth and processing (low thermal budget and plasma enhanced); properties (structural, electronic, and optical characterization); defects (role of grain boundaries and interfaces, effects of hydrogen); dopant incorporation (supersaturated polysilicon, ion implantation, highly doped, and dopant diffusion); oxidation of polysilicon; process integration, rapid thermal processing, contacts, interconnects; pattern transfer to polysilicon films; effect of polysilicon on thin gate-oxide properties and integrity; modeling and computer simulation; novel technologies and equipment; and polysilicon devices. A joint session will be held with Symposium B.

Symposium D—Critical Currents in High-Temperature Superconductors

Tuesday-Friday, April 17-20

Chairs: John R. Clem, *Iowa State University*; Jack W. Ekin, *National Institute of Standards & Technology*; Sungho Jin, *AT&T Bell Laboratories*; Donald M. Kroeger, *Oak Ridge National Laboratory*.

Approximately 67 oral and 66 poster papers will consider the critical-current problem from both experimental and theoretical viewpoints. Topics include: fundamental flux-pinning theory and experiments; dependence of critical currents upon magnetic field and temperature; effects of twin boundaries, deformation processing, radiation damage, microdefects, anisotropy, and composition upon intragranular and intergranular critical currents; dependence of critical currents upon processing variables; effects of texturing by melt processing and control of grain growth; critical currents in thin films; flux creep, history effects, logarithmic magnetization relaxation, and thermally-activated flux motion; and comparisons of critical-current densities obtained by different experimental methods.

Symposium E—High Resolution Electron Microscopy of Defects in Materials

Monday-Wednesday, April 16-18

Chairs: Robert Sinclair, *Stanford University*; U. Dahmen, *University of California, Berkeley*; David J. Smith, *Arizona State University*.

Approximately 44 oral and 27 poster presentations will concentrate on recent developments and improvements in understanding atomic arrangements at defects in materials as revealed by high-resolution electron microscopy (HREM) techniques. All classes of materials and innovative approaches, as well as traditional lattice or structure imaging, will be discussed. Papers will emphasize novel information derived about structural imperfections and, where possible, relate this knowledge to new or improved defect models and indicate their relevance to material properties. Topics include: point defects and aggregates; dislocations and linear defects; grain boundaries and extended planar defects; epitaxial interfaces and heterojunctions; precipitate morphologies and interfaces; surfaces and small particles; defect controlled phase transformations and reactions; and amorphous

materials. Advances in computer simulations, as well as experimental image interpretation, and techniques related to or supplementing "classical" HREM will also be considered.

Symposium F—Degradation Mechanisms in III-V Compound Semiconductor Devices and Structures

Tuesday-Wednesday, April 17-18

Chairs: V. Swaminathan, *AT&T Bell Laboratories*; Stephen J. Pearton, *AT&T Bell Laboratories*; Omar Manasreh, *Wright Patterson AFB*.

Significant interest has developed both in the methods of detecting device degradation and in understanding degradation mechanisms. This symposium will bring together those actively researching failure and success mode analysis of electronic and photonic devices with the objective of identifying and eliminating device failure. Approximately 31 oral presentations will discuss the following topics: degradation mechanisms in lasers, LEDs, photodetectors; role of point defects and dislocations in degradation; recombination enhanced motion of defects; electromigration, macroscopic and microscopic stress effects; characterization methods for detecting the onset or presence of defect related degradation (e.g., electroluminescence); and reliability statistics and analysis.

Symposium G—Materials Issues in Art and Archaeology II

Co-sponsored by the Getty Conservation Institute and the Conservation Analytical Laboratory, Smithsonian Institution

Monday-Friday, April 16-20

Chairs: James R. Druzik, *Getty Conservation Institute*; Pamela B. Vandiver, *Smithsonian Institution*; George Wheeler, *Metropolitan Museum of Art*.

This symposium will provide a multidisciplinary forum on new developments in technical studies of material culture and efforts, both theoretical and experimental, aimed at stabilizing and preserving that heritage. Its goal is to promote a dialogue between researchers having a primary interest in the behavior and longevity of pigments, metals, ceramics, polymers and other materials, as well as those expert in the characterization of these materials, their processing and properties. Approximately 77 oral and 20 poster presentations

will treat various topics related to the role of technology in material culture, deterioration and treatment, characterization through compositional and structural analysis, and mechanical and physical properties of art materials.

Symposium H—Materials for Sensors and Separations

Monday-Thursday, April 16-19

Chairs: Marc Anderson, *University of Wisconsin-Madison*; John Armor, *Air Products and Chemicals, Inc.*; D. Jed Harrison, *University of Alberta*; Antonio J. Ricco, *Sandia National Laboratories*.

This symposium will offer an opportunity for cross-fertilization between the highly interdisciplinary fields of sensors and separations, within the context of materials science. Approximately 47 papers will emphasize: (1) the utilization of materials to enhance the specificity, selectivity, sensitivity, and general utility of sensors or separations; and (2) novel application of sensors to problems in materials characterization and separations processes. Sensor device technologies to be considered include acoustic wave/piezoelectric, capacitor/diode/FET/resistor, electrochemical, optical, and other solid-state devices. Separations will focus on ceramic membranes/thin films, membranes vs. adsorbents, molecularly-engineered adsorbents, molecular sieves for gas phase separations, and membrane catalysis.

Symposium I—Alloy Phase Stability and Design

Wednesday-Friday, April 18-20

Chairs: G. Malcolm Stocks, *Oak Ridge National Laboratory*; David P. Pope, *University of Pennsylvania*; Anthony F. Giamei, *United Technologies Research Center*.

This symposium will bring together a wide cross section of researchers interested in alloy design, encompassing the gamut from quantum/statistical mechanical theory to alloy design. Researchers from the disparate fields will present their work in a way that emphasizes the connection between the underlying electronic structure/bonding and materials properties. Approximately 65 oral and 15 poster papers will span such areas of interest as: quantum mechanical theories of the properties of alloys; statistical simulations of materials properties; phase stability and the control of crystal structure; fracture behavior (cleavage, grain boundary ...); design of high temperature ordered intermetallics (aluminides, silicides); Ni-based superalloys (σ -phase formation); Al-

Li and other Al based alloys; and the effect of magnetic interactions on bonding and phase stability.

Symposium J—Thin Film Structures and Phase Stability

Monday-Tuesday, April 16-17

Chairs: Bruce M. Clemens, *Stanford University*; William L. Johnson, *California Institute of Technology*.

This symposium will focus on thin film structures, with emphasis on situations where thin film processing allows formation of metastable phases, highly strained materials, and novel solid-state reaction phenomenon. Approximately 45 oral and 24 poster papers will discuss thin film solid-state reactions, including formation of amorphous alloys and other metastable phases; application of free energy diagrams to thin film processes; characterization methods for thin film structural investigations; simulation techniques applied for understanding of deposition processes; and epitaxial stabilization of phases and coherency strains.

Symposium K—Thin Films: Stresses and Mechanical Properties II

Monday-Thursday, April 16-19

Chairs: Warren Oliver, *Oak Ridge National Laboratory*; George Pharr, *Rice University*; Mary Doerner, *International Business Machines*; Franz R. Brotzen, *Rice University*.

Approximately 68 papers will describe macroscopic or microscopic phenomena from both experimental and theoretical view-points. Areas to be covered include: thin film microstructures and mechanical properties, *in-situ* deformation studies of thin films, tailored microstructures for control of mechanical properties, intrinsic stresses in thin films, interface effects on film properties, direct observations of defects in thin films, deformation mechanisms in thin films, mechanical testing of thin films, and defects in thin films.

Symposium L—Microwave Processing of Materials

Endorsed by the American Ceramic Society and the International Microwave Power Institute

Tuesday-Friday, April 17-20

Chairs: William B. Snyder, *Oak Ridge National Laboratory*; D. Lynn Johnson, *Northwestern University*; Willard H. Sutton, *United Technologies Research Center*; Magdy F. Iskander, *University of Utah*.

This symposium will highlight progress and recent developments in the interaction

of microwave energy with solids, liquids, gases, and plasmas. Subjects will include materials processing and products from research, development, and production viewpoints. Approximately 68 oral and 15 poster presentations will discuss: consolidation and processing of ceramics and composites, polymer processing, biological effects and medical applications, enhanced chemical kinetics, dielectric properties measurements, design and use of applicators for materials processing, numerical modeling and computation techniques, and new and unique applications of microwave energy.

Symposium M—Plasma Processing and Synthesis of Materials

Tuesday-Thursday, April 17-19

Chairs: Diran Apelian, *Drexel University*; Julian Szekely, *Massachusetts Institute of Technology*.

Previous conferences on plasma processing have focused on plasma fundamentals and modeling and diagnostics. This symposium will be directed toward the applications of plasma processing in materials engineering. Approximately 55 oral papers will be presented in sessions on plasma processing of composite materials, plasma hearth melting, coatings, synthesis, and plasma etching. Each of the sessions dedicated to applications will address the science base, modeling, diagnostics and relevant aspects of plasma processing.

Symposium N—Laser Ablation for Materials Synthesis

Thursday-Friday, April 19-20

Chairs: David C. Paine, *Brown University*; John C. Brauman, *Stanford University*.

Organized as the first scientific meeting solely devoted to what is becoming a major physical vapor deposition process, this symposium will provide a forum for those active or interested in this research area to present their results, exchange scientific information, and discuss issues. Approximately 45 oral presentations will consider: fundamentals of laser-solid interaction related to ablation process, both theoretical and experimental; correlation between ablation process and film microstructural properties; topics related to the unique advantages and disadvantages of this technique; ablation and thin film growth mechanism; thin films of various materials, such as high T_c superconductors, semiconductors, dielectric materials, etc.; and experimental hardware development.

Symposium O—Amorphous Silicon Technology - 1990

Tuesday-Friday, April 17-20

Chairs: P.C. Taylor, *University of Utah*; Y. Hamakawa, *Osaka University*; Malcolm J. Thompson, *Xerox PARC*; Arun Madan; P.G. LeComber, *University of Dundee*.

Approximately 62 oral and 71 poster papers will address issues spanning structure, electronic and optical properties, defects, interfaces, contacts, heterostructures, non-equilibrium behavior, and stability. Applications to be considered 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.

Symposium P—Surface and Near Surface Structure of Polymer Interfaces

Monday-Tuesday, April 16-17

Chairs: Jeffrey A. Kelber, *Sandia National Laboratories*; Matthew V. Tirrell, *University of Minnesota*; Ralph G. Nuzzo, *AT&T Bell Laboratories*; Ernesto Occhiello, *Instituto Guido Donegani*.

This symposium will bring together workers studying surface and interface structures and investigators of interphase properties in order to gain a fuller appreciation of the relationships between these two areas. Approximately 33 oral papers will cover traditional areas of polymer surface/interface structure and structure-property relationships and also deal with polymer interphase structure, structure-property relationships, and the conformation of polymers at surfaces and interfaces. Topics include: adhesion, polymer metallization, structures of polymer blends, surface forces, surface modification, interphase structure, and novel methods of surface or interphase characterization.

Symposium Q—Atomic-Scale Calculations of Structure in Materials

Monday-Tuesday, April 16-17

Chairs: Michael A. Schluter, *AT&T Bell Laboratories*; Murray S. Daw, *Sandia National Laboratories*.

This symposium will emphasize the calculations of atomic-scale structure in the condensed phase. The structure of bulk phases as well as the structure of defects, surfaces, and grain boundaries will be covered. Approximately 31 oral and 49 poster presentations will report on these areas and also theoretical investigation of the atomic-scale structure of clusters, overlayers/adatoms on surfaces, clean surfaces reconstructions, grain boundaries and interfaces, and dislocations. Excited states, compositional ordering, and magnetism will be examined as related to investigation of structure. Structural phase transitions will also be addressed from atomic-scale calculations. The symposium will cover a broad range of theoretical techniques, from semi-empirical and many-body models to fundamental, first principles formulations. The invited speakers will highlight theoretical advances and also experimental perspectives.

Symposium R—Intermetallic Matrix Composites

Wednesday-Friday, April 18-20

Chairs: Donald L. Anton, *United Technologies Research Center*; Daniel Miracle, *Wright-Patterson AFB*; Robert McMeeking, *University of California*; Patrick Martin, *Los Alamos National Laboratory*.

This symposium, dedicated solely to the subject of structural intermetallic matrix composite materials, will bring together active workers from the divergent fields of micromechanics modeling, primary materials synthesis, thermodynamics (phase stability measurement and prediction), microstructural correlation and mechanical property determination. Approximately 78 oral presentations will consider the following topics: extensions of micromechanics models for strength and toughness to the level of the microstructure in continuous and discontinuous reinforcement composite systems; effects of synthesis variables on the microstructure and properties of composite materials intended for high temperature service; measurements or predictions of multiphase stability during long-time exposures to elevated temperatures; correlations of microstructural variables to physical and/or mechanical properties in intermetallic-based systems, including low temperature damage tolerance and high temperature strength; and novel mechanical property testing techniques applicable to the characterization of composite materials, especially regarding interfacial properties.

Symposium S—Physical Phenomena in Granular Materials

Monday-Friday, April 16-20

Chairs: Theodore H. Geballe, *Stanford University*; G.D. Cody, *Exxon Research & Engineering*; Ping Sheng, *Exxon Research & Engineering*.

This symposium has been organized in honor of the 65th birthday of Ben Abeles, whose scientific career reflects significant contributions to the physics of granular materials and spans the growth and maturity of the entire field. Approximately 82 oral and 18 poster papers will discuss such physical phenomena as percolation and hopping conduction, metal-insulator transitions, negative magneto-resistance, superparamagnetism, Josephson-coupling mediated superconductivity, quantum size effects, and optical effects unique to granular materials. Additional topics include: fabrication and morphology, thermal and diffusive transport, elastic response and on applications such as varistors, cermet resistors, strain gauges, photo-thermal conversion. Papers will also consider materials such as gels, colloids, membranes, coal, rocks, etc., which are governed by granular behavior.

Symposium T—Superplasticity in Metals, Ceramics, and Intermetallics

Monday-Thursday, April 16-19

Chairs: Merrilea J. Mayo, *Sandia National Laboratories*; Masaru Kobayashi, *Technological University of Nagaoka*; Jeffrey Wadsworth, *Lockheed Missile & Space Co., Inc.*; Amiya K. Mukherjee, *University of California at Davis*.

This symposium will explore the state-of-the-art in superplasticity, beginning with theoretical considerations, progressing through phenomena associated with superplastic behavior, and culminating in the practical application of superplasticity in forming operations. Approximately 68 oral and 22 poster papers will report on: fundamentals and theory, synthesizing superplastic microstructures (metallic and non-metallic), phenomena of metallurgical superplasticity, phenomena of ceramic and intermetallic superplasticity, and superplasticity in use (superplastic forming and diffusion bonding).

Symposium U—Materials Interactions Relevant to the Pulp, Paper and Wood Industries

Co-Sponsored by TAPPI - The Technical Association of Pulp and Paper Industries

Wednesday-Friday, April 18-20

Chairs: June D. Passaretti, Pfizer Minerals Research Center; Rustum Roy, Pennsylvania State University; Daniel Caulfield, USDA Forest Service; Vance Setterholm, USDA Forest Service; Stanley F. Sobczynski, Department of Energy.

This symposium will bring together materials scientists of different disciplines whose areas of research impact upon the pulp, paper and wood industries. The symposium will give scientists the opportunity to discuss issues of a fundamental nature, keeping in mind the longer term objectives, goals, and potentials of these industries. Approximately 35 oral presentations will discuss: 1. structural relationships and component properties (including the micro and macro morphology of wood; interactions of wood, pulp and paper with other materials to enhance mechanical, optical, and barrier properties; and the physics and chemistry of the interaction of ligno-cellulosic surfaces with other materials); and 2. structure and properties at interfaces (including fiber-fiber and fiber-matrix interactions; cellulose fiber-polymer composites; cellulose fiber-inorganic composites; colloidal interactions in pulp suspensions; and wood surface interactions with finishes, pigments, and adhesives). Invited speakers will provide introductory overviews and also critical and updated analyses of selected research areas.

Symposium V—Epitaxial Heterostructures

Monday-Friday, April 16-20

Chairs: Don W. Shaw, Texas Instruments, Inc.; Vassilis G. Keramidas, Bellcore; John C. Bean, AT&T Bell Laboratories; Paul S. Percy, Sandia National Laboratories.

This symposium will address the theory, preparation, characterization, and applications of complex layered structures of dissimilar materials prepared by epitaxial growth. Sessions will consist of an international representation of 104 invited and contributed papers on: strained-layer epitaxy, mismatched epitaxy, III-V heterostructures, II-VI heterostructures, Si-based heterostructures, metal/semiconductor and insulator/semiconductor structures, modeling, characterization, and applications.

Symposium W—Workshop on Specimen Preparation for Transmission Electron Microscopy of Materials II

Thursday evening-Friday, April 19-20

Chair: Ron Anderson, IBM.

This symposium, to be held in a workshop format, will provide a forum for exchanging information on recent developments in TEM sample preparation. Six invited oral presentations will address top-

ics of interest to a broad spectrum of investigators in a half-day session. Approximately 23 contributed papers will be presented in poster format with unlimited time for discussion between authors and attendees. Topics span both novel work and the improvement of traditional tools and methods for TEM specimen preparation, the effect of TEM specimen preparation on microscopy, and work relating to all categories of materials. Specific areas will include: rapid fabrication of cross section samples, preparing micron-sized prespecified regions of interest in bulk specimens, lithographic methods for preparing specimens, cleavage and microtomy of solid-state materials, design and construction of specimen preparation tools and fixtures, production and control of artifacts during specimen preparation, and powder sample preparation.

Symposium X—Frontiers of Materials Research

Monday-Thursday, April 16-19

Chair: Robert A. Huggins

This luncheon-time series will consist of 30-40 minute lectures (given by leaders in a field) of a definitely didactic nature. The lectures will give nonspecialists an overview of the latest developments in one of the frontier areas of materials research. Specific topics will be announced at the meeting.

Symposium Y—Ferroelectric Thin Films

Wednesday-Friday, April 18-20

Chairs: Angus I. Kingdom, North Carolina State University; Edward R. Myers, National Semiconductor.

The symposium will address important research issues in this field, including processing methods for ferroelectric films, integration into silicon technology and their electrical, chemical and physical properties. Invited speakers from industry and academia will present overview papers covering the latest advances. Approximately 54 oral presentations will deal with: thin film growth, deposition technology, novel synthesis techniques, ferroelectric properties, microstructure-switching relationships, composition-property relationships, ferroelectric-antiferroelectric switching, control of interface structure and effect on properties, electro-optic properties, performance of nonvolatile memories, and modeling of switching and aging. □

Hotel Reservations for the 1990 MRS Spring Meeting

The deadline is March 19, 1990...make your reservations now!

Call the San Francisco Marriott at (800) 228-9290 or (415) 896-1600. You can also fax your reservation directly to the Marriott at (415) 442-0141.

You must mention the Materials Research Society meeting to receive the meeting rates.

See special American Airlines offer, p. 16.