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Role of Particle – Polymer Interactions on the Dynamics of Polymer Nanocomposites GUGLIELMO CAPUANO, University of Naples, RAMAKRISHNA PONNAPATI, University of Houston, DOMENICO ACIERNO, University of Naples, RAMANAN KRISHNAMOORTI, University of Houston — Understanding the physics of polymers in the presence of nanoparticle fillers is of crucial importance, since it can lead to the formulation of truly engineered, functional nanocomposites with unique features and broad commercial utilization. The thermomechanical behavior of polymer nanocomposites qualitatively resembles those of polymer films confined to the nanoscale. It has been recently hypothesized that the suppression of physical aging in PMMA/silica nanocomposites is primarily due to hindered mobility of polymer molecules resulting from hydrogen bonding with hydroxyl units on the silica. Further, when solid nanoparticles are dispersed in polymer melts adsorption of polymer chains on the surface of nanoparticles alters the mobility of the chains far into the bulk, and several non-continuum effects are observed. We therefore investigate the effects of polymer-particle interactions on the relaxation dynamics and viscoelastic properties of a model nanocomposite based on a mixture of silica nanoparticles and poly(methyl acrylate). Narrow molecular weight distribution PMA was synthesized using ATRP and mixed with nanoparticles at different concentrations. Alterations in the viscoelastic behavior are attributed to filler structuring and interactions with the host polymer.

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