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Towards Single-Chirality Armchair Carbon Nanotube Ensembles using Combined Size Exclusion Chromatography and Density Gradient Ultracentrifugation ERIK HAROZ, JUNICHIRO KONO, ROBERT HAUGE, Rice University, STEPHEN DOORN, Los Alamos National Laboratory, CONSTANTINE KHRIPIN, MING ZHENG, National Institute for Standards and Technology — Recently, density gradient ultracentrifugation (DGU) has been shown to produce aqueous ensembles enriched in armchair carbon nanotubes (CNTs), introducing new experimental insight into the photophysics of one-dimensional metals. However, despite these successes, DGU-produced armchair CNT ensembles contain multiple armchair species, which is not ideal for extracting chirality-specific optical quantities. Sample heterogeneity is partly due to tube-to-tube variability in other CNT properties such as end-capping, CNT diameter and length, resulting in differences in the observed CNT mass density. For example, CNT sedimentation velocity increases with decreasing tube length, resulting in a given CNT species appearing in multiple separated fractions after DGU. Here, using surfactant-based, size exclusion chromatography, high-concentration, uniform length CNT fractions were produced. These fractions were subsequently used for armchair enrichment DGU with the expectation that greater uniformity of the starting CNT material will lead to more monodispersed fractions, enhancing separation towards the goal of single-chirality armchair ensembles. The resulting separated fractions were analyzed using optical absorption and resonant Raman spectroscopy to assess improvement in separation.

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