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Phthalimide Copolymer Solar Cells HAO XIN, University of Washington, XUGANG GUO, University of Kentucky, GUOQIANG REN, FELIX KIM, University of Washington, MARK WATSON, University of Kentucky, SAMSON JENEKHE, University of Washington — Photovoltaic properties of bulk heterojunction solar cells based on phthalimide donor-acceptor copolymers have been investigated. Due to the strong $\pi - \pi$ stacking of the polymers, the state-of-the-art thermal annealing approach resulted in micro-scale phase separation and thus negligible photocurrent. To achieve ideal bicontinuous morphology, different strategies including quickly film drying and mixed solvent for film processing have been explored. In these films, nano-sale phase separation was achieved and a power conversion efficiency of 3.0% was obtained. Absorption and space-charge limited current mobility measurements reveal similar light harvesting and hole mobilities in all the films, indicating that the morphology is the dominant factor determining the photovoltaic performance. Our results demonstrate that for highly crystalline and/or low-solubility polymers, finding a way to prevent polymer aggregation and large scale phase separation is critical to realizing high performance solar cells.

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