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Dodecagonal Quasicrystal Phase in a Diblock Copolymer Melt[1]
FRANK BATES, TIMOTHY GILLARD, University of Minnesota, SANG-WOO LEE, RPI — Recent experiments with low molecular weight asymmetric poly(isoprene-*b*-lactide) (PI-PLA) diblock copolymers have established an equilibrium Frank-Kasper σ-phase at compositions between 18 and 22 percent by volume PLA, which transforms to a BCC phase followed by disordering with increasing temperature. This presentation will describe synchrotron small-angle x-ray scattering and dynamic mechanical spectroscopy experiments conducted following rapid temperature quenches from the disordered state to temperatures associated with the σ-phase. We document the development of a long-lived dodecagonal quasicrystalline (DQC) phase that transforms with time into the associated quasicrystal approximate σ-phase at a rate that is highly temperature dependent. Remarkably, the DQC does not form from either the σ-phase or BCC state. These finding will be discussed in the context of an apparent spontaneous structural transition that occurs when the disordered melt is supercooled below a threshold temperature coincident with the BCC to σ-phase order-order transition temperature.

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