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Resonance Raman spectroscopy of length fractionated single-walled carbon nanotubes[1] A. HIGHT WALKER, J.A. FAGAN, B.J. BAUER, E.K. HOBBIE, J.R. SIMPSON, National Institute of Standards and Technology, Gaithersburg, MD 20899 — In many potential applications of single-walled carbon nanotubes (SWNTs), the difficulty of separating nanotubes by their structural properties, *e.g.*, length and chirality, remains an impediment to their widespread implementation. Our studies include HiPco, CoMoCat, and arc-discharge SWNTs wrapped with 30-mer 5'-GT$(GT)_{13}$-3' single-stranded DNA and dispersed in solution. These samples display an exceptionally low degree of SWNT bundling and clustering, in the limit of nanodispersion.[2] Size-exclusion chromatography collects length fractions ranging in size from $< 100\,\mathrm{nm}$ to $\approx 400\,\mathrm{nm}$. Multi-angle light scattering, AFM, and TEM characterize the length distribution of each fraction. We measure resonance Raman spectroscopy (RRS) over a wide range of laser excitation wavelengths for vibrational modes including the radial breathing mode (RBM) and higher order graphite modes. All modes exhibit a monotonic increase of Raman scattering intensity with increasing nanotube length. We discuss these results in terms of an optical scattering model. Furthermore, we hybridize these length separated fractions with complimentary DNA sequences functionalized with nanoparticles to study the effects of DNA-wrapping on SWNT properties.

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[2]J. A. Fagan *et al.*, J. Phys. Chem. B (in press).

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