Physics
AT QUEENS COLLEGE

Colloquium Notice

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Quantitative visualization of charge carrier transport in semiconductor nanowires

One-dimensional (1-D) nanomaterials in general and semiconductor nanowires in particular have begun to be explored extensively as promising building blocks for high-performance nanoscale devices. Their promises derive in part from expectations of exceptional electronic properties, such as enhanced charge carrier transport characteristics in 1-D. In this context, quantitative characterizations of carrier transport are desirable to substantiate these high expectations and to establish the performance limitations of nanowire-based devices. In addition, quantitative metrics of carrier transport can also be used to quantify the effects of nanowire surface passivation schemes being developed that aim to improve the device performance.

In this talk, quantitative visualization of carrier transport in semiconductor nanowires using a scanning photocurrent microscopy (SPCM) technique will be demonstrated. Specifically, analysis of the local photocurrent maps obtained by the SPCM technique enables the measurement of carrier diffusion length, a critical transport parameter that controls electronic and opto-electronic device performance, for bipolar and unipolar carrier transport processes in intrinsic (undoped CdS) and extrinsic (n-type Si) nanowires, respectively. In addition, the bipolar carrier diffusion length is found to be enhanced as a result of increased carrier lifetime and the electrostatic repulsion when electrons and holes are spatially separated, and this is supported by local transient (nanosecond) photocurrent measurements and photocurrent mapping under various excitation intensities.

Monday
October 29, 2007
Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326