



Seminar

Date: 15 July 2009 (Wednesday)
Time: 4:00 pm -5:00 pm
Venue: EF 305, The Hong Kong Polytechnic University

Thermal Transport and Thermoelectric Energy Conversion in Nanomaterials

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Abstract:

The high electron mobility and thermal conductivity of carbon nanotubes and graphene have drawn interest in their applications for nanoelectronic devices and thermal management solutions. Meanwhile, the suppressed thermal conductivity of various nanomaterials is being explored for improving the energy efficiency of thermoelectric devices. In an effort to evaluate the promises and challenges of these nanomaterials-enabled designs, we have developed a set of methods based on nanofabricated devices and scanning probe microscopy to characterize thermal transport and thermoelectricity at the individual nanostructure level. Our experiments reveal that thermal transport is limited by contact resistance in high-quality individual carbon nanotubes, and the thermal conductivity of a supported graphene nanoribbon is lower than that of graphite because of phonon scattering by substrate phonon modes. Interface scattering of phonons can be utilized to suppress the lattice thermal conductivity of semiconducting nanowires, layered thin films, and nano-dot composites. However, electron transport are also impacted by interfaces, making it a viable but delicate approach to suppressing the lattice thermal conductivity more than the power factor in order to enhance the thermoelectric figure of merit of some of the nanomaterials.

Biosketch:

Li Shi received a B.E. degree from Tsinghua University, Beijing in 1991, M.S. degree from Arizona State University in 1997, and Ph.D. degree in Mechanical Engineering from University of California at Berkeley in 2001. Dr. Shi was a Research Staff Member at IBM Research Division from 2001 to 2002. He joined UT Austin Department of Mechanical Engineering and Texas Materials Institute as an assistant professor in January 2002 and was promoted to associate professor in September 2006. He received the CAREER award from the National Science Foundation in 2003, the Young Investigator Award from Office of Naval Research in 2004, the ASME Transaction Journal of Heat Transfer Outstanding Reviewer Award in 2005, and the Myron L. Begeman Fellowship in Engineering at UT Austin in 2007.

* Refreshment will be served after the seminar.