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Effect of Molecular Weight on Competitive Self-Assembly of Poly(3-dodecylthiophene)-block-poly(methyl methacrylate) Copolymers KYU SEONG LEE, JICHEOL PARK, CHUNGRYONG CHOI, JONGHEON KWAK, Pohang Univ of Sci Tech, HONG CHUL MOON, University of Seoul, JIN KON KIM, Pohang Univ of Sci Tech — The fabrication of poly(3-alkylthiophene) (P3AT) nanopatterns with 10∼20 nm scale using block copolymer self-assembly is one of key issues to achieve highly efficient organic optoelectronic devices. However, most P3HT-containing rod-coil block copolymers show only fibril structures due to their strong rod/rod interaction. P3DDT containing block copolymer shows well defined nanostructure, however, when P3DDT block chain is much longer than coil block, it also shows fibril structure. We suggest a simple but effective strategy to induce block copolymer microphase separation: increasing χN_{total} with larger N_{total} instead of reducing rod/rod interaction. We investigated, via small angle X-ray scattering (SAXS) and transmission electron microscopy (TEM), the microphase separation of P3DDT-b-PMMA at high weight fractions of P3DDT. A high molecular P3DDT-b-PMMA ($w_{P3DDT} = 0.76$) formed cylindrical morphology, which is quite different from fibril morphology of a lower molecular weight P3DDT-b-PMMA having the same w_{P3DDT}. Furthermore, the crystallinity of the P3DDT block chains confined in self-assembled microdomains showed higher than that of P3DDT homopolymer, which is verified by differential scanning calorimetry (DSC).

Jin Kim
Pohang Univ of Sci
Tech

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