Supplemental material for

Polymer/Polymer Blend Solar Cells Improved by Using High-Molecular-Weight Fluorene-Based Copolymer as Electron Acceptor

Daisuke Mori,[1] Hiroaki Benten,[*,1] Hideo Ohkita,[2] Shinzaburo Ito,[*,1] and Kunihito Miyake[3]

[1]*Department of Polymer Chemistry, Graduate School of Engineering, Kyoto University, Katsura, Nishikyo, Kyoto 615-8510, Japan*

[2]*Department of Polymer Chemistry, Graduate School of Engineering, Kyoto University, Katsura, Nishikyo, Kyoto 615-8510, Japan, and Japan Science and Technology Agency (JST), PRESTO, 4-1-8 Honcho Kawaguchi, Saitama 332-0012, Japan*

[3]*Tsukuba Research Laboratory, Sumitomo Chemical Co., Ltd., 6 Kitahara, Tsukuba 300-3294, Japan*

E-mail address: benten@photo.polym.kyoto-u.ac.jp, sito@photo.polym.kyoto-u.ac.jp

Further Experimental Details:

Transient Absorption Measurements

Transient absorption data were collected using a femtosecond pump-probe transient absorption spectroscopy system.[1,2] The pump and probe femtosecond transient absorption spectroscopy system consists of a transient absorption spectrometer (Ultrafast Systems, Helios) and a regenerative amplified Ti:sapphire laser (Spectra-Physics, Hurricane). The

amplified Ti:sapphire laser provided 800-nm fundamental pulses at a repetition rate of 1 kHz, with an energy of 0.8 mJ, and with a pulse width of 100 fs (FWHM); the pulses were split into two optical beams with a beam splitter to generate pump and probe pulses. One fundamental beam was converted into pump pulses at 400 nm with a second harmonic generator (Spectra-Physics, TP-F). The other fundamental beam was converted into white light continuum pulses for use as probe pulses in the wavelength region from 400 to 800 nm. The pump pulses were modulated mechanically at a repetition rate of 500 Hz. The temporal evolution of the probe intensity was recorded with a Si CCD-array photodetector (Ocean Optics, S2000). Transient absorption spectra were obtained over the time range from −5 ps to 3 ns.

Dark *J–V* curve (logarithmic scale)

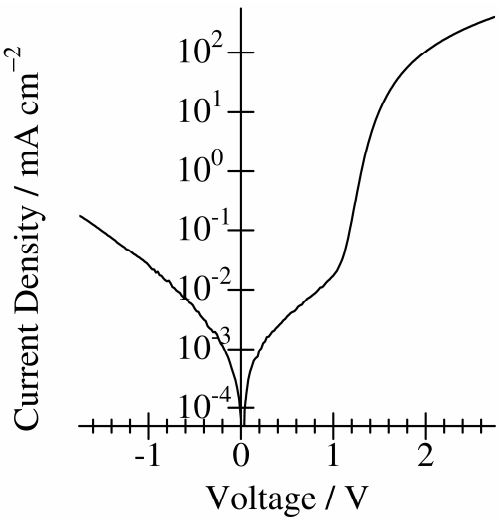

Figure S1. Dark *J–V* characteristic of a P3HT/PF12TBT solar cell with 2.7% PCE. The molecular weight of PF12TBT was M_w = 78,000 g mol^{-1}. The device was fabricated by spin-coating a chloroform solution of P3HT and PF12TBT (1:1 weight ratio) and annealed at 140 °C for 10 min. The device parameters are listed in Table 2.

Annealing-Temperature Dependence of *J–V* characteristics

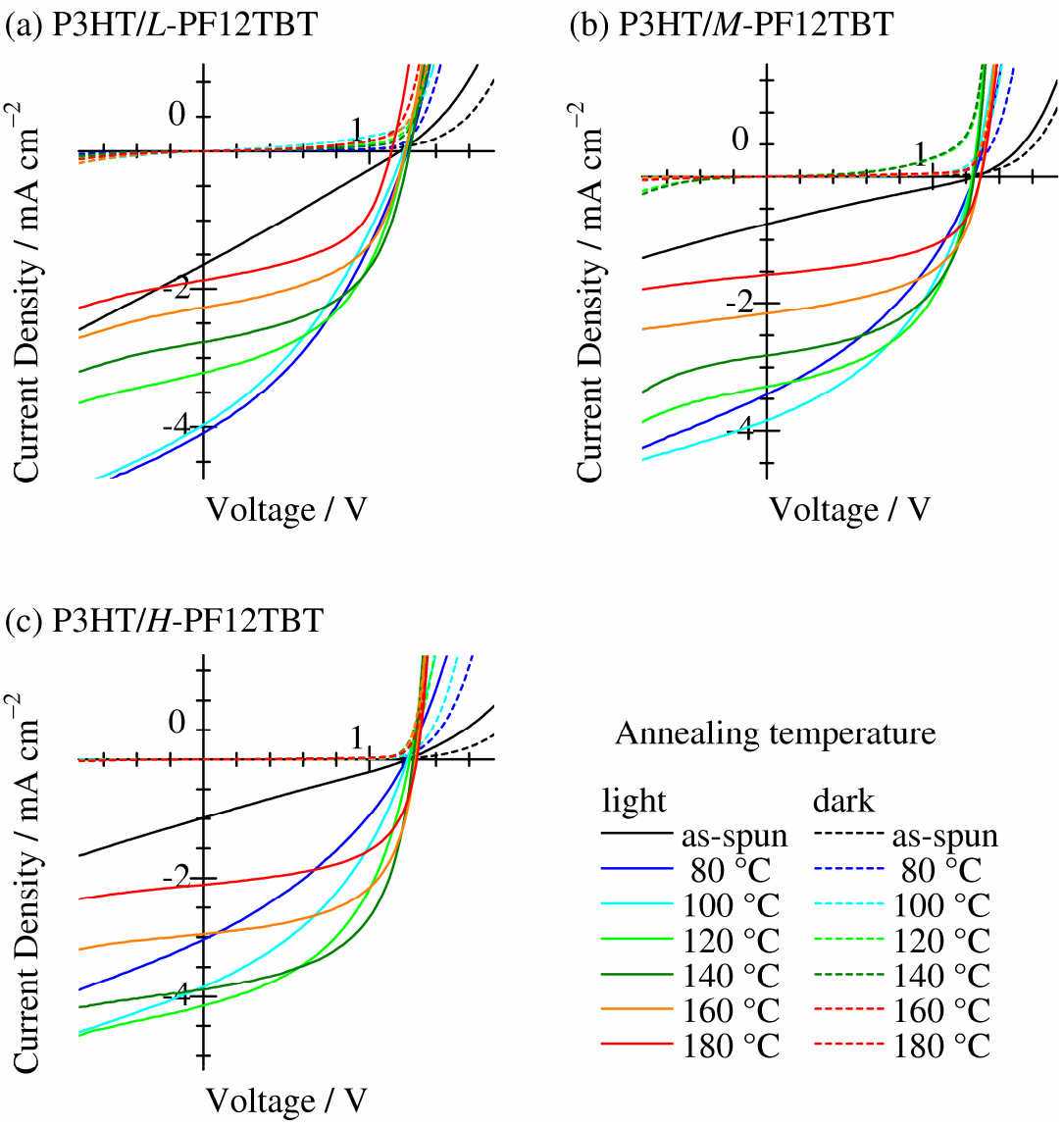

Figure S2. Annealing-temperature dependence of *J–V* characteristics measured for (a) P3HT/*L*-PF12TBT, (b) P3HT/*M*-PF12TBT, and (c) P3HT/*H*-PF12TBT under AM 1.5G illumination from a calibrated solar simulator with an intensity of 100 mW cm^{-2} (solid lines) and the dark condition (dashed lines). The devices were fabricated by spin-coating a chloroform solution of P3HT and PF12TBT (1:1 weight ratio) and annealed for 10 min.

References

(1) Guo, J.; Ohkita, H.; Benten, H.; Ito, S. *J. Am. Chem. Soc.* **2009**, *131*, 16869−16880

(2) Honda, S.; Yokoya, S.; Ohkita H.; Benten, H.; Ito, S. *J. Phys. Chem. C* **2011**, *115*, 11306−11317