Optical absorption intensity of semiconductor single-wall carbon nanotubes

○Y. Oyama[1], R. Saito[1], A Grüneis[1], J. Jiang[1], Y. Miyauchi[2], S. Maruyama[2]

[1]*Department of Physics, Tohoku University and CREST JST, Sendai 980-8578*
[2]*Department of Mechanical Engineering, The University of Tokyo, Tokyo 113-8656*

Near-infrared fluorescence spectroscopy made it possible to measure the chirality distribution of single-wall carbon nanotubes (SWNT) synthesized by alcohol CCVD (ACCVD) method and HiPco method [1]. The emission intensity of SWNTs is determined from the emission intensity of a SWNT and the abundance of SWNTs. We present the emission intensity of a SWNT by calculating optical absorption matrix element. Combined with experimental results, the abundance of the SWNT for ACCVD and HiPco are given as a function of (n,m). The calculated intensity is obtained by integrating near van Hove singularity energy. The optical absorption intensity is inversely proportional to the diameter in the unit of per carbon atom. The chiral angle dependence for a given diameter is small compared with the chirality dependence of photoluminescence observation. Thus near-armchair nanotubes grow selectively for the diameter less than 0.8nm. This selection is understood by the stability of the cap in the early stage of SWNT formation.

[1] Y. Miyauchi, S. Chiashi, Y. Murakami, Y. Hayashida, S. Maruyama, *Chem. Phys. Lett.* **387** 198 (2004)

Corresponding Author: Yuji Oyama
E-mail address: oyama@flex.phys.tohoku.ac.jp
Tel: +81-22-217-7754 Fax: +81-22-217-6447