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Confined Crystallization in Poly(3-alkylthiophene)-containing Diblock Copolymers VICTOR HO, RACHEL SEGALMAN, University of California, Berkeley — Organic optoelectronic device active layers require optimization of both the crystalline structure and the morphology at the nanometer length scale. These can be controlled simultaneously with a block copolymer in which one component is a crystalline conjugated polymer such as poly(3-alkylthiophene) (P3AT). While self-assembly of these systems requires balancing the driving forces of crystallization and self-assembly, in many systems, crystallinity dominates resulting in significant distortion or destruction of the melt phase structure. However, we show that judicious selection of the alkyl side chain in P3ATs results in melting transitions which can be controlled over a range of 150 C, and when incorporated into a block copolymer, these depressed melting transitions lead to regions of phase space for which the strength of segregation is sufficiently high at crystallization to allow for self-assembly. Phases such as crystalline majority-phase hexagonally-packed cylinders and lamellae are observed, and importantly the crystallinity of the conjugated polymer is retained in these confined geometries.

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