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From Carbon Nanotube Dispersion to Composite Nanofibers YACHIN COHEN, YAEL DROR, WAEL SALALHA, ALEXANDER L. YARIN, EYAL ZUSSMAN, Technion, Israel, WIM PYCKHOUT-HINTZEN, IFF, Fz Juelich, Germany — Composite polymer nanofibers containing single-walled carbon nanotubes (SWCNT) are fabricated by electrospinning. We describe the path from dispersing individual SWCNTs or thin bundles in water using amphiphilic polymers, through a structural characterization of the polymer conformation in the SWCNT/polymer hybrid to the characteristics of the electrospun composite nanofibers. An alternating copolymer of styrene and sodium maleate (PSSty) and gum arabic (GA)-a highly branched natural polysaccharide were successfully used to produce stable aqueous dispersions. Measurements of small angle neutron scattering (SANS) show that both polymers form a thick corona of adsorbed coils on the nanotubes. The large coils introduce a significant steric barrier stabilizing the dispersions, in addition to electrostatic repulsion by charged groups. The composite nanofibers showed good distribution and alignment of the SWCNTs in the poly(ethylene oxide) (PEO) nanfubers, as revealed by transmission electron microscopy. X-ray diffraction demonstrated a high degree of orientation of the PEO crystals in the electrospun nanofibers. Enhanced tensile properties were achieved due to the high degree of alignment of both nanotubes and polymer crystals, and a strong interface, especially with PSSty. The morphology and possible applications of these composite nanofibers will be discussed.

Yachin Cohen
Technion

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