Functional Inks Based on Monodisperse Carbon Nanomaterials

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Carbon nanomaterials have attracted significant attention due to their potential to improve applications such as transistors, transparent conductors, solar cells, batteries, and biosensors [1]. This talk will highlight our latest efforts to develop solution-phase strategies for purifying, functionalizing, and assembling carbon nanomaterials into functional arrays. For example, we have recently developed [2,3] and commercialized [4] a scalable technique for sorting surfactant-encapsulated single-walled carbon nanotubes (SWCNTs) by their physical and electronic structure using density gradient ultracentrifugation (DGU). The DGU technique also enables multi-walled carbon nanotubes to be sorted by the number of walls [5,6], and graphene to be sorted by thickness [7,8], thus expanding the suite of monodisperse carbon nanomaterials. The resulting monodisperse carbon nanomaterials enhance the performance of field-effect transistors [9,10], high frequency electronics [11,12], digital circuits [13], optoelectronic devices [14,15], sensors [16], structural composites [17], transparent conductors [18], catalysts [19], and photovoltaics [20,21]. By extending our DGU efforts to carbon nanotubes and graphene dispersed in biocompatible polymers (e.g., DNA, Pluronics, and Tetronics) [22-24], new opportunities have emerged for monodisperse carbon nanomaterials in biomedical applications.

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