

ENRICHMENT OF ARMCHAIR CARBON NANOTUBES VIA DENSITY GRADIENT ULTRACENTRIFUGATION: RESONANT RAMAN SCATTERING POPULATION MAPPING

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Using resonant Raman scattering spectra collected over a broad range of excitation wavelengths (440-850 nm), we have constructed Raman excitation profiles of the radial breathing mode phonon for each (n,m) species present in as-produced and metal-enriched single-walled carbon nanotube ensemble samples. From this, we determine the relative abundances of all metallic and semiconducting chiralities. Strikingly, the data clearly show that our density gradient ultracentrifugation (DGU) process enriches the metal-enriched sample in armchair and near-armchair species. In particular, we observe that armchair carbon nanotubes constitute more than 50% of each metallic $(2n + m)$ family and $\sim 70\%$ of the entire metal-enriched sample. Such data combined with absorption and photoluminescence measurements elucidate elements of the mechanism of the DGU metallic type-enrichment process and the importance of surfactant micelle composition. Finally, we compare our measured relative abundances determined from Raman spectroscopy to absorption area estimates to assess the validity of the usage of absorption spectroscopy for determining % metallicity of ensemble nanotube samples.