

Domain Structures of P3DDT-*b*-P2VP Block Copolymers Depend on Regioregularit

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Phase separation of conjugated-amorphous block copolymers (BCPs) is mainly determined by interplay between Flory-Huggins interaction (χ), liquid crystalline (LC) interaction and crystallization. In particular, the strong LC interaction and crystallization can provide morphological richness, but often suppress the formation of ordered domains. Therefore, tuning the LC and crystalline behavior can be a key to form desirable nanostructures of conjugated-amorphous BCPs. Here, we studied morphologies of poly(3-dodecylthiophene)-block-poly(2-vinylpyridine) (P3DDT-*b*-P2VP) depending on regioregularity (RR), which determines the LC and crystalline behavior of conjugated polymer. Above the melting temperature, we observed a clear transition in domain spacing of ordered structures as the RR decreased from 94% to 85%. This could be attributed to a change in chain-packing configuration due to the reduction in LC interaction. Upon cooling, the BCPs with 94% of RR showed morphology deformation driven by strong crystallization whereas the melt morphologies of lower RR BCPs were almost not affected.