MRS-Mexico/MRS meeting held in Cancun

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The **XIX International Materials Research Congress (IMRC)** was held in Cancun, Mexico, on August 15–19, 2010, with half of the symposia organized jointly by the Materials Research Society and the Sociedad Mexicana de Materiales (MRS-Mexico) to complement the 12 IMRC symposia organized by MRS-Mexico. The NACE International Section Mexico was also a co-sponsor. In addition to the technical symposia, the Meeting chairs **Luis Enrique Sansores Cuevas** (Instituto de Investigaciones en Materiales), **Miguel Contreras** (National Renewable Energy Laboratory), **Darrell Schlom** (Cornell University), and **Miguel Jose Yacaman** (University of Texas—San Antonio) provided plenary sessions, tutorials, an exhibit, government funding seminars, and a luncheon talk on Mayan mathematics.

Environmental conservation

The theme of environmental conservation ran throughout the meeting. Much research was reported on making "green" materials, energy-conserving materials, alternative fuel source materials, and materials for rectifying environmental damage, for example. One of the presentations in the New Catalytic Materials symposium addressed the problem of environmental damage caused by waste water that is generated by coffee production. With over 122 million 60-kg bags of coffee expected to be produced in 2010–2011, coffee producers such as Mexico, Colombia, and Brazil will battle pollution in their rivers due to organic contaminants. Moreover, the chemical and biological treatments necessary to mitigate the damage being done by the production is cost-prohibitive. In the symposium, G. Corro of Benemérita Universidad Autonóma de Puebla, Mexico introduced her solution to use a solar-powered copper/titanium oxide catalyst to degrade the contaminants.

With her method, the acetic acid that results during coffee production is quickly converted to CO_2 and H_2O using a photocatalytic reaction, Corro said. In her experiment, she compared the use of a titanium oxide (TiO_2) catalyst with a 10% copper/titanium oxide catalyst (Cu/TiO_2). Both used solar radiation as their energy source; however, TiO_2 can only be excited by ultraviolet (UV) radiation. During the reaction process, bubbling air mixed 1 g of the catalyst with 1 l of the waste water. The mixture was exposed to 6 h of sunlight at 1000 W/m^2 each day. In the absence of electricity, solar panels were used to power the pump that circulated the system. Samples were analyzed for their concentration of polluting molecules and byproducts using UV-visible (UV-Vis) and Fourier transform infrared spectroscopy. The results revealed that over a period of 50 days, the activity level of the Cu/TiO_2 catalyst was greater than that of TiO_2 alone and was able to maintain high amounts of CO_2 production over a much longer period of time.

Ron Turco (Purdue University, USA), with expertise in soil microbiology, is interested in what happens to the soil–food web when different types of nanomaterials are introduced. In soil, a rich community of bacteria and fungi help support plant life and other important environmental processes such as nitrification. In his presentation in the symposium on Nanostructure Applications in Crossover Scientific and Technology Fields, Turco said that assessing the effects of nanomaterials on this system is a key part of understanding overall environmental impact. His group has studied materials composed of carbon, fullerenes, and single-walled carbon nanotubes, as well as metals including nano-silver, -indium, and -gallium. Methods of assessment included soil sorption tests, microbial community diversity, the respiratory response of fungi, and plant growth assays. Results demonstrate that carbon-based materials have little effect on soil communities, and fullerenes may even be degraded by certain types of fungi when first photo-oxidized to form hydroxyfullerenes. Overall, the impacts of nano-metals are "more negative, immediate, and warrant further study," Turco said, although indium and gallium showed milder effects than silver. Turco emphasized the importance of develop

The XIX International Materials Research Congress, (left to right): Miguel Contreras, Meeting Chair; Luis Enrique Sansores, President, MRS-Mexico; Dave Ginley, President, MRS; and Darrell Schlom, Meeting Chair.

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ing a system to classify different types of nanomaterials and maximize the impact of environmental studies such as these.

Energy

The reduction of greenhouse gases, specifically carbon dioxide (CO_2) emissions, is a pressing global concern. Minimizing the consumption of fossil fuels through the use of alternative energy sources such as photovoltaics (PVs) is one of the most feasible options. With the rate of PV production growing at 40% a year to meet this demand, the trend is toward thinner silicon materials with good passivation properties to improve efficiency and decrease cost. In the symposium on Advances in Semiconducting Materials, Stuart Bowden (Arizona State University, USA) gave an inspiring talk on how the silicon heterojunction (SHJ) solar cell will be part of this revolution.

Though the utilization of photovoltaics made from crystalline silicon (c-Si) solar cells is widespread because of its abundance and high efficiencies, there is still a need for a material that will further increase the current maximum efficiency while improving affordability. SHJ solar cells achieve this by using amorphous silicon (a-Si) deposition in place of the high-temperature diffused junction in current c-Si cells. These heterojunction cells are composed of an intrinsic a-Si layer and c-Si substrate sandwiched between *p*- and *n*-type amorphous silicon, a design that allows for better passivation. Enhanced passivation yields an increase in the open-circuit voltage and conversion efficiency. Bowden said that SHJ solar cells manufactured by Sanyo have shown efficiencies as high as 24%. Additionally, the cell exhibits good thermal stability over a period of six months and employs low temperature production methods. Bowden said that these factors, among others such as wafer thickness and feedstock cost, have been identified by a U.S. national panel as targets for improvement in future photovoltaics.

In the current family of photovoltaic materials, organic photovoltaics (OPV) represent an important component, and a low cost, scalable approach for producing renewable energy, according to David S. Ginley of the National Renewable Energy Laboratory, USA, (and president of the Materials Research Society). Current module efficiencies are nearing 4%, supporting scalability, and there is now a clear pathway for developing acceptors and donors to achieve 10% or greater efficiency, he said. One of the key questions is that of the stability of OPV devices and the potential for their lifetime to be sufficient for commercial use. Critical to this is both the intrinsic stability of the donor/acceptor phase separated mixture and the stability of the interfaces, especially those between the inorganic and organic phases. Ginley discussed how the use of metal oxide intermediate contact layers, such as NiO, TiO_2, and WO_3, can significantly improve device characteristics.

Ginley discussed this in the context of both the standard architecture for OPV devices and the newer inverted polarity devices that can use higher work function contacts. In the inverted architecture, ZnO and Ag can be used as contacts, thereby significantly reducing cost and improving the ease of processing. The present data demonstrates that there is no inherent instability in the bulk heterojunction and that solving the interfacial issues may lead to devices of sufficient stability for commercial viability. Ginley said that metal oxides provide control for contact properties resulting in increased performance and lifetimes in OPV devices. Scalable processes were demonstrated for NiO as alternatives for pulsed laser deposition, including sputtering and solution deposition. And enhanced performance and lifetime for NiO was demonstrated with deep highest occupied molecular orbital donor material.

In the symposium on Renewable Energy and Sustainable Development, M. Stanley Whittingham (State University of New York at Binghamton, USA) discussed prospects for replacing the traditional electrodes in batteries, carbon anodes, and lithium cobalt oxide cathodes. He outlined the pros and cons of two candidate classes of cathode materials, layered lithium metal oxides and lithium iron phosphates, also known as olivines. While the olivines have lower cost, layered oxides have higher energy densities. This leads to a trade-off in terms of use; olivines are currently used in stationary applications and buses, for example, while layered oxides are used in volume-restricted applications such as laptops. Alternative anode materials with greatly increased Li capacities compared to traditional carbon architectures include tin and silicon. The issue with these materials is that while they can accommodate many more Li ions per host atom, volume changes during cycling are large. After a few cycles, this expansion and contrac-

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tion severely disrupts the solid-electrolyte interface (SEI) leading to failure. Whittingham discussed nanostructured materials as a solution to the volume expansion problem. For example, amorphous tin-cobalt nanoparticles embedded in an amorphous carbon matrix can accommodate the volume expansion while leaving the SEI layer intact. Performance was shown to be stable over many cycles.

Biomaterials

Stem cells are an attractive system for use in tissue engineering because of their ability to differentiate down numerous developmental pathways. One major challenge in this area of research is ascertaining how the cell's physical environment affects how it behaves. As Ali Khademhosseini (Harvard-Massachusetts Institute of Technology, USA) said, it is important to understand that "what a cell sees determines what a cell does" because cells *in vivo* see a much different environment than researchers are currently able to replicate in an *in vitro* culture. Khademhosseini outlined different ways by which soft lithography microfabrication techniques have proven useful to address this question.

Methods to differentiate stem cells often begin with forming cell aggregates called embryoid bodies (EBs). By using microfabricated wells of poly(ethylene glycol) in sizes ranging from 150 μm to 450 μm in diameter, the size of the EBs was controlled before further steps were taken for differentiation. It was shown that larger EBs were better suited for cardiac differentiation while smaller EBs exhibited better performance when differentiated down endothelial lineages.

Khademhosseini also described research aimed at replicating the complex three-dimensional environment that cells "see" within an organ. As a bottom-up approach, cells were encapsulated into microgels; small pieces of hydrogel of various shapes were created through stamping, molding, or stop-flow lithography techniques. These microgels were used as building blocks for self-assembly of more complex structures using surface tension in a two-phase solution system or at an air–water interface.

From the top-down perspective, channels were ablated inside hydrogels containing cells to mimic a vascular network. Cell viability was found to be higher nearer to the channels, presumably because access to diffusing nutrients was higher. On the horizon are network structures built with the viability length scale in mind and seeding the channels with endothelial cells to encourage actual vascular growth within the "gel organ," Khademhosseini said.

Karine Anselme (Universite de Haute-Alsace) discussed, in Symposium 6: Biomaterials, how interest in cell–material interfaces is focused on the millimeter scale, but that this behavior is determined by interactions at micron and nanometer scales. It is therefore important to know how cells respond to the micro- and nanotopology of surfaces. Specifically, Anselme showed the response of osteoblasts to a host of different surfaces: five different processes, three different metal alloys with each surface treated in two ways. It was determined that short-term adhesion (24 hours) was dependent more on surface chemistry while long-term adhesion (21 days) was determined more by surface topology, with isotropic roughness being more beneficial for adhesion. The best process, electro-erosion, was used to generate different surface roughness amplitudes from 1 μm to 21 μm while maintaining the same surface morphology, isotropic peaks, and valleys. There is an apparent "sweet spot" for low adhesion of cells when surface roughness is about the same size scale as the cells. This provides an important length scale to keep in mind when designing materials for *in vivo* applications, Anselme said.

Technical highlights

Graphene is being intensively investigated by numerous researchers. Hector A. Calderon (ESFM-IPN, Mexico) gave a presentation in the symposium on Advanced Structural Materials on using exit wave reconstruction and an 80 kV accelerating voltage to quantitatively image the structure of graphene. This is a collaborative effort between ESFM-IPN and FEI Company, Eindhoven, The Netherlands. With transmission electron microscopy, focal series reconstruction was used wherein 20 images at exposure time interval of 0.1 s were obtained, and the images formed a complex exit wave image. This residual aberration generated was then corrected using software yielding a corrected phase image that was directly interpretable and could be analyzed quantitatively.

This method was used to resolve and image a double layer of graphene, as confirmed using simulations. The difference between a single and double carbon atom position, and an upper and lower layer single carbon atom could be distinguished, demonstrating that an atomic three-dimensional structure was resolved. In fact, said Calderon, the contrast difference between the upper and lower layer carbon atoms matched a focus change of 0.3 nm which is equivalent to the distance between two carbon sheets. Calderon said that this method will be valuable to investigate the structure of graphene and defects.

Shape memory polymers (SMPs) are a special class of "smart" polymers that after deformation recover their original shape in response to an externally applied stimulus. Interest in these unique polymers is growing as an inexpensive replacement for shape memory alloys in a variety of applications. Ignacio Varela (Tecnológico de Monterrey, Mexico)

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explained in a talk in the symposium on New Trends in Polymer Chemistry and Characterization that the design of SMP-based devices requires characterization and modeling of the thermomechanical behavior to approximate a material's behavior. Therefore, the storage and recovery of these unique polymers must be characterized.

The goal of Varela's research is to develop a constitutive model of flow stress of acrylate SMPs using a temperature-induced glassy-active phase transformation approach. This approach assumes that the polymer is composed of a "glassy" (hard, crosslinked) phase and an "active" (soft, uncrosslinked) phase. It is considered that the SMP phase transformation is a sigmoidal function of temperature and that the volume fraction of the glassy and active phases both equal 0.5 at a characteristic temperature. Strain-temperature data for three different SMPs were obtained by dynamic mechanical analysis and were used to determine the volume fractions of the glassy phases. A fitting parameter was determined for each SMP by the least squares method, which was found to be related to the temperature sensitivity of the polymer, a function of composition. The final model describes stress on SMPs based on a glassy-active phase transformation as function of strain, temperature, and glass transition temperature, and the predicted results were consistent with experimental data. Varela said that this model can be applied to other smart materials such as Ni-Ti alloys, magnetorheological fluids, and electroactive polymers.

In the same symposium, Mathieu Hautefeuille of the Universidad Nacional Autónoma de México gave a talk about his work with a ferroelectric polymer, polyvinylidene fluoride (PVDF), for use in microsystems. PVDF is inexpensive, strong, flexible, easy to process, biocompatible, and stable under harsh conditions, in addition to having piezoelectric properties, which gives it an edge over comparable ceramic materials. Fabrication of PVDF films in their favorable crystalline form β-phase remains a challenge that has limited its use in areas where this polymer would otherwise be well suited. Hautefeuille and his colleagues have therefore used a direct approach to make these films whereby PVDF powder is dissolved in a polar solvent and deposited from solution onto various substrates using a heat-controlled spin-coating process. This technique reproducibly orients the polymer chains in the desired β-phase without additional processing. According to Hautefeuille, this direct method of fabrication could pave the way for PVDF film use in nonvolatile memory, curvature sensors, artificial muscles, acoustic-wave propagation substrates, and other specialty microsystem applications.

In the symposium on Solid-State Chemistry, Shiv Halasyamani from the University of Houston, USA, gave an in-depth review of the factors that play a role in determining which elements influence polarity in a titanium iodate crystal structure. Polar oxide materials are of great interest because of the unique properties with which polarity embodies a material, such as pyroelectricity and ferroelectricity. These are of particular importance in various sensing devices, capacitors, and power generation applications. However, polarity only exists in solid-state materials if it falls into one of 10 crystal classes. Halasyamani said that the foundation for building solid-state materials with polarity is using oxides that contain octahedrally coordinated d0 transition metal ions such as Ti^{4+} and lone-pair cations TI^{+}. In recent work, he synthesized a new series of alkali titanium iodates using five of the group 1 alkali metals and thallium. However, he found that cations with this configuration do not always result in polarity. The larger cations created nonpolar centrosymmetric crystals whereas the smaller ions, Na^+ and Li^+, were polar but noncentrosymmetric. Additionally, he found that while $Na_2Ti(IO_3)_6$ and $Li_2Ti(IO_3)_6$ are polar, they were not ferroelectric, since polarity was not reversible in the presence of an electric field. This is most likely due to unfavorable energy requirements, he said.

In the symposium on Materials and Devices for Flexible Electronics, Ana L. Salas Villasenor of the University of Texas at Dallas, USA, described the synthesis of thin-film transistors (TFTs) based on CdS *n*-type semiconductor as the active layer. The objectives of this work were to find the best gate dielectric material and thickness while developing a TFT suitable for flexible electronic applications. CdS was deposited onto SiO_2 and HfO_2 gate dielectrics by chemical bath deposition. An aluminum top contact was deposited using e-beam evaporation using shadow mask. The common gate metal was also aluminum. Villasenor reported significantly higher effective mobility of TFTs when HfO_2 was used compared to SiO_2, with no annealing performed before or after CdS deposition. X-ray diffraction revealed that CdS films were more polycrystalline when grown on SiO_2, resulting in more grain boundaries and therefore higher carrier scattering. Also, formation of $Cd(OH)_2$ from hydroxyl groups on the HfO_2 surface resulted in enhanced nucleation of CdS film compared to SiO_2. Effective mobility of ~25 cm^2/Vs and threshold voltage of 2 V were obtained for devices with 90 nm HfO_2 gate dielectric. These values are the best reported for CdS TFTs to date, said Villasenor.

Future devices for a wide range of applications, including biosensors, optics, catalysis, and electronics, are likely to use hybrid organic/inor-

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ganic junctions, said Damien Aureau of the University of Texas at Dallas, USA, in a presentation in the symposium on Nanostructured Materials and Nanotechnology. One method commonly used to tether nanoparticles to a surface is to functionalize an oxidized silicon surface with silanes, molecules that form a self-assembling monolayer, or SAM. The formation of a SAM on oxide-free silicon can lead to higher chemical stability and better organization of the SAM on the surface. A higher level of gold nanoparticle coverage was achieved using the oxide-free method compared to traditional methods. The organic SAM layer also completely passivates the silicon surface and protects it from oxidation during treatment with nanoparticle solutions, making the final surface highly homogenous in chemical composition. This high-quality surface was used in experiments to study energy transfer through the organic layer. Data was shown that proved a monolayer of quantum dots was deposited on the surface of the silicon, a feat achievable because of the high-quality organic interface. The quantum dot monolayer makes it possible to study the energy transfer from quantum dot to silicon without confounding the signal of transfer between quantum dots in different layers. Aureau said that this technique may find viable applications in photovoltaic technology, and that the gold patterning could be used in developing a one-electron transistor using a gold nanoparticle as the electron island.

The Texas Advanced Computing Center (TACC) is a world-renowned leader in advanced computing support for visualizations. In the symposium on Theory and Computer Simulation of Materials, TACC Director Jay Boisseau presented an overview of TACC's goals for increasing computational support to the scientific community, the current petascale cyberinfrastructure, and the future of high-speed computing. One of their chief concerns is increasing access of this computing power to a broader range of disciplines such as materials science, which has been underrepresented in the use of the systems at their facility relative to other disciplines. To help achieve this goal they have partnered with the National Science Foundation TeraGrid network which would create a hub at the Texas center and connect it to a nexus of 10 other resource providers throughout the United States. Over the years, their facility has acquired several high performing computers. Currently these technologies employ a petascale cyberinfrastructure which can have a computing performance greater than one petaflop, very useful for simulations using advanced computations. However, Boisseau said that the future may be in exascale computing and that science will drive the need for faster and more powerful computers. The progression from petascale computing to exascale computing would be a thousand-fold increase in computing capabilities. But the biggest obstacle in this progression is the immense amounts of power needed, at least one gigawatt. Boisseau believes that the technology for his type of computing is several years away.

Plenary presentations

The XIX International Materials Research Congress offered five plenary addresses covering various topics.

Michele Parrinello (Swiss Federal Institute of Technology, Zurich, Switzerland) is a trailblazer in the field of molecular dynamics. On the first night of the conference, Parrinello commenced the scientific program with a rousing talk on the current state of *ab initio* molecular dynamics in materials science (AIMD). Classic molecular dynamics is a computational method of determining the movement of atoms using the particles' potential energy. AIMD uses quantum mechanics, specifically density functional theory to approximate interactions. Parrinello said that while AIMD is an ideal simulation method that is especially suitable for complex chemical reactions, it has significant disadvantages in dealing with mixed systems such as nanoparticles embedded in solid matrices. He said that the challenges for the future are to produce, "bigger, better, and longer" simulation methods because real-life problems require higher accuracy, more computing power, and longer time scales. To meet this challenge, Parrinello introduced the concept of metadynamics, a method that he and his group have developed to analyze molecular systems. This sampling method explores the surface free energy of the system. It provides enhanced sampling and minimizes convergence and overfilling issues. The model would provide significant benefits in simulating protein and lipid transitions.

The second plenary speaker, **Jeffrey Brinker** of the University of New Mexico, USA, discussed research he has conducted in direct assembly of engineered bio–nano interfaces to achieve biocompatibility, direct cellular behavior, and enable development of targeted nanoparticle delivery strategies, such as through cell-directed assembly, multiphoton protein lithography, and protocells. As one example, Brinker described his latest work with silica nanoparticle-supported lipid bilayers called protocells. These cell-like structures synergistically combine advantages of porous inorganic nanoparticles and liposomes and repre

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sent a model nanomedicine platform. Key properties of protocells include enhanced cargo capacity, long-term stability, tunability of release rate and circulation time, and low inherent toxicity and immunogenicity. Protocells bearing the SP94 peptide were found to have a high specific affinity for human hepatocellular carcinoma and minimal interaction with healthy hepatocytes and other tissue. Brinker stated that SP94-modified protocells combine drastically enhanced capacity for chemotherapeutic agent cocktails, high specificity at low peptide densities, and long-term stability that is independent of the type of lipid in the supported bilayer. One protocell is sufficient to kill a cancer cell, a killing efficiency 10^5 greater than current liposome delivery agents

The work of plenary speaker **Shiv Khanna** of Virginia Commonwealth University, USA, involves theoretical studies of electronic structure, magnetic properties, and catalytic properties of metal clusters, cluster assemblies, and nanoscale materials. Much the same way as a single atom has defined energy levels, small clusters of atoms (a few dozen or less) do, too. These clusters were found to be stable at certain sizes termed "magic numbers" that have non-traditional properties. One major attribute of these "superatoms" that determine their reactivity is geometry. Using aluminum clusters as an example, Khanna outlined theory and experiments showing that certain sizes of Al superatoms can react with water to produce hydrogen due to positioning of reactive sites on the cluster. The fact that individual clusters have tunable properties based on size and geometry leads to the idea of using these clusters as building blocks to generate highly tunable materials. Khanna discussed several examples of bandgap tunability including the variation of counterions used to assemble clusters and whether assemblies were extended in one, two, or three dimensions. Further investigations into superatom assemblies and the design rules for tunability could lead to an "era of designer reactants" and precise control over material properties, said Khanna.

Practical gas separation membranes operate by a solution-diffusion mechanism wherein the gas molecules dissolve in the polymer and then diffuse through it rather than flowing through pores, as would be true in some types of membranes. Glassy polymers have been found to be most useful for gas separation. In his plenary talk, **Donald R. Paul** of the University of Texas, Austin, USA, presented recent results on the use of very thin glassy polymer films as membranes for gas separation applications.

Some glassy polymers used for gas separation include polysulfone (PSF), Matrimid® (BTDA-DAPI), and poly(2,6-dimethyl-1,4-phenylene oxide) (PPO). In order to achieve high fluxes (thereby high productivity) these membranes need to be very thin, typically 100 nm in thickness or less. Paul's group has found that such thin films of glassy polymers undergo much more rapid physical aging than thick or bulk glassy polymers. As a result, thin films of glassy polymers, or membranes, do not have the same properties as the same polymer would have in bulk (or a thick film), which is particularly important as membrane processes are being considered for applications such as purification of natural gas streams.

Paul also discussed the effect of CO_2 exposure on aging and consequently gas separation properties. Permeability and selectivity change more rapidly after CO_2 exposure, and conditioning with CO_2 seems to "restart" aging behavior to some extent. This is important in applications such as natural gas processing. Currently, 100 trillion standard cubic foot of natural gas is used worldwide annually. This requires pretreatment and amine absorption is currently the leading technology. Membranes have <5% market share. However, with appropriate optimization and modifications, the share of membrane technology could be significantly increased making this process more compact and efficient.

Miguel Contreras of the National Renewable Energy Laboratory, USA, began his plenary lecture by describing the world energy landscape. He described his dream future where greater than 90% of energy would come from renewable sources, much of which would come from the sun. From the first-generation solar cells, polycrystalline cells make up about 94% of the market share today but, Contreras said, it takes a lot to make silicon out of sand, and a by-product of common processing techniques is carbon dioxide. Second generation, also called thin-film, solar cells use direct bandgap materials such as CdTe, CIGS, and amorphous Si which can absorb light with only several microns of material. These types of cells are becoming major players in the PV market, Contreras said. The third generation is a mixture of many alternative approaches including multi-junction cells and organic-based active layers. The goal moving forward with any member of this generation is to make highly efficient cells at very low cost. As a future direction, Contreras recommends learning how natural systems function in order to design PVs on inspiration from nature.

For additional meeting highlights provided by the MRS Meeting Scenes, access Web site www.mrs.org/meetingscene. □

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MRS elects officers, Board of Directors for 2011

Members of the Materials Research Society have elected two officers and five directors to join the 2011 MRS Board of Directors. The board is composed of the officers and up to 18 directors. The officers of the Society are the president, the vice president (who is also the president-elect), the secretary, the treasurer (a position appointed by the Board of Directors), and the immediate past president. The annual election ended November 10, 2010.

The Board of Directors is organized into the following governing committees: Planning, Operational Oversight, External Relations, and Governance. The president, who serves as chair of the board, appoints each of the directors and officers to one of the first three governing committees, and designates the chairs of these committees.

Terms of office expire at the end of the year indicated in parentheses. The asterisk (*) designates those who are newly elected.

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Applications Sought for 2011-2012

Congressional Science and Engineering Fellowship

PROGRAM

The Fellow spends one year working as a special legislative assistant on the staff of a member of Congress or congressional committee. Activities may involve conducting legislative or oversight work, assisting in congressional hearings and debates, and preparing briefs and writing speeches. The Fellow also attends an orientation program on congressional and executive branch operations, which includes guidance in the congressional placement process, and a year-long seminar series on science and public policy issues. These aspects of the program are administered by the American Association for the Advancement of Science.

PURPOSE

To provide **Materials Research Society**, **Optical Society of America**, and **The Minerals, Metals & Materials Society** members with an invaluable public policy learning experience, to contribute to the more effective use of materials and/or optical science knowledge in government, and to broaden awareness about the value of scientist and engineer-government interaction among Society members and within the federal government.

CRITERIA

A prospective Fellow must demonstrate a record of success in research or scholarship, in a field relevant to materials science and technology and/or optical science and technology. The Fellow must also demonstrate sensitivity toward policy issues and have a strong interest in applying scientific and technical knowledge to U.S. public policy issues. The Fellow must be able to work quickly and communicate effectively on a wide variety of topics, and be able to work cooperatively with individuals having diverse viewpoints. U.S. Citizenship is not required, however, applicants must be authorized to work in the United States.

AWARD

The Fellow will have a one-year appointment beginning September 1, 2011. The Fellowship stipend will be $68,000 plus assistance for health insurance, travel and relocation expenses to the Washington, DC area. Final selection of the Fellow will be made in early 2011.

APPLICATION

Applications must be postmarked or e-mailed by January 7, 2011. Candidates must submit the following materials: (1) a detailed vita providing information about educational background, professional employment and activities, professional publications and presentations, public policy and legislative experience, and committee and advisory group appointments; (2) a statement of approximately 1000 words addressing the applicant's interests in the fellowship, career goals, contributions the applicant believes he or she can make as a Fellow to the legislative process, and what the applicant wants to learn from the experience; and (3) three letters of reference, specifically addressing the applicant's ability to work on Capitol Hill as a special legislative assistant, sent directly to the appropiate address below.

The deadline for applications is January 7, 2011.

Letters of reference may be emailed but must be in PDF format, on official letterhead and include an electronic or scanned signature.
Candidates applying to both programs must submit separate applications.

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MRS/OSA
Congressional Science and Engineering Fellow Program

c/o Lyndsay Basista
Optical Society of America
2010 Massachusetts Avenue, NW
Washington, DC 20036-1023
lbasista@osa.org

Applicant must be a member of MRS or OSA
(or an applicant for membership) and have a doctorate.

For additional information, contact
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Congressional Science and Engineering Fellow Program

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Applicant must be a member of MRS or TMS
(or an applicant for membership) and have a doctorate or
masters degree with three years of professional experiance.

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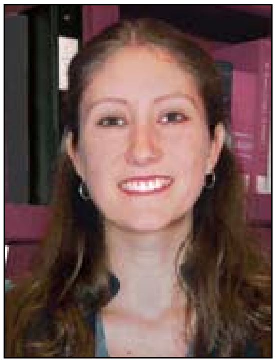

Ashley A. White serves as 2010–2011 MRS/OSA Congressional Fellow

Ashley A. White is serving as the 2010–2011 MRS/OSA Congressional Science and Engineering Fellow. Her tenure began in September.

As a recipient of this one-year appointment, sponsored jointly by the Materials Research Society (MRS) and the Optical Society of America (OSA), White accepted a position in the office of Senator Al Franken (D-Minn.) to work on an education portfolio. Franken serves on the Committee on Health, Education, Labor, and Pensions.

His office is an appropriate match for White, whose science policy interests are in education as well as nanotechnology and immigration. While at Cambridge University, where she received her PhD degree this year in materials science, White was heavily involved in teaching, serving as co-director of the Science and Engineering Experiments for Kids program, instructing undergraduates, and developing laboratory courses.

But her interest in education extends beyond those experiences. While attending Cambridge as a British Marshall Scholar and NSF Graduate Research Fellow, she engaged in conversations with her colleagues—representing 15 different countries—on the topic of education. She said, “Comparing experiences, it is clear that education, especially in the sciences, is vastly different in our respective countries.” White noted that science in developing countries is progressing rapidly and that many countries have surpassed the United States in terms of standardized testing.

“I would like to use my educational experience, both at home and abroad, to facilitate policy changes that will improve science education in the U.S. so we can continue to lead in scientific discoveries and innovations that will strengthen our economy and ensure our long-term security,” she said.

White also expressed a particular interest in immigration due to the visa obstacles materials researchers have experienced when coming to the United States. “In the wake of recent events, no one disputes security is paramount, but policies need to balance security concerns with the economic and educational advantages of international scientific exchange,” she said.

In terms of nanotechnology, one of White’s concerns is that policymakers should be aware of the different types of nanotechnology and what each can achieve, as well as the risks to environment and health. For her dissertation, White developed carbon nanotube-reinforced hydroxyapatite bone graft materials with improved mechanical properties, and in her post-doctoral work, she focused on the removal of carbon nanotubes from body tissue using laser irradiation.

Prior to receiving her PhD degree, White received her BS degree in materials science and engineering and her BA degree in music performance from the Virginia Polytechnic Institute and State University (Virginia Tech). As an undergraduate student, she gained research experience through several Research Experience for Undergraduate programs, Department of Energy internships, and work abroad as well as at Virginia Tech. Furthermore, as an accomplished violinist, White has served as president of the Cambridge Graduate Orchestra, performed with various orchestras and chamber groups, and spent time in Paraguay and Mexico doing research and teaching related to youth orchestras.

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