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Nanoparticle Ordering in Semicrystalline Polymers VIANNEY GIMENEZ-PINTO, DAN ZHAO, SANAT KUMAR, Columbia University — One way to engineer the macroscopic properties of a crystalline polymer matrix is to place nanoparticles into them, but in an organized manner. We have recently found that NP organization can be controlled by varying the crystal growth rate. We develop a coarse-grained model to study this situation in particular, we focus on the out-of-equilibrium dynamics of nanoparticles being pushed/engulfed by a solidification front depending on crystallization velocity v_s. Particle engulfment occurs when v_s is higher than a critical velocity v_c. When v_s is smaller than v_c, particles are pushed by the crystallization front and organize in a 2-D plane. Even though most models for particle engulfment consider dynamic force equilibrium at v_c, we show the system is not in equilibrium in this regime. Thus, we consider conditions for engulfment based on particle velocity with respect to crystal growth rate. Our results agree with experimental observations on anisotropic organization of nanoparticles in semicrystalline polymers driven by crystallization speed.

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