Supramolecular Functionalization of Carbon Nanotubes Using Poly(2,7-carbazole)s

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A novel 2,7-carbazole monomer unit was synthesized and used to prepare two poly(2,7-carbazole)s, a homopolymer and an alternating copolymer with 2,7-fluorene. Both polymers were obtained in relatively high molecular weight, and both display excellent solubility in common organic solvents. The carbazole polymers were able to effectively disperse single-walled carbon nanotube bundles in both THF and toluene using a relatively simple procedure to yield concentrated polymer-carbon nanotube samples that were stable for months. The polymer-coated carbon nanotube samples were characterized by thermogravimetric analysis, atomic force microscopy, absorbance spectroscopy, photoluminescence mapping and Raman spectroscopy. It was found that the polymers used in this study preferentially interact with carbon nanotubes having diameters of 1.15 nm or less. Additionally, absorbance and photoluminescence data indicates that the dispersions are enriched in semiconducting nanotubes. Strong carbon nanotube fluorescence was observed in both photoluminescence mapping and Raman spectra of thin films of our polymer-carbon nanotube composites, indicating that our polymers are capable of keeping single-walled carbon nanotubes effectively debundled after removal of solvent. [1]