Photoluminescence studies of cross-polarized absorption of single-walled carbon nanotubes

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Though our previous studies of photoluminescence (PL) of single-walled carbon nanotubes (SWNTs) consisting of carbon-13 ($SW^{13}CNTs$) synthesized from isotopically modified ethanol [1], we have found the excitonic phonon sideband peak due to the strong exciton-phonon interaction with the expected isotope shift [2]. Phonon sideband features observed for (7,5) and (6,5) nanotubes are remarkably similar to the excitonic phonon sideband predicted by Perebeinos *et al.* [3]. In addition to these phonon sideband features, we also found low-intensity 'pure electronic' peaks whose origin has never been discussed. In order to examine these 'pure electronic' features, polarized PLE measurements on individually-dispersed SWNTs aligned in a gelatin-based thin film. By comparing optical transitions of SWNTs for incident light parallel or perpendicularly polarized to the nanotube axis, we have attributed these features to excitation by cross-polarized light to the nanotube axis. Finally, the cross-polarized absorption energies and line-shapes are compared with cross-polarized version of the Kataura plot.

References:

[1] S. Maruyama and Y. Miyauchi, AIP Conf. Proc. 786, 2005, 100-105.

[2] Y. Miyauchi and S. Maruyama, cond-mat/0508232.

[3] V. Perebeinos, J. Tersoff, Ph. Avouris, Phys. Rev. Lett. 94, 027402 (2005).