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Synthesis and Microstructure of a Fullerene-Terminated Poly(3-hexylthiophene) BRYAN W. BOUDOURIS, Department of Chemical Engineering and Materials Science - University of Minnesota, FRANCESC MOLINS, DAVID A. BLANK, MARC A. HILLMYER, Department of Chemistry - University of Minnesota, C. DANIEL FRISBIE, Department of Chemical Engineering and Materials Science - University of Minnesota — End-functionalized poly(3-hexylthiophene) (P3HT) was synthesized such that both polymer chain ends were terminated with fullerene units to create an internal electron accepting-donating-accepting molecule, methylfulleropyrrolidine-poly(3-hexylthiophene)-methylfulleropyrrolidine (C_{60}-P3HT-C_{60}). The molecular properties of the polythiophene were characterized to confirm covalent linkage of the fullerene units to the polymer ends. Differential scanning calorimetry (DSC) and x-ray diffraction (XRD) experiments were used to study the microstructure of the polymers, and revealed that microphase separation occurs between the main polymer chain and the fullerene end groups. This suggests the creation of two distinct semicrystalline regimes in C_{60}-P3HT-C_{60} that are akin to those seen in a compositionally similar blend of P3HT and C_{60}. This comparable domain formation, coupled with the possibility of enhanced charge transfer generally associated with internal electron donating-accepting species, makes C_{60}-P3HT-C_{60} a promising candidate for organic electronic applications.

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