

Supplementary Information

PCDTBT based solar cells: one year of operation under real-world conditions

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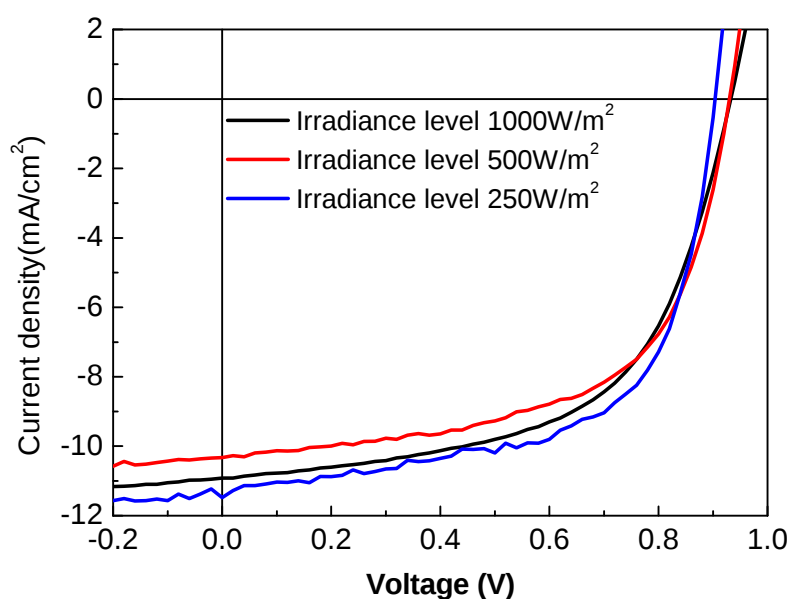


Figure S1: The J-V curves of devices measured under different irradiance levels in laboratory and then normalized to an irradiance intensity of 1000W/m².

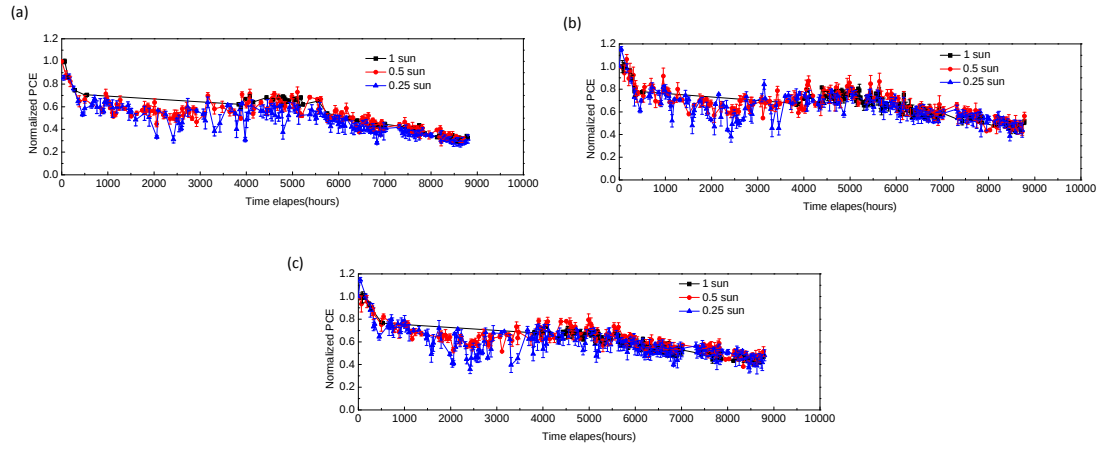


Figure S2 Evolution of PCE normalized to different irradiance level as a function of time of OPVs whose active layer was spin-cast from (a) CB, (b) CF and (c) CS₂/Acetone

Table S1: Metrics of a device measured under different irradiance levels in laboratory and then normalized to an irradiance intensity of 1000W/m².

Irradiance level (W/m ²)	1000	500	250
PCE (%)	5.90	5.73	6.33
J _{sc} (mA/cm ²)	-10.91	-10.32	-11.49
V _{oc} (V)	0.93	0.93	0.90
FF (%)	58.00	59.64	60.95

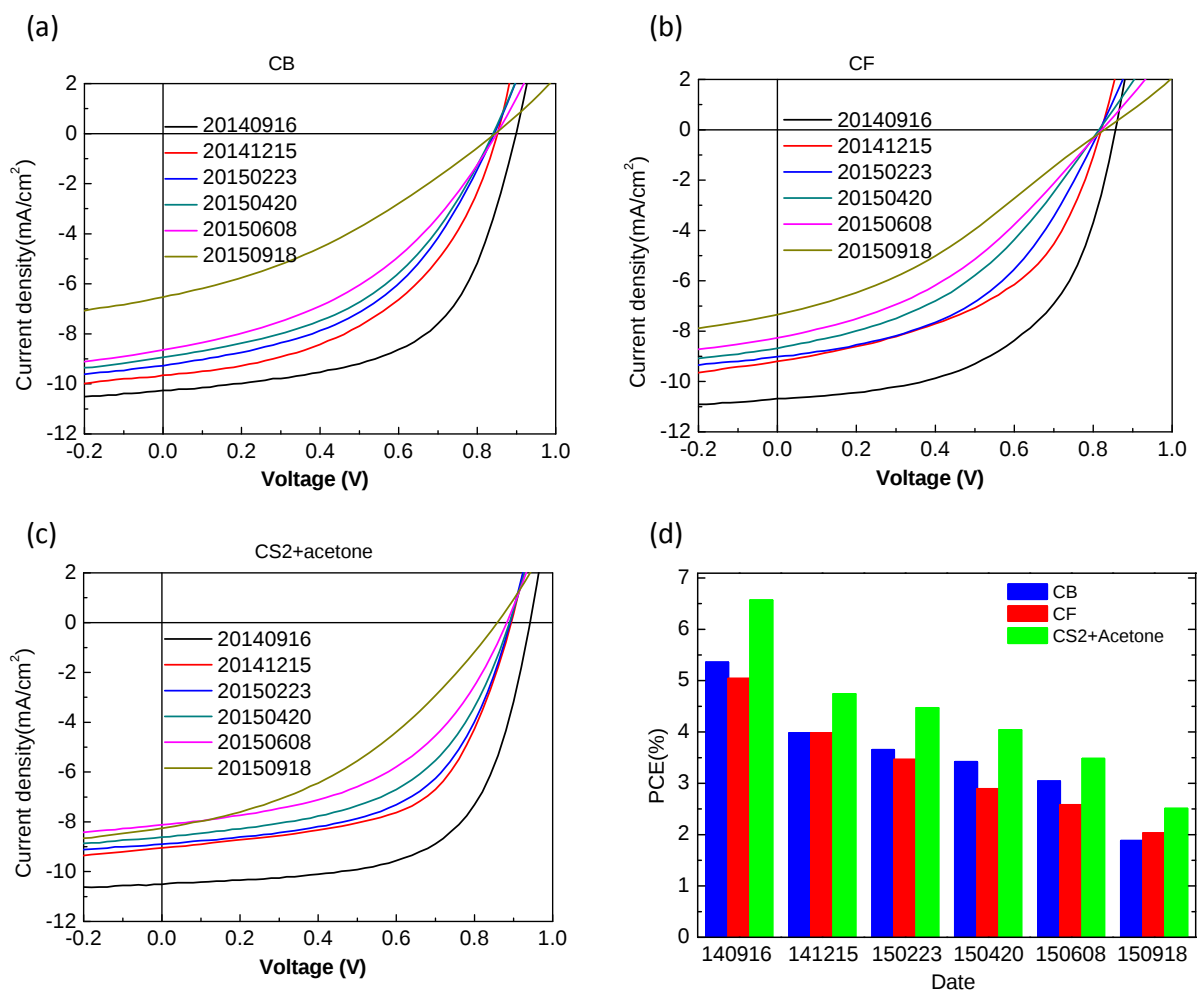


Figure S3: J-V curves of devices cast from (a) CB, (b) CF, (c) CS₂/Acetone measured in laboratory and (d) a summary of the efficiency recorded on different dates.

Table S2: Device metrics measured in the laboratory on different testing dates.

Solvent	Metrics	20140916	20141215	20150223	20150420	20150608	20150918
CB	PCE (%)	5.36	3.98	3.65	3.41	3.04	1.88
	J_{sc} (mA/cm ²)	-10.25	-9.65	-9.27	-8.94	-8.65	-6.53
	V_{oc} (V)	0.90	0.85	0.84	0.84	0.85	0.85
	FF (%)	58.14	45.48	46.74	45.51	41.42	34.05
CF	PCE (%)	5.04	3.69	3.46	2.89	2.58	2.03
	J_{sc} (mA/cm ²)	-10.68	-9.20	-9.01	-8.68	-8.26	-7.34
	V_{oc} (V)	0.86	0.82	0.82	0.81	0.82	0.83
	FF (%)	55.16	48.96	47.00	40.92	38.06	33.41
CS ₂ /Acetone	PCE (%)	6.24	4.74	4.47	4.04	3.48	2.78
	J_{sc} (mA/cm ²)	-10.51	-9.04	-8.99	-8.61	-8.12	-8.25
	V_{oc} (V)	0.94	0.89	0.89	0.89	0.89	0.86
	FF (%)	63.00	58.59	56.42	52.74	48.55	39.24

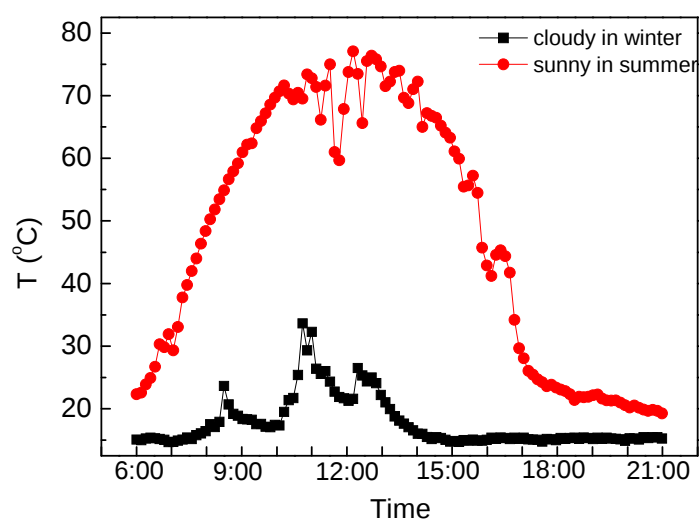


Figure S4: Comparison of measured temperature variation in the device testing chamber on a cloudy day in winter and a sunny day in summer.

Table S3 The statistics of degradation after outdoor testing for one year for the two central pixels (3 and 4) from two different substrates. Data is tabulated for devices cast from the three different solvents.

Solvent	CB		CF		CS ₂ /acetone	
Relative PCE after 1 year (PCE _{1y} /PCE ₀)%	Pixel 1	29%	Pixel 1	31%	Pixel 1	43%
	Pixel 2	31%	Pixel 2	42%	Pixel 2	45%
	Pixel 3	35%	Pixel 3	40%	Pixel 3	42%
	Pixel 4	25%	Pixel 4	45%	Pixel 4	38%
	average	30% ± 4%	average	40% ± 6%	average	42% ± 3%
Relative J _{sc} after one year (Jsc _{1y} /Jsc ₀)%	Pixel 1	61%	Pixel 1	53%	Pixel 1	74%
	Pixel 2	59%	Pixel 2	67%	Pixel 2	79%
	Pixel 3	64%	Pixel 3	69%	Pixel 3	76%
	Pixel 4	47%	Pixel 4	72%	Pixel 4	63%
	average	58% ± 7%	average	65% ± 8%	average	73% ± 7%
Relative V _{oc} after 1 year (Voc _{1y} /Voc ₀)%	Pixel 1	93%	Pixel 1	96%	Pixel 1	91%
	Pixel 2	93%	Pixel 2	97%	Pixel 2	91%
	Pixel 3	94%	Pixel 3	97%	Pixel 3	93%
	Pixel 4	93%	Pixel 4	96%	Pixel 4	94%
	average	93% ± 0%	average	96% ± 1%	average	92% ± 2%
Relative FF after one year (FF _{1y} /FF ₀)%	Pixel 1	51%	Pixel 1	62%	Pixel 1	64%
	Pixel 2	57%	Pixel 2	64%	Pixel 2	62%
	Pixel 3	57%	Pixel 3	61%	Pixel 3	59%
	Pixel 4	58%	Pixel 4	65%	Pixel 4	65%
	average	56% ± 3%	average	63% ± 2%	average	62% ± 3%