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Domain compositions in the active layer of low band gap polymer/fullerene solar cells strongly affect device performance[1] SAMEER VAJJALA KESAVA, Penn State University, ZHUPING FEI, MARTIN HEENEY, Imperial College, London, CHENG WANG, ALEXANDER HEXEMER, Advanced Light Source, LBL, ENRIQUE GOMEZ, Penn State University, ENRIQUE GOMEZ-MARTIN HEENEY COLLABORATION, ENRIQUE GOMEZ-ALEXANDER HEXEMER COLLABORATION — We have characterized the morphology of mixtures of a germole-containing polymer, poly[(4,4'-bis(2-ethylhexyl)dithieno[3,2-b:2',3'-d]germole)-2,6-diyl-alt-(2,1,3-benzothiadiazole)-4,7-diyl] (PGeBTBT), and PCBM using Resonance Soft X-ray Scattering (RSOXS) and Energy-Filtered Transmission Electron Microscopy (EFTEM). PGeBTBT belongs to cyclopentadithiophene-based polymer family with a band gap of 1.5 eV. Analyses of RSOXS data and EFTEM images have shown that the volume fraction of polymer in the fullerene matrix enveloping PGeBTBT fibers (∼10 nm diameter) decreases with increasing overall composition of PCBM. Furthermore, PGeBTBT/PCBM devices demonstrate a correlation between the short circuit current and the purity of the PCBM-rich phase. We hypothesize that the relationship between PCBM domain composition and device performance is related to charge recombination, where increasing the polymer content suppresses charge transport thereby increasing the transit time.

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