Preparation and Characterization of Polypropylene / MWCNT Dispersions SASWATI PUJARI, WESLEY BURGHARDT, THILLAIYAN RAMANATHAN, L. CATHERINE BRINSON, KOSMAS KASIMATIS, JOHN TORKELSON, Northwestern University — Dispersions of multiwall carbon nanotubes in polypropylene are prepared via melt batch mixing and solid-state shear pulverization, and characterized via linear viscoelastic measurements, SEM, polypropylene crystallization kinetics, electrical conductivity and dynamic mechanical analysis. Increasing the intensity or duration of the melt mixing leads to higher dispersion, evidenced by increases in a low-frequency elastic plateau and accelerated PP crystallization kinetics attributed to more effective heterogeneous nucleation. The sample prepared by pulverization exhibits faster crystallization kinetics than any of the melt blended samples, but in contrast shows no measurable low frequency elastic plateau. Electrical conductivity measurements similarly show higher conductivity in melt blended samples. This may be attributable to scission of the nanotubes during pulverization, such that even well dispersed tubes cannot form an entangled network at a given concentration. At the same time, pulverized composites show marked increase in stiffness at low loadings, indicating that tube scission due to pulverization is not catastrophic. Conversely, long mixing times required in melt blending cause substantial thermal degradation of the polymer matrix with a corresponding loss of mechanical properties.

Wesley Burghardt
Northwestern University

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