

Polymer-based Nanocomposites: Properties at the Nanoscale

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Properties at the nanoscale are of broad interest, and the technical challenges associated with the nanoscale cross-cut many disciplines, with issues ranging from electron transport to mechanical properties. Polymer-based nanocomposites, where a polymer serves as the host for nanoparticles, are of great current interest, with diverse applications from luminescence to automobile bumpers. The nature of nano-scale assemblies, which include carbon nanotubes, inorganic layered silicates (clays), fullerenes (buckyballs, C60) and various metallic nanoparticles, within the material determine the properties and hence the application of the nanocomposite.

In this presentation we discuss the effect of nano-scale assemblies, single-walled carbon nanotubes, layered silicates and C60 fullerenes, on the glass transition and mechanical properties of thin film and bulk polystyrene and polymethylmethacrylate. Perhaps one of the most striking findings of our study is that as little as 1 wt % nanoparticles can have a significant effect, shifting many degrees, on the T_g of thin PS films. We will discuss our results in light of current predictions.