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Control of Morphology and Lamellae Orientations in Thin Poly(ϵ -caprolactone) Films by Blending with Different Molar Mass of Polystyrene

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ABSTRACT: The morphology and lamellar orientations in the thin blend films (~30 nm) of poly(ϵ -caprolactone) (PCL) and different molar mass of polystyrene(PS) were investigated by atomic force microscopy (AFM). The influence of PS molar mass on the PCL crystal structures was studied. The results show that both fibrous edge-on and flat-on microcrystal can be obtained when low molar mass PS (LPS with M_w =3.7k and 7.5k) is added into the thin PCL films, while only flat-on crystal is constructed for the films blending with high molar mass PS (HPS with M_w =15.5k and 54k and 106k). The different crystal morphology formation is explained based on the competition between phase separation and crystallization. For the LPS/PCL blend films, it is the homogeneous nucleation crystallization of PCL at the films surface that leads to the formation of fibrous edge-on together with several isolated and faceted flat-on crystals. While for the HPS/PCL blend films, it is the first vertical phase separation followed by the heterogeneous nucleation of PCL at polymer/substrate interface

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