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

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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 (≈ 4.5 eV) and perpendicular (≈ 5.25 eV) excitations. We compared absorption and PLE spectra and found there is no feature corresponding to ≈ 4.5 eV peak in the PLE spectra. Since only semiconducting SWNTs contribute to PLE spectra, this result suggests that the ≈ 4.5 eV peak is only for metallic nanotubes.