Electronic Supplementary Information (ESI)

Medium Bandgap Copolymers Based on Carbazole and Quinoxaline Exceeding 1.0 V Open-Circuit Voltages

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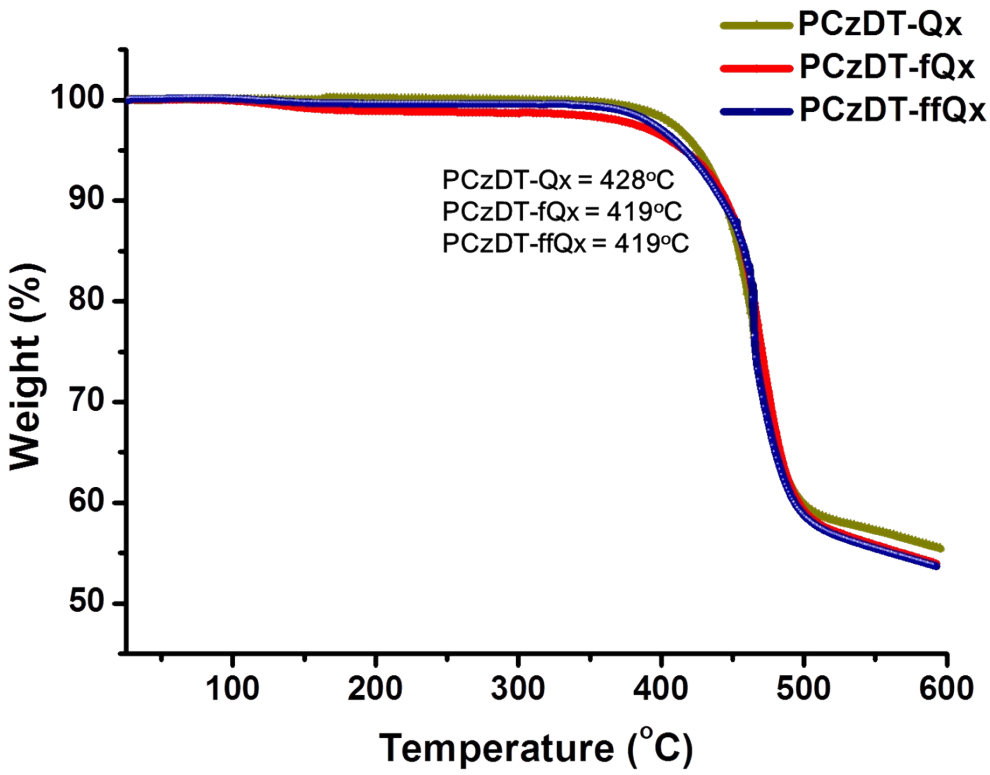

Fig. S1 TGA for a series of the of the Cz- Qx-based coolymers

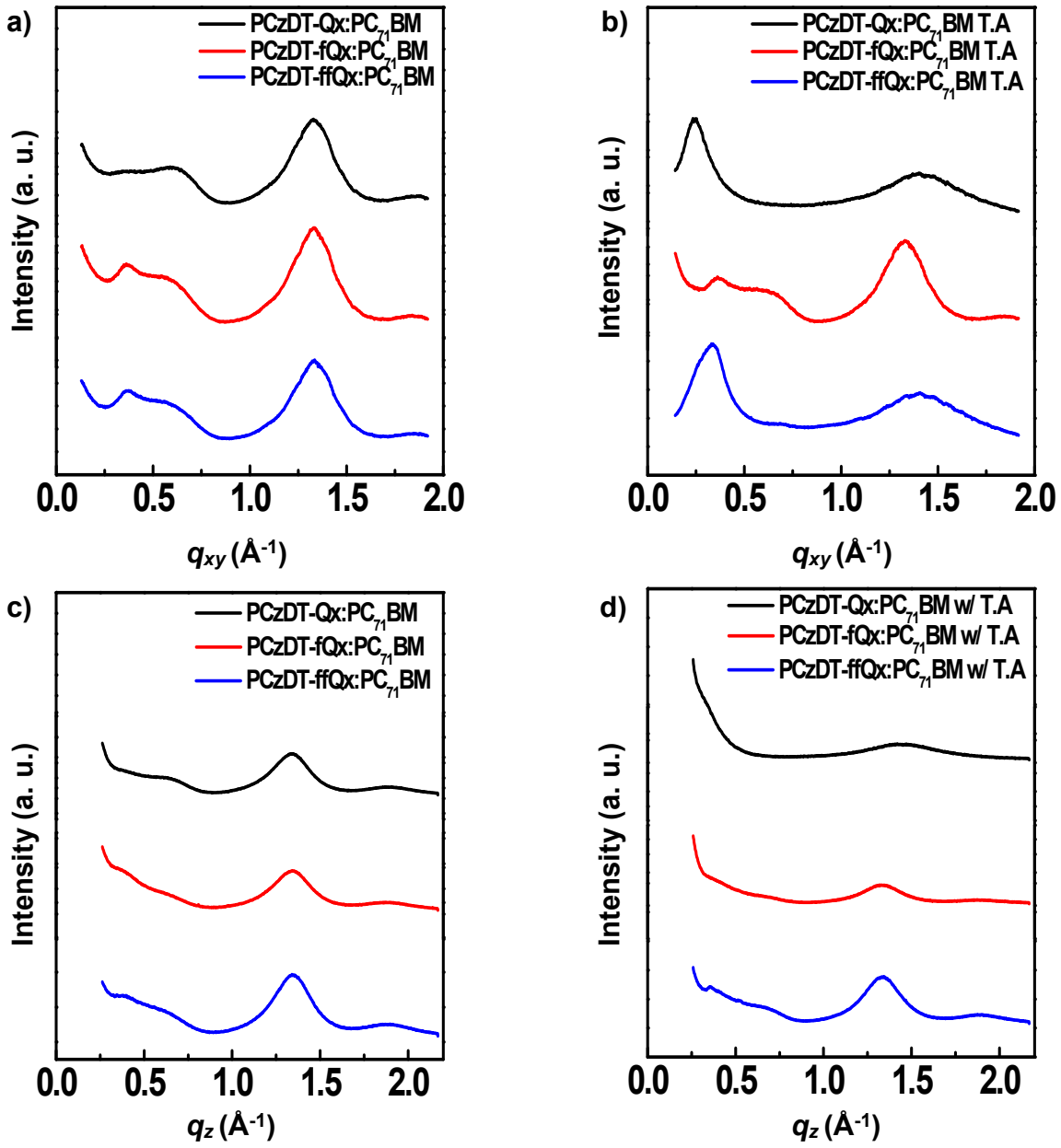

Fig. S2 GIWAXS line cut images of the optimized BHJ PSCs; (a-b) in-plane line cuts and (c-d) out-of-plane line cuts.

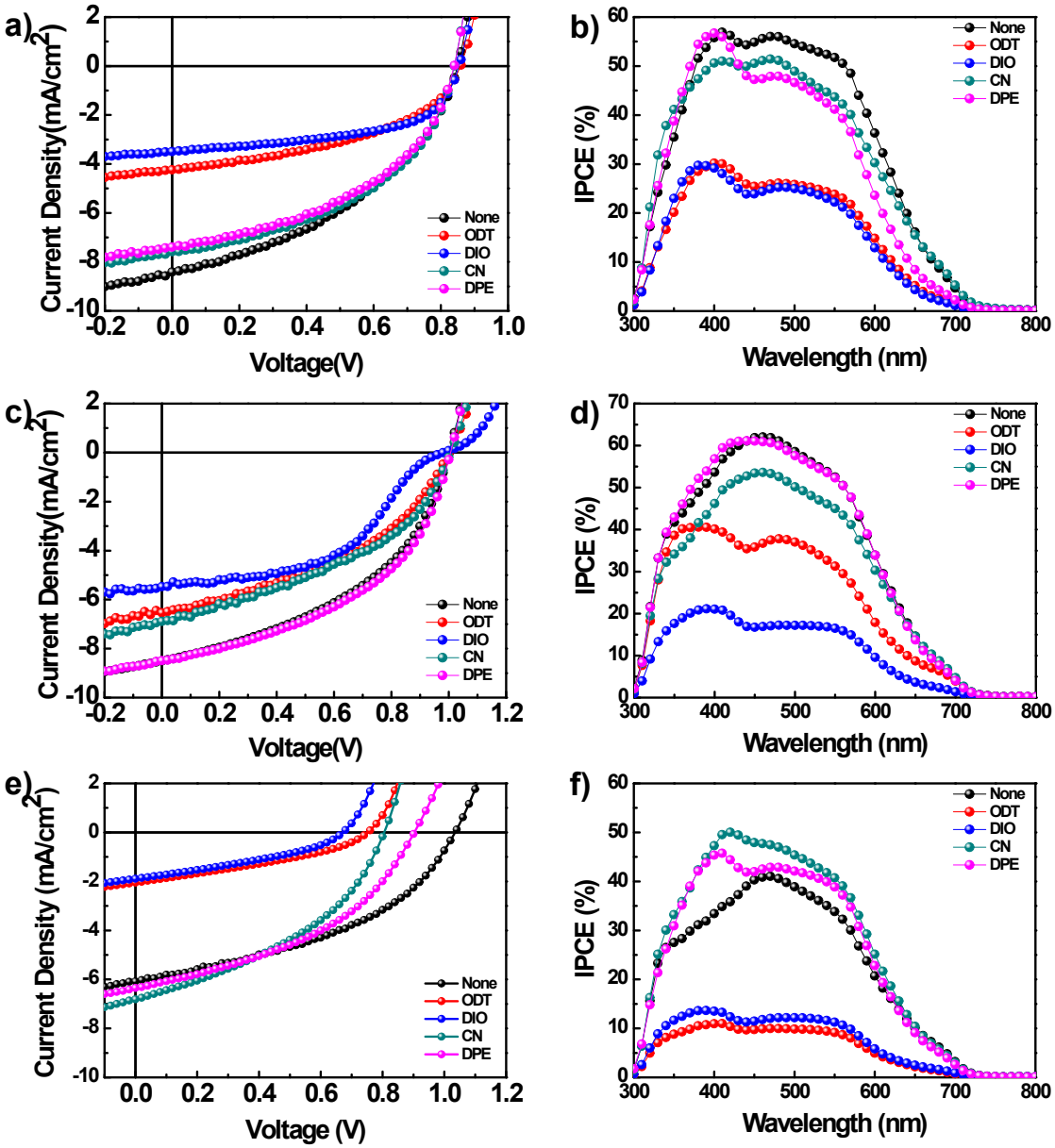

Fig. S3 Photovoltaic characteristics of the annealed PSCs with various additives. (a, c, e) Current density versus voltage (*J–V*) characteristics and (b, d, f) the corresponding incident photon-to-current efficiency (IPCE) for (a,b) **PCzDT-Qx**, (b,c) **PCzDT-fQx**, (e,f) **PCzDT-ffQ**x, respectively.

Table S1 Summary of photovoltaic characteristics the annealed PSCs with various additives.

Polymer[a]	Polymer:$PC_{71}BM$ ratio	additive[b]	J_{SC} (mA/cm^2)	V_{OC} (V)	*FF*	PCE (%)
PCzDT-Qx	1:3	X	8.42	0.85	0.42	3.24
		ODT	4.24	0.86	0.45	1.77
		DIO	3.50	0.85	0.55	1.78
		CN	7.58	0.84	0.47	3.23
		DPE	7.39	0.84	0.46	3.08
PCzDT-fQx	1:2.5	X	8.51	1.00	0.45	3.80
		ODT	5.47	0.98	0.47	2.54
		DIO	6.54	1.00	0.42	2.76
		CN	6.89	1.00	0.42	2.88
		DPE	8.63	0.96	0.49	4.03
PCzDT-ffQx	1:2	X	6.08	1.04	0.42	2.67
		ODT	2.51	0.81	0.39	0.79
		DIO	1.93	0.70	0.35	0.47
		CN	6.81	0.81	0.40	2.21
		DPE	6.35	0.90	0.42	2.40

[a]Thermal annealing at 110 ^oC, 10min. [b]2%, v/v