Supporting Information

Eliminating the solvent-blocking requirement of interconnection layers in polymer tandem solar cells by thin-film transfer technique

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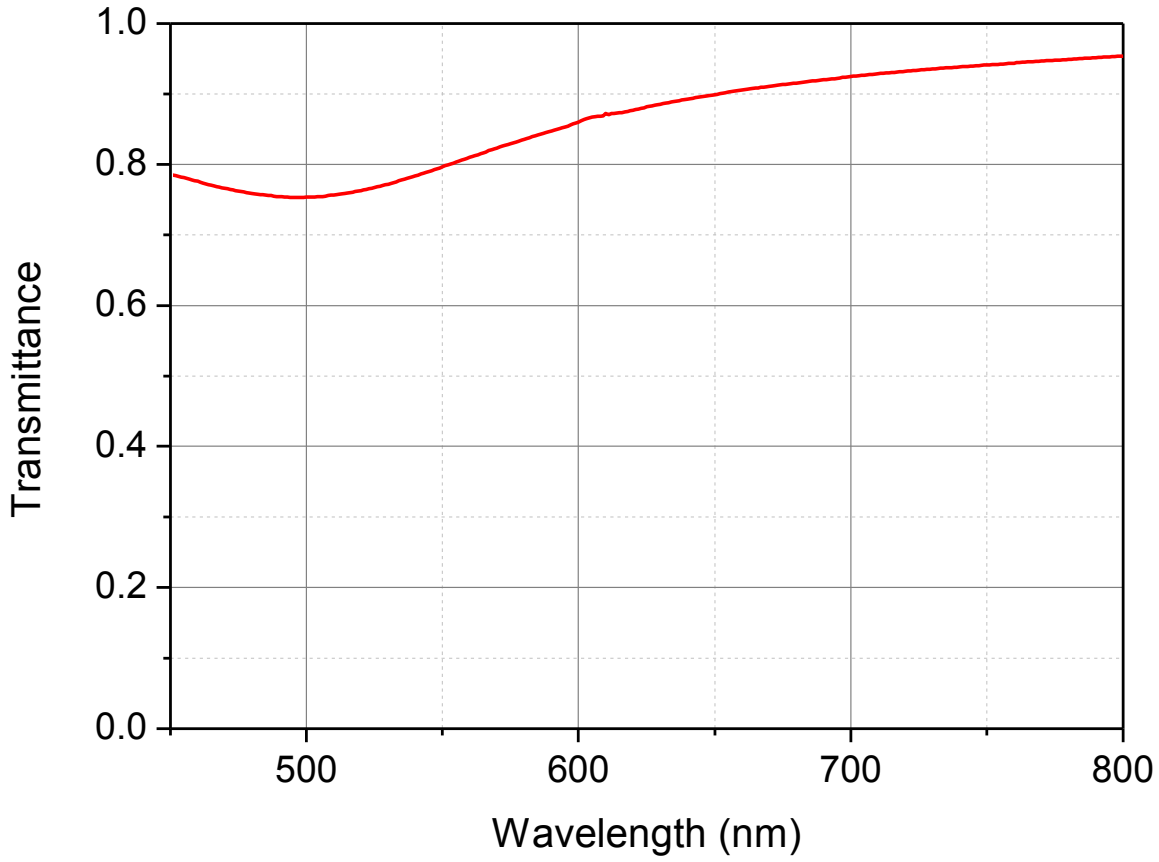

Figure S1 Transmittance spectrum of an interconnection layer composed of 10 nm BCP:Ag / 0.5 nm Ag island / 10 nm HAT-CN.

Table S1 Photovoltaic parameters of polymer tandem solar cells with t_{Ag} = 0.5 nm and different $t_{BCP:Ag}$ values

	J_{SC} (mA/cm^2)	V_{OC} (V)	FF	PCE (%)
Without BCP:Ag	6.18	0.62	0.39	1.49
BCP:Ag (5 nm)	7.34	1.09	0.53	4.24
BCP:Ag (10 nm)	7.24	1.20	0.60	5.21
BCP:Ag (15 nm)	5.20	1.20	0.48	3.00
BCP:Ag (30 nm)	5.74	1.16	0.31	2.08

Table S2 Photovoltaic parameters of polymer tandem solar cells with $t_{BCP:Ag}$ = 10 nm and different t_{Ag} values

	J_{SC}[a] (mA/cm^2)	V_{OC}[a] (V)	FF[a]	PCE[a] (%)
Without Ag islands	6.80	1.05	0.56	3.98
0.5 nm Ag islands	7.18	1.18	0.58	4.94
2 nm Ag islands	5.47	1.09	0.53	3.16

[a]Averaged over eight devices

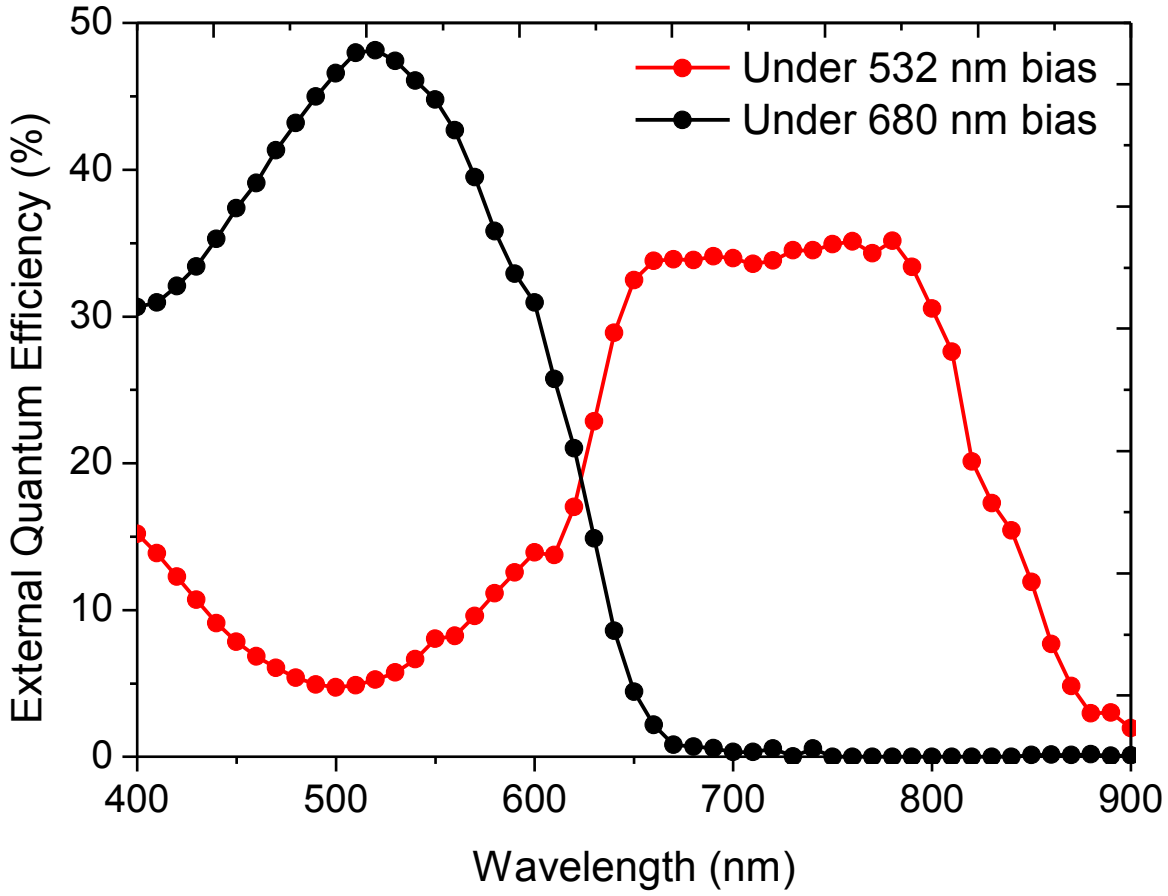

Figure S2 External quantum efficiency (EQE) spectra of the tandem device with $t_{BCP:Ag}$ = 10 nm and t_{Ag} = 0.5 nm measured under light biases at 532 nm (red) and 680 nm (black) show a qualitative agreement with the calculated absorption spectra of the subcells shown in Fig. 1(b). The EQE measurements were performed by following a method described elsewhere.[1] A monochromatic light generated using a laser-driven light source (EQ-99, Energetiq) and a monochromator (Monora 200, Dongwoo Optron) was modulated by a chopper at a frequency of ~400 Hz before irradiating the device, and the resulting photocurrent was measured using a current amplifier (SR570, Stanford Research) and a lock-in amplifier (SR830, Stanford Research).

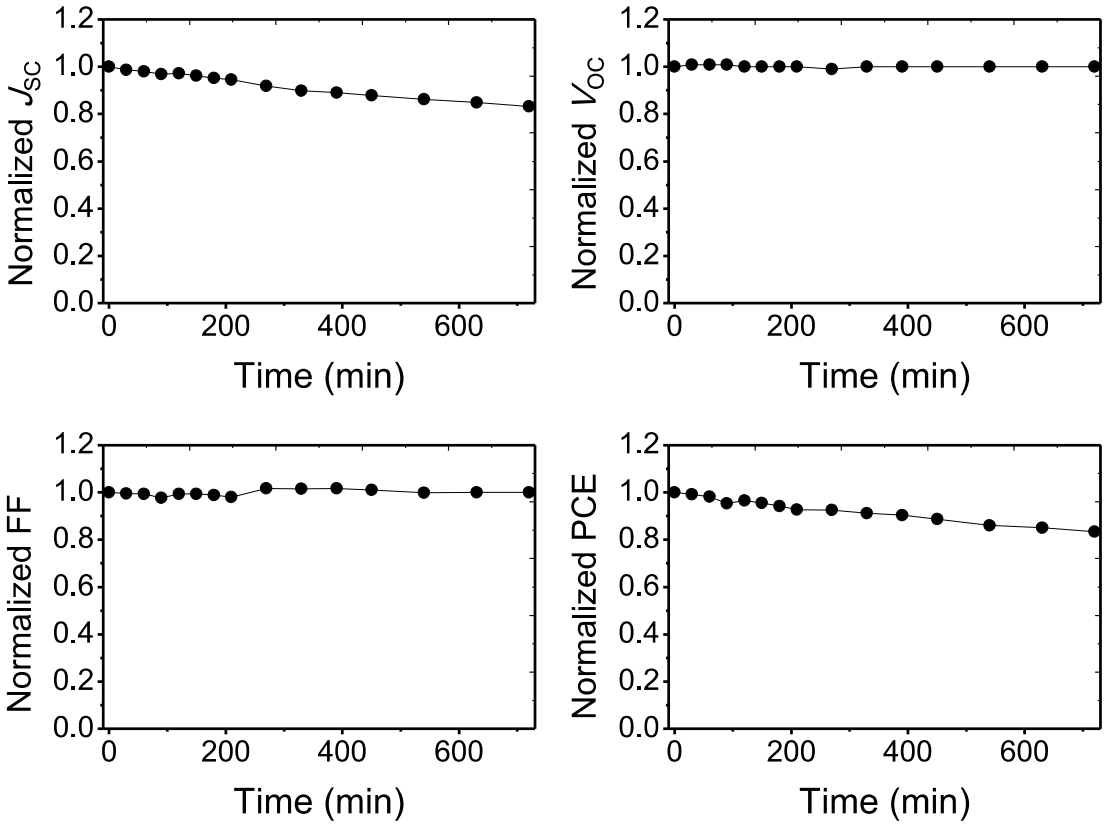

Figure S3 Photovoltaic parameters extracted from intermittently measured *J*–*V* characteristics of the optimized tandem cell. The measurement was performed without encapsulation in ambient at 50 % relative humidity.

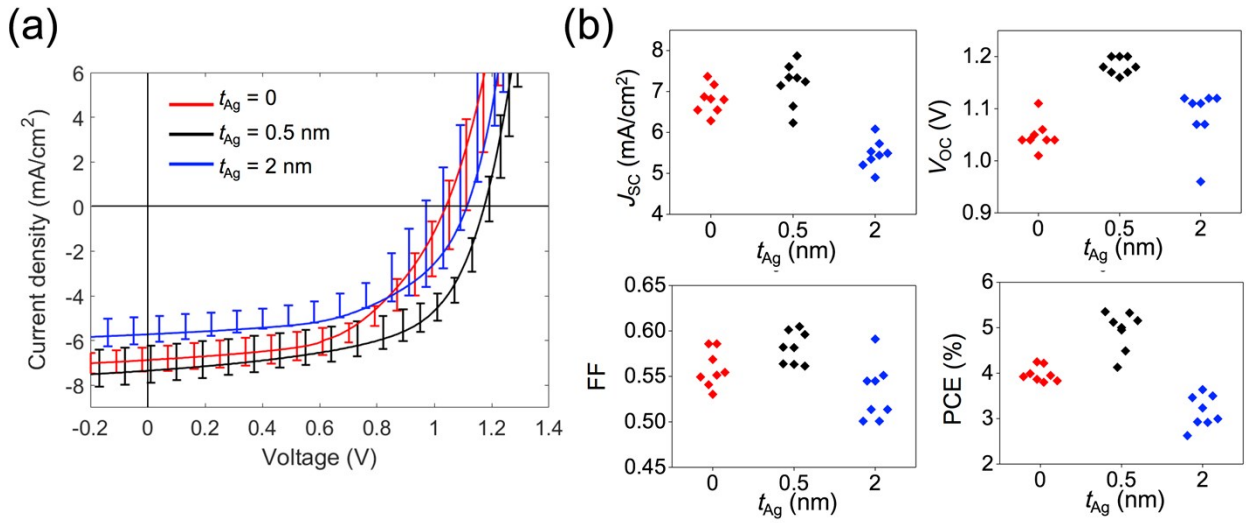

Figure S4 (a) Device-to-device variations of the *J*–*V* characteristics of the tandem cells shown in Fig. 3(b). Top and bottom of errors bars correspond to maximum and minimum values obtained from eight devices for each tandem cell. (b) The photovoltaic parameters of all twenty-four devices, eight for each tandem cell.

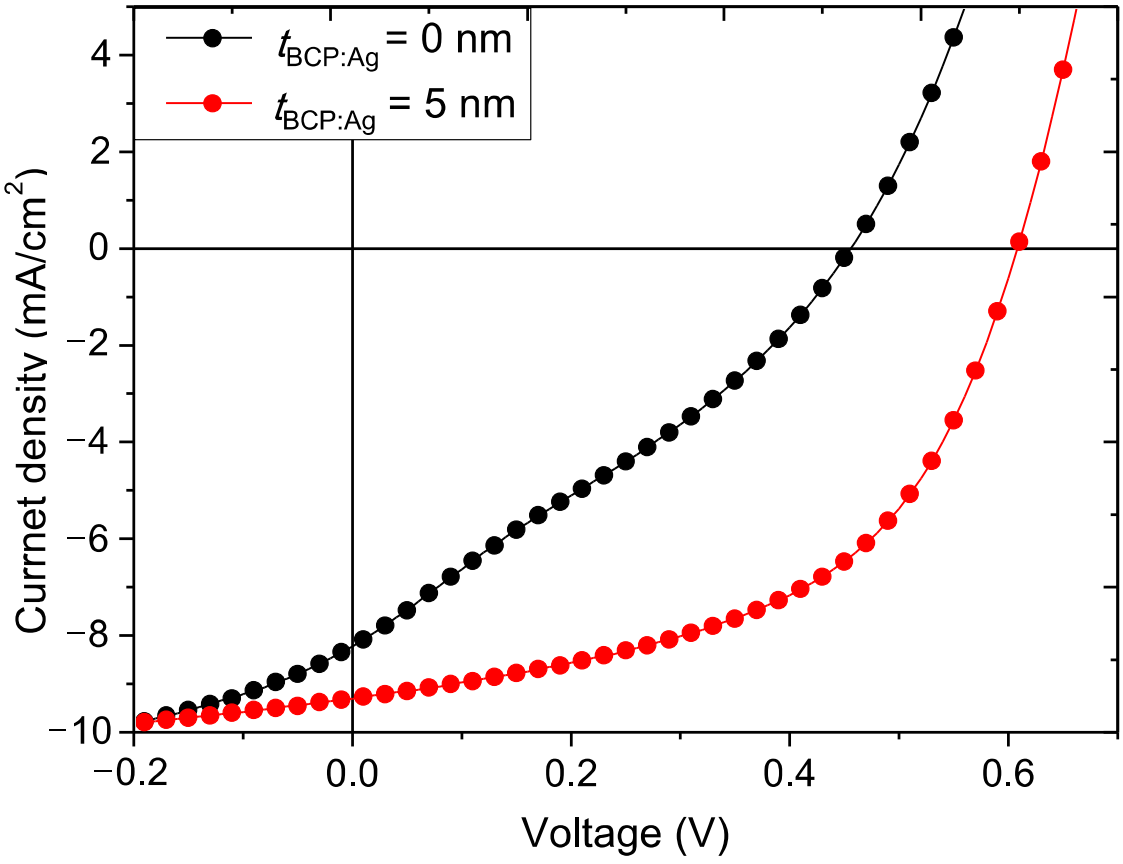

Figure S5 *J–V* characteristics of P3HT:$PC_{61}BM$ single-junction devices, without a BCP:Ag layer (black) and with a 5-nm-thick BCP:Ag layer (red).

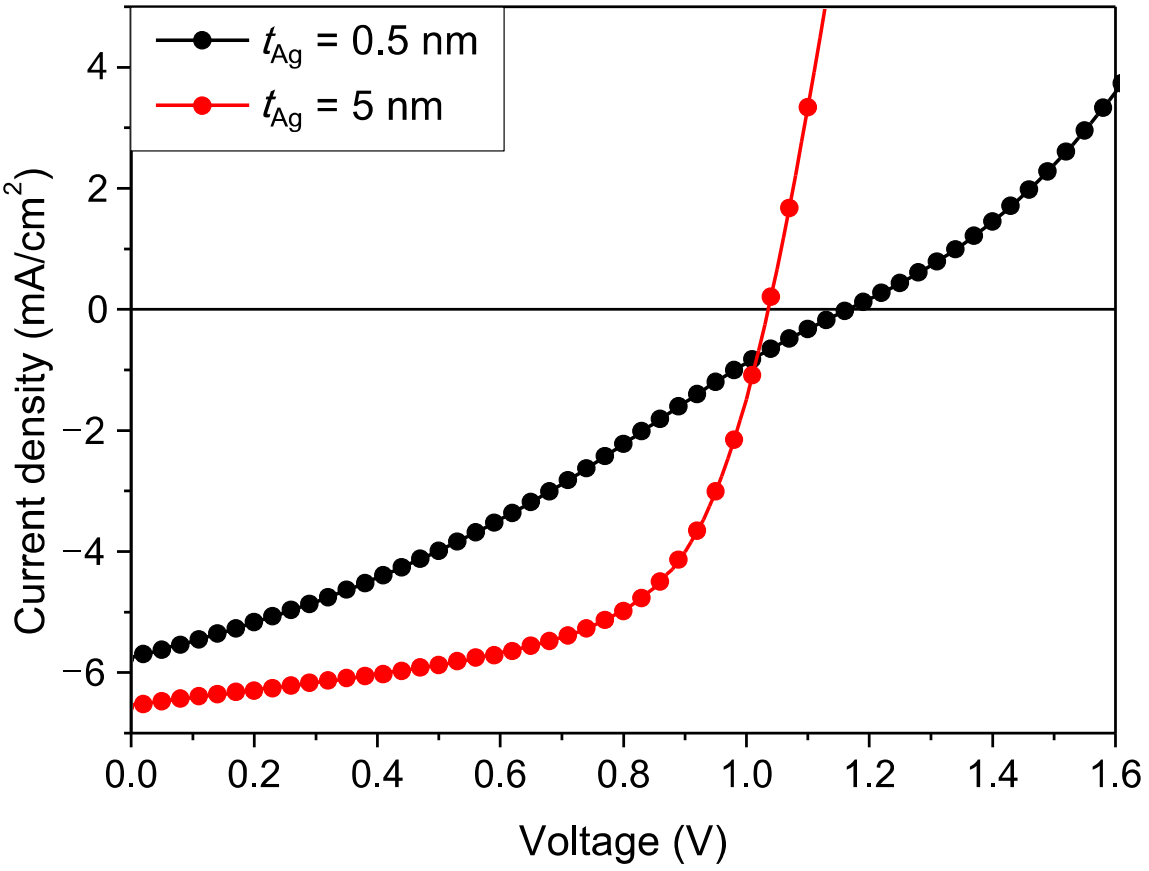

Figure S6 *J–V* characteristics of polymer tandem devices with ($t_{BCP:Ag}$, t_{Ag}) = (30 nm, 0.5 nm) (black) and ($t_{BCP:Ag}$, t_{Ag}) = (30 nm, 5 nm) (red), respectively.

Reference

1 J. Gilot, M. M. Wienk and R. A. J. Janssen, *Adv. Funct. Mater.*, 2010, **20**, 3904-3911.