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Synthesis and Application of Conducting Block Copolymers in Organic Photovoltaics BRYAN W. BOUDOURIS, MARC A. HILLMYER, C. DANIEL FRISBIE, University of Minnesota — Recent advances in the fabrication and post-processing of polymer – fullerene bulk heterojunction solar cells have allowed for devices with power conversion efficiencies up to 5% to be generated. An understanding of how the internal morphology of the active layer affects device performance would facilitate optimization and ultimately lead to higher efficiencies. Block copolymers have been shown to self-assemble into well-structured, microphase-separated domains on the order of the diffusion length (~ 10 nm) of an exciton (bound electron-hole pair) in thin films. In an effort to make a nanostructured active layer morphology we have synthesized block copolymers where the conducting moiety is either poly(3-hexylthiophene) or poly(3-dodecylthiophene) and the second, etchable block is polylactide. Hydroxyl-terminated polythiophene molecules were synthesized via the McCullough method and used as macroinitiators for the ring-opening polymerization of D,L-lactide. AFM images of spin-coated block copolymer films show separation between the polythiophene and polylactide segments. After subjecting the samples to a dilute aqueous base for short periods of time, we have selectively etched the polylactide segments to create pits in the semicrystalline polythiophene matrices. In addition to these findings, preliminary device results will also be discussed.

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