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Carbon Nanotube Population Analysis from Raman and Photoluminescence Intensities[1] ADO JORIO, UFMG, C. FANTINI, UFMG, P.A.T. ARAUJO, UFMG, M.A. PIMENTA, UFMG, D.A. HELLER, UIUC, M.S. STRANO, UIUC, M.S. DRESSELHAUS, MIT, Y. OYAMA, Tohoku Univ., J. JIANG, Tohoku Univ., R. SAITO, Tohoku Univ. — Large efforts are now being directed to developing synthesis or manipulation processes able to generate single-wall carbon nanotubes (SWNT) with well-defined geometric structure, i.e. (n, m) indices. The (n, m) population in a SWNT sample can be obtained from intensity analysis of photoluminescence excitation (PLE) and Resonance Raman spectroscopy (RRS) experiments, after the information is corrected to account for the (n, m) dependence of the RRS and PLE efficiency. In the absence of standard single-wall carbon nanotube samples with well-known (n,m) population, we provide both a photoluminescence excitation (PLE) and resonance Raman scattering (RRS) analysis that together can be used to check the calculations for PLE and RRS efficiency. We show that available models describe well the chirality dependence of the intensity ratio, confirming the differences between type 1 and type 2 semiconducting tubes and the existence of a node in the radial breathing mode intensity for type 2 carbon nanotubes with chiral angles between 20° and 25°. The method is used to characterize SWNT samples grown by the CoMoCAT, HiPco and alcohol-CVD processes.

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