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Structure of DNA-Carbon Nanotube Hybrids[1] SURESH MANOHAR, ANAND JAGOTA, Lehigh University, XIAOMIN TU, MING ZHENG, National Institute of Standards and Technology — Hybrids of single-stranded DNA (ssDNA) and carbon nanotubes (CNT) render the latter water-dispersable and have allowed their separation by chirality. ssDNA adsorbs on the CNT through π stacking while the negatively charged DNA backbone stabilizes the hybrid in solution. DNA-CNT hybrids have many potential applications in medicine and materials science. These include their use for imaging and as probes inside the cell, for thermal ablation to destroy cancer cells, and the sorting and patterned placement of CNTs. We have recently reported that sorting of CNTs occurs by recognition of individual chirality semiconducting CNTs by special ssDNA sequences. As the basis of this recognition we have proposed a novel ordered form for DNA analogous to the protein β-sheet and β-barrel structures. Using molecular dynamics simulations, we show that this structure is stabilized by interactions with the CNT substrate. We present experimental evidence supporting the existence of hydrogen-bond based ordering in special sequences, and discuss the structure and topology of these new secondary structures.

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