



Nanoparticle, Segmental and Chain Dynamics in Polymer Nanocomposites

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Polymer nanocomposites encompass a wide variety of systems comprised of thermoplastics or thermosets and nanoparticles of various shapes and sizes. While a few polymer nanocomposite systems have very well-established applications, the scope of these materials could be expanded further, perhaps even into construction and infrastructure applications that require improved creep performance. This talk will focus on the dynamic properties of polymer nanocomposites wherein there are either neutral or favorable interactions between the nanoparticles and thermoplastics. Using a combination of experimental methods (single particle tracking, ion beam methods, dielectric spectroscopy, modulated DSC, and quasielastic neutron scattering), as well as coarse-grained molecular dynamics simulations, we are developing a comprehensive description of the nanoparticle diffusion and hierarchical polymer dynamics. I will specifically discuss the importance of nanoparticle size and loading, as well as polymer molecular weight and nanoparticle dispersion. Finally, I will present our recent work of the role of nanoparticles on creep properties.