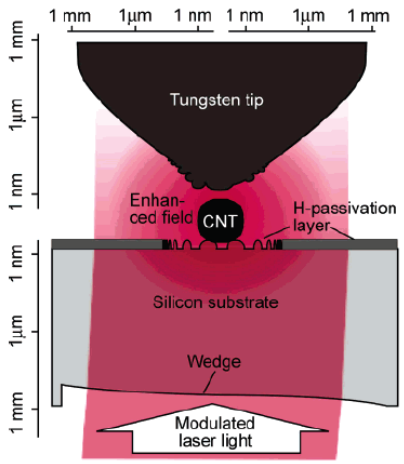
NANOHOUR

Wednesday, October 17, 2007
3:00 PM, Beckman Institute - Room 3269

Single Molecule Absorption Detected by Scanning Tunneling Microscopy

Erin Carmichael - Graduate student in Chemistry



Carmichael et. al. J. Phys. Chem. C 2007, 111, 3314-3321

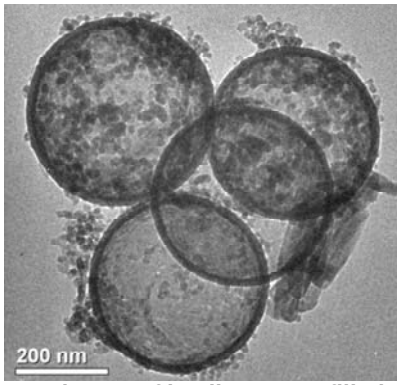
Scanning tunneling microscopy (STM) consistently provides the highest spatial resolution among the scanning probe methods, allowing surfaces to be investigated on the atomic level. With the addition of optical excitation, STM promises to become a powerful technique for single molecule spectroscopy, enabling one to examine the response of single molecules on a surface. Atomic scale laser-assisted STM has thus far remained an elusive goal, with few recent experiments reaching sub-nanometer resolution. This is due to the many difficulties faced as a result of light perturbing the tunneling junction. We combine a novel rear illumination geometry with frequency-modulated laser excitation to probe the optical absorption of single-walled carbon nanotubes on silicon surfaces. Modulations in the local electronic density of states can be detected with near-atomic resolution and measurements of the molecular absorption coefficients can provide information about the chirality of a nanotube.

AND

Nanostructured Materials for Self-healing

Ben Blaiszik - Graduate student in Theoretical and Applied Mechanics

We have developed an *in situ* encapsulation method demonstrating over an order of magnitude size reduction for the preparation of urea-formaldehyde (UF) capsules filled with a healing agent, dicyclopentadiene (DCPD). Capsules with diameters as small as 220 nm are achieved using sonication techniques and an ultrahydrophobe to stabilize the DCPD droplets. The capsules possess a uniform UF shell wall (77 nm average thickness) and display good thermal stability. By controlling the ζ-potential, the capsules are uniformly dispersed in an epoxy matrix and shown to cleave rather than debond upon fracture of the matrix. Mechanical properties of the composite, including mode-I fracture toughness, elastic modulus, and ultimate tensile strength are measured and compared to previous data for larger capsules (ca. 180 μm).



TEM image of healing agent filled nanocapsules produced for use in advanced composite materials.

Coffee and cookies will be served.
http://nanohour.beckman.uiuc.edu