vapor-phase etch to take away the underlying silicon, and then removed the oxide shell with a buffered hydrofluoric acid etch, which releases the silicon levers.

Once antibody-based recognition is implemented to form an "immuno chip," these ultra-sensitive nanomechanical oscillators may prove to be rapid, economical biosensors, said the researchers.

RICHARD LOUIE

Damage Threshold of Extreme-Ultraviolet Multilayer Mirrors Measured

The rapid advance of coherent extreme-ultraviolet (EUV) sources, such as free-electron lasers, requires the development of new optical materials. Among them are high-reflectivity mirrors, which are usually prepared by producing multilayer coatings of Mo/Si, W/C, W/Si, and, more recently, Sc/Si. However, damage to the mirrors when exposed to high peak powers of EUV light presents a problem because the peak power and fluence of EUV sources have recently increased significantly. For example, the radiation fluence of a capillary-discharge neon-like Ar laser operating at 46.9 nm can exceed 1 J/cm^2. In the March 15 issue of *Optics Letters*, M. Grisham of Colorado State University, Yu.P. Pershyn of the National Technical University in the Ukraine, A.V. Vinogradov of the P.N. Lebedev Physical Institute in Moscow, and their colleagues have studied the damage of Sc/Si multilayer mirrors exposed to intense EUV laser pulses.

The researchers prepared the multilayer mirrors by dc magnetron sputtering. The multilayers consisted of several periods of Sc/Si pairs, each with a thickness of 26.7 nm and a ratio of layer thickness of H (Sc)/H(Si) of 0.7. A 5-nm-thick Si protective layer capped the multilayers. Mirrors were fabricated on substrates of silicon and borosilicate glass. The irradiation was conducted by focusing the output of a tabletop capillary-discharge neon-like Ar laser emitting 1.2 ns pulses at a wavelength of 46.9 nm. Scanning and transmission electron microscopy (SEM and TEM) and small-angle x-ray diffraction (XRD) techniques were used to analyze the multilayers after irradiation. For some of the tests, the sample was moved after each laser shot, so that the site was hit by only a single pulse. In other tests, the sample was moved relative to the laser beam, so that a large area was damaged to permit small-angle XRD measurements to be performed. The results of the SEM, cross-sectional TEM, and small-angle XRD measurements show that the damage mechanism is of a thermal nature, with evidence of melting and even boiling of the material at high laser fluence. A damage threshold of 0.08 J/cm^2 was measured, comparable to the 0.7 J/cm^2 found necessary to damage a bare Si substrate. This value is similar to the thresholds found in Mo/Si, W/C, and W/Si coatings measured at much shorter wavelengths.

ROSALIA SERNA

Single ZnS Nanoribbons Lase under Optical Pumping

Nanowires have exciting applications as building blocks of nanodevices. However, they are difficult to study due to their small size. Nanoribbons are easier to study because their larger size allows easier access, manipulation, and processing. In the February 16 issue of *Applied Physics Letters*, S.T. Lee from the City University of Hong Kong, X.M. Meng from the Technical Institute of Physics and Chemistry in Beijing, and co-workers report the fabrication of ZnS nanoribbons that were then studied using transmission electron

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microscopy (TEM), selected-area electron diffraction (SAED), and photoluminescence spectroscopy to probe the correlation of the size, morphology, and structure of these nano-objects with their photoluminescent characteristics.

The researchers used 2H wurtzite single-crystal ZnS nanoribbons synthesized by hydrogen-assisted thermal evaporation. This method produces nanoribbons that have nearly perfectly rectangular cross sections, with lengths of tens of micrometers, widths of several micrometers, and an average thickness of approximately 80–100 nm. The nanoribbons were dispersed onto a TEM grid, and TEM measurements were performed on a single nanoribbon, confirming the 2H wurtzite structure and the orientation of the crystal. The nanoribbon was then illuminated with the 266 nm output of a frequency-quadrupled Nd:YAG laser to study the nanoribbon photoluminescence. Light emission was observed near 338 nm, just below the band edge of the ZnS nanoribbon. At high optical pump intensity, the spectral width of the photoluminescence peak narrowed, and the optical emission increased superlinearly, indicating the stimulation of lasing action in the nanoribbon. An optical fiber was used to collect the photoluminescence, thus permitting study of the lasing characteristics of individual nanoribbons at a variety of angles. Room-temperature lasing was observed in at least 20 of the single-crystal ZnS nanoribbons and also in a macroscopic amount of the ribbons. The researchers believe that the study of lasing phenomena in ZnS nanoribbons can be extended to nanoribbons of other semiconductor materials with direct bandgaps.

LARKEN E. EULISS

Review Articles and Special Issues

Review of Scientific Instruments **75** (3) (2004) contains L. Eldada, "Optical Communication Components," p. 575.

Low Temperature Physics **30** (2) (2004) contains A.M. Kosevich, "Topology and Solid-State Physics," p. 97.

Physics of the Solid State **46** (2) (2004) contains S.M. Dunaevski, "Magnetic Phase Diagrams of Manganites in the Electron Doping Region," p. 193.

Technical Physics (February 2004) contains A.L. Stepanov, "Optical Properties of Metal Nanoparticles Synthesized in a Polymer by Ion Implantation: A Review," p. 143.

Applied Mechanics Reviews **57** (1) (2004) contains V. Raizer, "Theory of Reliability in Structural Design," p. 1; S. Seelecke and I. Muller, "Shape Memory Alloy Actuators in Smart Structures: Modeling and Simulation," p. 23; G.W. Brodland, "Computational Modeling of Cell Sorting, Tissue Engulfment, and Related Phenomena: A Review," p. 47; and A. Gyr and W. Kinzelbach, "Bed Forms in Turbulent Channel Flow," p. 77.

Reviews of Modern Physics **76** (1) (2004) contains M. Dine and A. Kusenko, "Origin of the Matter–Antimatter Asymmetry," p. 1; R.G. Endres, D.L. Cox, and R.R.P. Singh, "Colloquium: The Quest for High-Conductance DNA," p. 195; A.S. Jenson, K. Riisager, D.V. Federov, and E. Garrido, "Structure and Reactions of Quantum Halos," p. 215; and R. Casalbuoni and G. Nardulli, "Inhomogeneous Superconductivity in Condensed Matter and QCD," p. 263.

Journal of Environmental Engineering **130** (3) (2004) is a special issue on Air Quality—Capture and Recovery or Destruction of Trace Vapors from Gas Streams.

IEEE Transactions on Instrumentation and Measurement **53** (1) (February 2004) is a special issue on Lightwave Technology in Instrumentation and Measurement.

Powder Diffraction **19** (1) (March 2004) contains a special section on X-Ray Studies of Art and Archaeological Objects.

Journal of Biomedical Optics **9** (1) (2004) contains a special section on Ophthalmic Diagnostics.

Journal of Computing in Civil Engineering **18** (1) (2004) is a special issue on Applications of Imaging Technologies in Civil Engineering Materials.

Journal of Microlithography, Microfabrication, and Microsystems **3** (1) (2004) contains a special section on Immersion Lithography.

IEEE Transactions on Device and Material Reliability **3** (4) (December 2003) is a special issue on Interface Reliability.

Journal of Computing and Informational Science in Engineering **3** (4) (December 2003) is a special issue on Solid Modeling Theory and Engineering Applications.

IEEE Journal of Selected Topics in Quantum Electronics **9** (6) (November/December 2003) is a special issue on Quantum Internet Technologies.

Journal of Physics and Chemistry of Solids **65** (4) (2004) is a special issue containing the Proceedings of Symposium K on Design, Characterization, and Modeling of Molecule-Based Magnetic Materials, from the E-MRS Spring Meeting, held in Strasbourg, France, in June 2003.

Optical Materials **25** (2) (March 2004) is a special issue containing selected papers on Photonic Glasses presented at ICO XIX, the 19th Congress of the International Commission for Optics in Firenze, Italy, August 25–30, 2002.

Thin Solid Films **451–452** (March 22, 2004) is a special issue containing papers from the Proceedings of Symposium D on Thin Film and Nanostructured Materials for Photovoltaics, from the E-MRS Spring Meeting (Strasbourg, June 2003).

Vacuum **73** (2) (March 19, 2004) is a special issue containing papers from the Proceedings of the European Vacuum Congress Berlin 2003, June 23–26, 2003, featuring the 8th European Vacuum Conference, 2nd Annual Conference of the German Vacuum Society, held in Berlin, Germany, June 23–26, 2003.

Vacuum **73** (1) (March 8, 2004) is a special issue containing papers from the 16th Ion–Surface Interactions Conference held in Zvenigorod, Russia, August 25–29, 2003.

Journal of Lightwave Technology **22** (1) (2004) is a special issue containing papers from the Optical Fiber Communications Conference, 2003.

Replica-Molded, Polymeric Microresonators Demonstrate High Quality Factors

Micrometer-scale dielectric resonators are able to store and confine optical energy for long periods of time and are characterized by a quality factor (Q factor), which is essentially the number of oscillations of light that takes place during the storage time of the device. Applications include biosensing, photonics, and telecommunications. Using lithography and etching techniques, ultrahigh-Q, toroid-shaped, silica microresonators (termed "whispering gallery" resonators because optical trajectories occur near the surface of the interior periphery of the microcavity) were recently fabricated on a silicon chip. Employing these resonators as a master, a team of researchers at the Department of Applied Physics, California Institute of Technology, has developed a fast, effective, and novel micromolding method that produces high-Q polymeric microresonators, with Q factors as high as 5×10^6, which is nearly 40× greater than previous polymeric microresonators.

As reported in the March 15 issue of *Optics Letters*, A.L. Martin, D.K. Armani, L. Yang, and K.J. Vahala used poly-(dimethylsiloxane) (PDMS) and Vicast (a polymer used in domestic consumer applications) to demonstrate their replica-

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