E-MRS Celebrates 20th Anniversary During 2003 Spring Meeting

The European Materials Research Society (E-MRS) celebrated its 20th anniversary during its 2003 Spring Meeting, which was held June 10–13 last year in Strasbourg, France. During the plenary session, then E-MRS president and meeting chair Giovanni Marletta and president of the International Union of Materials Research Societies (IUMRS) Robert J. Nemanich welcomed attendees. This meeting saw the inauguration of the E-MRS 20th Anniversary Award, which was presented to Richard Friend of the Cavendish Laboratory at Cambridge University, recognizing his contributions to the development of polymer-based electronics (see the December 2003 issue of *MRS Bulletin*). The awards ceremony was followed by Friend's presentation on "Plastic Electronics." Materials Research Society 2003 president, Merrilea Mayo, as well as Tania Friederichs, a member of the European Union (EU) cabinet, also participated in the plenary session. Friederichs, representing Philippe Busquin, the EU European Commissioner for Research, described European research policy for materials, while Mayo discussed structural challenges for materials research in the United States.

The speakers during the plenary session at the 2003 European Materials Research Society Spring Meeting were, from left to right, Giovanni Marletta, then E-MRS President; Matthias Werner, Deutsche Bank AG, Berlin, Germany; Richard Friend, Cavendish Laboratory, Cambridge, UK; Merrilea J. Mayo, 2003 MRS President; Robert Mertens, Division Director IMEC, Leuven, Belgium; and Peter Glasow, IUMRS Past-President.

The meeting, held at the Palais de la Musique et des Congrès, offered 16 symposia, including traditional topics such as ion beams (Symposium E), protective coatings and thin films (Symposium G), and current trends in nanoscience (Symposium A), and topics new for E-MRS such as materials aspects of art (Symposium O). The venue included oral and poster presentations, with international participation.

In Symposium O, particular attention was devoted to the analysis, characterization, conservation, and restoration of many different materials, all involved in Cultural Heritage. Reports were given on the most recent results in the field, and very often the results were obtained with the use of sophisticated apparatus to investigate ancient materials at a nanometric level, with the goal of understanding and developing their properties. For instance, nanomaterials were discovered in the "luster" decoration present on Islamic ceramics produced 1200 years ago. The sessions addressed dating, conservation, and restoration; ceramics and glazes; metallurgy; pigments; paper and inks; and other materials, including waxes, plasters, jade, and cosmetics.

Ion beams are a unique tool for modifying the properties of solid surfaces on the nanometer scale. The localized energy and material deposition of energetic ions can be exploited to create and manipulate the nanomaterials that are presently challenging materials scientists, as addressed in Symposium E. The ion energy range that can be used for such applications spans from a few 10 eV up to several hundred MeV. Some new applications of ions at the other end of the energy range, ultralow-energy ions, were also addressed. Si nanocrystals embedded in SiO_2 may potentially be used in the floating gate of a field-effect transistor for charge storage. Si and Ge nanocrystals formed by ion-beam synthesis in SiO_2, and also the damage produced in SiO_2, were therefore discussed in a number of talks. Beam-induced formation of Si nanocrystals in SiO_2 can also turn Si into a photo- and electroluminescent material. A number of researchers discussed ion-beam-synthesized nanoclusters in insulators, some of them in the shape of metallic nanoparticles, allowing for new optical and magnetic applications, and some of them in the shape of gas bubbles or cavities, resulting from H^+ and/or He^+ implantations. Some of these nanocluster ensembles exhibit particle size distributions that were shown to be influenced by Ostwald ripening effects. The same effect has a marked influence on the distribution of Si self-interstitials resulting from implantations into Si and the agglomeration of such defects into extended defects.

The band PAPYROS' N entertained meeting attendees during a reception of the 2003 E-MRS Spring Meeting.

Deep insight has been gained recently from molecular dynamics (MD) simulations. The influence of grain boundaries on the defect evolution within single collision cascades was determined using MD techniques to simulate the atomic rearrangement processes within the first few picoseconds of energy dissipation in a collision cascade. The fact that "damage" can be useful was assessed by MD techniques through which it was observed, for example, that nanotubes can be interlinked and welded by ion irradiation. Presentations at the symposium also showed that the application of ion beams to create morphological surface nanostructures in a self-organized way is an emerging field.

Symposium J covered recent advances in the physics and applications of photonic materials. This area of avid research activity has witnessed several important developments. The main application of this research has been the development of

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optical amplifiers and sources for telecommunications. Contributions have been made to electroluminescent devices based on Er^{3+}-doped Si crystals. In the last few years, considerable research activity took place in doping wide-bandgap semiconductors, such as GaN and SiC, with Er^{3+}. This has led to highly reduced thermal quenching of the infrared luminescence. Recently, other rare-earth elements, such as Pr^{3+}, Eu^{3+}, Tb^{3+}, and Tm^{3+}, have been used, yielding light emission at visible wavelengths. Green, red, and blue electroluminescence from devices based on GaN thin films doped with rare-earth ions has been demonstrated.

Several innovations were reported in Symposium K on the design, characterization, and modeling of molecule-based magnetic materials. The first session began with an examination of the effects of templating ligands on the size and morphology of magnetic oxide and hydroxide aggregates and the formation of polymetal-oxide clusters. Subsequent functionalization of the templating ligands allows the formation of various structural moieties such as chains, sheets, and extended three-dimensional arrays, with varying modifications of the supramolecular magnetic interactions. The cation templating effect was also discussed in manganese-heptacyanomolybdenum(III) complexes in relation to the nature of the Mn^{2+}–Mo^{3+} interactions. Also of note is the unusual magnetic behavior of Li_xMoS_2 ($0 \le x \le 2.3$) nanotubes that exhibit very large Pauli paramagnetism attributed to weak interactions between the nanotubes, as evidenced by their very low shear moduli, resulting in a nearly ideal one-dimensional state. Reflecting the evolution of the field toward materials science aspects, several talks addressed the synthesis and magnetic properties of nanoparticles such as iron, nickel, or cobalt oxide embedded in cyclodextrin crystals, as well as Prussian blue-based nanoparticles in a core-shell-type arrangement or in an amorphous matrix. An important result concerning pure organic materials is the discovery of magnetic phase transitions—thiazyl radicals such as $F–(CF_2)_n–NSSN$—which exhibit a diamagnetic-paramagnetic transition near 36 K.

A report on the structure–property relationships in $Cu^{2+}/[Mo^{IV}(CN)_8]^{4-}$ complexes provided an example of magnetic ordering and/or exchange coupling resulting from photoinduced electron transfers. A recent trend concerns the use of rare-earth magnetic centers as a source of magnetic anisotropy in mixed transition-metal/lanthanide compounds. High-spin molecules and single-molecule magnets are the object of intense investigation. In particular, the spin-flop behavior of Mn_{12}, Fe_8, and Mn_4 magnetic clusters is found to result from quantum tunneling across the magnetic anisotropy energy barrier.

Recent progress in the density functional theory-based method of calculating electron paramagnetic resonance and Mössbauer spectra of metal radical complexes were described. Similarly, it was demonstrated that the density functional theory methods originally developed to study the magnetic properties of binuclear transition-metal complexes can be applied to more complex polynuclear complexes, such as Fe_8 and various transition-metal dicyanamides, and to extended periodic systems. In particular, a density function approach to the calculation of the electronic structures of molecular magnets such as $Mn_{12}(OAc)$, Mn_4 dimers and Co_4 monomers was described, with emphasis on the spin–vibron interactions that are shown to contribute substantially to tunnel splitting.

Applications can arise from the design of multiproperty materials combining magnetism with another property such as conduction or photoactivity, which can lead to sensors or molecular switches. The ability of the molecular materials to be obtained as thin films is significant for the realization of integrated devices. The use of multidentate ligands for the directed assembly of metal cyanide clusters with up to 27 metal centers was reported, where the selected substitution of various transition metals into the clusters allows variation of the molecules' ground state spins and anisotropies. Some of these clusters have been incorporated into single-molecule transistors.

This report is based on summaries provided by the symposium organizers as of press time. Abstracts of the presentations in all of the symposia can be accessed on the E-MRS Web site at www-emrs.c-strasbourg.fr.

MRS-J Hosted 8th IUMRS-ICAM Conference in October 2003

The Materials Research Society of Japan (MRS-J) organized the 8th International Union of Materials Research Societies International Conference on Advanced Materials (IUMRS-ICAM), chaired by Teruo Kishi (NIMS), Masahiro Yoshimura (Tokyo Institute of Technology), Tisato Kajiyama (Kyushu University), and Ryoichi Yamamoto (University of Tokyo). The conference was held at Pacifico Yokohama Conference Center, Yokohama, October 8–13, 2003. About 2100 members of the international scientific and materials research community representing 34 countries attended, including 400 researchers and graduate students from abroad. More than 30 vendors displayed equipment and products at the accompanying exhibition. The conference banquet was held at the Yokohama Bay on the cruise ship, Royal Wing.

The conference commenced with welcome addresses by MRS-J president Kishi and the president of IUMRS, Robert J. Nemanich (North Carolina State University), followed by opening plenary lectures by Toyoki Kunitake (University of Kitakyushu, Japan) on "Molecular Organizations and Ultrathin Films"; A. Paul Alivisatos (University of California, Berkeley) on "Inorganic Nanorods and Nanocrystals of Complex Shape: Synthesis, Properties, Applications"; and Timothy G. Gutowski (Massachusetts Institute of Technology) on "Materials Development for a Sustainable Society."

(Left to right) MRS-J president Teruo Kishi, IUMRS president Robert J. Nemanich, and IUMRS General Secretary Robert P.H. Chang participated in Kagami-Wari—opening a Sake barrel—at the conference banquet on the cruise ship Royal Wing during the 8th International Union of Materials Research Societies International Conference on Advanced Materials (IUMRS-ICAM).

The objectives of the conference were to discuss and share recent achievements and innovations in the fields of advanced materials research and technology in the world; to promote interest in the application of various kinds of materials, especially as related to "nano, information, eco (environmentally conscious), and advanced" materials and technologies; to facilitate interactions among researchers from

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industry, national laboratories, and academia for future international collaborations; and to encourage students, young scientists, and young engineers to pursue future professional careers in materials research, engineering, and technology.

The main topics of the conference were "Nanotechnology and Nanoscale Materials Processing," "Electronic and Photonic Materials and Devices," "Advanced Materials for Environment and Society," and "Fabrication and Processing of Advanced Materials with Novel Performance." The conference consisted of two forums, one on "Materials Education and Research" and the second on a "United Approach to Materials Science," and 39 symposia on advanced materials perspectives and future research directions.

Symposium A-10, "2nd Workshop on Nanotechnology Networking and International Cooperation," was the second in a series of workshops to plan and organize the development of a Global Nanotechnology Network (GNN). Nanotechnology leaders from around the world worked together to formulate plans and practical strategies for building the network. Informational briefings were followed by hands-on working group sessions. Focus talks highlighted successful models, strategies, and tools. International working groups met on both days to discuss ways to link national and regional networks to form the GNN. Recommendations were compiled into a written report to serve as a road map for developing the Global Nanotechnology Network. The workshop was financially supported by Nanotechnology Researchers Network Center of Japan and Northwestern University.

IUMRS General Assembly meeting held at Kakushu-kaku, a Japanese-style guest house, in Sankeien Garden, Yokohama.

In Symposium A-8, "Nanocarbons and Related Structures," the industrial developments of nanocarbons and the latest academic research results were presented. The 40 ton plant of C_{60} was completed in Kyushu in April 2003. Several chemical vapor deposition plants of multiwalled carbon nanotubes have already been operating for more than a year in Japan and the United States. A high-yield method of producing carbon nanohorns has just been announced. The first nanodiamond conference was held in Russia in July, and the first commercial samples of 4 nm nanodiamond particles in aqueous colloid are being distributed in Japan for testing.

Conference proceedings will be published in *Transactions of the Materials Research Society of Japan* **29** (2004). Proceedings from some limited symposia (C-7, D-5, D-8, and D-11) and the forum on materials education and research will be published in other journals. Information on the conference program can be accessed at Web site www.mrs-j.org/ICAM2003.

INTERNATIONAL UNION OF MATERIALS RESEARCH SOCIETIES SEEKS NOMINEES FOR 2004 SŌMIYA AWARD ON INTERNATIONAL COLLABORATION

The following criteria are used by the Commission on Awards for selection:

- The *team* to be honored must have collaborated *across* at least two continents (e.g., North America, Europe, Asia, Australia) some time during the last decade.
- The collaborative work must be of the highest quality and well recognized by the international materials community.
- The impact on technology or society is also a major factor.

Submission deadline is February 20, 2004

The annual Sōmiya award is named in honor of Shigeyuki Sōmiya, Emeritus Professor of the Tokyo Institute of Technology, and later Dean at Teikyo University of Science and Engineering. Information about the award and submission forms are available at **www.iumrs.org**.

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