

Preview: 2000 MRS Spring Meeting

San Francisco Marriott and Argent Hotels • San Francisco, California

Technical Meeting: April 24–28 • Exhibit: April 25–27

Meeting Chairs:

Anna C. Balazs

University of Pittsburgh

Robert Q. Hwang

Sandia National Laboratories

Kevin S. Jones

University of Florida

Frances M. Ross

IBM T.J. Watson Research Center

The 2000 MRS Spring Meeting launches materials research into the next millennium with 34 symposia examining the current state of materials research, and giving some vectors for future work. The 2,300 oral and poster papers include many in joint sessions integrated into the technical program due to the significant interplay between symposium topics. Cross-cutting Symposium GG will be held on Analyzing, Predicting, and Preventing Disasters, spanning the range from semiconductor chip failure to concrete, from battleships to conflagrations, and from engines to asteroids. Traditionally held during the Fall Meeting, Symposium HH on Materials Science and Engineering Education in the New Millennium is offered for the first time at a Spring Meeting. Of the 24 proceedings volumes planned, 18 will be published electronically on the Web, available free to MRS members.

Symposia A–E cover critical issues in the processing of silicon ranging from front-end processing to back-end metallization and chemical-mechanical polishing. Symposium A on amorphous silicon addresses ordering, metastability, high-rate deposition, solar cells, amorphous silicon structure, dynamics, thin-film transistors, and heterogeneous materials. A “Millennium Session” will look at early research on amorphous silicon, a 40-year trajectory of amorphous semiconductor research, and a European adventure in amorphous materials from past to future. A panel discussion will conclude the session.

Front-end processing has become increasingly significant recently, as very shallow junctions are needed along with tight control of dopant profiles and defects as silicon devices are scaled down in size. Symposium B will address questions such as, “How far will ion implantation take us?”

Symposium C delves into materials and technologies for high-dielectric-constant materials, novel gate insulators, silicides, and integration issues. Symposium D

extends the dielectric constant in the other direction. With air being a desirable low- k material, much of the research in this area is focusing on incorporating pores into appropriate materials. In addition to testing for electrical properties and reliability, mechanical properties will be covered. A wide variety of analysis techniques will be presented including x-ray and neutron analysis, ellipsometric porosimetry, and positron annihilation lifetime spectroscopy. A look at process integration and manufacturability will wrap these topics together.

In the area of thin films, the Meeting will feature magnetoelectronics, polycrystalline films, corrosion, and epitaxy of oxides and semiconductors. Symposium F continues coverage of recording media and characterization. Some magnetic materials are taking on a new spin, adding the dimension of spin polarization to the tricks electrons can play in the electronics arena. Areas such as spin valves and spin-dependent transport will be covered. Processing techniques and methods of fabricating colossal magneto-resistive materials will also be discussed.

In the United States alone, 4.2% of its GNP per year is spent to understand and repair failures due to corrosion. Symposium H examines some of the issues that contribute to this huge expense, offering insight into how to control corrosion in systems ranging from aluminum-copper alloys in integrated circuits to aluminum sheet and aerospace alloys. Passivation and breakdown of oxides will also be considered. Several joint sessions with Symposium M cover growth and morphology of oxide-solution interfaces and dissolution of metals and alloys.

Symposium I covers vapor deposition for applications ranging from micro-machines to spin valves. The Symposium will explore models and mechanisms to better understand vapor deposition and practical developments such as how to sense material growth within production deposition tools.

An important processing tool is the laser, and Symposium J addresses laser desorption and ablation, nanoparticle formation, direct writing, micromachining, surface modification, deposition of oxides, and pulsed-laser deposition.

Strain has a tremendous effect on the morphology and composition of hetero-epitaxial films. Symposium K will examine

these effects in semiconductors, focusing on mechanisms rather than materials. Surface dynamics, interdiffusion, and segregation will be addressed, along with growth on patterned, high-index, and vicinal substrates. The theme of epitaxy will be continued in Symposium L.

With a focus on physical and structural studies of growth and dissolution processes, Symposium M considers multiple chemical species, molecular anisotropy, and the interface between fluid and solid phases. Both inorganic and organic materials will be discussed, including supra-molecular solids, fluid-mineral interfaces, biogenic and biomimetic systems, and metals and alloys.

Symposium N will meet on Monday to address Materials for Separations in Analytical Chemistry.

Computation and modeling have been growing components of materials research, addressed in Symposia O–P. Some technologically important areas where computation is gaining use (Symposium O) include chemical processes, electronic and optical materials, and magnetic phenomena. Models to accelerate the impact of materials computation will be presented. Symposium P turns to organic materials, modeling them at multiple length scales.

Another cluster of symposia will cover state-of-the-art developments in flat panel displays, wide-bandgap devices and other electronic materials, and novel oxide-based devices.

Symposium Q on flat panel displays relates closely to several other symposia, covering field emission (joint with Symposium R), organic emitters (joint with Symposium S), as well as cathodoluminescence, electroluminescence, thin-film transistors, and laser crystallization. Symposium R also covers wide bandgap materials, diamond, and carbon nanotubes.

Symposia S–U include papers on polymer, semiconductor, and oxide electronics. Symposium S covers polymer sensors, thin-film transistors, conductive polymers, and organic light emitters. Bioactive electroconductive polymers that combine molecular recognition and electrical transduction will be considered, as well as novel biological and chemical sensors based on fluorescent polyelectrolytes, and even moving into the realm of organic transistor-based large-scale integrated circuits. Switching to inorganic materials, SiC and III-nitride devices for electronic and photonic applications will be

covered in Symposium T. Symposium U examines ferroelectrics, transparent conductors, and other oxides that are gaining applications as active devices in electronic systems. Processing techniques such as laser-based deposition (in a session joint with Symposium J) and other new approaches will be presented.

New at this meeting is Symposium V, Materials Development for Direct Write Technologies, beginning with an overview of potential direct-write technologies. Some highlights include microcontact printing, micropen direct write of integrated electroceramic devices, pulsed laser and thermal spray approaches, and direct focused ion beam writing of printheads for pattern transfer. Extending the area of direct patterning is Solid Freeform and Additive Fabrication III, Symposium Y. This Symposium covers direct metal fabrication, photoprocessing, direct patterning, composites, and ceramics.

Symposium W applies the combinatorial approach to optimizing and screening materials quickly. This approach has been applied to thin films, catalysis, laser and scintillator materials, amorphous silicon-based materials, phosphor materials, and even pigment research and smell digitization.

Symposium Z will cover skutterudites, superlattices, quantum wires and dots, quasicrystals, clathrates, and other thermoelectric materials. Wednesday afternoon, a special discussion session will be held focusing on future directions in thermoelectric research.

The one-day, new Symposium AA, Millimeter-/Submillimeter-Wave Technology—Materials, Devices, and Diagnostics, addresses characterization and diagnostics, along with materials components and devices.

The growing interest of MRS in soft materials continues in this meeting, with topics covering polymer nanostructures, organic/inorganic hybrids, and the granular state. Symposium BB examines granular materials from sandcastles to avalanches, seeking to understand structure, flow, and stress distributions within these collections of particles.

Biomedical materials can be found within Symposium CC on hybrid materials. Artificial organs and biomedical sensors are among materials produced through sol-gel and other processing methods. Also filling out this large Symposium are chemical routes to production of nanostructures and mesostructures.

Additional biomedical developments are found in Symposium DD. In the area of tissue engineering, surfaces are like blank slates for engineering biomaterials. "Engineering a new chemical language onto cell surfaces" can lead to designed

shapes and chemistries. One presentation even addresses an approach to a tissue-engineered spinal cord. Several joint sessions with Symposium FF cover polyelectrolytes and proteins at surfaces and mechanical aspects of soft biomaterial interfaces. Also, cellular response and lipid membranes and vesicles will be covered.

Nanotechnology is an accelerating area of research in soft materials. Symposium EE addresses Nanostructures in Polymers. Self-assembly and templating are methods of building such structures from the ground up. This Symposium also covers hybrids, electrolytic systems, thin films, and bulk materials. These last two topics will be held jointly with Symposium FF, Interfaces, Adhesion, and Processing in Polymer Systems. Surface properties and adhesion are important elements of polymer-polymer interfaces and other polymer composites. In addition to film adhesion, this Symposium covers such topics as pressure-sensitive adhesives and how roughness on polymer surfaces develops due to processing technique.

Special Events and Opportunities

The **Plenary Session and Awards Ceremony** will take place on Monday, April 24, 6:00 p.m., Salon 7, Marriott Hotel. The **Plenary Speaker** will be **Arthur Bienenstock**, Associate Director for Science in the White House Office of Science and Technology Policy, addressing U.S. public policy. Meeting Chair **Frances M. Ross** (IBM T.J. Watson Research Center) will receive the **Outstanding Young Investigator Award** for developing novel *in situ* electron microscope techniques. She will give her presentation in Symposium C on Tuesday, April 25, 11:30 a.m., Salons 5 and 6, Marriott Hotel. The finalists for the **Graduate Student Awards** will be presented with Gold or Silver Awards.

Several seminars will be presented describing opportunities for U.S. government funding of materials research: **Army Research Office** on Tuesday, April 25, 5:30 p.m., Golden Gate A2, Marriott Hotel; **National Nanotechnology Initiative** on Tuesday, April 25, 6:30 p.m., Golden Gate B2, Marriott; **National Science Foundation** on Wednesday, April 26, 5:30 p.m., Golden Gate A2, Marriott; and **NIST Advanced Technology Program** on Wednesday, April 26, 6:30 p.m., Golden Gate B2, Marriott.

Symposium X, Frontiers of Materials Research, presents a series of authoritative reviews for the nonspecialist between noon and 1:30 p.m., Monday through Thursday. Topics cover biotechnology versus chemical warfare; materials to fight counterfeiting; improvement in high-school education; metallurgy of the RMS

Titanic; recycling of nature's strongest polymers from wood; and real-time videos of crystal growth. **Materials MicroWorld** will be introduced during Symposium X and HH. An area will be available to see plans in progress for this proposed interactive traveling science exhibit and education program. **Poster Sessions** will be held Tuesday through Thursday, 8:00–11:00 p.m., in the Metropolitan Ballroom, Argent Hotel and Salons 1–7, Marriott Hotel. The Meeting Chairs will sponsor a Best Poster Award competition at which a prize of \$500 will be awarded to the presenting author(s) of the winning paper(s). Award recipients will be selected on the basis of the poster's technical content, appearance, graphic excellence, and presentation quality. Additionally, several symposia have in-room posters during their sessions.

Five Symposium **Tutorial** sessions by leading experts will be given on Sunday and Monday (see Tutorial matrix). The **MRS Equipment Exhibit**, to be held Tuesday through Thursday in Salons 8 and 9, Marriott Hotel, will hold a reception for meeting participants on Tuesday evening, 5:00 p.m. in the Exhibit Hall.

A **Student Mixer and MRS University Chapter** meeting will be offered for graduate students, members of University Chapters, Chapter officers, and faculty advisors. The date, time, and location of both events will be announced in the *Meeting Guide* on site.

Grant recipients of the **MRS Undergraduate Materials Research Initiative (UMRI)** will have their posters on display with Symposium HH on materials education during the poster session on Tuesday, April 25, 8:00–11:00 p.m., Metropolitan Ballroom, Argent Hotel.

Symposium Assistant positions are available for graduate students. Symposium Assistants will receive a complimentary student registration, a one-year MRS student membership commencing July 1, 2000, and a stipend to help defray expenses.

MRS will offer an **Employment Center** for meeting attendees. Date, time, and location will be announced in the *Meeting Guide* on site.

See the following pages for a matrix of symposia sessions, a list of tutorials, highlights of special events, profiles of exhibitors, and hotel and transportation arrangements. The 2000 MRS Spring Meeting program is available on the MRS website (www.mrs.org). For additional information regarding any of the meeting activities, contact MRS Member Services, 506 Keystone Drive, Warrendale, PA 15086-7573; e-mail info@mrs.org; tel. 724-779-3003; fax 724-779-8313. The deadline for preregister for the meeting is Friday, April 7. 