The gold layer is coated with an insulating polymer coating ~10 nm thick. The researchers use a focused ion beam to slice off the end of the nanotube, exposing a conducting ring of gold sandwiched between an insulating core and an insulating outer ring.

The process yields nanoelectrodes with a diameter of 100 nm, and a length of up to 30 μm.

Because the nanotube is attached to a much larger probe, the researchers can manipulate the nanotube like a needle. They can control precisely where the nanotube penetrates a cell, for example, and even pinpoint smaller cell structures, such as the nucleus or mitochondrion.

"Nanoelectrodes offer new opportunities for electrochemical sensing in intracellular environments," said Yu, who was scheduled to describe the fabrication process and demonstrate the feasibility of nanoelectrodes at the meeting of the American Physical Society held in Denver in March. "By functionalizing the active area of the nanoelectrode with an appropriate chemical, we can target the detection of specific chemical species."

The researchers have demonstrated that their nanoelectrode can sense the chemical environment within a droplet 10 μm in diameter. Their next step is to show that the probe can penetrate the cellular membrane of a living cell, without damaging the cell.

News of MRS Members/Materials Researchers

Patrick Bruno and Peter Gumbsch Named 2007 Leibniz Prize Recipients

Patrick Bruno of Max Planck Institute of Microstructure Physics, Halle and Peter Gumbsch of the Institute for Reliability of Components and Systems (IZBS), University of Karlsruhe, and Fraunhofer Institute for Mechanics of Materials (IWM), Freiburg and Halle have each been named recipients of Germany's most highly endowed research award, the Gottfried Wilhelm Leibniz Prize, given by the German Research Foundation (DFG). DFG has named 10 scientists and academics to receive the 2007 prize, which includes up to 2.5 million euros to be used flexibly over a period of seven years to finance their research.

Patrick Bruno's scientific interests are focused on theoretical solid-state physics, especially the theory of magnetism in low-dimensional systems and in nanostructures.

Patrick Bruno

His explanation of special exchange interactions in ferromagnetic layered systems ("interlayer exchange coupling") is already a staple of modern textbooks on solid-state physics.

Bruno analyzed several magnetic effects in quantum mechanics (e.g., Casimir effect, spin Hall effect) and examined the role of Berry phases in anisotropic ferromagnets. In doing so, he often elucidated new aspects of standard theories. The scope of his knowledge, which spans the entire field of theoretical solid-state physics, is especially evident in numerous overview articles he published about hot topics such as the spin polarization of nanostructures, quantum nanomagnets, and magnetic semiconductors.

Bruno studied physics in Saint-Cloud and Paris, where he graduated in solid-state physics in 1986. He earned his doctorate degree in Orsay in 1989. Since 1998 he has been a scientific member of the Max Planck Society and a director at the Max Planck Institute of Microstructure Physics in Halle. In 1999, he was appointed honorary professor at the Martin Luther University Halle-Wittenberg.

At the intersection of physics and engineering, **Peter Gumbsch** works in the field of materials science, where he specializes in the mechanics of materials. In addition to his research on deformation in thin films, he has focused particularly on the dynamics of deformation processes and the dislocations underlying deformation (irregularities in the lattice structure of solid materials) at high velocities. In a similar manner, Gumbsch has analyzed the elementary mechanisms of fracture. Using atomistic investigations and the first serious quantum-mechanical calculations of brittle fracture behavior, he expanded the thermodynamic model that had been the textbook standard with important insights into the breaking of atomic bonds. He is instrumental in the development of multiscale materials modeling, a cutting-edge discipline used to describe materials across scales, from individual atoms to crystals to complete workpieces.

Peter Gumbsch

After obtaining his doctorate degree in physics at the University of Stuttgart, Gumbsch went to Oxford in 1991 as visiting scientist, before returning to Stuttgart to work at the Max Planck Institute for Metals Research. He is currently tenured professor for mechanics of materials and head of the Institute for Reliability of Components and Systems at the University of Karlsruhe, as well as director of the Fraunhofer Institute for Mechanics of Materials (IWM) in Freiburg and Halle.

Paul Alivisatos (University of California at Berkeley and E.O. Lawrence Berkeley National Laboratory) and **Moungi Bawendi** (Massachusetts Institute of Technology) have received a joint **Ernest Orlando Lawrence Award** for the Materials Research category and **Steven Zinkle** (Oak Ridge National Laboratory) received the award for the Nuclear Technology category. The award honors scientists and engineers at mid-career for exceptional contributions in research and development that support the Department of Energy and its mission to advance the national, economic, and energy security of the United States.

Siegfried S. Hecker has been appointed as co-director of the Center for International Security and Cooperation in the Freeman Spogli Institute for International Studies at Stanford University. He also assumed positions as a professor in the Stanford School of Engineering's Department of Management Science and Engineering and a senior fellow at FSI. The center, traditionally co-directed by a scientist and social scientist since its founding in 1983, draws from a range of disciplines to focus on current problems in international security.

Hsiu-Wen Wang (Indiana University, Bloomington) and **Christian Long** (University of Maryland) have each been awarded a **Bruker AXS 2006 Excellence in X-Ray Diffraction Scholarship**. Wang was honored for unique applications in the category of Geology and Chemistry; the title of her winning paper is "Dehydration/Rehydration Induced Phase Transitions in Natrolite." Long was honored for unique applications in the category of Materials Science; his paper is entitled "Rapid Structural Mapping of the Ternary Metallic Alloy Systems Using the Combinatorial Approach and Cluster Analysis." **Honorary mentions** went to **Matt Izawa** (University of Western Ontario) and **Svetlana Neretina** (McMaster University, Ontario). □

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