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Optical properties of single-walled carbon nanotube aerogels[1]
GORDANA OSTOJIC, Northwestern University — A network of connected single-walled carbon nanotubes (SWNT) is created by a novel DNA-protein complex directed assembly. Due to a point-like nature of connectors, the SWNT aerogel represents a network of self-suspended nanotubes with a record ultra-low density of less 0.75 mg/cm^3. The assembly method and low density enables a direct comparison of optical properties of nanotubes in solvent and air to surfactant solubilized nanotubes. Optical properties of SWNT gels are investigated using optical absorption, photoluminescence and Raman spectroscopy. Gelled nanotubes in water and in the low population regime behave similar to solubilized nanotubes. In contrast, photoluminescence of SWNT aerogels exhibit nonlinear effects and a phonon-induced broadening. In addition, aerogels show a previously unobserved photoluminescence peak at 1.3 eV that corresponds to a phonon-assisted recombination of photoexcited charges. Raman spectra of carbon nanotube aerogels display narrow peaks due to the phonon decoupling of suspended SWNTs in air and a redistribution of G phonon population due to nonlinear effects.

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