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Phase separation-driven stratification in conventional and inverted P3HT:PCBM organic solar cells[1] ELENI PAVLOPOULOU, GUILLAUME FLEURY, DARGIE DERIBEW, LCPO, University of Bordeaux, France, FABRICE COUSIN, Laboratoire Léon Brillouin, CEA-CNRS, France, MARK GEOGHEGAN, University of Sheffield, UK, GEORGES HADZIIOANNOU, LCPO, University of Bordeaux, France — We have used neutron reflectivity to investigate the stratification of poly(3-hexylthiophene) (P3HT) and phenyl-C_{61}-butyric acid methyl ester (PCBM) blend films. Films were spun-cast on poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) and titanium oxide (TiOx) layers to mimic the procedures followed for the fabrication of conventional and inverted organic photovoltaics respectively. A 60% and 75% PCBM enrichment of the active layer at the interface with PEDOT:PSS and TiOx respectively has been revealed, as well as a PCBM depletion at the free surface of the film which is driven by the lower surface energy of P3HT. PCBM segregation close to the substrate is further enhanced by annealing. In case of the films cast on PEDOT:PSS, this stratification could be detrimental for conventional solar cell performance, since the electron-acceptor material enriches the interface with the hole-collecting electrode. The agglomeration of PCBM at the TiOx interface could, however, be favorable for an enhanced charge collection, thus improving device performance.

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