Electronic Supplementary Information (ESI) available:

Highly efficient exciton harvesting and charge transport in ternary blend solar cells based on wide- and low-bandgap polymers

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Photoemission yield spectra

Figure S1 shows the photoemission yield spectra of P3HT, PSBTBT, and PCBM neat films. The HOMO energy levels of these materials were estimated from a threshold energy of the cubic root of the photoelectron yield. The LUMO energy levels of polymers were estimated from the HOMO energy levels and the optical bandgap energy that was evaluated from the crossing point of the absorption and PL spectra. The LUMO energy level of PCBM was taken from the literature.[S1]

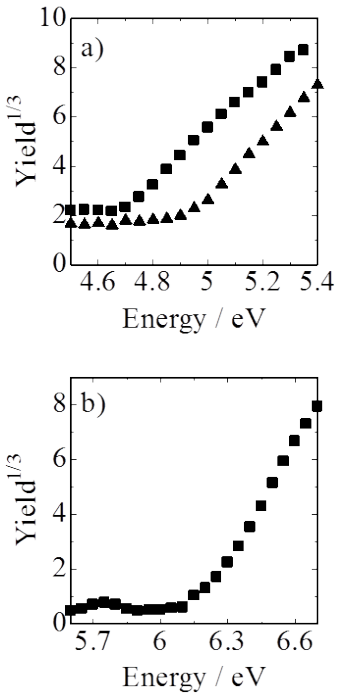

Figure S1. Photoemission yield spectra of a) P3HT (squares) and PSBTBT (triangles), and b) PCBM (squares). The cut-off energy was estimated from a threshold energy of the cubic root of the photoelectron yield.

Absorption and PL spectra

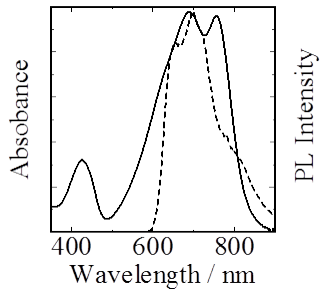

Figure S2. Absorption and PL spectra of PSBTBT (solid line) and P3HT (broken line) films, respectively. The excitation wavelength was 550 nm.

Photovoltaic parameters

Table S1. Photovoltaic parameters of P3HT-L/PSBTBT/PCBM ternary solar cells.

P3HT : PSBTBT : PCBM	J_{SC} / mA cm^{-2}	V_{OC} / V	FF	PCE / %
50 : 0 : 50	6.67	0.62	0.57	2.4
40 : 10 : 50	6.82	0.62	0.55	2.3
30 : 20 : 50	6.83	0.64	0.46	2.0
20 : 30 : 50	7.52	0.66	0.45	2.2
10 : 40 : 50	8.09	0.67	0.51	2.8
0 : 50 : 50	13.4	0.65	0.56	4.9

Table S2. Photovoltaic parameters of P3HT-H/PSBTBT/PCBM ternary solar cells.

P3HT : PSBTBT : PCBM	J_{SC} / mA cm^{-2}	V_{OC} / V	FF	PCE / %
50 : 0 : 50	8.61	0.54	0.68	3.2
40 : 10 : 50	10.4	0.54	0.68	3.8
30 : 20 : 50	12.3	0.56	0.66	4.5
20 : 30 : 50	15.8	0.58	0.61	5.6
10 : 40 : 50	15.1	0.61	0.53	4.9
0 : 50 : 50	13.3	0.62	0.57	4.7

Reference

S1) H. Yoshida, *J. Phys. Chem. C*, 2014, **118**, 24377–24382.