Characterizing the adsorption of molecules onto SWCNTs

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Surfactants or ligands play an important role in the dispersion of nanomaterials. However, characterizing the structure of these molecular layers remains difficult. Understanding and ultimately controlling these surface layers is important because of its influence on reactivity, adsorption of pollutants, and interaction with biological materials. For example, we have shown that the interaction of single walled carbon nanotubes (SWCNTs) with agarose-based gels is controlled by the structure of the surfactant. The structure of the surfactant or other molecules around the SWCNTs could also have important implications in environmental remediation and drug delivery. Because SWCNTs are an ideal chemical sensor, changes to the local environmental surrounding SWCNT can be tracked by photoluminescence (PL). Proton NMR is another probe that can monitor the interaction of molecules with the surfactant surrounding the SWCNTs. Analyzing the chemical shifts and relaxation times allow the location of molecules to be determined (i.e., preferred interaction with the head or tail groups of the surfactant). By combining PL and Proton NMR analysis, we aim to understand the formation and morphology of both surfactant and solvent structures around SWCNTs. We find that solvents and amino acids have different adsorption sites that influence the PL properties of the SWCNTs. The aim is to learn how to control these structures around SWCNTs to influence their interaction with biological materials and other surfaces.