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 multifunc-
tional applications. We have successfully dispersed such SWNTs in various polymer
nanocomposites and have recently examined the linear and non-linear viscoelas-
tic measurements. The nanocomposites in the melt state of the polymer demon-
strate 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 frac-
tal 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.