Electronic Supplementary Information

Fullerene bisadduct as effective phase-separation inhibitor in preparing poly(3-hexylthiophene)/[6,6]-phenyl-C_{61}-butyric acid methyl ester blends with highly stable morphology

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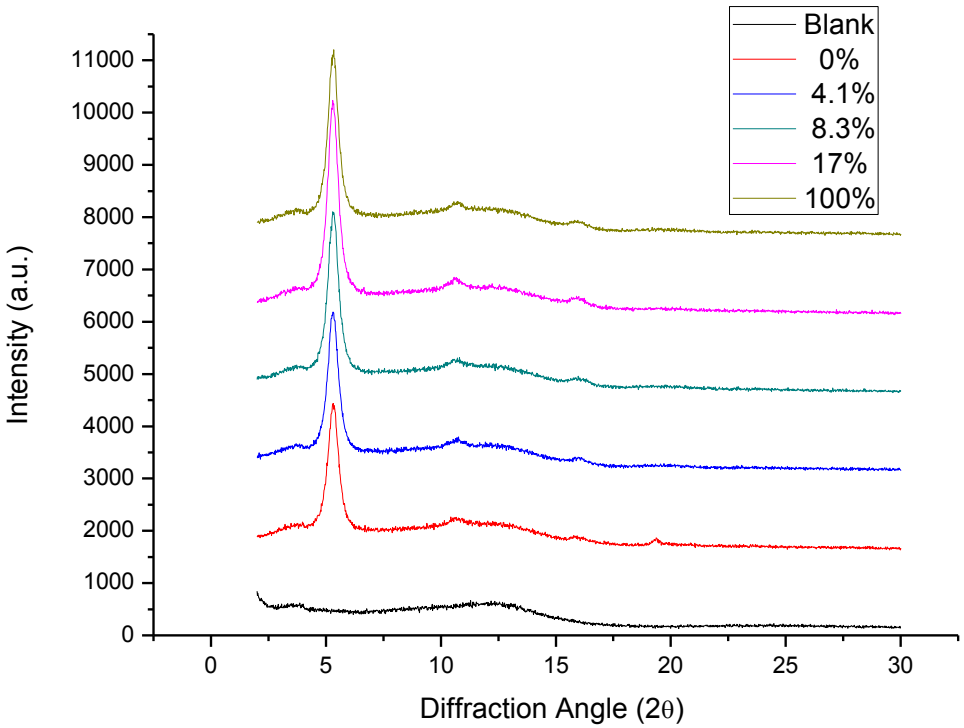
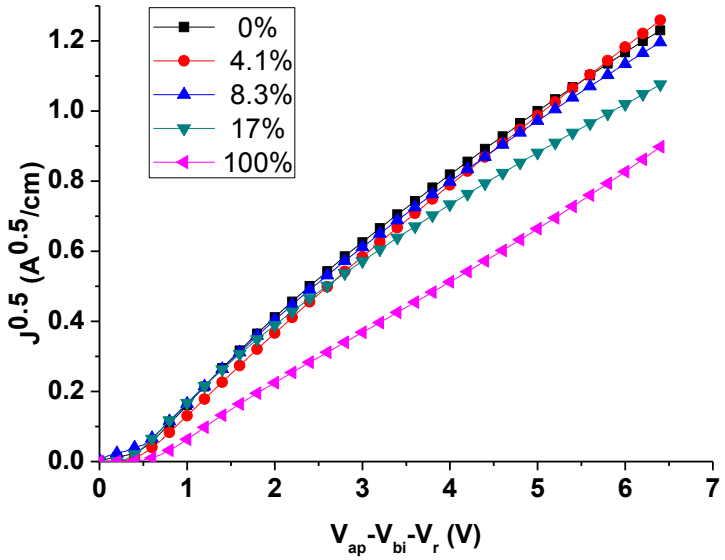


Figure S1 X-ray diffraction patterns of the films of P3HT/PCBM:bis-PCBM ternary blends with various weight percentage of bis-PCBM over the sum of both fullerene derivatives, which were annealed at 150 °C for 10 min.

(a)



(b)

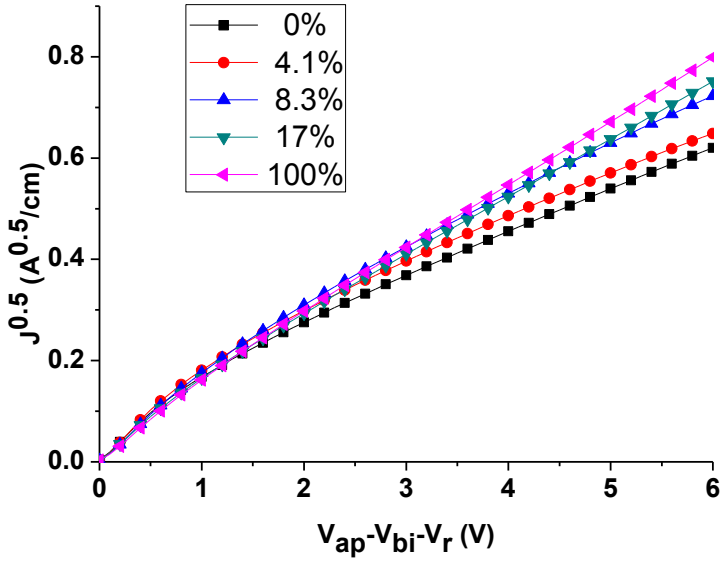


Figure S2 $J^{0.5}$ vs. V plots for the (a) electron-only (ITO/SAM (4-aminobenzoic acid)/active layer/Ca/Al) and (b) hole-only (ITO/PEDOT:PSS/active layer/Ag) devices based on P3HT/PCBM:bis-PCBM blends with various weight percentage of bis-PCBM over the sum of both fullerene derivatives.

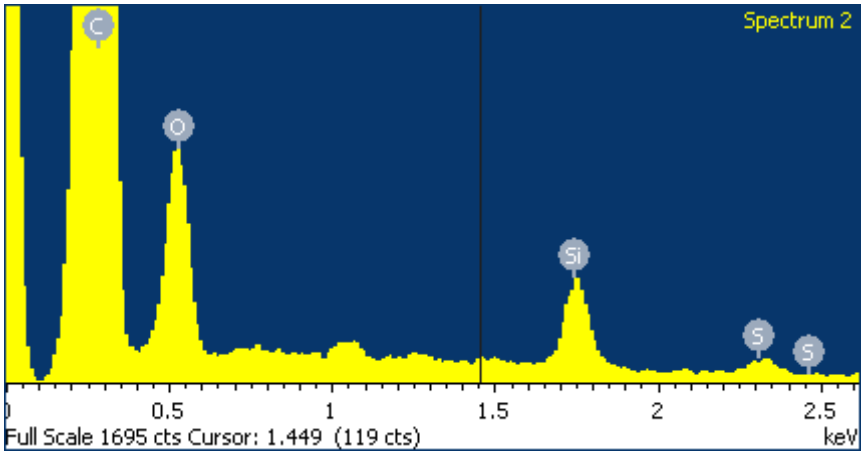


Figure S3 Energy-dispersive X-ray spectroscopy (EDS) spectrum of the surface of micro-sized clusters appeared in the P3HT/PCBM blend after aging at 150 °C for 900 min.

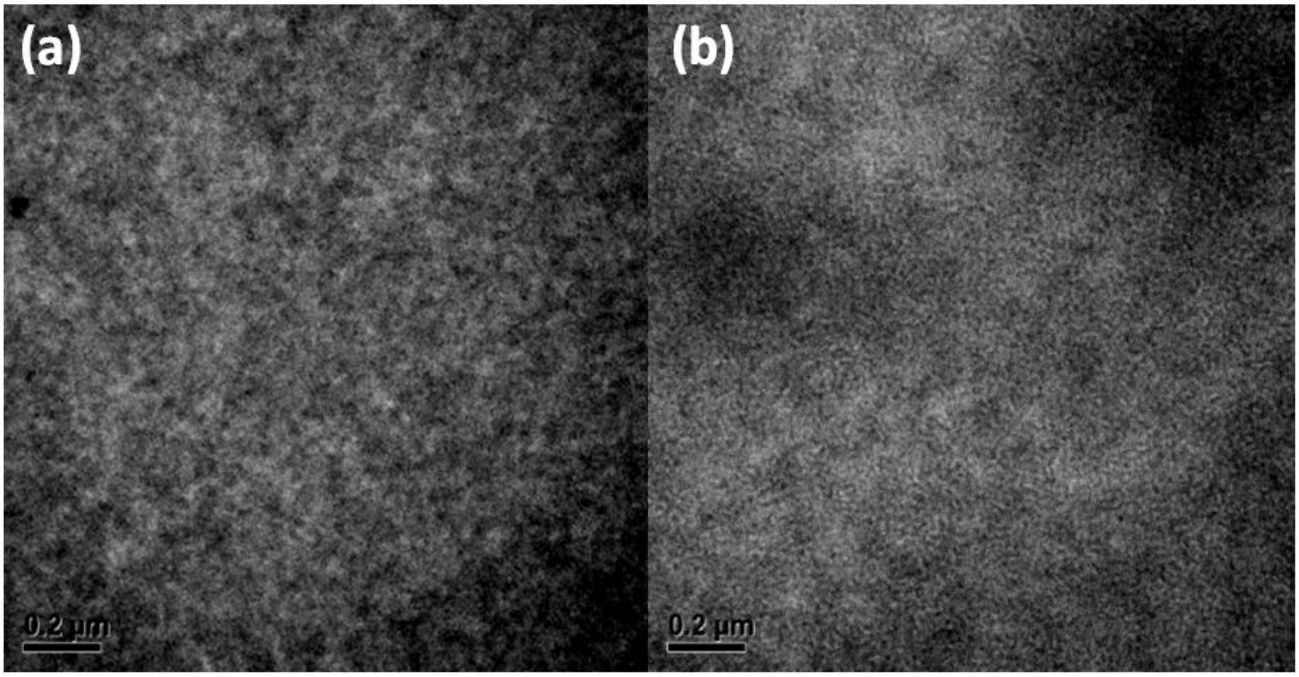
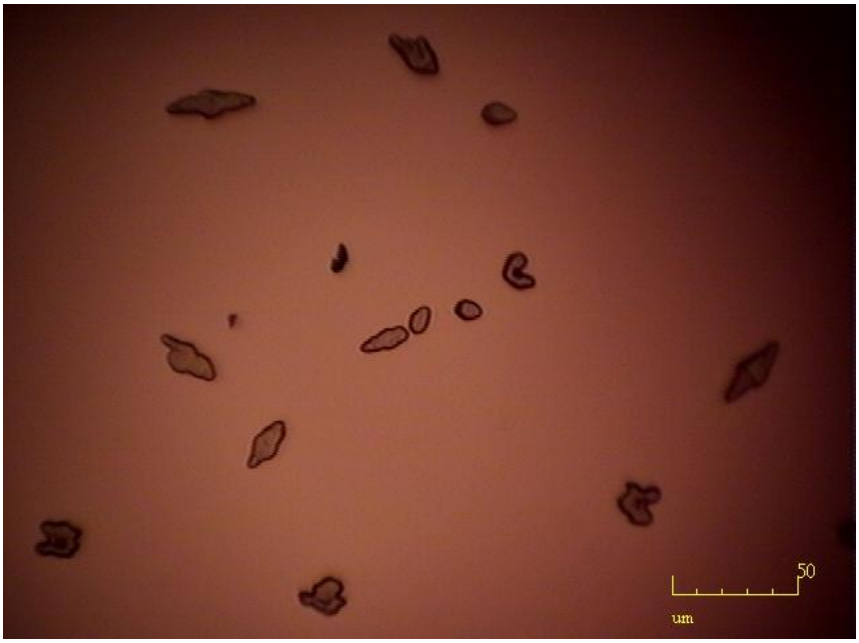


Figure S4 TEM images of the films of (a) P3HT/PCBM (b) P3HT/PCBM:bisPCBM (1:0.73:0.07) after aging at 150 °C for 900 min. (scale bar: 0.2 µm).

(a)



(b)

Figure S5 Optical microscopy images of the films of the P3HT/PCBM blends with a weight ratio of (a) 1:0.73, and (b) 1:0.67, which were heated at 150 °C for 15 hours.

Table S1 XRD data of P3HT/PCBM:bis-PCBM films with various weight percentage of bis-PCBM over the sum of both fullerene derivatives

bis-PCBM (wt%)	FWHM	Diffraction peak (2θ)	d-spacing (nm)	Grain size of P3HT crystallites (nm)
0%	0.707	5.37	16.7	11.2
4.1%	0.691	5.31	16.7	11.5
8.3%	0.685	5.34	16.7	11.6
17%	0.668	5.29	16.7	11.9
100%	0.657	5.34	16.7	12.1

FWHM: the full width at the half maximum

Table S2 Electron and hole mobilities of P3HT/PCBM:bis-PCBM films with various weight percentage of bis-PCBM over the sum of both fullerene derivatives, which are determined by using the SCLC method

bis-PCBM (wt%)	μ_e (cm^2/Vs)	μ_h (cm^2/Vs)	μ_e/μ_h
0%	3.64×10^{-4}	1.86×10^{-4}	1.95
4.1%	3.47×10^{-4}	2.82×10^{-4}	1.23
8.3%	3.38×10^{-4}	3.04×10^{-4}	1.11
17%	3.03×10^{-4}	3.27×10^{-4}	0.92
100%	1.04×10^{-4}	3.34×10^{-4}	0.31