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Time and Temperature Dependent Rheological Behavior of Single-Walled Carbon Nanotubes Dispersed in Thermoreversible Acrylic Copolymer & Alcohol Solutions ANDREW B. SCHOCH, KENNETH R. SHULL, MSE, Northwestern University, L. CATHERINE BRINSON, MSE & ME, Northwestern University — SWCNT stabilized by A-B diblock and A-B-A triblock copolymers are excellent model systems for studying the relationship between nanotube dispersion and mechanical response. We have investigated the mechanical properties of these materials with low-amplitude oscillatory shear rheological measurements. The solvent used here, 2-ethyl-1-hexanol, is a poor solvent for PMMA (A) at low temperatures but a good solvent for PnBA (B) over the entire temperature range studied. The solubility of the PMMA blocks in 2-ethyl-1-hexanol drives the formation of an elastic gel in the ABA triblock copolymer at low temperatures. In these SWCNT/copolymer materials the storage and loss moduli have been observed to increase with time at fixed temperature. When triblock copolymer gels are used as the matrix, we find that the aging effect is erased by cycling the temperature through the gel transition. An increase in storage modulus is observed upon cooling before the gel formation. However, the moduli revert back to lower values when the gel dissolves on heating. We believe this is a result of semi-permanent nanotube junctions being pulled apart when the gel forms. This reversibility is not observed when the nanotubes are dispersed in solutions of diblock copolymer, which do not form gels.

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