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Solution assembly behaviors of 3-hexylthiophene polymer based rod-coil graft copolymer YOUNGKWON KIM, JIN-SUNG KIM, HYEONG JUN KIM, BUMJOON KIM, KAIST — Solution assembly of conjugated polymer based block copolymers (BCPs) is an attractive approach for achieving conducting nanowires (NWs) with nanometer-scale cross-sectional dimensions. In particular, conjugated block offers one-dimensional self-growth of crystalline NWs, and secondary block gives rise to stable dispersion of NWs and additional tuning parameter for the structures of NWs. Herein, we developed a series of poly(3-hexylthiophene)-graft-poly(2-vinylpyridine) (P3HT-g-P2VP) rod-coil copolymers with systematically controlled crystallinity by modifying both grafting density and molecular weight (Mn) of coil block, and their solution assembly behaviors were carefully examined. As increasing the volume fraction and grafting density of the secondary blocks, melting temperatures, crystallization temperatures, and the crystallinity were gradually decreased by hindering rod-rod interaction between P3HT backbones, resulting in the formation of short NWs. Furthermore, the length of NMs was relatively shorter for the densely grafted copolymer despite same volume fraction of secondary block. These results suggested that controlling Mn and the number of branched coil block was critical to regulate the crystalline properties and new approach for determining the NWs growth.

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