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Charge Generation Dynamics in Efficient All-Polymer Solar Cells: Influence of Polymer Packing and Morphology BHOJ GAUTAM, North Carolina State University, CHANGYEON LEE, Korea Advanced Institute of Science and Technology (KAIST), ROBERT YOUNTS, North Carolina State University, WONHO LEE, Korea Advanced Institute of Science and Technology (KAIST), EVGENY DANILOV, North Carolina State University, BUMJOON KIM, Korea Advanced Institute of Science and Technology (KAIST), KENAN GUNDOGDU, North Carolina State University — All-polymer solar cells exhibit rapid progress in power conversion efficiency (PCE) from 2 to 7.7% over the last few years. While this improvement is primarily attributed to efficient charge transport and balanced mobility between the carriers, not much is known about the charge generation dynamics in these systems. Here we measured exciton relaxation and charge separation dynamics using ultrafast spectroscopy in polymer/polymer blends with different molecular packing and morphology. These measurements indicate that preferential face on configuration with intermixed nanomorphology increases the charge generation efficiency. In fact there is a direct quantitative correlation between the free charge population in the ultrafast time scales and the external quantum efficiency, suggesting not only the transport but also charge generation is key for the design of high performance all polymer solar cells.

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