

Supporting Information

Hybrid Solar Cells Fabricated with Amorphous Silicon and Fullerene Derivative

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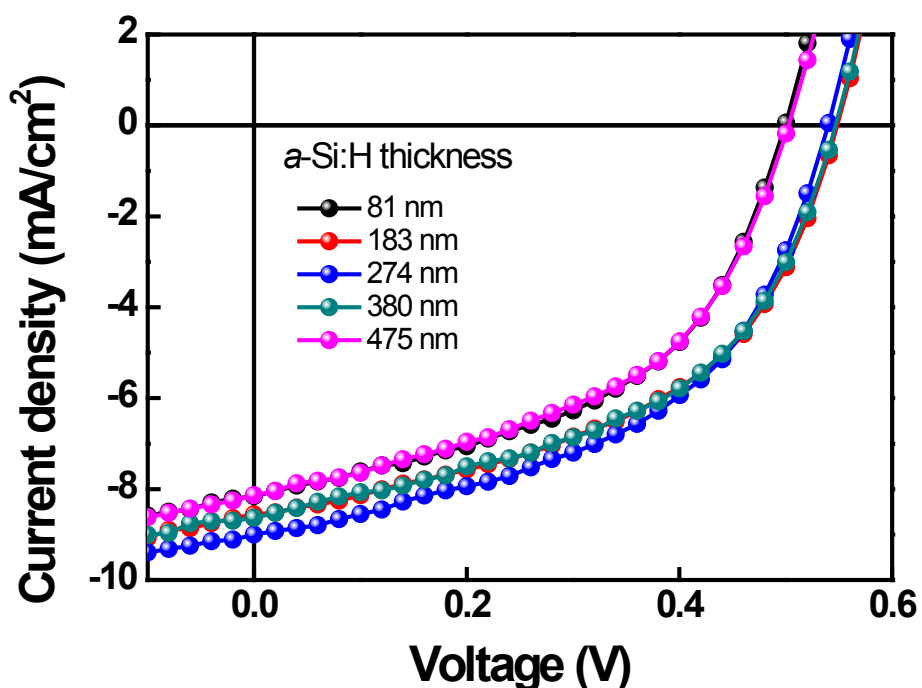


Figure S1. Current density–voltage (J – V) characteristics of the a -Si:H/[71]PCBM devices with different thickness 81–475 nm before thermal annealing at 150°C measured under AM1.5G illumination from a calibrated solar simulator with irradiation intensity of 100 mW/cm².

Table S1. Photovoltaic parameters of the a -Si:H/[71]PCBM devices with different thickness before thermal annealing at 150°C

a -Si:H/[71]PCBM	a -Si:H thickness	J_{sc} (mAcm ⁻²)	V_{oc} (V)	FF	Efficiency (%)
No annealing treatment	81 nm	8.16	0.50	0.49	1.99
	183 nm	8.56	0.55	0.49	2.31
	274 nm	9.11	0.56	0.49	2.51
	380 nm	8.64	0.55	0.49	2.32
	475 nm	8.14	0.50	0.48	1.98

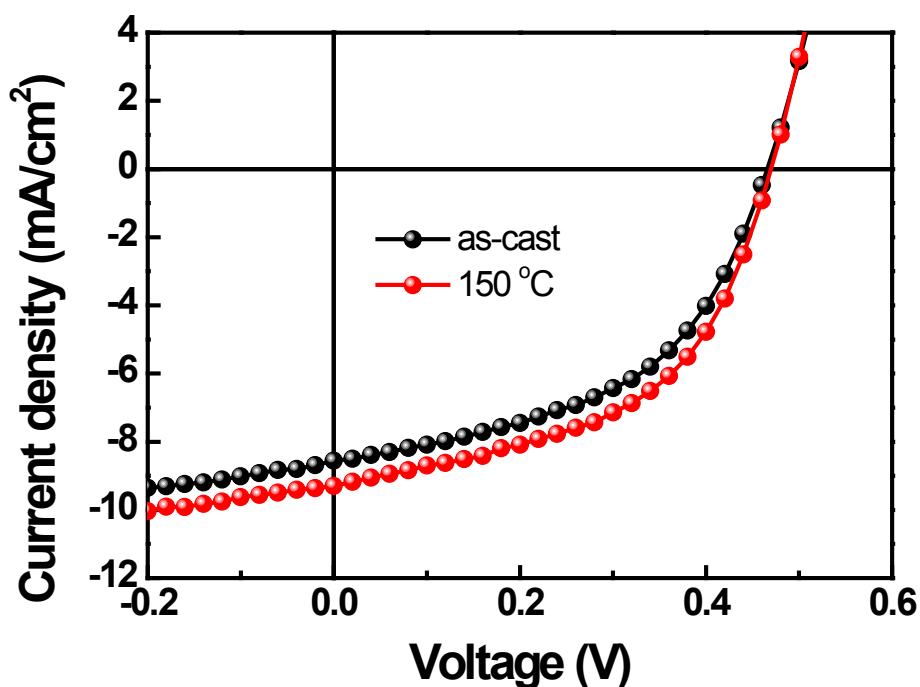


Figure S2 Current density–voltage (J – V) characteristics of the a -Si:H/[71]PCBM devices with 274 nm of a -Si:H thickness and around 20 nm thickness of [71]PCBM measured under AM1.5G illumination from a calibrated solar simulator with irradiation intensity of 100 mW cm^{-2} .

Table S2 Photovoltaic parameters of the a -Si:H/[71]PCBM devices with 274 nm thickness of a -Si:H of and around 20 nm of [71]PCBM before thermal annealing at 150°C .

a -Si:H/[71]PCBM	a -Si:H thickness	Annealing treatment	J_{SC} (mA cm^{-2})	V_{OC} (V)	FF	Efficiency (%)
	274 nm	x	8.53	0.50	0.48	2.03
		150°C	9.08	0.52	0.50	2.35

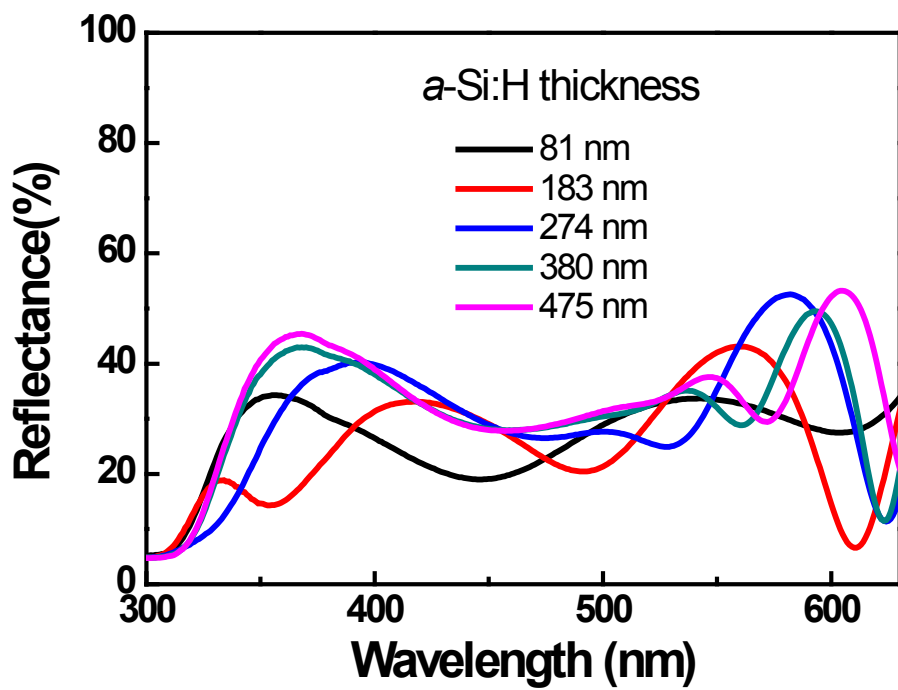


Figure S3. Comparing reflectance spectra of the solar cells with *a*-Si:H of different thickness.

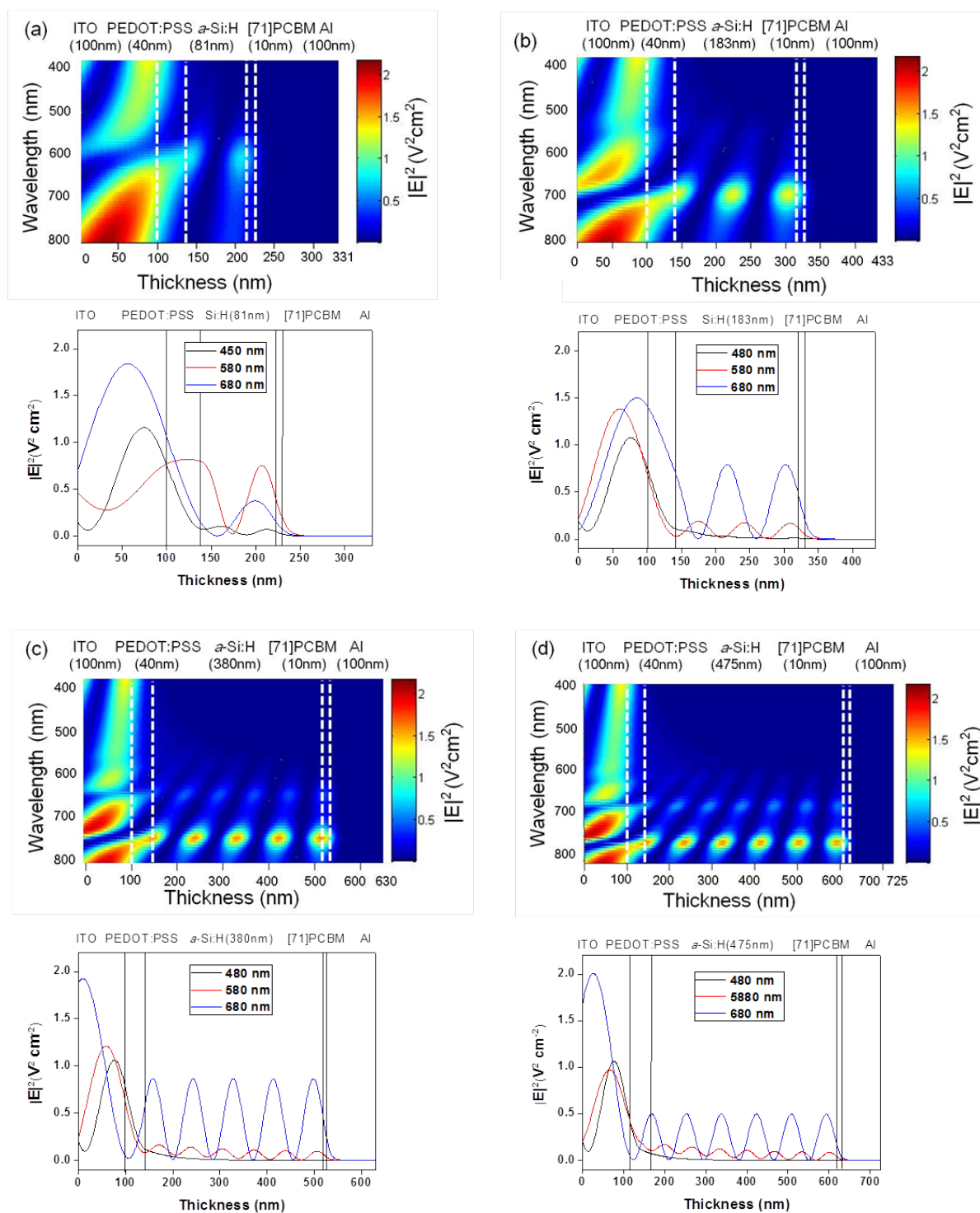


Figure S4. Mesh image and plot images of the model output for the device consisting of ITO/PEDOT:PSS/*a*-Si:H/[71]PCBM/Al with different thickness of *a*-Si:H. Modulus squared of electric field ($V^2 cm^{-2}$). (a) 81 nm, (b) 183 nm, (c) 380 nm, and (d) 475 nm.

Table S3. Photovoltaic parameters of the *a*-Si:H/[71]PCBM devices with different p-layer.

p-layer	Thickness	J_{sc} (mA cm ⁻²)	V_{oc} (V)	FF	Efficiency (%)
PEDOT:PSS	20 nm	8.25	0.36	0.45	1.34
PEDOT:PSS	10 nm	7.73	0.37	0.42	1.20
V ₂ O ₅	5 nm	9.46	0.45	0.40	1.71
MoO ₃	5 nm	5.50	0.43	0.35	0.84

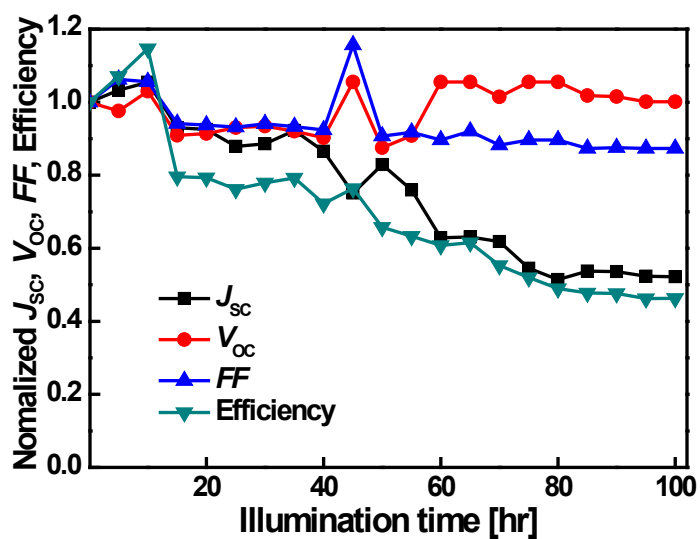


Figure S5. *a*-Si:H/[71]PCBM solar cell performance characteristics for illumination time.