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Design of P3HT-g-P2VP Graft Copolymers as Efficient Compatibilizers for Stable Operation of Polymer Solar Cells (PSCs) BUMJOON KIM, HYEONG-JUN KIM, JIN-SEONG KIM, HYUN-SEUNG YANG, KAIST — Fabrication of ordered structures from block copolymers of conjugated polymers has been limited due to the strong rod−rod interactions between the conjugated blocks. In this work, we developed a molecular design of conjugated polymer-based graft copolymers to control the rigidity of the copolymers and to produce a variety of ordered nanostructures. A series of well-defined poly(3-hexylthiophene)-graft-poly(2-vinylpyridine) (P3HT-g-P2VP) copolymers in which the P2VP chains had different molecular weights (M_n) was prepared. As the M_n of the grafted P2VP chains increased, the crystallinity of the P3HT block in the copolymers decreased. Therefore, we produced well-ordered, non-fibrillar nanostructures of P3HT-based copolymers. In addition, P3HT-g-P2VP polymers can be used as efficient compatibilizers in the active layer of PSCs. P3HT-g-P2VP polymers can modify the sharp interface between polymer donors and fullerenes, resulting in dramatic enhancement in the thermal stabilities and mechanical properties of PSCs. The effectiveness of the graft copolymers as compatibilizers will be demonstrated by comparing them with the P3HT-b-P2VP block copolymers.

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