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Stucture and dynamics of a microphase separating block copolymer melt. AMISH PATEL, NITASH BALSARA, U. C. Berkeley, SURESH NARAYANAN, ALEC SANDY, Argonne National Laboratory, SIMON MOCHRIE, Yale University — A block copolymer melt is quenched from the disordered state to a temperature (T_q) below the order-to-disorder transition (T_{ODT}). The structure and dynamics of the melt is studied as a function of quench time using Small-Angle X-ray Scattering (SAXS) and X-ray Photon Correlation Spectroscopy (XPCS) respectively. For T_q well below T_{ODT}, we observe that the broad SAXS peak corresponding to the disordered state transforms into a sharp peak indicating the formation of the ordered state. The ordering process is accompanied by an increase in the XPCS relaxation time. On the other hand, for T_q close to T_{ODT}, the static structure factor remains unchanged and the melt remains disordered. However, even though the structure remains unchanged, the XPCS relaxation time increases and then reaches a plateau. Finally, we have shown that microphase separation can be stimulated in the above case of T_q close to T_{ODT}. In order to do so, the melt is first taken to a temperature, $T' < T_q$, where microphase separation would eventually occur. After holding the melt at T' for a short period of time, it is taken to T_q. At this time the melt is still disordered. However, in contrast to a direct quench to T_q, this procedure eventually results to the formation of a micrphase-separated state.

Amish Patel
U. C. Berkeley

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