

Abstract Submitted
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Effect of Asymmetric Dynamics of Interfacial Polymers on Mechanical Response and Particle Dynamics of Polymer Nanocomposites¹

SIYANG YANG, Stevens Institute of Technology, SURESH NARAYANAN, Argonne National Laboratory, PINAR AKCORA, Stevens Institute of Technology — Miscible polymer blends with different glass transition temperatures are known to create confined interphases between glassy and mobile chains. We recently showed that nanoparticles adsorbed with a high- T_g polymer, poly(methyl methacrylate) (PMMA), and dispersed in a low- T_g matrix polymer, poly(ethylene oxide) (PEO), exhibited a liquid-to-solid transition at temperatures above T_g s of both polymers. Such mechanical adaptivity to temperature underlies the existence of dynamically asymmetric bound layers on nanoparticles, and their role on microscopic mechanical behavior. In this talk, we will present the mechanical responses of other polymer combinations with varying T_g differences to reveal the stiffening mechanism. The strength of particle-polymer attractions, rigidity of adsorbed chains and the length of adsorbed chains are varied to explain unusual rheological responses of composites. The effect of the mobility of adsorbed chains on particle relaxations is measured. Confinement and dynamic coupling of polymer blends will be discussed by means of particle relaxations measured in X-ray photon correlation spectroscopy.

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