Abstract Submitted
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Gelation of Freely Associating Single-Wall Carbon Nanotube Networks[1] DANIEL CHEN, Department of Physics and Astronomy, University of Pennsylvania, LARRY HOUGH, Rhodia Inc., MOHAMMAD ISLAM, Department of Chemical Engineering and Department of Materials Science and Engineering, Carnegie Mellon University, ARJUN YODH, Department of Physics and Astronomy University of Pennsylvania — We report on the rheological evolution of a model filamentous network comprised of a semidilute dispersion of Single-Wall Carbon Nanotubes (SWNT). Using microrheology, we follow the gelation of a surfactant stabilized SWNT suspension from an initial sol of contacting but unbonded SWNT, endpointing in a gel network with a finite, zero-frequency elastic modulus. The SWNT network exhibits all the hallmarks of a critical sol-gel transition, including divergence of the viscosity as the gel point is approached from below, emergence of a finite elastic shear modulus above the gel point, and power law scaling of the viscosity and shear modulus below and above the gel point, respectively. The viscoelastic moduli exhibit a remarkable collapse under time-cure superposition, a footprint of self-similarity in inter-tube bond connectivity. Additionally, we present a scheme to spatially map rheological inhomogeneities in the network during gelation.

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