CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY

University of Illinois at Urbana Champaign

Center for Nanoscale
Chemical-Electrical-Mechanical
Manufacturing Systems

Structure-Function Relationships of Nanomaterials and their Toxicity

Traditionally, nanotechnology has been motivated by the growing importance of very small (d < 50nm) medicinal, computational, and optical elements in diverse technologies. Our effort has considered broadly how these features can be leveraged in environmental technologies. We consider how the nano/bio interface manifests itself in cell culture systems, thus giving an indication of the toxic effects of a nanoparticle. For example, we consider the environmental chemistry and biological interactions of a model nanostructure, carbon-60 (C60). Though a hydrophobic substance, fullerenes form stable, sub-micron, colloidal clusters which can persist in water for long times under a variety of conditions. This behavior makes fullerenes more accessible to biological systems and permits them to have a marked effect on bacteria and cells in culture. However, it is the structure of the C60 aggregate that determines its function in a biological entity. Specifically, the more water-soluble derivatives are covalently attached to the surface of the C60 cage, the less toxic it becomes. The ability to change the structure of the nanomaterial, thus tune its toxicity, will indeed greatly advance the current research in drug delivery, diagnosis, and patient recovery.

Wednesday, February 22, 2006
4:00 pm
B02 Coordinated Science Lab

Vicki Colvin
Center for Biological and Environmental Nanotechnology
Rice University, Houston, TX

Dr. Vicki Colvin received her Bachelor's degree in chemistry and physics from Stanford University in 1988, and in 1994 obtained her Ph.D. in chemistry from the University of California, Berkeley, where she worked under the guidance of Dr. Paul Alivisatos. During her time at the University of California, Berkely, Colvin was awarded the American Chemical Society's Victor K. LaMer Award for her work in colloid and surface chemistry. Colvin completed her postdoctoral work at AT&T Bell Labs. In 1996, Colvin was recruited by Rice University to expand its nanotechnology program. Today, she serves as Professor of Chemistry at Rice University as well as Director of its Center for Biological and Environmental Nanotechnology (CBEN). CBEN was one of the nation's first Nanoscience and Engineering Centers funded by the National Science Foundation. One of CBEN's primary areas of interest is the application of nanotechnology to the environment. Colvin has received numerous accolades for her teaching abilities, including Phi Beta Kappa's Teaching Prize for 1998-1999 and the Camille Dreyfus Teacher Scholar Award in 2002. In 2002, she was also named one of Discover Magazine's "Top 20 Scientists to Watch" and received an Alfred P. Sloan Fellowship. Colvin is also a frequent contributor to Advanced Materials, Physical Review Letters and other peer-reviewed journals, and holds patents to four inventions.