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An insight on hierarchical nanoparticle order by polymer crystallization VIANNEY GIMENEZ-PINTO, DAN ZHAO, Columbia University, JACQUES JESTIN, Laboratoire Lon Brillouin, SANAT KUMAR, Columbia University — We investigate multiscale nanoparticle (NP) order via solidification in polymer nanocomposites tunable by a single parameter: crystallization speed G. NPs are fully dispersed for crystallization faster than a threshold Gc. However, for slower crystallization rates, G ¡ Gc, anisotropic NP order arises. Given that polymer crystallization is inherently anisotropic, it can organize nanoparticles in different length scales (from sub-100nm to cm) determined by the crystalline superstructure morphology. Via molecular dynamics simulations on a geometric-kinetic model, we study how crystallization-driven NP assembly and threshold speed depends on surface tension as well as solvent and NP size. These studies agree with experimental observations and provide an insight on the key factors for achieving tunable multiscale NP order in these polymeric materials.

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