

Highly Efficient Exfoliation of Individual Single-Walled Carbon Nanotubes by Biocompatible Phenoxyated Dextran

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Highly efficient exfoliation of individual single-walled carbon nanotubes (SWNTs) was successfully demonstrated by utilizing biocompatible phenoxyated dextran, a kind of polysaccharide, as a SWNT dispersion agent. Phenoxyated dextran shows greater ability in producing individual SWNTs from raw materials than any other dispersing agent, including anionic surfactants and another polysaccharide. Furthermore, with this novel polymer, SWNT bundles or impurities present in raw materials are removed under much milder processing conditions compared to those of ultra-centrifugation procedures. There exists an optimal composition of phenoxy groups (~13.6 wt%) that leads to the production of high-quality SWNT suspensions, as confirmed by UV-vis-nIR absorption and nIR fluorescence spectroscopy. Furthermore, phenoxyated dextran strongly adsorbs onto SWNTs, enabling SWNT fluorescence even in a solid-state film in which metallic SWNTs co-exist. By bypassing ultra-centrifugation, this low-energy dispersion scheme can potentially be scaled to industrial production levels.