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Crystallization,
Crystal Orientation and Morphology of Poly(ethylene oxide) under 1D Defect-Free Nanoscale Confinement MING-SIAO HSIAO, The University of Akron, JOSEPH X. ZHENG, RYAN M. VAN HORN, RODERIC P. QUIRK, EDWIN L. THOMAS, MIT, BERNARD LOTZ, Institute Charles Sadron, STEPHEN Z. D. CHENG — One-dimensional (1-D) defect-free nanoscale confinement is created by growing single crystals of PS-b-PEO block copolymers in dilute solution. Those defect-free, 1-D confined lamellae having different PEO layer thicknesses in PS-b-PEO lamellar single crystals (or crystal mats) were used to study the polymer recrystallization and crystal orientation evolution as a function of recrystallization temperature (T_{rx}) because the T_g^{PS} is larger than T_m^{PEO} in the PS-b-PEO single crystal. The results are summarized as follows. First, by the combination of electron diffraction and known PEO crystallography, the crystallization of PEO only takes place at T_{rx} <-5^{o}C. Meanwhile a unique tilted PEO orientation is formed at T_{rx} >-5^{o}C after self-seeding. The origin of the formation of tilted chains in the PEO crystal will be addressed. Second, from the analysis of 2D WAXD patterns of crystal mats, it is shown that the change in PEO c-axis orientation from homogeneous at low T_{rx} to homeotropic at higher T_{rx} transitions sharply, within 1^{o}C. The mechanism inducing this dramatic change in crystal orientation will be investigated in detail.

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