Supporting Information

Low Band-gap Conjugated Polymer based on Diketopyrrolopyrrole Units and its Application in Organic Photovoltaic

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Table S1. The optimization of D/A weight ratio of the P266: $PC_{71}BM$-based PSCs[a]

D/A	V_{oc} (V)	J_{sc} (mA/cm^2)	FF	PCE (%)
1:1	0.734	15.85	0.557	6.48
1:1.5	0.712	16.66	0.606	7.18
1:2	0.705	16.02	0.646	7.30
1:3	0.711	14.35	0.672	6.85

a) 3% vol. DPE was used as additive here because that the primary PCE acquired from CB is too low. The results were acquired from the conventional method.

Table S2. The optimization of additive feed ratio of the P266: $PC_{71}BM$-based PSCs[a]

DPE (%)	V_{oc} (V)	J_{sc} (mA/cm^2)	FF	PCE (%)
1	0.731	6.87	0.584	2.87
3	0.711	16.60	0.639	7.54
5	0.693	17.14	0.598	7.10

a) The D/A weight ratio adopted here is 1:2. The results were acquired from the conventional method.

Table S3. Photovoltaic Characteristics of P266/$PC_{71}BM$–based PSC Devices with different film thickness.

Film Thickness(nm)	V_{oc} (V)	J_{sc} (mA/cm^2)	FF	PCE (%)
340	0.69	21.08	0.519	7.60
305	0.69	21.32	0.562	8.28
270	0.69	20.25	0.599	8.42
250	0.69	19.65	0.612	8.35
230	0.69	19.24	0.630	8.41
210	0.70	18.10	0.657	8.32

180	0.70	17.58	0.669	8.20
160	0.71	17.63	0.699	8.72
130	0.71	17.54	0.701	8.76
100	0.72	17.30	0.716	8.92

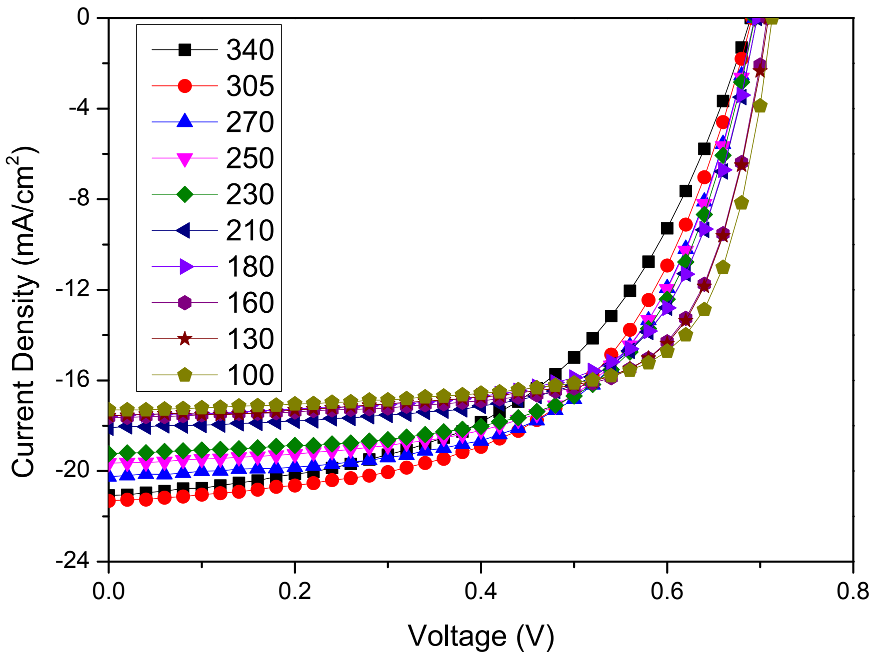

Figure S1. The *J-V* curves of the P266:$PC_{71}BM$-based devices with various film thickness (nm)

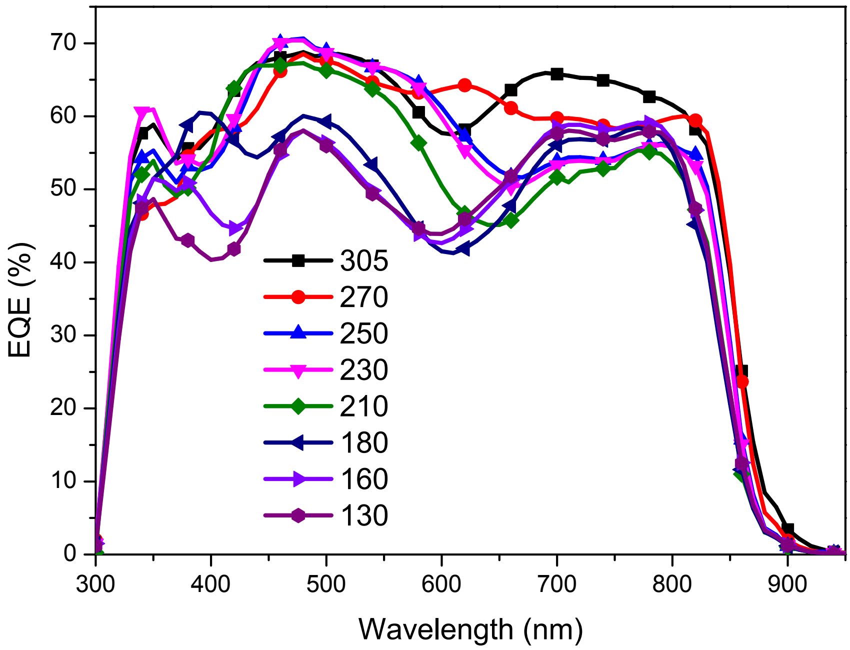

Figure S2. The EQE curves of the P266:$PC_{71}BM$-based devices with various film thickness (nm)

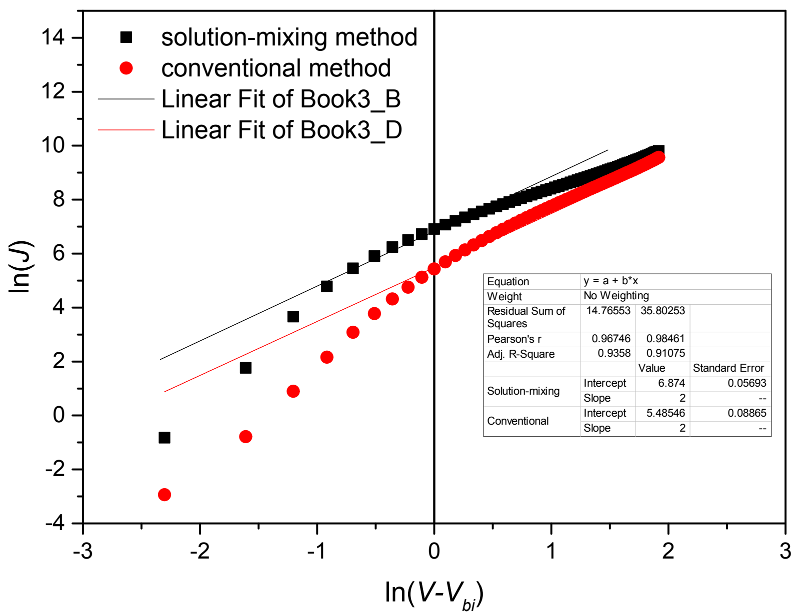

Figure S3. *J-V* Characteristics of the hole-only devices used for SCLC fitting (both films thickness are **180nm)**

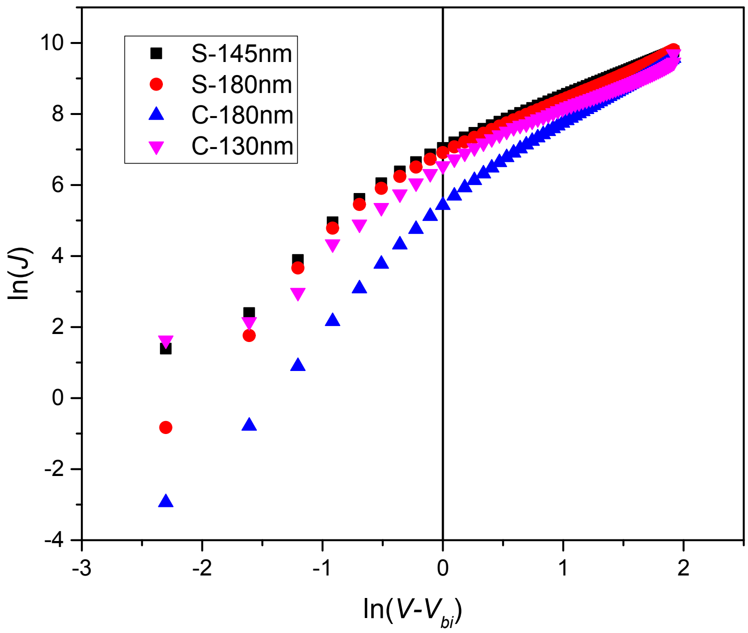

Figure S4. *J-V* Characteristics of the hole-only devices of the samples prepared from sloution-mixing method (S-180nm and S-145 nm) and conventional method (C-180nm and C-130 nm).

Table S4. Hole mobilities calculated from devices with different film thickness.

Thickness	180nm	145nm	130nm
Solution-mixing Method	1.52×10^{-3} $cm^2/(V\cdot s)$	1.28×10^{-3} $cm^2/(V\cdot s)$	--
Conventional Method	2.96×10^{-4} $cm^2/(V\cdot s)$	--	3.47×10^{-4} $cm^2/(V\cdot s)$

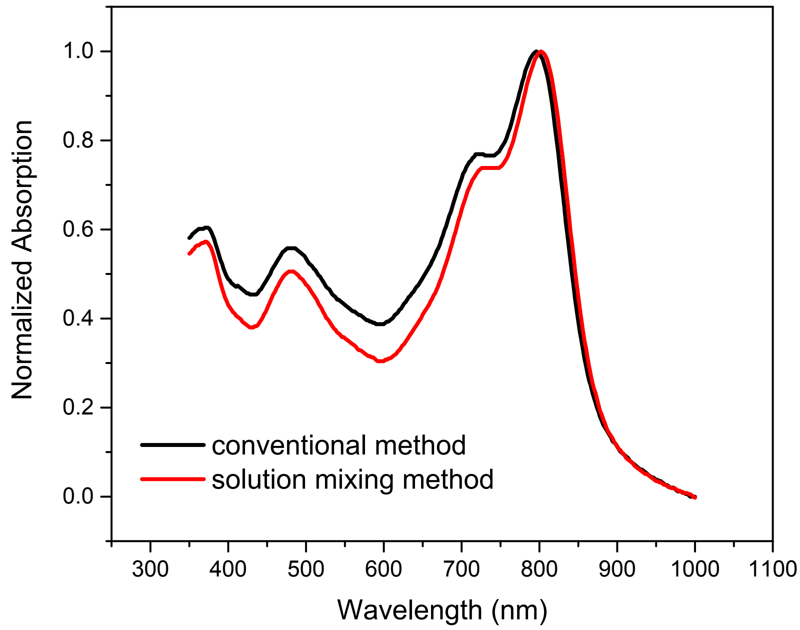

Figure S5. The absorption spectra of the blend film prepared by two methods.