Supporting Information

Small molecule carbazole based diketopyrrolopyrroles with tetracyanobutadiene acceptor unit as Non-Fullerene acceptor for Bulk Heterojunction Organic Solar Cells

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Experimental details

Device fabrication and characterization

The chemicals were used as received unless otherwise indicated. The PSCs were fabricated with a configuration of ITO/ PEDOT:PSS (40 nm)/**P**:**DPP7** of **DPP8**/PFN/Al. A thin layer of PEDOT:PSS was deposited through spin-coating on pre-cleaned ITO-coated glass substrate from a PEDOT:PSS aqueous solution (Baytron P VP AI 4083) at 2000 rpm and dried subsequently at 120 °C for 15 min in air. The active blend layer was spin-coated from THF solution containing a blend of P and **DPP7 or DPP8** onto the PEDOT:PSS layer. The optimized conditions are with a spin rate of 2000 rpm and with a blend THF solution containing weight ratio of 1: 2 between the

donor and acceptor with total concentration 18 mg/mL for both **DPP7** and **DPP8** acceptors. For solvent vapour annealing (SVA) treatment, the films were subjected to chloroform vapor, for a period of 60 s in a sealed petri dish. Then methanol solution of PFN at a concentration of 1.0 mg/ mL was deposited on the top the active layer at 3000 rpm for 30 s to afford a thickness of 15 nm. Finally, top Al electrode was deposited in vacuum onto the cathode buffer layer at a pressure of $\approx 1.0 \times 10^{-5}$ Pa. The active area of the device was 10 mm^2. We have fabricated four devices in one substrate. The current-voltage (*J*−*V*) characteristics of the PSCs were measured on a computer controlled Keithley 2450 Source meter. Solar Simulator with a 450 W xenon lamp and an air mass (AM) 1.5 filter was used as the light source. The light intensity was kept constant at 100 mW/cm2. The IPCE of the devices was measured at illuminating the device through the light source and monochromator and the resulting current was measured using a Keithley electrometer under short circuit condition.

Table S1 Photovoltaic parameters for the OSCs based on SVA treated **P:DPP8** active layers.

Device No	J_{sc} (mA/cm^2)	V_{oc} (V)	FF	PCE (%)
1	13.85	0.91	0.56	7.06
2	14.07	0.89	0.57	7.14
3	13.49	0.91	0.58	7.12
4 (best)	13.78	0.90	0.58	7.19
5	14.14	0.91	0.55	7.08
6	13.48	0.90	0.58	7.04
7	13.28	0.91	0.58	7.01
8	13.78	0.90	0.57	7.07

Table S2 Photovoltaic parameters for the OSCs based on SVA treated **P:DPP7** active layers.

Device No	J_{sc} (mA/cm^2)	V_{oc} (V)	FF	PCE (%)
1	10.82	0.92	0.48	4.78
2	10.16	0.94	0.50	4.75
3	10.73	0.92	0.47	4.64
4 (best)	10.56	0.94	0.49	4.86
5	10.56	0.93	0.48	4.69
6	10.06	0.92	0.50	4.63
7	10.58	0.92	0.48	4.68
8	10.66	0.95	0.47	4.76

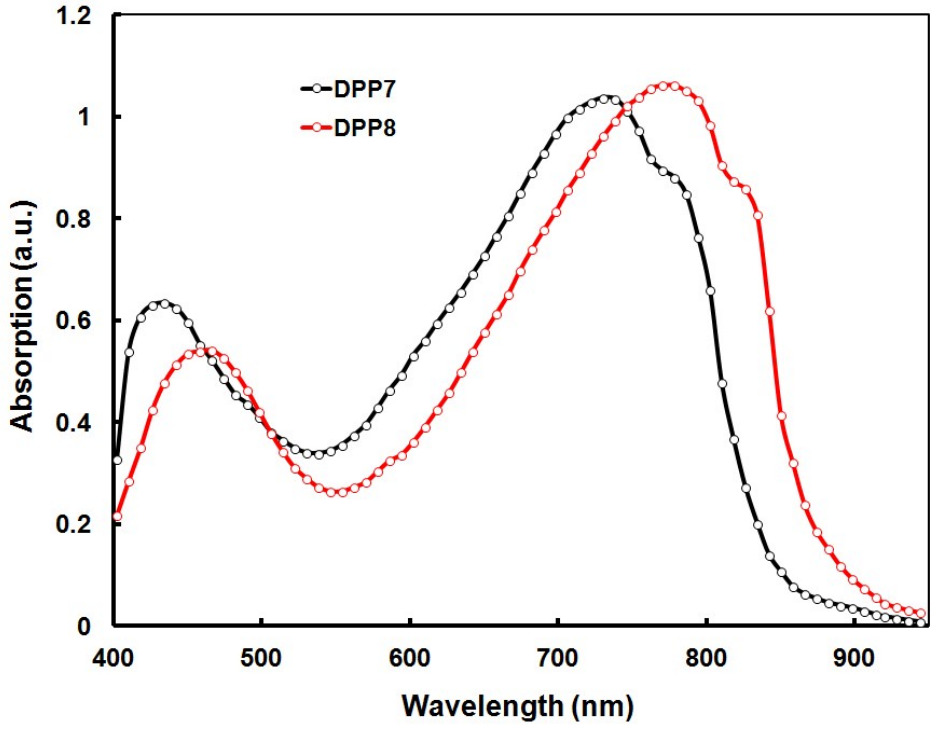

Fig. S1 Normalized absorption spectra of SVA **DPP7** and **DPP8** thin film.

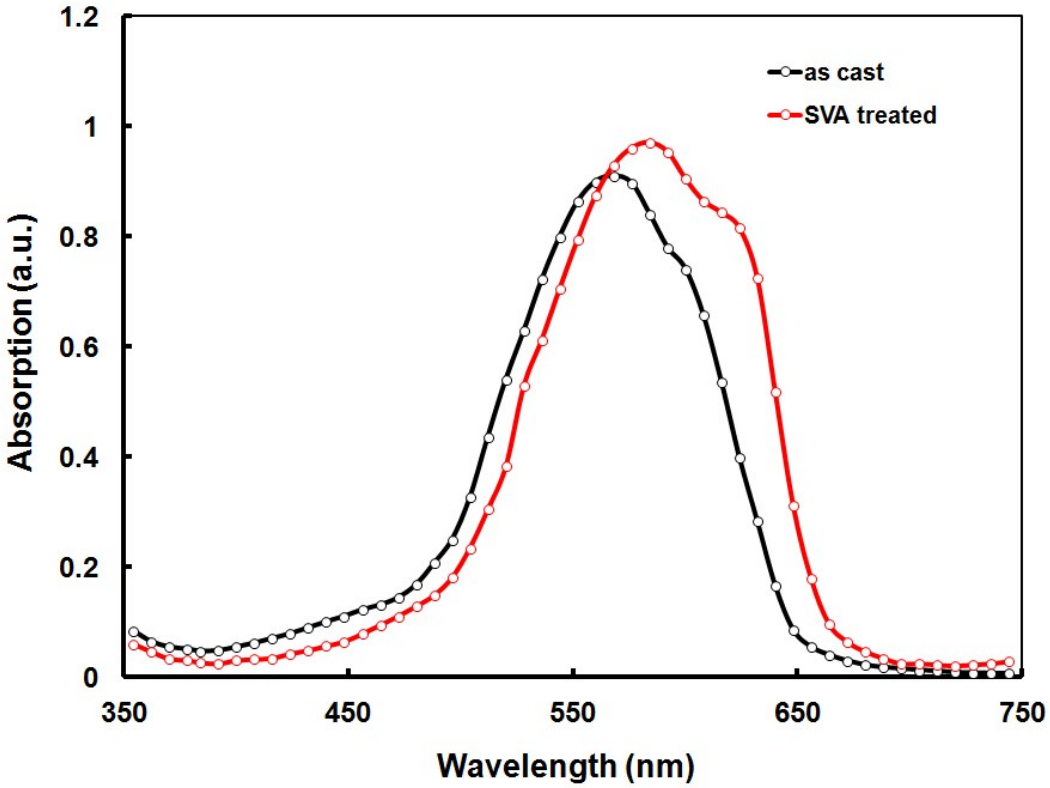

Fig. S2 Normalized absorption spectra of as cast the SVA treated D-A copolymer **P** thin films.