

Effect of Fluorine Substitution on the Photovoltaic Performance of Poly(thiophene-quinoxaline) Copolymers

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Table S1. The detailed photovoltaic data of the optimization process of the PSCs

polymer	Ratio ^a	treatment	Voc(V)	Jsc(mA cm ⁻²)	FF(%)	PCE(%)
PT-QX	1 : 1	none	0.61	5.81	33.82	1.20
	1 : 2	none	0.59	5.82	34.49	1.19
	1 : 3	none	0.58	4.68	38.62	1.05
	1 : 1.4	none	0.63	6.76	34.58	1.47
	1 : 1.4	annealing	0.63	6.76	34.58	1.47
	1 : 1.4	CH3OH	0.63	7.17	43.17	1.95
	1 : 1.4	Zracac	0.64	7.41	51.09	2.44
	1 : 1.4	Zracac、 3%DIO	0.60	9.10	51.79	2.82
PT-FQX	1 : 1	none	0.62	5.42	49.27	1.67
	1 : 2	none	0.71	5.62	56.27	2.25
	1 : 3	none	0.67	5.72	53.48	2.03
	1 : 1.3	none	0.72	7.53	50.97	2.76
	1 : 1.3	annealing	0.70	7.34	53.53	2.77
	1 : 1.3	CH3OH	0.73	8.60	50.21	3.16
	1 : 1.3	Zracac	0.73	8.27	54.88	3.31
	1 : 1.3	Zracac、 3%DIO	0.68	11.05	54.92	4.14
PT-DFQX	1 : 1	none	0.70	6.87	51.21	2.46
	1 : 2	none	0.72	6.81	48.69	2.40

	1 : 3	none	0.70	6.16	51.40	2.22
	1 : 1.2	none	0.81	9.20	53.29	3.96
	1 : 1.2	annealing	0.77	8.77	58.45	3.96
	1 : 1.2	CH3OH	0.80	10.49	53.17	4.44
	1 : 1.2	Zracac	0.83	10.80	57.00	5.09
	1 : 1.2	Zracac、 1%DIO	0.77	12.62	53.11	5.19
	1 : 1.2	Zracac、 3%DIO	0.76	13.16	51.90	5.17

[a] Polymer/PC₇₁BM weight ratio.

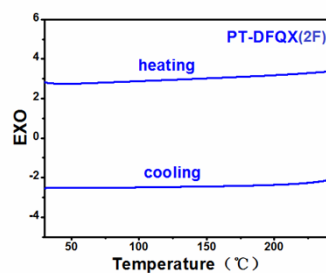
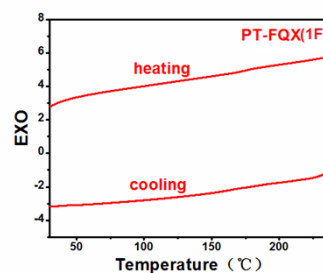
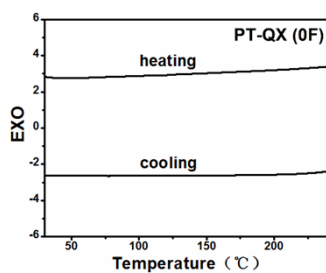


Figure S1. The differential scanning calorimetry (DSC) thermograms of the polymers under the protection of nitrogen (heating and cooling rate: 10 °C / min)

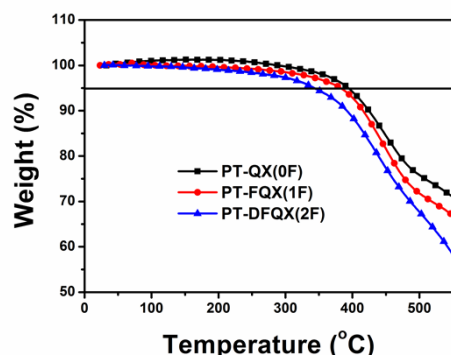


Figure S2. TGA plots of the polymers with a heating rate of $10\text{ }^{\circ}\text{C min}^{-1}$ under a N_2 atmosphere.

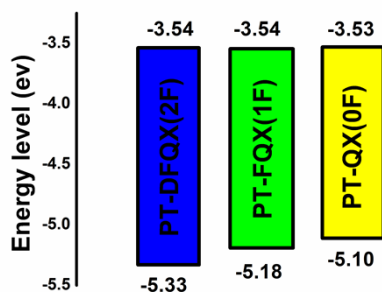


Figure S3. Energy level diagrams for the PT-QX (0F), PT-FQX (1F) and PT-DFQX (2F) based polymers.

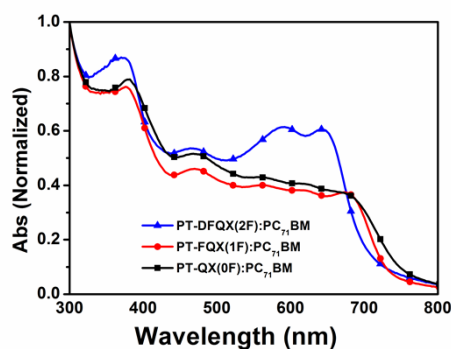


Figure S4. UV/Vis absorption spectra of blend films of polymer/PC₇₁BM prepared under the optimal conditions.

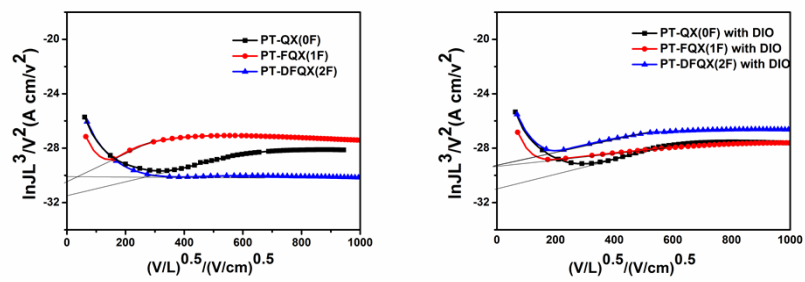


Figure S5. Plots of $\ln(JL^3/V^2)$ versus $(V/L)^{0.5}$ for the measurement of the hole mobility in the devices based on polymer/PC₇₁BM by the SCLC method