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Mechanical behavior of polymer-grafted iron oxide nano particles under large shear deformation[1] YANG JIAO, ERKAN SENSES, PINAR AKCORA, Stevens Institute of Technology, STEVENS INSTITUTE OF TECHNOLOGY TEAM — Grafting particles with polymers is an effective strategy to control the dispersion and assembly of fillers that will enhance the structural and mechanical stability of polymer nanocomposites (PNCs). Viscoelastic properties of polymer-grafted nanoparticles (NPs) dispersed in homopolymer melts at nonlinear regimes are particularly important as nonlinearities are sensitive to any microstructural change. Her, we report on the nonlinear mechanical behavior of poly(styrene) (PS)-grafted iron oxide NPs in PS homopolymers to reveal the importance of brush-matrix interface and dynamic entanglement under large shear deformations. With oscillatory shear flow, wetting is enabled and long-range ordering of particles is achieved in the system where free chains are longer than the grafted one. We show that large oscillatory deformations can strengthen the interfaces that result in the enhanced mechanical properties. These shear-induced ordered particles can perform as reinforced polymer networks for energy absorbing application.

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