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Selective crystallization of conjugated polymers into nanowires from graphene coated surfaces. DANIEL ACEVEDO-CARTAGENA, JIAXIN ZHU, Univ of Mass - Amherst, ELVIRA TRABANINO, None, EMILY PENTZER, Case Western Reserve University, TODD EMRICK, ALEJANDRO BRISEO, Univ of Mass - Amherst, STEPHEN NONNENMANN, RYAN HAYWARD, Univ of Mass, Amherst — Solution-based crystallization of conjugated polymers offers a scalable and attractive route to develop hierarchical structures for organic electronic devices, especially solar cells. The introduction of well-defined nucleation sites into metastable supersaturated solutions provides a way to regulate the crystallization behavior, and therefore the morphology of the material. We focus on metastable solutions of poly(3-hexylthiophene) (P3HT) dissolved in mixtures of m-xylene, a marginal solvent, and chlorobenzene, a good solvent. Appropriate levels of supersaturation are identified to suppress homogenous nucleation of crystals at room temperature, while allowing for crystallization on heterogeneous nucleation sites. We show that in these metastable solutions, P3HT selectively crystallizes on graphene-coated surfaces. Through in situ atomic force microscopy, we confirm that nanowires grow vertically in a face-on orientation from highly oriented pyrolytic graphite and graphene. Moreover, this method can be successfully extended to other conjugated polymers with superior electronic properties, such as poly[2,5-bis(3-tetradecylthiophen-2-yl)thieno[3,2-b] thiophene]. Therefore, this method is a promising route to improve the performance of organic electronics.

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