

tering the pattern with chromium in an adjacent chamber followed by a rinse in isopropanol to remove the ice and excess chromium. The ice can also be removed by sublimation. When no chromium was deposited, the researchers observed that a thin layer of material had grown in the patterned areas. The group posits that the material is a silicon oxide formed by a beam-induced reaction between the silicon substrate and the ice.

The potential advantages of an ice resist include the simplicity and purity of the process: The resist is deposited *in situ* under vacuum, there is little residue, and no harsh solvents are required. In comparison to the commonly used resist poly(methyl methacrylate) (PMMA), the researchers said that ice results in finer lines under typical exposure conditions and that ice does not suffer from the same proximity effects as PMMA due to a non-cumulative effect of back-scattered electrons. A downside of the ice resist is that it requires an area dose of  $8.8 \times 10^5 \mu\text{C}/\text{cm}^2$  to clear a 75 nm layer of ice, which is three orders of magnitude greater than that required for PMMA; however, the use of a focused ion beam results in faster writing speeds. The researchers said that further

investigations are needed to minimize the dose as well as to probe the resolution limit and explore the use of other condensed gas species—both noble gases to prevent surface reactions and reactive gases to produce novel materials for nanoscale devices.

AMANDA GIEMANN

### CNTs Used to Produce Multi-Beam Scanning Field-Emission X-Ray Source

Researchers J. Zhang of the University of North Carolina-Chapel Hill and Y. Cheng at Xintek Inc., Research Triangle Park, North Carolina, and their colleagues have reported a multi-beam field-emission x-ray source that can generate a scanning x-ray beam to image an object from multiple projection angles without mechanical motion. Details of their work appear in the May 2 issue of *Applied Physics Letters* (184104; DOI: 10.1063/1.1923750).

The key component of the device is a gated carbon nanotube (CNT) field-emission cathode comprising an array of five electron-emitting CNT pixels that are individually addressable by a metal oxide semiconductor field-effect transistor (MOSFET)-based electrical circuit. A

pixel is activated when a voltage signal is applied to a corresponding MOSFET circuit. Under appropriate conditions, electrons are emitted from this activated pixel and are accelerated and focused on an area on a molybdenum target to produce an x-ray beam. Electrons from different pixels lead to x-ray emissions from different areas on the target. To generate a scanning x-ray beam, a pulsed controlling signal with a predetermined pulse width is swept across individual MOSFETs to generate a pulsed electron beam from each pixel, producing x-ray radiation from the corresponding focal point on the target. The controlling electrical circuit automatically compensates for cathode current intensities across the pixels. By using a digital area x-ray detector, images of an object from different angles of projection were recorded without moving the object or the x-ray source.

"This is a first step towards experimental realization of a multi-beam field-emission x-ray source," the researchers said. "The device can potentially lead to a fast acquisition rate for laminography and tomography with simplified experimental set-up."

SHIMING WU

## News of MRS Members/Materials Researchers

### Mildred S. Dresselhaus Honored with Heinz Award



Mildred S. Dresselhaus

Mildred S. Dresselhaus of the Massachusetts Institute of Technology received the 11th Heinz Award for Technology, the Economy, and Employment in recognition of her contributions as a scientist, researcher, educator, and trailblazer for women in the sciences. An MIT professor and researcher for more than four decades, Dresselhaus is recognized by the Heinz Award as one of the United States' foremost experts in the multifaceted field of condensed matter and materials physics. Her investigations into the electronic properties of graphite, the structure and properties of novel forms of carbon, thermoelectricity, and the new physics at the nanometer scale have significantly advanced these fields, while at the same time, she has worked to break down stereotypes and expand opportunities for women in science. She has lectured around the world, written extensively about her research and served in prominent leadership roles, including as director of the Office of Science at the U.S. Department of Energy and as president of

the American Physical Society and the American Association for the Advancement of Science, among other high-profile posts. She is a recipient of the National Medal of Science.

Presented by the Heinz Family Foundation of Pittsburgh since 1994, the \$250,000 Heinz Awards, among the largest individual achievement prizes in the world, recognize profound contributions across a spectrum of activity—from the arts and the environment to technology and public policy. The award is named for the late Sen. John Heinz (R-Pa.). The Heinz Award was presented to Dresselhaus at a private ceremony in Washington, D.C., on May 24.

### Eduard Arzt Receives 2005 German Science Prize



Eduard Arzt

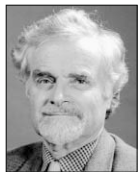
Eduard Arzt, director of the Max Planck Institute for Metals Research and a professor of physical metallurgy/metal physics at the University of Stuttgart, has been named the 2005 recipient of the German Science Prize, awarded by the Stifterverband für die Deutsche Wissenschaft. This industrial foundation supports applied research in

Germany. The prize recognizes Arzt's interdisciplinary team of materials scientists and biologists for their studies of artificial mechanical attachment systems based on biological attachment in flies, spiders, and geckos. The €50,000 research award was presented to Arzt at the Annual Max Planck Society meeting on June 23 in Rostock, Germany.

### Ian W. Boyd Awarded the John Yarwood Memorial Medal and Senior Prize

Ian W. Boyd of the Department of Electronic and Electrical Engineering and London Centre for Nanotechnology at University College London has received the John Yarwood Memorial Medal and Senior Prize for "outstanding pioneering contributions to thin-film growth technology applied to microelectronics." The Medal and Prize are awarded by the British Vacuum Council, whose constituent bodies include the Institute of Physics and the Royal Society of Chemistry, and which is a full member of the International Union for Vacuum Science and Application (IUVSTA). The award will be presented to Boyd by Sir David King at the annual conference in September 2005.

**Robert W. Cahn Elected to Johns Hopkins University Society of Scholars**



Robert W. Cahn

Robert W. Cahn, distinguished research fellow at Cambridge University, has been elected to the Johns Hopkins University Society of Scholars. Cahn and 14 other esteemed scientists and clinicians were honored at the university in May. The Society of Scholars was created on the recommendation of former president Milton S. Eisenhower and approved by the university board of trustees in 1967. The society inducts former postdoctoral fellows and junior or visiting faculty at Johns Hopkins who have gained marked distinction in their fields of physical, biological, medical, social, or engineering sciences or in the humanities. Cahn was a visiting assistant professor in the departments of Materials Science and Engineering and of Metallurgy from 1954 to 1955.

**Awschalom, Dietl, and Ohno Awarded Agilent Europhysics Prize**

David Awschalom of the University of California, Santa Barbara; Tomasz Dietl of the Polish Academy of Sciences, Poland; and Hideo Ohno of Tohoku University, Japan, have been awarded the European Physical Society's 2005 Agilent Technologies Europhysics Prize for Outstanding Achievement in

Condensed Matter Physics. The prize was given in recognition of the scientists' investigations of magnetic semiconductors and spin coherence in the solid state, which has paved the way for the emergence of spin electronics, or "spintronics."

"We are proud to recognize these scientists for combining advanced materials engineering, insightful theoretical modeling, ingenious experimental techniques, and international collaboration to attain important breakthroughs in spintronics," said Jim Hollenhorst, director of molecular technology at Agilent Laboratories, the company's central research organization.

**Marcel Ausloos Recognized by Bulgarian Academy of Sciences**

Marcel Ausloos of the University of Liège has received the Decoration of Honor for Special Merit from the Bulgarian Academy of Sciences for his "outstanding personal merit in establishing and furthering cooperation and joint research activities between the Institute of Electronics of the Bulgarian Academy of Sciences and the University of Liège in the field of high-temperature superconductivity physics and the applications of statistical methods to physics."

**Baldev Raj Receives Two Honors**

Baldev Raj, Distinguished Scientist and director of the Indira Gandhi Centre for Atomic Research (IGCAR) in Kalpakkam, India, has been awarded the prestigious Jaeger Lecture Award by the International Institute of Welding (IIW) and International Standards Organization (ISO). IIW is a premier body consisting of experts from over 30 countries. It formulates welding directives and policies for the advancement of welding science and technology. Raj has also been honored with the Lifetime Achievement Award for 2004 by the Indian Welding Society for his contributions to the field of welding science and technology. □

**George D.W. Smith Receives 2005 Acta Materialia Inc. Gold Medal**



George D.W. Smith

George D.W. Smith, FRS, professor of materials and head of the Department of Materials at the University of Oxford and non-executive chair of Polaron plc., has been awarded the 2005 Acta Materialia Inc. Gold Medal in recognition of his leadership in materials research. Over a career spanning 40 years, Smith has made many outstanding contributions to the field of metallurgy and materials science as a researcher, teacher, and administrator. The award consists of the gold medal, an inscribed certificate, and a cash honorarium. The 2005 Acta Materialia Inc. Gold Medal was scheduled to be presented to Smith on June 15 at the IOM<sup>3</sup> banquet in London.

**Alton D. Romig Receives 2005 Acta Materialia Inc. J. Herbert Hollomon Award**



Alton D. Romig

Alton D. Romig Jr., vice president of Non-proliferation and Assessments at Sandia National Laboratories, has been named to receive the 2005 Acta Materialia Inc. J. Herbert Hollomon Award. The award recognizes outstanding contributions to understanding the relations between materials technology and society, and/or contributions to materials technology that have had major impact on society. Acta Materialia Inc. recognizes that one vitally important aspect of Romig's work is the protection and disposition of nuclear materials and technology in the former Soviet Union. Other aspects include the technology to impede the introduction of weapons of mass destruction into the United States through seaports, and to protect vital assets such as the country's own nuclear materials and bioagents.

The award consists of a Steuben glass sculpture on an inscribed base, a certificate, and a cash honorarium. The 2005 Acta Materialia Inc. J. Herbert Hollomon Award will be presented to Romig at the Materials Science and Technology Conference in Pittsburgh, Pa., on September 27, 2005.

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