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Nanoscale Structure and Interaction of Compact Assemblies of Carbon Nano-Materials. RAJU TIMSINA, XIANGYUN QIU, Geroge Washington University, Washington DC — Carbon-based nano-materials (CNM) are a diverse family of multi-functional materials under research and development world wide. Our work is further motivated by the predictive power of the physical understanding of the underlying structure-interaction-function relationships. Here we present results form recent studies of the condensed phases of several model CNMs in complexation with biologically derived molecules. Specifically, we employ X-ray diffraction (XRD) to determine nanoscale structures and use the osmotic stress method to quantify their interactions. The systems under investigation are dsDNA-dispersed carbon nanotubes (dsDNA-CNT), bile-salt-dispersed carbon nanotubes, and surfactant-assisted assemblies of graphene oxides. We found that salt and molecular crowding are both effective in condensing CNMs but the resultant structures show disparate phase behaviors. The molecular interactions driving the condensation/assembly sensitively depend on the nature of CNM complex surface chemistry and range from hydrophobic to electrostatic to entropic forces.

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