

SPECIAL SEMINAR

The wonderful world of nanotechnology

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Room 226, Eng. Bldg #8, Hongo Campus, The University of Tokyo
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ABSTRACT

Owing to their extreme aspect ratio and atomic-scale perfection, nanometer-wide yet up to millimeter-long carbon nanotubes play an important role in nanotechnology. Their high intrinsic stiffness, in combination with a soft inter-tube interaction, gives rise to an unusual phonon spectrum in bundled or multi-wall tubes. Excitation of soft phonon modes initiates an uncommon orientational melting behavior of nanotube systems [1]. The hard phonon modes, with a very large mean free path, are responsible for an unprecedented thermal conductivity [2]. Nanotubes may also play an important role as atomic-level pumps. Atoms can be dragged along by an electric current, which is excited by single-photon or coherent two-photon excitations [3,4]. Applied Coulomb field can drive even larger molecules, such as metallofullerenes, along nanotubes in the "bucky-shuttle" [5] or in peapods.

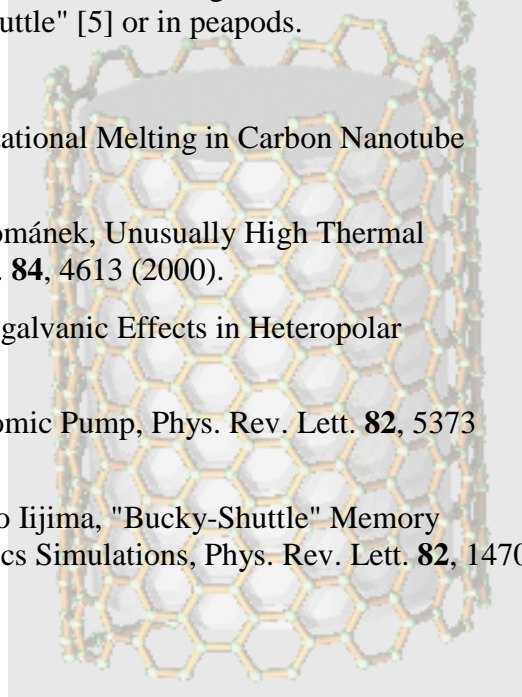
[1] Young-Kyun Kwon and David Tománek, Orientational Melting in Carbon Nanotube Ropes, *Phys. Rev. Lett.* **84**, 1483 (2000).

[2] Savas Berber, Young-Kyun Kwon and David Tománek, Unusually High Thermal Conductivity of Carbon Nanotubes, *Phys. Rev. Lett.* **84**, 4613 (2000).

[3] Petr Král, E.J. Mele, and David Tománek, Photogalvanic Effects in Heteropolar Nanotubes, *Phys. Rev. Lett.* **85**, 1512 (2000).

[4] Petr Král and David Tománek, Laser Driven Atomic Pump, *Phys. Rev. Lett.* **82**, 5373 (1999).

[5] Young-Kyun Kwon, David Tománek, and Sumio Iijima, "Bucky-Shuttle" Memory Device: Synthetic Approach and Molecular Dynamics Simulations, *Phys. Rev. Lett.* **82**, 1470 (1999).



Picture from <http://www.pa.msu.edu/~tomanek/gallery/>

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