



VINSE & NanoFemto Group Seminar

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Separating single-walled carbon nanotubes by electronic structure via density differentiation

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The heterogeneity of as-grown single-walled carbon nanotubes (SWNTs) limits their application in electronics, optics, and sensing. To address this problem, we have developed a method for sorting SWNTs by diameter, band gap, and electronic type (metallic versus semiconducting) using structure-discriminating surfactants to create subtle variations in their buoyant densities. Via the scalable technique of density gradient ultracentrifugation, we have isolated narrow distributions of SWNTs in which > 97% are within a span of 0.02 nm in diameter. Additionally, utilizing competing mixtures of co-surfactants, we have generated bulk quantities of SWNTs of predominantly a single electronic type. The latter were employed to fabricate thin film electrical devices of networked SWNTs characterized by either metallic or semiconducting behavior. In addition to enabling applications in electronics, these sorted SWNTs are expected to facilitate the study of SWNT-photophysics and permit applications in opto-electronics.