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Role of nanoscale morphology on the nano and macro-scale performance of polythiophene based polymer solar cells PETER GREEN, JOJO AMONOO, EMMANOUIL GLYNOS, CHELSEA CHEN, Materials Science and Engineering, University of Michigan, Ann Arbor — Maximization of the short circuit current, J_{SC}, the open circuit voltage, V_{OC}, and the fill factor (FF) to achieve highest power conversion efficiencies (PCEs) in donor/acceptor, polymer/polymer, solar cells is dependent on optimization of variables associated with the active material's chemical and morphological structure. Control of the nanoscale structure of polythiophene (P3HT)/phenyl-C61-butyric acid methyl ether ($PC_{61}BM$) active materials was achieved through use of a novel low temperature processing strategy. With the use of energy filtered transmission electron microscopy (EF-TEM), electron and X-ray diffraction, together phase contrast, deflection and photocurrent measurements at the nanoscale, we were able to tailor nanoscale morphologies to achieve increases in the J_{SC} by a factor of 1.2 and the PCE by 30%, beyond that using conventional heat treatments for processing.

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