European Policy and Materials Innovations Featured at 2007 E-MRS Spring and Fall Meetings

www.emrs-strasbourg.com

In 2007, the European Materials Research Society (E-MRS) held its Spring Meeting in Strasbourg on May 28–June 1 and its Fall Meeting in Warsaw on September 17–21.

The Spring Meeting, chaired by I.W. Boyd (University College London), J.K.N. Lindner (University of Augsburg), H.-U. Habermeier (Max Planck Institute), and J. Perriere (University Paris VII), attracted 2100 participants from 61 countries and provided a program of 19 symposia, a plenary session, poster sessions, a 50-company industrial exhibition, and other technical and social events. The technical symposia covered materials innovations in the areas of photonics, nanostructures, photovoltaics, electronic materials, transparent electronics, nanoscale self-assembly, carbon nanotubes/nanowires, sensors, laser processing, coatings, molecular magnets, and the science and technology of art conservation and restoration.

The Meeting Chairs for the 2007 European Materials Research Society Spring Meeting in Strasbourg were (*left to right*): **H.-U. Habermeier** (Max Planck Institute), **J. Perriere** (University Paris VII), **I.W. Boyd** (University College London), and **J.K.N. Lindner** (University of Augsburg).

The E-MRS and MRS Society officers met to discuss areas of mutual interest. Shown (*left to right*) are **Paul Siffert**, General Secretary, E-MRS; **Anulf Jäger-Waldau**, Institute for Environment and Sustainability, European Commission; **Cynthia Volkert**, 2007 MRS President-Elect; **Peter Green**, MRS Past President; **Al Hurd**, 2007 MRS President; **Hanns-Ulrich Habermaier**, Conference Chair 2007; **John Blizzard**, E-MRS; **Jean-Pierre Massué**, 2006–2007 President of E-MRS; **Michał Kleiber**, president of the Polish Academy of Sciences; **Gabriel Crean**, E-MRS; **Peter Glasow**, Past President E-MRS; and **Abdelilah Slaoui**, 2007–2008 President E-MRS.

The Plenary Session consisted of presentations addressing specific materials topics and European scientific policy and initiatives. Geoffrey A. Ozin (University of Toronto, Canada) presented a talk on photonic paper. Ozin and his colleagues are working on "P-Ink," which they hope will be "one material offering infinite colors." P-Ink is unlike conventional liquid crystal displays, light-emitting diodes (LEDs), organic LEDs, and plasma display technologies as it is based on diffraction, enabling it to be viewed in full sunlight. Polymer gel chemistry is used to create a nanocomposite thin film of photonic crystallites in a partially crosslinked polymer. Silica microspheres from 100 nm to 1000 nm diameter are dispersed in a regular array in a poly(ferrocenylsilanes) (PFS) polymer which is capable of dimensional changes controlled by the redox potential. Thus it is active, tunable, and reversible. By placing the system between electrodes and applying a voltage bias, the gel swells or contracts, which changes the interplane spacing of the silica microspheres. This results in a color-tunable device.

Ozin reported that P-Ink is stable in air, does not degrade in humid conditions, and can be applied to rigid or flexible substrates, making photonic paper possible. The image remains when power is switched off, saving energy. P-Ink's ability to produce wavelengths from the blue end of the spectrum, which requires very small microspheres, through red to the near IR has been demonstrated. P-Ink is defect-tolerant, so that precise microsphere placement is not necessary for a working device, which creates the possibility of the large-scale self-assembly of thin films. P-Ink is still in the development stage, with issues of the degree of crosslinking, the number of swelling/shrinking cycles that can be withstood, and the manufacturability by self-assembly still to be addressed.

Plenary speaker Marshall Stoneham (University College London and the London Center for Nanotechnology) built a case for the emergence of simple demonstration quantum computers based on silicon technology by 2010, contending that "nanoscales force us to think

https://doi.org/10.1557/mrs2008.109 Published online by Cambridge University Press

Abdelillah Slaoui (left), elected by the Executive Committee as President of E-MRS during the E-MRS Spring Meeting in Strasbourg, confers with E-MRS General Secretary **Paul Siffert**.

quantum." In answering the question "Why do we need quantum?" Stoneham cited inevitability and opportunity: inevitability because present trends indicate that only one electron will be required to switch by 2020; opportunity lies in the possibility of seeking a radical quantum technology living alongside Si technology. "Ideally, the quantum technology would be based on silicon, using off-the-shelf techniques," he said, "but only from the best of shelves."

Stoneham delved into quantum computing with its strange and non-intuitive qubits, entanglement, and decoherence properties. He proposed the production of a quantum computer based on optically controlled spins in a Si-based device. The process starts with a bare Si wafer, followed by a 20–100-nm-thick layer randomly doped with qubits with control donors randomly doped alongside the qubits. The random doping results in patches of material (~2 μm in diameter) where qubits and control donors are close enough to be effective. This will give a maximum of 20 gates per patch, which Stoneham called "useful, but not brilliant." "Flying qubits" are needed to connect the patches into a larger system with many more gates.

"Biology will be the queen of sciences in this century, like physics in the last," said Olle Inganäs (Linköpings Universitet, Sweden), at the beginning of his presentation on electronic polymers and biosystems. He sees electronic polymers such as polythiophene and polyfluorene as tools for interfacing to neural systems. Current interfaces like cochlear implants and artificial retinas are made of hard materials and are not mechanically compatible with soft biological tissue. Soft polymers may help solve the problems with stiffer polymers as actuators.

The key is biocompatibility as most materials put into biological systems cause an immune response or encapsulating tissue forms around the material. Neural cells can grow on polymer hydrogel surfaces and functional biochemicals can be attached to the polymer surface to help this process. Neural prosthetics require many electrodes and there is a problem in addressing each electrode individually, but Inganäs believes textile geometry for weaving could solve the problem. Wire electrochemical transistors (WECTs) can modulate the conductivity of neural material. A system on a sheet (SOS) has been demonstrated, but its response is slow; however, Inganäs envisages embroidered WECTs in a Surgicel hydrogel with electronic circuitry encapsulated in poly(dimethylsiloxane) (PDMS) polymer as steps toward efficiently interfacing electronic polymers with biosystems.

In the policy area, John Marks, CEO of the European Science Foundation (ESF)—a conference co-sponsor, outlined the role of the ESF. The Strasbourg-based ESF, whose official slogan is "Catalyzing the Advancement of European Research," comprises 75 European organizations and may be compared to the American Association for the Advancement of Science (AAAS). Some problems for European science are caused by new research disciplines falling between boundaries of the funding mechanisms and collaboration that is sometimes made more complicated by national interests. The ESF is addressing these difficulties by providing a network of organizations and a new source of funding for "research-driven science."

During the E-MRS Fall Meeting in Warsaw, **Shuji Nakamura** of the University of California in Santa Barbara received the **Czochralski Award**.

Michał Kleiber, of the European Research Council (ERC) and president of the Polish Academy of Sciences, described the council as "a new element in the European Union's research policy." The ERC currently has a budget of €1 billion/year, about 14% of the 7th Framework Program research funds. About 45% of the ERC funds are earmarked for physical sciences and engineering, 40% for biology and life sciences, and 15% for social sciences. A major improvement is the establishment of a 22-person Scientific Council to guide strategy. The ERC is dedicated to providing "attractive funding for ambitious frontier research projects," encompassing all fields of research, including cross-disciplinary and unconventional high risk endeavors. Funding is available to researchers worldwide, but the research must be undertaken in Europe.

Two-thirds of the research budget is for Advanced Investigator Grants (AdG), but one-third is for Starting Independent Researcher Grants (StG), designed to "recruit, repatriate, and retain top young researchers, two to nine years from PhD graduation." According to Kleiber, the principal investigator must have the potential to perform world-class research and will be eligible for up to €400,000 per grant. Almost 9,200 proposals were received in the first year of the program. The AdG program for established researchers with proven excellence can award up to €500,000 per year for a 3–5 year period. Kleiber said, "Excellence is the sole criteria for awarding of these grants."

The European Institute of Technology (EIT) was proposed in 2005 "to make Europe a very competitive knowledge-based society," according to Matteo Bonifacio of the European Commission. The concept was to create an institution to rival the Massachusetts Institute of Technology, but some mistakenly believed that an actual university would be established. After two years of debate, a network of Knowledge and Innovation Communities (KICs) is being considered. KICs are groups of researchers, universities, businesses, and local authorities from different countries collaborating on research projects across disciplinary and national boundaries.

A 15-member Governing Board of high-level people in research, education, and innovation will set the strategy for members of the institute. The strategic innovation agenda will be reviewed every seven years. Bonifacio emphasized the need to ensure a critical mass of scientific talent.

https://doi.org/10.1557/mrs2008.109 Published online by Cambridge University Press

"Being a performer means that the EIT is not a funding mechanism, but is dedicated to delivering education, research, and innovation to European society. It will be a reference model by adopting and disseminating best research practices across the KICs," said Bonifacio. At the time of the conference, the European Parliament and the European Council were both considering the concept of the EIT for approval. Also at the time of the conference, Bonifacio said that the first KIC was likely to address climate change.

The 6th E-MRS Fall Meeting held in Warsaw consisted of 10 symposia and the Acta Materialia Gold Medal Workshop and was attended by 800 participants from 64 countries, many from Eastern Europe. The Plenary Session included presentation ceremonies of the E-MRS Czochralski Award and the Acta Materialia Gold Medal.

Shuji Nakamura (University of California, Santa Barbara) received the Czochralski Award. Nakamura delivered a presentation devoted to the recent performance of nonpolar, semipolar, and polar GaN-based blue light-emitting diodes. With recent decisions in some European countries to ban incandescent light bulbs in the next few years, such developments are of immense industrial significance.

Herbert D. Gleiter (Institute of Nanotechnology at Karlsruhe) received the Acta Materialia Gold Medal. In his plenary lecture, Gleiter reviewed the methods of modifying the structure and properties of crystalline materials by lattice defects and the interesting concept of nanoglasses. Two approaches have been considered: first, for systems with mobile charge carries, electronic screening effects at interphase boundaries are utilized. If nanocomposites of immiscible components with a crystal size comparable to the electronic screening length are prepared, the electronic structure of the entire specimen is modified. This may result in solid solutions of conventionally immiscible components, for example, of Ag and Fe. In systems without mobile charge carriers, vapor deposition of ions of one of the components on an electrically charged substrate may be used to generate solid solutions.

Herbert D. Gleiter, K.P. Chao Endowed Professor, Zhejjiang University, China and Senior Member of the Institute of Nanotechnology, Research Center Karlsruhe, received the **Acta Materialia Gold Medal Award** during the E-MRS Fall Meeting in Warsaw.

Plenary speaker K. Hashimoto (Tohoku Institute of Technology, Sendai, Japan) presented an interesting and thought-provoking lecture on global carbon dioxide recycling for the supply of renewable energy and prevention of global warming. Hashimoto said that conventional fuel sources will be exhausted by the middle of the century and that new technology will have to meet the global energy demand and that his proposal for global CO_2 recycling is essential. Controversially, he suggested desert-based solar cells can be used to generate hydrogen that could then be converted to methane for transportation. After combustion, the CO_2 would be recovered and transported back to the desert coasts. Hashimoto stated that a prototype plant was constructed. Clearly, the possibilities and viability need to be studied in detail.

The 2008 E-MRS Spring Meeting in Strasbourg, France, is being held May 26–30 and the Fall Meeting in Warsaw, Poland, on September 15–19. Further details are available on the E-MRS Web site at www.e-mrs.org.

Singapore-Hosted ICMAT 2007 Connects with GEM^4 Conference on Cancer

www.mrs.org.sg/conference/icmat2007

The 4th International Conference on Materials for Advanced Technologies (ICMAT) 2007 was held in Singapore from July 1–6, 2007, welcoming 2050 attendees from 44 countries. This conference featured nine plenary lectures, two theme lectures, and two public lectures in addition to 18 symposia that covered a wide range of materials topics, including nanomaterials and nanotechnology, biomaterials, photonics, scanning probe microscopy, microelectromechanical systems, sensors, catalytic materials, synchrotron radiation, computational materials science, electromagnetic materials, polymers, molecular electronics, and education. Over 50 exhibitors brought together related worldwide industry representatives. ICMAT is an event of the Materials Research Society of Singapore.

The special lectures had a heavy leaning toward the medical field due to the Meeting's joint effort with the Global Enterprise for Micro-Mechanics and Molecular Medicine (GEM^4) Conference on Cancer which itself consisted of five symposia. Plenary speaker S. Suresh of the Massachusetts Institute of Technology (MIT) discussed the structure–property–function relations in the context of human diseases, including cancer and malaria. In cancer treatment, Suresh said there are tremendous opportunities for micro- and nanomechanics at the intersection of engineering, life sciences, and medicine. Suresh also described the single cell nanomechanics for *P. falciparum* malaria. The red blood cell (RBC) undergoes severe and reversible stretching during a half-million circulations over its life of 120 days, as the blood squeezes through narrow pores. For malaria, there are two critical effects—increased adhesion of the RBC to the endothelium and reduced deformability of the RBC. Suresh showed how an infected RBC loses its deformation properties. There are also specific interactions between parasitic proteins and RBC skeletal proteins; Suresh focused on RESA, which stands for ring-infected erythrocyte surface antigen. The presence of RESA stiffens the infected cell and, in particular, this effect is pronounced at 41°C, the temperature of high fever. Suresh described microfluidics channels that showed how infected RBC cannot pass through very narrow channels in the human body. In the future, micro- and nanofluidic chips can conceivably be used as devices for disease detection and control, he said.

Nobel laureate H.R. Horvitz, also of MIT, talked about programmed cell death, explaining that too little cell death is what occurs in cancers. D. Lane of the Institute of Molecular and Cell Biology in Singapore spoke on the role that the p53 gene plays in the control of cancer. The function of p53 is to kill unwanted cells (apoptosis) and it is the interruption of this function that allows cancer to flourish, Lane said.

https://doi.org/10.1557/mrs2008.109 Published online by Cambridge University Press

Moving toward the connection of materials and medicine, S. Iijima of Meijo University, NEC Fundamental Research Laboratories, Nagoya, described examples of work done with carbon nanotubes (CNTs). He described biomedical applications, focusing on the development of a drug delivery system using nanohorns, which are single-walled CNTs with one end closed to resemble a horn. The nanohorns were modified with folic acid and then targeted at human cancer cells. He also talked about the incorporation of drugs into nanohorns, including an anti-inflammatory agent, anti-cancer drugs such as Cisplatin and Docetaxel, as well as antibiotics.

As part of the Theme Lecture series, P. Vadgama of Queen Mary College, University of London, and M. Jansen of Max-Planck Institute for Solid State Research, Stuttgart, each addressed the topic of designer surfaces for the biological interface. Jansen talked about the use of computing to determine the stability and structure of chemical compounds possible by minimizing their free energy as a function of their atomic position. This is done to help the planning of syntheses of compounds, which is the first step in the use of materials. Vadgama described how human epithelial cells can be labeled using quantum dots, how whole-body fluorescence can detect cancerous regions, and how dendrimer-based particles can be used for imaging and drug delivery. He was enthusiastic about the use of sol-gel interconversion for glucose-dependent insulin release, since it is self-limiting and delivers the correct amount of insulin before it shuts off. Surfaces are important for the interactions between nanoelectronics and components, sensors, and structural materials and must be exploited in order to take advantage of the synergy between nanotechnology and medicine, Vadgama said.

Plenary speaker A.K. Cheetham of the University of California, Santa Barbara, reviewed the range of reactions and products in the area between organic and inorganic materials. In a parody of Richard Feynman's famous statement, he said, "There is plenty of room in the middle." Cheetham described a wide variety of materials, including coordination polymers, in which isolated metal ions or clusters are linked into arrays by organic ligands, and extended inorganic hybrids, such as hybrid metal oxides in which there is M-O-M connectivity in one-, two-, or three-dimensions. He described 3-D networks of open structures that are the lightest crystalline material known to be made, at 0.1 g/cm^3. Cheetham said that hybrid frameworks represent an enormous class of new materials that can harness the advantages and versatility of both organics and inorganics with a scope that is greater than the combined fields of coordination chemistry and organometallics. Porous coordination polymers have been shown to exhibit a wide range of unique properties and there is an opportunity for discovering hybrid analogs of classical oxide systems that exhibit a wide range of physical properties. Future targets should include metallic hybrids, lasers, and even superconductors, he said.

R.S. Williams of Hewlett-Packard Laboratories, Palo Alto, gave a plenary address on a new application of an old phenomenon for an old device (1971) for computing using a logic scheme, which was first described by Bertrand Russell in 1911. The present trend in nanotechnology is to make familiar devices (e.g., field-effect transistors) at the nanoscale. Williams said that a better approach is to look at what the nanoscale wants to compute and not impose our preconceptions. He described a diode made from titanium dioxide that can change its resistance by the application of a voltage, which causes positively charged oxygen vacancies to drift in the material. The devices are very small (3 nm) and the drift occurs in nanoseconds. This has the effect of reducing the width of a stoichiometric, highly resistive layer at one of the contacts and allows the tunneling current through the diode to increase rapidly. A "memristor" diode is thus formed that can be used to operate "Sequential Implication Logic." Digital electronics were first described by Shannon in a 1940 master's thesis. The diodes have demonstrated logic functions and require lower switching power than silicon devices. They are potentially radiation-resistant and their packing density is greater than for silicon (i.e., an area of 0.01 μm^2 compared to 0.3 μm^2 for silicon devices). Passivation of the devices is the next big challenge, Williams said.

During the opening ceremony of the 4th International Conference on Materials for Advanced Technologies (ICMAT) 2007 in coordination with the 1st GEM^4 Conference on Cancer, Guest of Honor **Vivian Balakrishnan** (above), Singapore Minister for Community Development, Youth & Sports and 2nd Minister for Information, Communication and Arts gave the welcoming speech. An ophthalmologist and eye surgeon by training, and hence a scientist in essence, he said that he did not need convincing from materials scientists about the importance of their work. Rather, he wants to be a cheerleader for the community in ensuring that the importance of what materials researchers do gets communicated to the general public as well as policy makers. In addition, one of his goals is also to convince researchers from outside Singapore that this is a country that is serious about research in science and technology. A number of entities and vehicles are available to fund and encourage research. In particular, Singapore is stressing "Translational Research" which is research that goes from the laboratory to the bedside, in medicine for example. He said that he hoped researchers from outside Singapore would seriously consider setting up collaborations with Singaporean researchers, or even consider making Singapore their base.

Plenary speaker R.H. Friend of Cavendish Laboratory, University of Cambridge, addressed organic electronics. He described how the control of excitons at interfaces is exploited in the operation of molecular and polymer electronic devices. The printing press that creates newsprint must be changed once a day; however, the masks used in a semiconductor fabrication line cannot be changed on that timescale. Electronics needs the functionality of silicon with the flexibility of organic materials. Friend showed polymer light-emitting diodes made from materials like PPV. These materials look like fluorescent paint but are able to move electrons between the chains of the polymer. Friend described how companies like Epson had used inkjet printers to produce 40-in. wide displays that are an order of magnitude cheaper than liquid-crystal displays.

Much of the work in this area is now aimed at solar cells, and Friend described how the junctions in the devices separated the holes and electrons. It is, however, the long-range separation of the carriers that is needed for efficient photovoltaic operation. Solar cells are presently 5% efficient but the theoretical limit is 30%. Friend described excitons, exciplexes, and polaron pairs as being states in

https://doi.org/10.1557/mrs2008.109 Published online by Cambridge University Press

which the carriers could exist. Friend discussed the field-effect transistor and remarked that the interface between the insulator and the polymer channel is very good and comparable to the interface between silicon and silicon dioxide.

Nobel laureates C. Cohen-Tannoudji of College de France and Laboratoire Kastler Brossel, France, and K.B. Sharpless of Scripps Research Institute also gave plenary lectures. Cohen-Tannoudji described the use of light to manipulate matter, explaining why ultracold atoms are so interesting. They have applications to atomic clocks that are accurate to one second in 300 million years. This is an accuracy of 7×10^{-16} and it is expected that this will be further improved to the point where Einstein's general theory of relativity regarding time slowing down as the gravitational field is reduced will be able to be tested for a vertical rise of one meter. A second property of ultracold atoms is that their de Broglie wavelengths become tens of microns long and direct images of the duality of the wave and particle nature of matter can be demonstrated by passing a cloud of cold atoms through two slits and viewing the resulting interference fringes. The third property is demonstrating the Bose–Einstein condensate gas that Einstein predicted. The wave functions of the bosonic atoms overlap to the extent that all the atoms occupy the same excited

(Left to right): Tan Eng Chye (Deputy President, Academic Affairs and Provost, National University of Singapore), Nobel laureate Claude Cohen-Tannoudji, Nobel laureate K. Barry Sharpless, Shih Choon Fong (President, National University of Singapore), and B.V.R. Chowdari (President, Materials Research Society of Singapore) at the Public Lectures delivered by Nobel laureates.

state. They can then form an atom laser. Fermions, unlike bosons, cannot occupy a single state but they can be paired at low temperatures to act like bosons. Pairs like these are responsible for effects such as superconductivity (Cooper pairs). Atoms can be cooled by laser Doppler cooling, by "Sisyphus" cooling, or by evaporative cooling, which gives a temperature of 10^{-6} K. Ultracold atoms permit the understanding of complicated many-body problems, such as high-T_c superconductors and quantum information.

Sharpless addressed the connection of materials and chemistry in a discussion of orthogonal reactivity. His plenary lecture followed his public lecture on "click chemistry," a field he created. He started with a question, "How much reactivity does a chemist need?" Many chemists presume they need to create complicated reactions to be taken seriously, said Sharpless. The philosophy of click chemistry and orthogonal reactivity is the antithesis of this mode of thinking. Click chemistry is modular, based on a few small molecules, and Sharpless referred to the reactions as sneaky reactions. Orthogonal reactivity powers these sneaky reactions and is an integral part of click chemistry. Organic azides and alkynes share two unique characteristics. Both are extremely reactive in principle, but in reality are restrained from most reactions by high kinetic barriers—like "tigers in a cage," and are therefore "invisible" in the acid/base environments of terrestrial chemistry. Their only reliable and highly selective reaction path is with each other, which sets the stage for unique "orthogonal reactivity scenarios." Sharpless described results crucially dependent on the "perfect" orthogonal reactivity of azide and alkyne groups by presenting various examples including adhesive polymers as well as dendrimers.

MRS-India Hosted IUMRS-ICAM 2007

www.icam2007.com

The International Union of Materials Research Societies 2007 International Conference on Advanced Materials (IUMRS-ICAM) was held October 8–13, 2007, in Bangalore, India. The conference included six plenary lectures, oral and poster presentations covering critical topics in materials research, and various special activities. The conference attendance was around 1100. The conference, organized by the Materials Research Society of India, was chaired by MRS-I general secretary S.B. Krupanidhi.

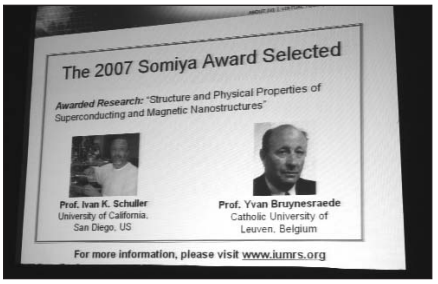
The technical sessions included 23 theme symposia covering intelligent materials, microelectromechanical systems, nanomaterials, soft matter, spintronics, optoelectronics, biomaterials, sensors, catalysis, novel synthesis, microscopy characterization, computational materials science, and materials education. Other topics covered include organic, photonic, polymer, magnetic, multilayered, composite, hybrid, structural, and energy materials. An industrial exhibit was also held in conjunction with the conference.

The first plenary lecture of the meeting was presented by C.N.R. Rao (Jawaharlal

(*Left to right*) **R.A. Mashelkar**, president of the Materials Research Society of India; **R.P.H. Chang**, general secretary of the International Union of Materials Research Societies (IUMRS); and **H. Katz**, first vice president of IUMRS light the ceremonial lamp, opening the IUMRS 2007 International Conference on Advanced Materials (IUMRS-ICAM) on October 8, in Bangalore, India.

Nehru Center for Advanced Scientific Research, India) on his involvement with oxide materials for about five decades. He narrated some of the outstanding research pertaining to the oxide materials and the various attractive properties exhibited by them, including special properties observed at the nano regime. In the second plenary lecture, D. Fichou of CEA-Saclay, France, described the self-assembly of functional organic molecules on atomically flat surfaces, which could be a major technique in the development of "molecular nanoelectronics" for future electronic devices. D. Fujita, managing director for the Advanced Nano Characterization Centre, NIMS, Japan gave the third plenary lecture in which he outlined the salient features of the third science and technology basic plan of Japan which places emphasis on research and development for policy-oriented subjects addressing national and social issues. In the fourth plenary lecture, M. Parrinello (ETH, Switzerland)

https://doi.org/10.1557/mrs2008.109 Published online by Cambridge University Press



The 2007 Sōmiya Award for International Collaboration in Materials Research was awarded to a U.S./Belgium research team led by Ivan K. Schuller of the University of California, San Diego and Yvan Bruynseraede of the Catholic University of Leuven for their investigation of "Structure and Physical Properties of Superconducting and Magnetic Nanostructures." The award recipients were unable to attend the conference to deliver their award talk; however, Schuller was able to record his presentation on DVD which was shown at the session. He described the work done in conjunction with Bruynseraede on metallic superlattices (giant magnetoresistance and roughness), low and high-T_c superconductors (dimensional transitions), and vortex physics (collective pinning). In addition to the science involved, Schuller talked about how such collaborations could work and succeed on an international scale.

stated that *ab initio* molecular dynamics (MD) simulations based on empirical potentials are currently widely used in materials science. However, there are limitations in the technique. The present challenge in MD is to overcome these limitations. He showed several examples wherein the use of novel techniques increases the efficiency and allows much larger time and length scales than previously thought possible. In his plenary address, F. Wudl of the University of California, Santa Barbara, described the progress that has been made in the development of organic semiconductors' ability to emit light and for those same semiconductors to act as photovoltaic devices. He also discussed the challenges in the design and synthesis of molecules for application in organic electronics. J. Livage of the Collège de France Paris, in his plenary address, described the properties of vanadium pentoxide gels and discussed some of the challenging applications to which these can be used. Livage also focused on the synthesis of nanostructured materials using the vanadium oxide gels through solution chemistry. These include nanoribbons, nanowires, nanobelts, and foams.

The technical symposia ran in 14 parallel sessions, consisting of overview and invited oral presentations and posters. Eighteen posters were selected for the best poster awards.

The conference banquet, held during the beginning of the conference, was accompanied by live Indian music. At the banquet, R.P.H. Chang, the general secretary of IUMRS, recognized MRS-India and S.B. Krupanidhi, the chair of ICAM 2007, for organizing the conference.

S.B. KRUPANIDHI
H.L. BHAT
R.V. KRISHNAN

https://doi.org/10.1557/mrs2008.109 Published online by Cambridge University Press