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Analysis of Photoluminescence from Solubilized Single-Walled Carbon Nanotubes

M. Jones, C. Engtrakul, T.J. McDonald, R.J. Ellingson, W. J. Metzger, M.J. Heben and G. Rumbles

National Renewable Energy Laboratory, 1617 Cole Boulevard, Golden, Colorado 80401-3393, USA

Using both steady-state and time-resolved photoluminescence spectroscopy, we have successfully detected luminescence from a number of SWNT samples over a wide spectral range. The detection of photoluminescence from isolated, single-wall carbon nanotubes[1] in solution has opened up a new avenue for exploring the properties of individual nanotubes of a known diameter and chirality. In addition to providing a valuable tool for evaluating different SWNT preparation methods, it also provides an insight into the nature of the absorbing and emitting species and the factors that influence their creation and decay. In this presentation, we report results on the determination of the photoluminescence quantum yields and excited state lifetimes from discrete SWNTs. Using spectral deconvolution procedures, we will also discuss the origin of the Lorentizian lineshape function and the appearance of high energy absorption features that are always associated with the main absorption transition.

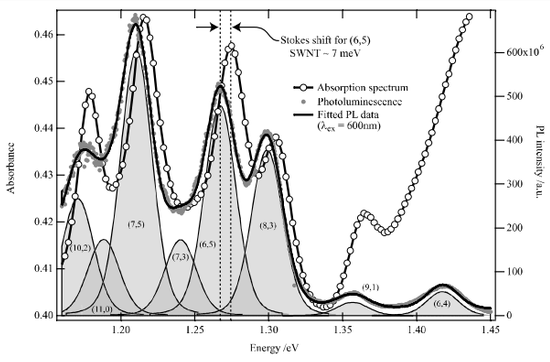

Figure 1. Absorption and fitted PL spectra. The fitted Voigt profiles (shaded) illustrate the individual SWNT PL components and allow a more accurate determination of the Stokes shift.

The role of excitons in describing these experimental data will be discussed and compared with the single-particle picture of the van Hove singularities. We will also discuss the coupling of the excitons with the bath and show this affects the electronic dephasing mechanism.

1. Bachilo, S.M., et al., *Structure-assigned optical spectra of single-walled carbon nanotubes.* Science, 2002. **298**(5602): p. 2361-2366.