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**Scaling of the strain hardening modulus with nanoparticle loading and the rejuvenated yield stress in polymer nanocomposites** ROBERT HOY, University of South Florida, ALAN LESSER, University of Massachusetts, JOSEF JANCAR, Brno University of Technology — We examine the nonlinear mechanics of polymer glasses by using silica nanoparticles as"probes" that alter the segmental packing and relaxation dynamics of glassy PMMA. At low $T = T_g - 80K$, the scalings of both the strain hardening modulus $G_R$ and the rejuvenated yield stress $\sigma_{yr}$ with NP loading (i.e. the silica volume fraction $\nu_f$) are predicted by a simple volume-replacement model. At higher $T = T_g - 20K$, this scaling breaks down, indicating substantially interface-retarded dynamics and packing frustration. At high strain rates, $G_R$ scales linearly with $\sigma_{yr}$, with a $\nu_f$-dependent offset. This linear scaling breaks down at lower strain rates $\dot{\epsilon} < \dot{\epsilon}^{crit}(\nu_f)$. Surprisingly, $\dot{\epsilon}^{crit}$ increases with increasing $\nu_f$, violating the intuitive expectation that NP filling would increase the controlling relaxation times. We explain this phenomena in terms of the increasing dynamical heterogeneity induced by filler particles.

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