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Resonance Raman Spectroscopy of Chirality Enriched Semiconducting Carbon Nanotubes A. R. HIGHT WALKER, Y. PIAO, NIST, J. R. SIMPSON, TU and NIST, M. LINDSAY, J. K. STREIT, G. AO, M. ZHENG, J. A. FAGAN, NIST — Relative intensities of resonant Raman RBM and G modes of 11 chirality-enriched SWCNT species were established under second-order excitation. Results demonstrate an under-recognized complexity in evaluation of Raman spectra for assignment of (n,m) population distributions. Strong chiral angle and mod dependencies affect the intensity ratio of RBM/G modes and can result in misleading interpretations. We report 5 new (n,m) values for chirality-dependent G^+ and G^- Raman peak positions and intensity ratios, extending the available data to cover smaller diameters down to (5,4). The Raman spectral library sufficiently decouples G peaks from multiple species and enables fundamental characterization in mixed chirality samples. Our results on dispersive properties of the D modes will also be discussed. Probing defects is crucial to evaluate SWCNT quality and to understand the photophysics behind defect-induced optoelectronic features. Using high-quality, chirality-enriched semiconducting SWCNTs and tunable lasers, our results show a non-dispersive D band throughout the resonant window within the same (n,m). Our results were validated by multiple (n,m) samples and intentional covalent surface functionalization generating D peaks with increased intensity, which remain non-dispersive.

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