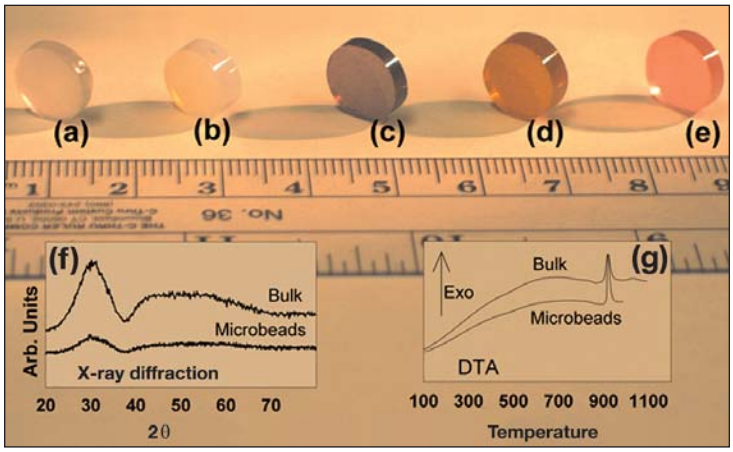

Figure 1. Bulk rare-earth aluminate glasses with the ALZ composition formed using the method described. No dopants were used for samples (a) and (b), while 5 wt% Nd_2O_3, Eu_2O_3, and Er_2O_3 were used for samples (c), (d), and e), respectively. Image (f) shows x-ray diffraction patterns, while (g) shows differential thermal analysis data for the microbead and bulk forms, revealing their amorphous nature and similar thermal behavior. Reprinted with permission from Nature ***430*** *(August 12, 2004) p. 762. ©2004 Nature Publishing Group.*

in the August 12 issue of *Nature* (p. 761), binary eutectic compositions of alumina and rare-earth oxide (Al_2O_3-RE_2O_3, RE = La, Gd, Y) as well as Al_2O_3:RE_2O_3:ZrO_2 (ALZ) ternary compositions were investigated. In their flame-spraying technique, particulate precursors were fed into a high-temperature hydrogen–oxygen flame, producing molten particles that were then quenched in water. Glassy beads of the material with diameters of less than 140 μm were obtained. Beads with diameters in the range of 75–109 μm (selected by sieving) were consolidated into bulk glasses by sintering the beads at a temperature within the kinetic window—between T_g (the glass-transition temperature) and T_x (the crystallization temperature). X-ray diffraction, differential thermal analysis, optical microscopy, and scanning electron microscopy revealed that the bulk glass that formed remained amorphous and transparent (see Figure 1).

The alumina-rich bulk glass was then heated above T_x for a short time to form a nanoscale glass–ceramic as a result of simultaneous crystallization and grain growth. The final microstructure contained ~100 nm crystalline grains, a finer and more homogeneous microstructure than that obtained using traditional methods. The glass–ceramics formed in this way also showed superior chemical, mechanical, and optical properties, as compared with silica-based glasses.

This technique yielded alumina-based glass–ceramic composites with superior fracture toughness, important for potential structural applications. This discovery of glass-forming ability and glass-converted nanoscale ceramics can be extended to other nonconventional bulk oxide systems as well, so long as a sufficiently wide kinetic window $\Delta T_x = T_x - T_g$ is available. The method could pave the path to numerous bulk oxide glasses and nanocrystalline ceramics.

GOPAL RAO

Composite Polymer–Carbon Nanotubes Function as Optoelectronic Memory Devices

In the past few years, interest in making nanoscale electronic devices from carbon nanotubes has skyrocketed, with the hopes of making devices that are smaller and more versatile. In the September issue of *Nano Letters* (p. 1587), A. Star from Nanomix Inc., G. Grüner from the University of California, Los Angeles, and co-workers report the fabrica-

tion and characterization of carbon nanotube optoelectronic devices made by using two different methods, both of which employ light-sensitive polymers and carbon nanotubes on silicon wafers. In one method, Au/Ti contacts were patterned on silicon wafers, and then a composite of polymer and nanotubes was deposited. In the second method, nanotubes were grown by chemical vapor deposition on a silicon wafer, then Au/Ti contacts were patterned, and finally the polymer was deposited. Both methods produced light-sensitive nanotube field-effect transistors (NT-FETs). However, NT-FETs fabricated by the second method also work as optoelectronic memories that can be controlled independently, as shown by the change in spectral response of the device using various polymers with unique light absorption characteristics.

Using the second method, a layer of either PmPV, poly{(m-phenylene-vinylene)-co-[2,5-dioctyloxy-*p*-phenlyene)vinylene]}, or P3OT, poly(3-octylthiolphene-2,5-diyl), was deposited over the contacts/nanotubes by drop-casting a solution of the polymer in $CHCl_3$. The optoelectronic memory device functions in a two-step sequence: The polymer layer absorbs incoming photons and converts them to excitons, after which the hole is transferred to the carbon nanotubes, preventing or delaying its recombination with the electron; these charged nanotubes then serve as electrodes to read and erase stored charge.

This novel research is a marked change from previously reported nanotube-based optical devices because the photons are directly absorbed by the polymer, as opposed to previous works that utilize the band absorption of nanotubes or photodesorption of molecular species. When devices are fabricated with both types of polymer, PmPV and P3OT, on neighboring devices, distinct and independent absorption behavior is observed, as shown in the current-versus-time response to light illumination of the modified NT-FETs (Figure 1). Therefore, depending on the type of light-sensitive polymer used for the coating, the nanodevices can be tuned independently.

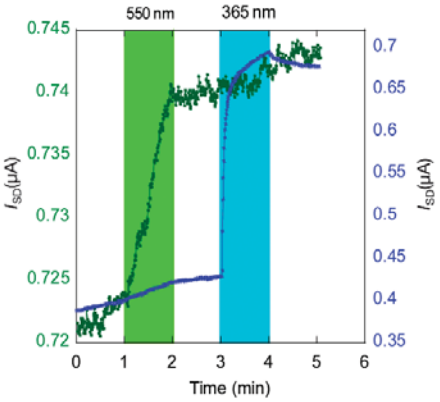

Figure 1. Optoelectronic response to light of nanotube field-effect transistors coated with PmPV (blue trace) and P3OT (green trace). Shaded regions (blue: UV light, λ = 365 nm; green: visible light, λ = 550 nm) and unshaded regions mark the light-on and -off periods, respectively. Reprinted in part with permission from Nano Lett. ***4*** *(9) (September 8, 2004) p. 1590. ©2004 American Chemical Society.*

Although the electronic properties of these devices exhibit long-term changes in state as a result of illumination, they can be reset electronically by sweeping the gate voltage. The researchers said that these optical sensors may find application as replacements for charge-coupled devices in high-speed cameras.

ADITI S. RISBUD

News of MRS Members/Materials Researchers

Siamak Akhlaghi, project scientist at Micralyne Inc. (Edmonton, Alberta, Canada), has received the **Silver Abner Brenner Award** from the American Electroplaters and Surface Finishers Society (AESF) for the best paper published in the *Plating and Surface Finishing Journal* during the year 2003. The award-winning article, "Effect of Processing Parameters on the Electroplating of Au-Sn Solders," focuses specifically on a co-electroplating process that has been developed for depositing Au/Sn alloys, from a slightly acidic, chloride-based solution using pulsed currents, onto patterned or blanket metallized ceramic and semiconductor substrates.

Robert J. Birgeneau, physicist and currently president of the University of Toronto, has accepted the position of chancellor of the University of California, Berkeley. He expects to begin his tenure in October. Outgoing chancellor Robert M. Berdahl has held the position for seven years and will join the UC–Berkeley faculty.

Howard E. Katz, 2004 MRS President, has accepted a position as a professor of materials science and engineering at Johns Hopkins University's Whiting School of Engineering, beginning this fall. Katz has been a Distinguished Member of Technical Staff at Bell Laboratories,