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Alignment of SWNT in Electrospun SWNT-Polymer Composite Fibers

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Alignment of single-wall carbon nanotubes within polymer composites is critical for applications requiring anisotropic electrical and thermal conductivity. Stable solutions of SWNT and polymers (including thermosets and biocompatible polymers such as PMMA, PEO, PVA, PVAc, PC) were electrospun to produce composite fibers with diameters varying from a few nanometers to hundreds of microns. High degrees of alignment of SWNT along the axis of the fibers were achieved as characterized by polarized microRaman spectroscopy of the SWNT within the fiber (up to 18:1 intensity ratio) for fibers of diameter less than ~ 20 microns. The strain-induced shift of the 2600 cm-1 Raman band of the SWNT inside the composites was used to investigate the load transfer to the nanotubes during their controlled mechanical loading. The ability to produce highly-aligned SWNT within electrospun polymer composite fibers offers numerous opportunities for nanotube-based membranes, fabrics, and other structures which will be discussed.

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