of *Electrochemical and Solid-State Letters* by collaborators at National Chiao-Tung University and National Nano Device Labs, Taiwan, and University of Illinois at Urbana-Champaign. This metal-oxide dielectric was formed using direct oxidation of sputtered Co/Ti films.

Samples were fabricated on *p*-type (100)-oriented silicon wafers. First, an ultrathin, ~10 Å-buffered layer of either Si-N or Si_3N_4 was formed to improve the interfacial quality. The former was created by growing a nitrided oxide on silicon, while the latter by NH_3-nitridization. Afterwards, the 50-Å Ti and Co films were deposited using the sputtering method, then direct thermal oxidation was conducted at 700 or 800°C in diluted O_2 gas, and annealed in N_2 gas ambient. Finally, a gate electrode of aluminum film was deposited on the wafer by a thermal coater.

X-ray diffraction analysis shows that NH_3-nitridization can suppress the diffusion of the metal, resulting in a pure $CoTiO_3$ phase, as also exhibited by transmission electron microscope cross-sectional analysis. The effective dielectric constant of $CoTiO_3$ gate dielectric film was proposed to be about 40. A smooth interface between the nitride and silicon substrate also suggests a good interface quality. $CoTiO_3$ samples buffered using Si_3N_4 show a lower leakage at low field and a higher breakdown voltage than those of Ta_2O_5 or TiO_2. It also demonstrates a high reliability after 10^4 s stressing.

WIRAWAN PURWANTO

Au, Ag, and Pt Nanowires Produced in Mesoporous Silica

Metal nanowires with tunable diameters below 10 nm have been intensively studied because they provide an excellent platform for investigation of the fundamental physics of nanowires and have potential applications in electro-optic chip devices. Professor Galen D. Stucky, postdoctoral associate Ji Man Kim, and graduate student Yong-Jin Han at the Department of Chemistry and Biochemistry at the University of California—Santa Barbara have introduced a method for the synthesis of such nanowires. The researchers produced Au, Ag, and Pt nanowires by reduction of the corresponding metal salts loaded into the pores of the mesoporous silicate template SBA-15. SBA-15 is characterized by large surface area; variable pore diameter (4–30 nm); a well-ordered, hexagonal array of pores; and long-range order. The resulting nanowires were 7 nm in diameter and 50 nm–1 μm in length. Free nanowires produced by dissolution of the template had an average length of 0.5 μm and retained the 7 nm diameter.

As reported in the August issue of *Chemistry of Materials*, SBA-15 with 7 nm diameter pores was loaded with precursors by immersion in an appropriate aqueous salt solution followed by drying and treatment with methylene chloride to force the outer surface bound precursors into the channels of the SBA-15. The loaded template was then dried in a vacuum oven, and the Au, Ag, and Pt salts reduced under continuous hydrogen flow at 393, 623, and 593 K, respectively. The SBA-15 was dissolved with HF/H_2O/ethanol to obtain free nanowires. Longer nanowires can be obtained by varying the degree of template loading and the annealing temperature. Thicker nanowires can be prepared by using SBA-15 with a larger pore diameter.

The researchers said that x-ray diffraction studies of the metal/SBA-15 samples demonstrate the formation of reduced metals with a 2D hexagonal structure and excellent textural uniformity. The presence of reduced metal in the template was confirmed by energy dispersive x-ray measurements. The dimensions of the nanowires were obtained from transmission electron micrographs.

According to Stucky, mesoporous silicates like SBA-15 are ideal candidates for templating nanostructured phases because they are durable, highly processable, and easily interfaced with silicon wafers to create nanostructured optical waveguides, chemical sensors, optical switches, and microlasers. The Stucky group is currently working on the synthesis of various nanostructures in a number of mesoporous silicates.

GREG KHITROV

Software Package Performs Molecular Dynamics Simulation with Over 5 Billion Particles

Using a recent upgrade of the Cray T3E-1200 at the Jülich Supercomputing Center,

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W. David Kingery, Professor of Materials and Archaeology at the University of Arizona, passed away on June 30 at his home in Wickford, Rhode Island, at age 73. He was an ex-MIT professor and long-time resident of the Boston area who became known as the "father of modern ceramics" for his role in providing a scientific foundation to the empirical practice used since ancient times to manufacture pottery, chinaware, tile, brick, cement, and glass. He received a SB degree in chemistry (1948) and ScD degree in ceramics (1950) from MIT, and served on the MIT faculty in the Department of Materials Science and Engineering from 1951–1988, where he was the first to hold the Kyocera Professorship. In 1988, he joined the University of Arizona to pursue interdisciplinary studies between Materials Science and Archaeology. In 1992 he was honored with the title of Regents Professor, the highest rank in the Arizona system. In the early 1950s, Kingery established at MIT the first graduate education and research program in the science and technology of ceramics, and wrote in 1960 the first edition of a seminal textbook *Introduction to Ceramics*, now in print for 40 years and translated into the world's major languages. His scientific research led to the development of advanced materials with unique electrical, thermal, mechanical, and chemical properties. Ceramics are used today in technologies such as automotive oxygen sensors, fuel cells, and a vast range of electronic components. In 1999, he was awarded the Kyoto Prize by The Inamori Foundation of Kyoto, Japan, for systematically integrating the knowledge and practice related to ceramic materials into a scientific discipline. Accompanied by his wife, Dr. Kingery is shown in the photo receiving the Kyoto Prize. In recent years, Dr. Kingery also analyzed, from an archaeological standpoint, the earthenware, pottery, and chinaware that are found throughout the world—studying the development and diffusion of ceramic techniques and providing cultural and anthropological interpretations of advanced technology. Dr. Kingery was interested in exploring how specific case studies related to "the big picture"—the broader issues of technology transfer, technological change, producer and consumer roles in design, technology, and engineering education. His recent books—*History from Things* (S. Lubar and W.D. Kingery, eds., The Smithsonian Press, Washington, DC, 1993) and *Learning from Things* (W.D. Kingery, ed., The Smithsonian Press, Washington, DC, 1996)—reflect these interests. Among his other recent books are *Japanese/American Technological Innovation* (W.D. Kingery, ed., Prentice Hall, Englewood Cliffs, NJ, 1991), and *Physical Ceramics* (Y.-M. Chiang, D. Birnie III, and W. D. Kingery, John Wiley and Sons, NY, 1998).

Dr. Kingery was also an avid sailor who co-organized the Marion-Bermuda Cruising Yacht Race, first sailed 20 years ago, which continues to this day. He is survived by his wife Lily (Koers); a son, William of Rolling Hills, Va.; a daughter, Rebecca Jones of Burlington, Mass.; a stepson, Bart H. LaPoole of Norwalk, Conn., a stepdaughter, Marina Vooren of Wichita Falls, Texas; two brothers, John M. of Greenwich, Conn., and Robert E. of Charlotte, NC; and nine grandchildren.

DUNBAR P. BIRNIE, III