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Evidence of Intertube Excitons Observed in the Raman Resonance Excitation Profiles of $(6,5)$-Enriched SWCNT Bundles J. R. SIMPSON, TU and National Institute of Standards & Technology (NIST), A. R. HIGHT WALKER, NIST, O. ROSLYAK, Fordham University, E. HAROZ, H. TELG, J. G. DUQUE, J. J. CROCHET, A. PIRYATINKSKI, S. K. DOORN, Los Alamos National Laboratory — Understanding the photophysics of exciton behavior in single wall carbon nanotube (SWCNT) bundles remains important for opto-electronic device applications. We report resonance Raman spectroscopy (RRS) measurements on $(6,5)$-enriched SWCNTs, dispersed in aqueous solutions and separated using density gradient ultracentrifugation into fractions of increasing bundle size. Near-IR to UV absorption spectroscopy demonstrates a redshift and broadening of the main excitonic transitions with bundling. A continuously tunable dye laser coupled to a triple-grating spectrometer affords measurement of Raman resonance excitation profiles (REPs) over a range of wavelengths, (505 to 585) nm, covering the $(6,5)$-E_{22}^S excitation. REPs of both the radial breathing mode (RBM) and $\mathrm{G}_{\mathrm{LO}}^+$ reveal a redshifting and broadening of the $(6,5)$ E_{22}^S transition energy with increasing bundle size. Most interestingly, we observe an additional peak in both the RBM and $\mathrm{G}_{\mathrm{LO}}^+$ REPs of bundled SWCNTs, which is shifted lower in energy than the main E_{22}^S and is anomalously narrow. We attribute this additional peak to a transverse, intertube exciton.

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