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In situ Raman Spectroscopy Study of Stress Transfer between Carbon Nanotubes and Amorphous Polymer MINFANG MU, Department of Materials Science and Engineering, University of Pennsylvania, SEBASTIAN OSSWALD, YURY GOGOSTI, Department of Materials Science and Engineering, Drexel University, KAREN WINEY, Department of Materials Science and Engineering, University of Pennsylvania — Stress transfer mechanism in single wall carbon nanotube (SWCNT) / poly(methyl methacrylate) nanocomposites was investigated using Raman spectroscopy on composite fibers. Without specific SWCNT-polymer interactions, the effective stress transfer to SWCNTs is limited to a small strain regime ($< 0.5\%$). At higher strain, the stress on SWCNTs decreases due to debonding at the nanotube-polymer interface. Debonding was also evident by scanning electron microscopy on fracture fiber surfaces produced by tensile testing. Overall, the presence of SWCNTs in composite fibers greatly improves their mechanical properties by two ways: a sufficient stress transfer at SWCNT-polymer interface and a SWCNT-induced polymer chain orientation. It was also observed that longer polymer chains transfer stress more effectively, and we attribute this to a greater extent of nanotube-polymer chain entanglement.

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