

Preview: 1987 MRS Fall Meeting

**Boston, Massachusetts
November 30–December 5, 1987**

Meeting Chairs



J. Murray Gibson
AT&T Bell Laboratories



S. Thomas Picraux
Sandia National
Laboratories



Barry E. Scheetz
Pennsylvania State
University

The 1987 Fall Meeting of the Materials Research Society will be held Monday–Saturday, November 30–December 5, 1987 at the Boston Marriott Hotel/Copley Place and the Westin Hotel/Copley Place. The meeting will feature 21 topical symposia, a workshop on Specimen Preparation for Transmission Electron Microscopy of Materials, a forum on Education in Materials Science and Engineering, 29 short courses, an equipment exhibit, and a job placement center.

Included among the symposia is a late-news session on High Temperature Superconductors, scheduled for Monday morning, November 30. Most symposia will not start until Monday afternoon or later to give all attendees an opportunity to participate in this special session. Also, most symposia will start late on Tuesday morning, December 1, to allow attendees to hear a presentation for Forum Y by Erich Bloch, director of the National Science Foundation.

Registration

Preregistration is strongly encouraged to speed check-in at the meeting. *Deadline for preregistration is November 6.* The fee for the 1987 Fall Meeting for registrations received by November 6 is \$165; the preregistration fee for students is \$50. The registration fee after November 6 and on-site is \$185 (\$60 for students). Payment of the registration fee allows the participant to attend all symposia, the Plenary Session, and the Von Hippel Award Reception.

At-meeting registration will be on the fourth floor of the Boston Marriott. Hours are:

Sunday: 4:00 p.m. - 9:00 p.m.
Monday: 7:00 a.m. - 7:00 p.m.
Tuesday through Thursday: 7:30 a.m. - 5:00 p.m.
Friday: 7:30 a.m. - noon

Lodging

Symposia will be held at the Boston Marriott/Copley Place and the Westin Hotel/Copley Place, which are connected by a covered walkway. A block of rooms has been reserved at each hotel for meeting participants. Reservations must be made directly with the hotels. Special rates are available for MRS meeting attendees. Hotel reservations should be made by *October 30, 1987.*

Local Transportation

Shuttle service from Logan Airport to the Boston Marriott/Copley Place and the Westin Hotel departs every half hour from the designated shuttle stop in front of each terminal. The cost is \$6. Cab fare ranges between \$10 and \$15. Parking is available adjacent to both hotels at a cost of \$16 per day.

Proceedings

Symposia AA, A, B, C, D, E, F, G, H, I, K, M, O, P, Q, R, and W will publish individual proceedings of their symposia in book form. MRS members and meeting attendees may purchase these proceedings

at special prepublication prices by filling out an order form when preregistering or at the meeting. Nonmember prices are higher; for information on nonmember prices and ordering procedures, contact MRS headquarters. Symposia J and S will publish extended abstracts that will be available at the meeting. These extended abstracts may be purchased by including the listed price with the registration payment.

Short Courses

An extensive short course program will be held concurrently for scientists who wish to update their knowledge and skills in a particular field. See the full-page ad elsewhere in this issue for a list of the courses, dates, instructors, and fees. A free brochure with complete details on all short courses is available from MRS headquarters. *Deadline for short course preregistration is November 16.* Later registration and at-meeting tuition fees are \$25 higher for each course than preregistration fees. A short course preregistration card is included in this issue.

Poster Sessions

Poster sessions will be held 7:00–10:00 p.m. at the Westin Hotel Tuesday and Thursday, December 1 and 3. The posters will be attended by their authors during these hours, but will also be available for viewing both before and after these times by participants unable to attend a poster session because of conflicts.

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Equipment Exhibit

A major equipment exhibit will display analytical and processing equipment closely paralleling the nature of the technical symposia.

Job Placement Center

A job placement service will be offered for MRS members and meeting attendees to arrange interviews between prospective employers and employees. The job placement center will be located in the Suffolk Room in the Boston Marriott/Copley Place.

The center will be open 9:00 a.m. to 5:00 p.m. Tuesday through Thursday, December 1-3. Individuals using the interviewing facilities to seek employment must register for the meeting as well as the job placement center. They should complete the employment candidate form in this issue. Preregistration for the center is strongly encouraged so that a candidate's resume can be included in the book of resumes made available to prospective employers. There will be a small fee for candidates to use the placement center.

Member Benefits

Attendees at the Fall Meeting receive a complimentary membership in the Materials Research Society for 1988. Membership benefits include a subscription to *Journal of Materials Research* and the MRS BULLETIN. Members automatically receive calls for papers and preliminary programs for the MRS Spring and Fall Meetings, and are entitled to reduced rates on *Materials Letters*. For information on membership, contact MRS headquarters. The membership fee for 1988 is \$45, of which \$25 is allocated to *Journal of Materials Research*.

Students may join MRS for \$15; membership benefits and privileges are the same as for regular members except that a subscription to *Journal of Materials Research* is not included. Students may subscribe to this journal for an additional \$15.

Von Hippel Award Presentation and Reception Wednesday, December 2, 1987 6:00 p.m.

The Society's most prestigious award, the Von Hippel Award, will be presented to the 1987 recipient. The Von Hippel Award is presented annually to a living scientist who, in the Society's estimation, best exemplifies throughout a career the originality, brilliance of intellect, and diligence of purpose that are the hallmark of science at its best. Recipients of MRS Graduate Student Awards will also be recognized at the ceremony. A reception for all meeting attendees will be held following the ceremony.

Plenary Session Monday, November 30, 1987 6:00-7:00 p.m.

Dr. William C. DeVries, a cardiovascular surgeon at Humana Heart Institute International, will present the keynote speech, "Medical and Materials Issues of the Total Artificial Heart." Dr. DeVries will describe the conditions under which artificial heart implantation is conducted, the construction and operation of the system, and the complications, their origins and their consequences, of artificial heart implantations. Significant progress continues in the total artificial heart system, and ongoing research supports the idea that someday the total artificial heart may be an acceptable therapeutic option for treating heart disease.

DeVries gained international acclaim when he performed the Jarvik-7 artificial heart implant on Seattle dentist Barney Clark in December 1982. Since then, he has implanted three additional artificial hearts. He remains the only surgeon certified by the U.S. Food and Drug Administration to implant the pneumatic artificial heart for permanent life support.

Raised in Utah, DeVries received his undergraduate degree in molecular and genetic biology at the University of Utah. He was awarded the Wintrobe Award from the University of Utah College of Medicine as the most outstanding graduating medical student. He pursued postgraduate training at Duke Medical Center from 1970-79 and is currently Board Certified in General and Thoracic Surgery. He has received many scholastic honors and research awards during his years of training.

TECHNICAL SYMPOSIA

Late News Symposium AA High Temperature Superconductors

Monday, November 30

Chairs: M.B. Brodsky, Argonne National Laboratory; R.C. Dynes, AT&T Bell Laboratories; H.L. Tuller, Massachusetts Institute of Technology; K. Kitazawa, University of Tokyo.

The program for this symposium on the new high temperature superconductors based on substituted perovskite compounds will be listed in a separate announcement that will be sent to MRS members at a future date so that the latest possible news and research can be included. The program will be listed in the Final Program and Abstracts book distributed at the Fall Meeting. Papers will explore the following areas: relationships between preparation methods, structure,

and superconducting properties; techniques for preparing conductors; properties of conductors; and properties of high T_c superconductors related to uses other than conduction, e.g., tunnel junctions.

Symposium A Fundamentals of Beam-Solid Interactions and Transient Thermal Processing

Monday-Thursday, Nov. 30-Dec. 3

Chairs: M.J. Aziz, Harvard University; L.E. Rehn, Argonne National Laboratory; B. Stritzker, Institut für Festkörperforschung.

Approximately 67 invited and contributed papers and 46 poster session papers will focus on laser-solid interactions and ultrafast energy transfer mechanisms, ion and electron beam-solid interactions, beam-induced epitaxy and phase transformations, melting and rapid solidification, kinetics and thermodynamics of phase transformations, and novel applications of transient thermal processing and beam-solid interactions. A joint plenary session with Symposium H will be held on Multilayers Synthesis by Ion Bombardment. Invited speakers include: W.L. Johnson, A.E. White, C. Jaussand, D.G. Armour, N.Q. Lam, J.G. Fujimoto, D.H. Lowndes, D.M. Follstaedt.

Symposium B Laser and Particle-Beam Chemical Processing for Microelectronics

Tuesday-Thursday, December 1-3

Chairs: D.J. Ehrlich, MIT Lincoln Laboratory; G.S. Hogashi, AT&T Bell Laboratories; M.M. Oprysko, IBM T.J. Watson Research Center.

Approximately 58 invited and contributed papers and 35 poster session papers will explore this emerging technology and the underlying science, including new beam techniques for monitoring reactions or measuring surface properties; laser chemical vapor deposition and photochemical vapor deposition; laser-controlled etching in gases and liquids; ion-beam-assisted etching and deposition; electron-beam-stimulated reactions; laser-chemical doping of solids; focused ion beam processing; new electron beam, ion beam, and laser diagnostics of processing reactions; laser photochemistry of adsorbed phases; technological applications of beam-stimulated processing; and new compounds and materials for beam-controlled processing. Invited speakers include: D.E. Eastman, C. Wittig, J.C. Polanyi, Y. Horiike, M. Rothschild, M. Stuke, D. Bauerle.

Symposium C **Epitaxy of Semiconductor Layered Structures**

Monday–Thursday, Nov. 30–Dec. 3

Chairs: R.T. Tung, AT&T Bell Laboratories; L.R. Dawson, Sandia National Laboratories; R.L. Gunshor, Purdue University.

Approximately 69 invited and contributed papers and 46 poster session papers will cover molecular beam epitaxial growth of Group IV, III-V, and II-VI compound semiconductor layers and superlattices; fundamentals of epitaxial growth; physics and chemistry of epitaxial interfaces; epitaxial metals and insulators; and related subjects (e.g., epitaxial perfection and doping profile using MOCVD, novel techniques for epitaxy, noncrystalline superlattices, interfacial metal-semiconductor reactions). A joint session with Symposium H will be held on Heteroepitaxy on Si: Epitaxial Silicides and Fluorides. Invited speakers include: A. Madhukar, N. Otsuka, J.-P. Faurie, S.K. Ghandhi, P.-Y. Lu, J.F. Schetzina, L.A. Kolodziejewski, H. Ishiwara, E. Kasper, L.C. Feldman, W.T. Tsang, G.B. Stringfellow.

Symposium D **Multilayers: Synthesis, Properties, and Nonelectronic Applications**

Wednesday–Friday, December 2–4

Chairs: T.W. Barbee Jr., Lawrence Livermore National Laboratory; F. Spaepen, Harvard University; L. Greer, Cambridge University.

Approximately 37 invited and contributed papers and 19 poster session papers will focus on growing activities in metallic and insulator and the nonelectronic properties of semiconductor multilayers, addressing multilayer characterization (x-ray scattering, TEM, SEM, Auger); atomic transport (diffusion, coarsening); phase stability in multilayers (theory, thermodynamics, strained layer structures); multilayer properties (magnetic, superconductive, mechanical, elastic); and multilayer applications (memory structures, x-ray optics, VLSI interconnects, tribology). Invited speakers include: R.W. Vook, M.H. Grabow, A. Zangwill, J.P. Hirth, L. Wilson, J.M. Vandenberg, W.M. Stobbs, B.W. Dodson, T. Tsakalagos, C. Falco, R.C. Cammarata, I.K. Schuller.

Symposium E **Defects in Electronic Materials**

Monday–Thursday, Nov. 30–Dec. 3

Chairs: M. Stavola, AT&T Bell Laboratories; S.J. Pearton, AT&T Bell Laboratories; G. Davies, University of London.

Approximately 59 invited and contributed papers and 51 poster session papers will report on fundamental and/or technologically relevant studies (both theoretical and experimental) concerning spectroscopy of point defects and defect complexes; hydrogen in semiconductors, passivation mechanisms, and physics of H-related complexes; metastable defects (e.g., EL2, DX centers); studies of defect structure, diffusion, and reactions; defects in superlattices and heterojunctions; and defects in device structures or due to fabrication. Invited speakers include: G.D. Watkins, G.B. Bochetet, A. Chantre, K.C. Pandey, F. Capasso, G. Davies, M. Kleveman, J.W. Corbett, W.C. Dautremont-Smith, H.J. von Bardeleben, J.-M. Spaeth, G.A. Baraff, F. Sette, R.A. Stradling, P.M. Mooney, P.M. Petroff, J.M. Gibson.

Symposium F **SiO₂ and Its Interfaces**

Tuesday–Friday, December 1–4

Chairs: G. Lucovsky, North Carolina State University; S.T. Pantelides, IBM T.J. Watson Research Center.

Approximately 53 papers will focus on fundamental understanding of the reactions that underlie growth (thermal oxidation, CVD, etc.), ways to selectively enhance growth, and the properties of the resulting films, interfaces, and substrates. Both theoretical and experimental work on structural, electronic, and thermodynamic properties will be included. Invited speakers include: A. Ourmazd, G.W. Rubloff, I.W. Boyd, J. Narayan, P. Avouris, G.K. Celler, T. Inushima, J. Batey, D.V. Tsu, M.V. Fischetti.

Symposium G **Polysilicon Films and Interfaces**

Tuesday–Thursday, December 1–3

Chairs: C.Y. Wong, IBM T.J. Watson Research Center; C.V. Thompson, Massachusetts Institute of Technology; K.-N. Tu, IBM T.J. Watson Research Center.

Approximately 56 papers will span the following topics: preparation and characterization—fabrication of poly-crystal and bi-crystal Si films, structure and electrical transport properties of grain boundaries; kinetics—grain growth, DIGM in doped poly-Si, grain boundary diffusion, passivation, segregation, dopant activation, oxidation, and rapid thermal annealing; interfaces—structure, reactions and properties of poly-Si/metal, poly-Si/SiO₂, and poly-Si/single crystal Si interfaces; and applications—bipolar emitters and base contacts, FET gates and trench capacitors, resistors, thin film transistors, display devices, sen-

sors, and solar cells. Invited speakers include: T. Kamins, R. Sinclair, H.J. Queisser, P. Hassen, C.V. Thompson, C.H. Handwerker, J.W. Mayer, G. Ottaviani, R.T. Howe, L.L. Kazmerski, T.H. Ning, R.W. Keyes, T. Noguchi.

Symposium H **Silicon-on-Insulator and Buried Metals in Semiconductors**

Monday–Thursday, Nov. 30–Dec. 3

Chairs: C.K. Chen, MIT Lincoln Laboratory; J.C. Sturm, Princeton University; P.L.F. Hemment, University of Surrey; L. Pfeiffer, AT&T Bell Laboratories.

Sequel to the successful symposium on this topic at the 1985 MRS Fall Meeting, this year's symposium will be expanded to include buried metal structures in semiconductors and features 65 papers and a late-news session. Two joint sessions will be held, one on Multilayers Synthesis by Ion Bombardment with Symposium A, and one on Heteroepitaxy on Si: Epitaxial Silicides and Fluorides with Symposium C. Other sessions will cover SIMOX; zone melting and recrystallization; buried silicides and silicon on metal; SIMOX, defects, and SOS; porous silicon, and buried nitride and carbide; wafer bonding and novel techniques; and devices, circuits and radiation effects. Poster session papers will focus on zone melting and recrystallization. Invited speakers include: W.L. Johnson, A.E. White, C. Jaussaud, D.G. Armour, P.D. Augustus, D. Dutartre, H. Ishiwara, A.F.J. Levi, S.J. Krause, R.E. Reedy, S. Cristoloveanu, S.S. Tsao, J.C. Sturm, C.-E.D. Chen, A.H. van Ommen.

Symposium I **Electronic Packaging Materials Science**

Monday–Thursday, Nov. 30–Dec. 4

Chairs: R. Jaccodine, Lehigh University; K.A. Jackson, AT&T Bell Laboratories; R.C. Sundahl, Allied Signal.

Approximately 54 invited and contributed papers and 23 poster session papers will cover fundamental aspects of packaging in the following areas: properties of thin films and bulk materials; new materials for packaging; interfaces between semiconductors, metals, ceramics, and polymers; interfaces and their properties (e.g. adhesion, interfacial stress, and electrical properties); mechanical and thermal management; soldering and other interconnects; and failure mechanisms. Two joint sessions will be held with Symposium L, both on Polymer Interfaces and Adhesion. Invited speakers include: B.W. Whalen, R.W. Keyes, C.A. Neugebauer, R.C. Frye, J.W. Balde, R.J. Jensen, S.H.

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Wen, K.L. Tai, S. Numata, D.W. Wang, S.H. Goodman, S.B. Rimsa, A.M. Ibrahim, L.E. Vigezzi, R. Rosenberg, D.C. Hofer, C.P. Wong, S.D. Senturia, M. Grunze, C.J. Bartlett, R.H. Estes, G.N. Taylor, S.K. Gupta, W. Borland, D. Jaffe, D.J. Lando, D.G. Grabbe, E. Kraft, C.A. Steidel, L.D. Hutcheson, S. Sriram, E.J. Murphy, M.F. Yan, J.W. Stafford.

Symposium J Structure-Property Relationships in Optical Materials

Thursday, December 3

Chairs: D. Eimerl, Lawrence Livermore National Laboratory; A.A. Ballman, AT&T Bell Laboratories; C.K. Lowe-Ma, China Lake Naval Weapons Center.

Approximately 15 papers will address linear refractive index and birefringence, second harmonic generation coefficients, electro-optic coefficients, nonlinear refractive index, laser-induced damage, photorefractivity, thermal conductivity and thermal expansion, zero thermal expansion materials, elastic constants, and mechanical strength or fracture toughness. Invited speakers include: S.P. Velsko, J.D. Bierlein, L.L. Chase, A.M. Harper, R. Roy, J.E. Marion.

Symposium K Nonlinear Optical Properties of Polymers

Tuesday-Thursday, December 1-3

Chairs: A.J. Heeger, University of California-Santa Barbara; J. Orenstein, AT&T Bell Laboratories; D.R. Ulrich, AFOSR.

Approximately 46 papers will span third harmonic generation, three and four wave mixing, dc field-induced second harmonic generation, etc. to characterize and evaluate these polymers as nonlinear optical materials; use of time-resolved optical techniques to study dynamics of nonlinear processes; materials synthesis, processing, and poling with the goal of optical quality uniform oriented films of polymers with anisotropic optical passages; theoretical studies of the origin of the large $\chi^{(3)}$ in conjugated polymers, including excitons and polaritons and the special role of electron-phonon coupled excitations in 1d; and design, fabrication, and evaluation of NLO devices based on polymers. Invited speakers include: B.G. Kushner, R. Lytel, J.F. Wolfe, L.R. Dalton, M. Thakur, G.I. Stegeman, J. Stamatoff, P.N. Prasad, E.J. Mele, F.L. Giles, A.F. Garito, A.C. Griffin, F. Wudl, S. Kivelson, D.K. Campbell, D.S. Chemla, D.J. Gerbi, T.J. Marks, B.I. Greene, K. Schulten, J. Zyss, G.K. Wong, C. Flytzanis, M. Sinclair, S. Etemad.

Symposium L Polymer Surfaces, Interfaces, and Adhesion

Monday-Thursday, Nov. 30-Dec. 3

Chairs: E.L. Thomas, University of Massachusetts; P.S. Ho, IBM T.J. Watson Research Center; R.P. Wool, University of Illinois.

Cosponsored by the Society of Plastics Engineers this symposium will feature 59 papers on the chemical and structural nature of polymer surfaces and interfaces, particularly in contact with other materials; and the mechanical properties of polymer composite interfaces, especially microstructural aspects of adhesion. Two joint sessions will be held with Symposium L, both on Electronic Packaging/Polymer Interfaces and Adhesion. Invited speakers include: P-G. deGennes, J.F. Rabolt, J. Klein, S. Granick, L. Leibler, H. Hasegawa, P. Pincus, M. Tirrell, R.P. Wool, R.J. Diefendorf, L.T. Drzal, A.N. Gent, H.R. Brown, R. Rosenberg, D.C. Hofer, C.P. Wong, S.D. Senturia, M. Grunze, C.J. Bartlett, R.H. Estes, T.J. McCarthy, R. Haight, G.R. Hamed, J.E. Ritter, J. Petermann, T. Hashimoto.

Symposium M Biomedical Materials and Devices

Monday-Friday, Nov. 30-Dec. 4

Chairs: J.S. Hanker, University of South Carolina; B.L. Giammara, University of Louisville.

Sequel to the successful symposium on this topic at the 1985 MRS Fall Meeting, this symposium will bring together scientists, engineers, and clinicians working with all types of biomedical materials and devices. Approximately 124 papers will be presented in sessions on biomaterials and devices for sensors, neural prostheses and pain; vascular and cardiovascular materials and devices; blood cell and plasma substitutes; standardization and control of biomedical materials and devices; bone graft substitutes; tissue/biomaterials interface; skin substitutes; controlled drug delivery and removal systems; novel materials and techniques; bone as a material: structure and properties; orthopaedic materials and prostheses; dental materials; structure and properties of biomaterials; ion implantation effects on orthopaedic and other biomaterials; devices and materials for therapeutic plasmapheresis, cyta-pheresis and dialysis; artificial organs; influence of implant parameters on skeletal remodeling and regeneration. Several sessions will be concurrent. Invited speakers include: R.L. Sidman, Y. Hosobuchi, M. Szycher, W.C. DeVries, C. Anthony, J.

Bonaventura, D.G. Singleton, J.E. Lemons, J.T. Lambrecht, R.M. Ottenbrite, B.P. Gaber, J.B. Koeneman, R. Ewers, M.G. Duncanson Jr., J.M. Williams, P. Sioshansi, Y. Suzuki, Y. Nosé.

Symposium N Plasma-Assisted Deposition of New Materials

Tuesday-Thursday, December 1-3

Chairs: R. Messier, Pennsylvania State University; J.J. Cuomo, IBM T.J. Watson Research Center; M.N. Yoder, Office of Naval Research; K.E. Spear, Pennsylvania State University.

This symposium will highlight the area of diamond and related materials film growth and will feature invited speakers from Russia, Japan, Poland, and the United States. Approximately 46 papers will discuss preparation methods—plasma-assisted CVD, ion sputtering, ion-plating, dc, rf, and microwave plasma, and organometallic input gases; new materials, including not only new phases but also new compositions, unique properties, or new configurations; plasma chemistry and plasma/solid interaction relations to film growth; diamond, c-BN, β -SiC; and oxides, nitrides, carbides, borides, silicides, metal alloys, etc. Invited speakers include: J. Paraszczak, P.K. Bachmann, B.V. Derjaguin, N. Setaka, T. Anthony, T.D. Moustakas, A. Hara, P. Koidl.

Symposium O Microstructure and Properties of Catalysts

Monday-Thursday, Nov. 30-Dec. 3

Chairs: M.M.J. Treacy, Exxon Research and Engineering Company; J.M. Thomas, The Royal Institution; J.M. White, University of Texas at Austin.

Approximately 60 papers from all areas of catalysis science will address the goal of unraveling structure/property relationships of catalysts, addressing such areas as physical characterization techniques (e.g. NMR, (S)TEM, SIMS, EXAFS, IR, Mössbauer, powder x-ray diffraction, powder neutron diffraction, diffusion measurements, sorption measurements); catalytic properties and reaction mechanisms; synthesis of oxides, hydroxides, zeolites, clays, and pillared clays; and theoretical studies of catalyst properties. Invited speakers include: H. Poppa, P.A. Sermon, R.T.K. Baker, P.J. Feibelman, W.A. Goddard, W.P. Halperin, K.W. Zilm, J.W. Johnson, A. Harriman, J.H. Lunsford, W. Ueda, D.E. Aspnes, J. Wei.

Symposium P
Scientific Basis for Nuclear Waste Management XI

Monday–Thursday, Nov. 30–Dec. 3

Chairs: M.J. Apted, Battelle, Pacific Northwest Laboratory; R.E. Westerman, Battelle, Pacific Northwest Laboratory.

The eleventh in a series, this symposium will focus on recent scientific advances and technical aspects of nuclear waste disposal. Invited panels of experts will define and debate key areas of current studies in barrier materials selection and characterization, waste form performance (spent fuel, glass, others), container corrosion/degradation, radiation effects, waste package system tests, natural analogue studies, disposal of non-high-level radioactive wastes, radionuclide migration in repository environments, predictive assessments of waste package performance, and validation of assessment models. Approximately 58 papers and 26 poster session papers will be featured. Invited speakers include: I. Grenthe, G.P. Marsh, L.H. Johnson, K.W. Stephens, T.H. Pigford, J.K. Bates.

Symposium Q
Fly Ash and Coal Conversion By-Products: Characterization, Utilization, and Disposal IV

Monday–Wednesday, Nov. 30–Dec. 2

Chairs: E.E. Berry, Ontario Research Foundation; R.M. Majko, American Fly Ash; G.P. McCarthy, North Dakota State University.

Approximately 37 papers at this fourth symposium dealing with the characterization, utilization, and disposal of fly ash and other by-products of coal combustion and conversion will continue to emphasize the use of modern materials characterization tools to understand the structure, properties, and reactions during utilization or disposal. The papers will also cover residues from advanced SO₂ control, resource recovery, ash beneficiation, engineering applications, and groundwater quality at waste disposal sites.

A joint session on Reactions and Admixtures will be held with Symposium R. Invited speakers include: M.J. Dudas, D. Rai, G.J. McCarthy, L.L. LaBuz, A.G. Eklund, R.T. Hemmings, P.K. Mehta, R.L. Smith.

Symposium R
Bonding in Cementitious Composites

Wednesday–Friday, December 2–4

Chairs: S. Mindess, University of British Columbia; S.P. Shah, Northwestern University.

Approximately 50 papers will consider the effects of *all* the interfacial regions in concrete (cement-aggregate, cement-fiber, concrete-reinforcing steel, etc.) on the properties of these composite materials, concentrating on the microstructure of interfaces, fracture mechanics of the interfaces, micromechanics of the interfacial region, measurements of bond strength, interfaces (or bonding) specifically with fibers, and the relationship between bond strength and the mechanical properties of the composites. A joint session on Reactions and Admixtures will be held with Symposium Q. Invited speakers include: R.L. Smith, P.K. Mehta, L.J. Struble, A. Bentur, A.A. Kruger, S.P. Shah.

Symposium S
Fractal Aspects of Materials: Disordered Systems

Tuesday–Friday, December 1–4

Chairs: A.J. Hurd, Sandia National Laboratories; D.A. Weitz, Exxon Research and Engineering Company; B.B. Mandelbrot, Harvard University.

The format for this symposium includes approximately 83 invited and contributed papers, a poster session, and a roundtable discussion on multifractal measures and on fractals, 1/f noise and self-organized criticality. Session topics will cover materials science areas involving fractals or disorder: scattering, fractal measures, percolation, reaction kinetics, fracture, interfacial phenomena glasses and localization, porous media, aggregation, and novel applications. Invited speakers include: L.M. Sander, T.C. Halsey, F. Family, M. Kolb, L.A. Turkevich, R.C. Ball, J.H. Kaufman, R. Kopelman, R.B. Laibowitz, P.J. Steinhardt, T.M. Shaw, F. Spaepen, G.Y. Onoda, S.H. Liu, J.P. Stokes, B. Sapoval, E. Orbach, E. Courtens, J.P. Wilcoxon, P. Sheng, D. Andelman, S. Garoff, A.J. Katz, P. Wong.

Workshop W
Workshop on Specimen Preparation for Transmission Electron Microscopy of Materials

Thursday, December 3

Chairs: J.C. Bravman, Stanford University; M.L. McDonald, AT&T Bell Laboratories; R. Anderson, IBM, East Fishkill.

This symposium will be held in a workshop format to provide a forum for exchanging information on novel methods for surmounting problems associated with preparing TEM samples from important categories and configurations of materials. A series of 6 invited papers will address topics of interest to a broad spectrum of

investigators. Approximately 38 contributed papers will be presented in poster format, allowing a maximum amount of time for discussion between authors and attendees. Topics include: rapid fabrication of cross-section samples, alleviating problems associated with differential ion-milling rates, design and construction of specialized TEM specimen holders, cleavage and ultramicrotomy for solid-state materials, and production of artifacts during specimen preparation. Invited speakers include: A.G. Cullis, F. Khoury, S.B. Rice, J.M. Brown, P.S. Sklad, P. Goodhew.

Symposium X
Frontiers of Materials Research

Monday–Friday, Nov. 30–Dec. 4

Chair: R. Roy, Materials Research Laboratory, Pennsylvania State University.

This luncheon-time series will consist of 30–40 minute lectures on the history of materials research, materials characterization in coal, materials for use in the human body, laser chemical processing of electronic materials, electronic polymers, ceramic archeology, nonlinear optic effects in polymers, and MBE growth of artificially structured materials.

Forum Y
Education in Materials Science and Engineering: The Changing Role of University, Industry, and Government Interactions

Tuesday, December 1

Chairs: I.M. Bernstein, Carnegie Mellon University; J.L. Merz, University of California; J.B. Wachtman Jr., Rutgers University.

This symposium will open with a plenary address by National Science Foundation director Erich Bloch titled, "Confronting New Challenges: Science and Engineering in a Competitive Global Economy." Approximately 9 papers will explore how universities should organize programs in materials in order to better prepare students as well as match the needs of employers. Sessions will cover materials education within the materials community—accredited materials programs; materials education within "satellite" areas—physics, chemistry, engineering; and industrial and government needs and expectations for materials education.