Supporting Information

High Performance Alternating Polymers Based on Two-dimensional Conjugated Benzo[1,2-b:4,5-b']dithiophene and Fluorinated Dithienylbenzothiadiazole for Solar Cells[‡]

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Content

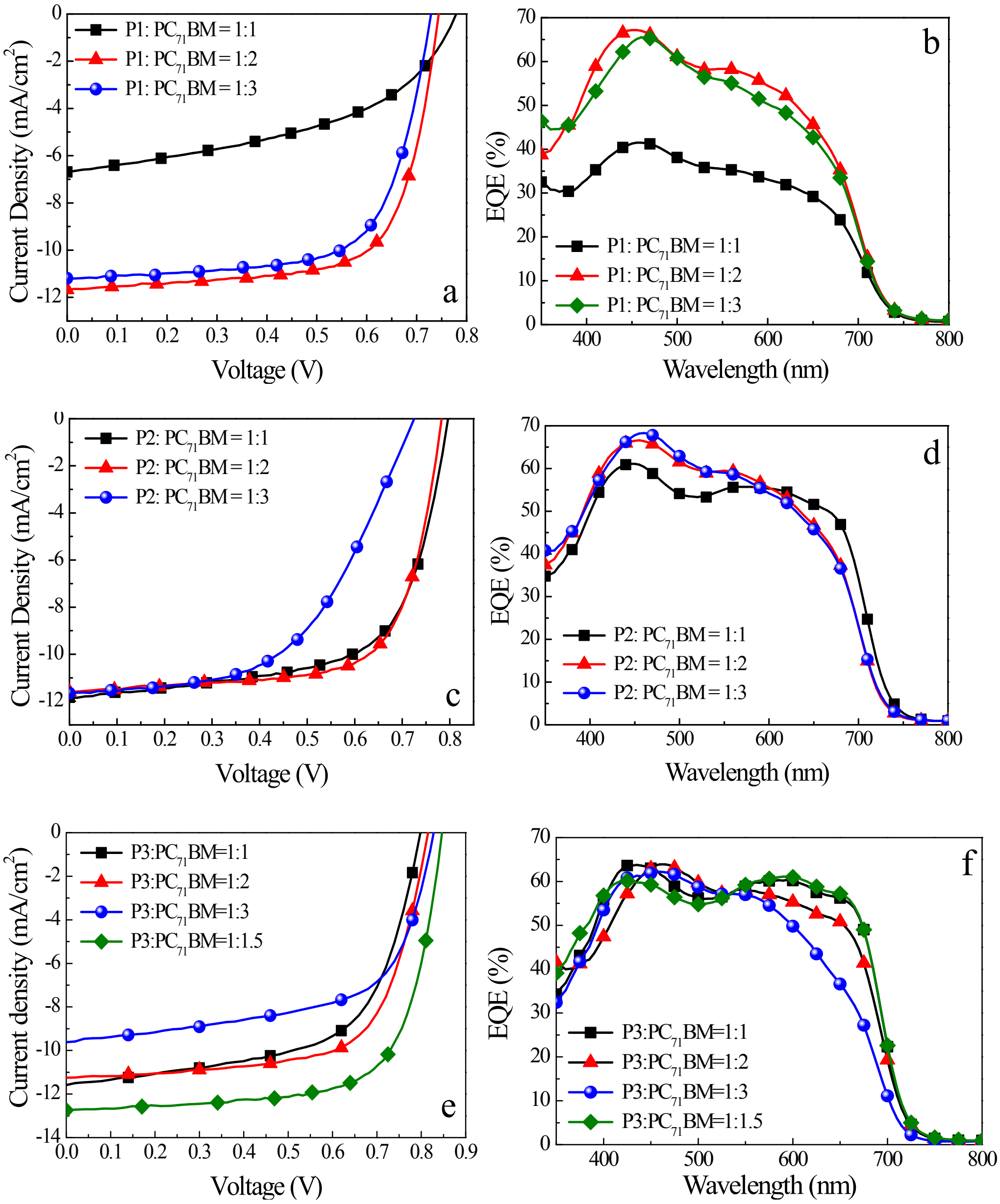

Figure S1 *J-V* (a, c, e) and EQE (b, d, f) curves of the PSCs based on **P1**, **P2** and **P3** blended with $PC_{71}BM$ at different weight ratios.

Table S1 Photovoltaic results of the PSCs based on **P1**, **P2** and **P3** blended with $PC_{71}BM$ at different weight ratios under the illumination of AM1.5G (100mW/cm^2)

Active layer	D:A	V_{oc} (V)	J_{sc} (mA/cm^2)	FF (%)	PCE (%)
P1:$PC_{71}BM$	1:1	0.78	6.69	46.4	2.42
	1:2	0.75	11.7	69.2	6.07
	1:3	0.74	11.2	67.5	5.59

P2:$PC_{71}BM$	1:1	0.80	11.8	63.9	6.03
	1:2	0.79	11.6	69.1	6.33
	1:3	0.73	11.7	52.9	4.52
P3:$PC_{71}BM$	1:1	0.80	11.58	60.8	6.05
	1:1.5	0.85	12.70	69.3	7.48
	1:2	0.82	11.2	66.7	6.61
	1:3	0.82	9.62	61.8	5.24

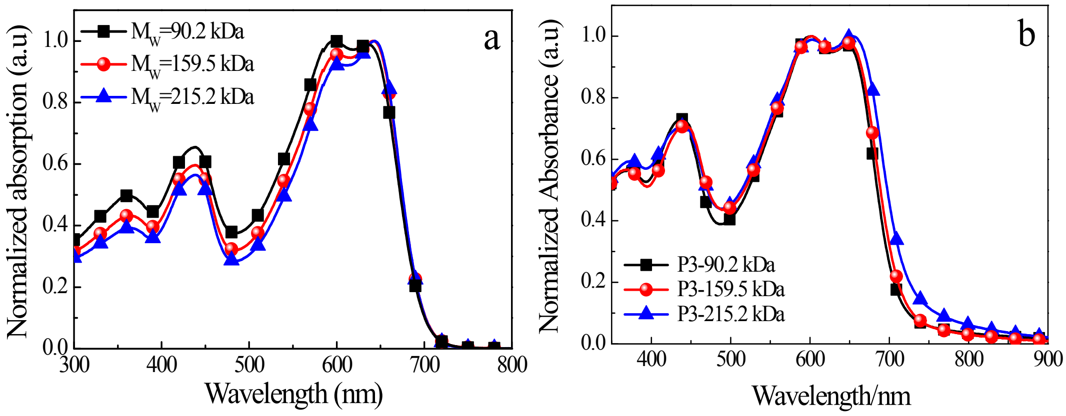

Figure S2 Absorption spectra of **P3** with different molecular weight in chloroform (a), and the absorption spectra of the corresponding films (b).

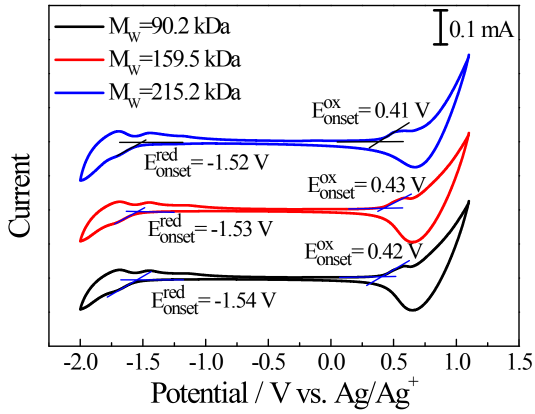

Figure S3 Cyclic voltammograms of three **P3** films with different molecular weight on a glassy carbon electrode measured in 0.1 mol/L Bu_4NPF_6 solutions at a scan rate of 50 mV/s.

Table S2 Optical, electrochemical properties of three **P3** films with different molecular weight

Polymer	Mn [kDa]	Mw [kDa]	PDI	λ_{edge} [nm]	$E_g^{opt\ a)}$ [eV]	$E_{red}^{b)}$ [V]	$E_{ox}^{c)}$ [V]	HOMO$^{b)}$ [eV]	LUMO$^{b)}$ [eV]	$E_g^{\ b)}$ [eV]
P3	24.2	90.2	3.73	710	1.75	-1.54	0.42	-5.13	-3.17	1.96
P3	40.8	159.5	3.91	714	1.74	-1.53	0.43	-5.14	-3.18	1.96
P3	46.3	215.2	4.65	722	1.72	-1.52	0.41	-5.12	-3.19	1.93

a) estimated from the onset of electronic absorption of the polymer films (E_g^{opt}=1240/λ(nm)).

b) cyclic voltammetry results.

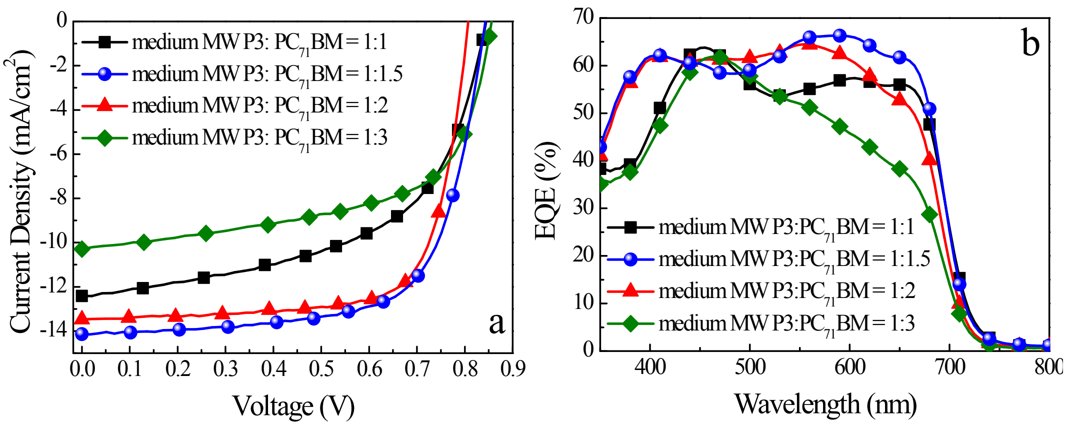

Figure S4 *J*-*V* (a) and EQE (b) curves of the PSCs based on medium MW **P3** blended with $PC_{71}BM$ at different weight ratios.

Table S3 Photovoltaic results of the PSCs based on medium MW **P3** blended with $PC_{71}BM$ at different weight ratios under the illumination of AM1.5G (100mW/cm^2)

Active layer	D:A	V_{oc} (V)	J_{sc} (mA/cm^2)	FF (%)	PCE (%)
P3:$PC_{71}BM$	1:1	0.84	12.4	55.5	5.81
	1:1.5	0.85	14.1	68.1	8.16
	1:2	0.82	13.5	72.5	8.02
	1:3	0.86	10.3	59.6	5.26