BAND GAP PHOTOLUMINESCENCE FROM SINGLE-WALL CARBON NANOTUBES

Unprocessed single-wall carbon nanotubes (SWNTs) in air, at room temperature can be made to emit photoluminescence (PL) when suspended on common substrates [1]. The results are broadly consistent with earlier report of PL from SWNTs in a surfactant solution [2]. A sharp, bright PL peak is associated with each SWNT species, with overall emission from the nanotube ensemble extending over a broad range of wavelengths. The mechanism of the PL is electron-hole recombination through the direct bandgap of semiconducting SWNTs. Our experimental technique enables detailed study of the optical properties on both the microscopic and macroscopic scales, and it is a convenient method for rapid chirality-dependent characterization. The results of detailed study using a variety of optical methods, including both resonant and non-resonant excitation, will be presented. Given their remarkable optical properties, it seems likely that the SWNT material system will ultimately emerge in practical optoelectronic applications.

[1] J. Lefebvre, Y. Homma, and P. Finnie, Phys. Rev. Lett. **90**, 217401 (2003).
[2] M. J. O'Connell *et al.*, Science **297**, 593 (2002).