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Influence of van der Waals contact forces on the deformation mechanics of thin flexible membranes assembled from metallic or semiconducting single-wall carbon nanotubes[1] ERIK K. HOBBIE, JOHN HARRIS, SWATHI IYER, NDSU, JI YEON HUH, JEFFREY A. FAGAN, STEVEN D. HUDSON, CHRISTOPHER M. STAFFORD, NIST — Thin membranes of single-wall carbon nanotubes (SWCNTs) assembled from either metallic or semiconducting SWCNTs are subjected to the compressive strains imposed by a stretched elastic substrate, and the mechanical characteristics of the membranes are inferred from the topography of the wrinkling instability that emerges. By depositing comparable films on quartz, we also use optical (UV-Vis-NIR) absorption spectroscopy to compute the effective London dispersion spectra of the purified materials, and from these we compute the attractive part of the van der Waals potential between nanotubes of identical electronic type as a function of separation and relative orientation. We find significant differences in the strength and shape of the contact potential depending on electronic type, which in turn are evident in the modulus and yield strain measured from the deformation of the films.

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