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Rheological Properties of Nanotube – Polymer Nanocomposites

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— Single walled carbon nanotubes represent the next generation of nanoparticles for the development of polymer nanocomposite materials with potential in multifunctional applications. We have successfully dispersed such SWNTs in various polymer nanocomposites and have recently examined the linear and non-linear viscoelastic measurements. The nanocomposites in the melt state of the polymer demonstrate solid – like behavior beyond a percolation threshold, which in many of these nanocomposites is below 0.1 wt % SWNT. The plateau modulus (corresponding to the stress supported by the percolated nanoparticle network structure) scales as the volume fraction of the SWNTs to the third power and inconsistent with current fractal models. The onset of the non-linear behavior occurs at progressively lower strain values with increasing SWNT concentration and is similar to other filled polymers. Interestingly the recovery of the polymer network following large strain is extremely slow and is similar to materials that are classified as soft- glassy materials.

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