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Polymer Solar Cell Device Characteristics Are Independent of Vertical Phase Separation in Active Layers YUEH-LIN LOO, Princeton University — Preferential segregation of organic semiconductor constituents in multicomponent thin-film active layers has long been speculated to affect the characteristics of bulk-heterojunction polymer solar cells. Using soft-contact lamination and delamination schemes – with which we have been able to remove compositionally well characterized polymer thin films, flip them over so as to reverse their composition profiles, and then transfer them onto existing device platforms – we showed unambiguously that the device performance of P3HT:PCBM solar cells are independent of the interfacial segregation characteristics of the active layers. Temperature-dependent single-carrier diode measurements of the organic semiconductor constituents suggest that the origin of this invariance stems from the fact that P3HT comprises a high density of mid-gap states. Hole carriers in these mid-gap states can in turn recombine with electrons at the electron-collecting interface, effectively promoting electron transfer from the cathode to the active layer.

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