PTH 16 **Optical absorption and photoluminescence excitation spectroscopy of SWNTs in UV-Vis range**

Yuhei Miyauchi, Zhengyi Zhang, Shigeo Maruyama
Department of Mechanical Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan

In our previous study [1], we have found that some PL peaks for cross-polarized excitation to the nanotube axis can be clearly observed in the PLE spectra of isolated SWNTs.
In this study, we focus on optical absorption and polarized PLE spectra for UV-Vis range. In Vis to UV range, there exist small but nonzero intensity tails for perpendicular excitation above the distinct peaks of parallel (E22) excitation. The PL intensities corresponding to the perpendicular excitation were almost comparable to those for the parallel excitation in a certain energy region.
In addition, we studied details of optical absorption of SWNTs in UV range by comparing optical absorption and PLE spectroscopy. In an optical absorption spectrum of SWNTs in UV range, there are two major peaks corresponding to parallel ($\approx$ 4.5 eV) and perpendicular ($\approx$ 5.25 eV) excitations. We compared absorption and PLE spectra and found there is no feature corresponding to $\approx$ 4.5 eV peak in the PLE spectra. Since only semiconducting SWNTs contribute to PLE spectra, this result suggests that the $\approx$ 4.5 eV peak is only for metallic nanotubes.
[1] Y. Miyauchi, M. Oba, S. Maruyama, Phys. Rev. B 74, (2006) 205440.

PTH 17 **Mixing of the A_1-modes in carbon nanotubes**

Marcel Mohr[1], Maria Machón[1], Christian Thomsen[1], Ivanka Milošević[2], Milan Damnjanović[2]
[1]Institut für Festkörperphysik, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin, Germany
[2]Faculty of Physics, University of Belgrade, POB 368, 11011 Belgrade, Serbia

Electron-phonon coupling (EPC) is a key magnitude in carbon materials like graphite or nanotubes, with important consequences on electronic transport or Raman intensities. In nanotubes, symmetry allows a mixing of the radial-breathing mode (RBM) and the high-energy modes (HEMs), often regarded as independent otherwise. This mixing has considerable effects on the electron-phonon coupling of carbon nanotubes. We compare electron-phonon coupling matrix elements $\mathcal{M}_{e-ph}$ obtained from ideal and mixed modes. The ideal RBM is purely radial and the ideal HEMs are directly derived from the E_{2g}-mode of graphene. We obtain the degree of mixing by a variational approach based on density-functional theory calculations. We find that the actual RBMs and HEMs differ from the ideal, irrespective of the nanotube chirality. Calculations of $\mathcal{M}_{e-ph}$ for the ideal RBM leads to deviations of up to 60 % showing the importance of a correct calculation of the eigenvectors. Since the observed intensity of Raman peaks is proportional to $|\mathcal{M}_{e-ph}|^2$ this effect is relevant for the optical characterization of nanotube abundance. The mixing also influences the calculation of phonon frequencies: while the frequency of the RBM is only slightly changed, we find deviations up to $50\,\mathrm{cm}^{-1}$ for the HEM.

PTH 18 **Disorder and mesoscopic transport in few-layer graphene**

Françoise Molitor[1], Davy Graf[1], Thomas Ihn[1], Klaus Ensslin[1], Christoph Stampfer[2], Alain Jungen[2], Christofer Hierold[2]
[1]Solid State Physics Laboratory, ETH Zurich, 8093 Zurich, Switzerland [2]Micro and Nanosystems, ETH Zurich, 8092 Zurich, Switzerland

We investigate effects of disorder in few-layer graphene observed by Raman spectroscopy and transport measurements.
At the transition from few-layer to single-layer graphene flakes, the G line of the Raman spectrum shifts to higher wave numbers [1]. This shift in the G peak position is, however, not constant in space but fluctuates within a given section. This can be attributed to inhomogeneities in the flake possibly related to doping variations leading to the shift [2,3].
Additionally we report on transport measurements on a few-layer graphene wire with a phase coherence length at low temperatures larger than the wire width, but comparable to the wire length [4]. By analyzing the weak localization peak in the one-dimensional dirty-metal regime, we find a density dependence of the quantum corrections to the conductivity. Side gates allow us to tune the Fermi energy locally and to change the disorder configuration for a fixed Fermi level.
[1] D. Graf et al., Nano Lett., accepted, cond-mat/0607562
[2] D. Graf, F. Molitor, K. Ensslin, C. Stampfer, A. Jungen, C. Hierold and L. Wirtz, submitted
[3] S. Pisana et al., cond-mat/0611714
[4] D. Graf, F. Molitor, T. Ihn and K. Ensslin, in preparation