NANOHOUR

Wednesday, May 3, 2006

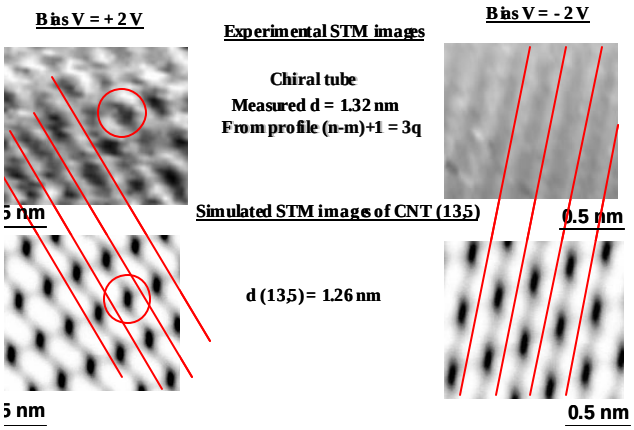
3:00 PM

Note room change: Beckman Institute - **Room 4269**

Determination of Single-Walled and Double-Walled Carbon Nanotube Chirality Using STM and Spectroscopy by Probing the Empty and Filled States

Noureddine Tayebi – Electrical and Computer Engineering Dept.

A tight-binding approach that allows for the prediction of scanning tunneling microscopy (STM) images and scanning tunneling spectroscopy (STS) of single-walled carbon nanotubes (SWNTs) on the Si(100) 2x1:H surface at room temperature (RT) is used in conjunction with experimental RT STM images and STS to precisely determine the chirality of SWNTs deposited on a silicon substrate. By applying a positive bias between the STM tip and the SWNT, the empty states of the SWNT are probed and bright stripes are observed around semiconducting SWNTs. The direction of these stripes is reversed upon probing the filled states of the SWNT (i.e., applying a negative bias between the tip and the SWNT). The direction of the bright stripes is highly dependent on the chirality of the SWNT and is due to the current enhancement that arises from the increase of the density of states of C-C bonds near the conduction band. This phenomenon is reversed under negative bias, where the density of states of the C-C bonds near the valence band dominates. For the case of a metallic SWNT, the direction of the bright stripes is not affected by the bias polarity. The direction of bright stripes is unique for a SWNT of given diameter and chirality under positive and negative biases. This behavior is exploited to determine the chirality of SWNTs by comparing simulated and experimental STM images and STS. The same procedure is used in conjunction with the Moiré pattern effect seen in double-walled nanotubes (DWNT) to determine both outer and inner tube chirality.

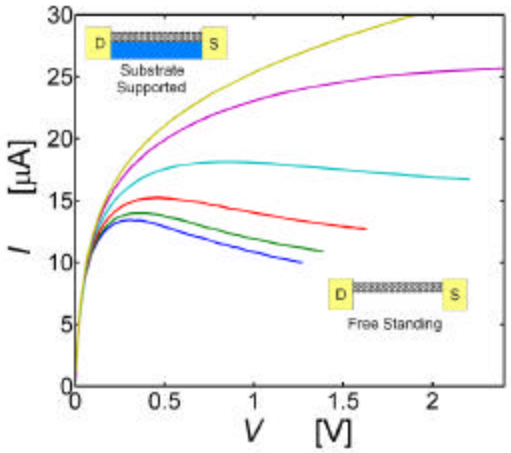


AND

Nonlinear electronic transport in metallic carbon nanotubes

Marcelo Kuroda – Physics Dept.

Metallic carbon nanotubes represent prominent materials as interconnects in nanoscale electronics. Recent experiments performed on individual nanotubes have shown that, unlike other metals, the IV characteristics present a nonlinear behavior in the high field regime. Moreoever, the features of these curves strongly depend on the experimental setup. In this talk, I will present a semiclassical model describing the transport in this systems where thermal effects are taken into account. The origins of the different features will be discussed and a comparison with the experimental data will be provided.



Coffee and cookies will be served.