

Dependence of exciton transition energy of single-walled carbon nanotubes on surrounding dielectric materials

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Optical transition energies of single-walled carbon nanotubes (SWNTs) are strongly affected by the change of environment around SWNTs [1]. In this report, we theoretically investigate the dependence of exciton transition energies on dielectric constant of surrounding materials. We make a simple model for the relation between dielectric constant of environment and a static dielectric constant describing the effects of electrons in core states, σ bonds and surrounding materials [2]. Although the model is quite simple, calculated results well reproduce the feature of experimentally observed transition energy dependence on dielectric constant of various surrounding materials, and various d_t and θ . One of the authors (Y.M.) was supported through the 21st Century COE Program, Mechanical Systems Innovation, by the Ministry of Education, Culture, Sports, Science and Technology. [1] Y. Ohno, S. Iwasaki, Y. Murakami, S. Kishimoto, S. Maruyama, T. Mizutani, arXiv:0704.1018v1 [cond-mat.mtrl-sci] (2007). [2] Y. Miyauchi, R. Saito, K. Sato, Y. Ohno, S. Iwasaki, T. Mizutani, J. Jiang, S. Maruyama, arXiv:0704.1380v1 [cond-mat.mtrl-sci] (2007).