

Support information

High-Performance Inverted Perovskite Solar Cells using 4-Diaminomethylbenzoic as Passivant

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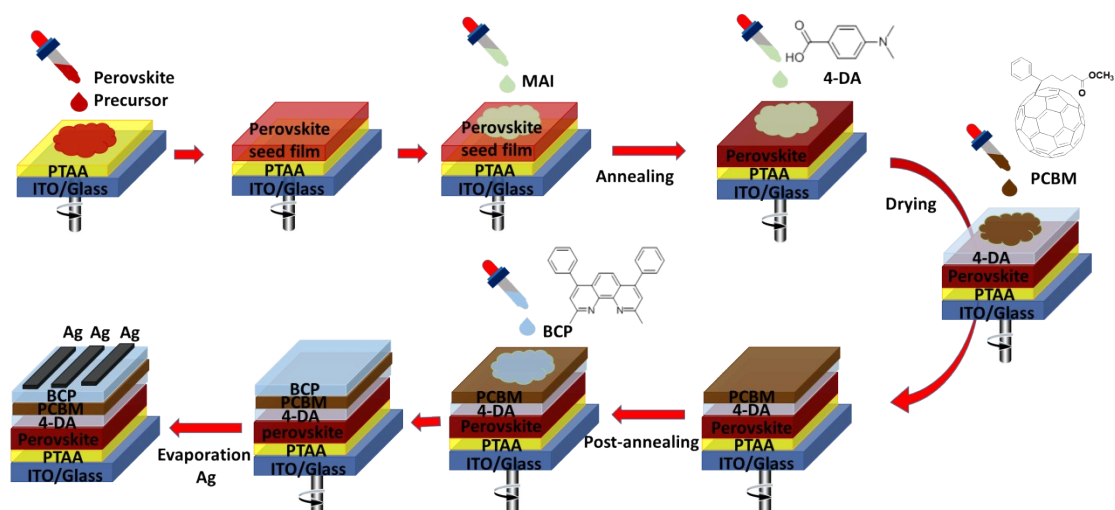


Fig.1 Schematic illustration of the procedure for preparing inverted PSCs with 4-DA as passivant.

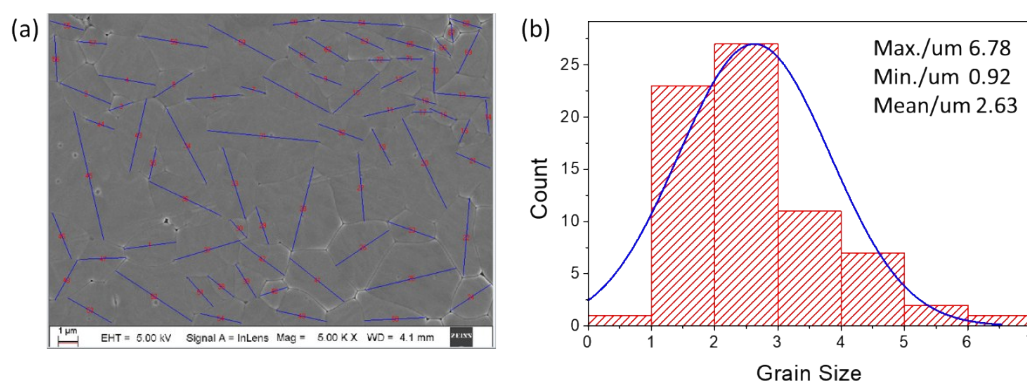


Fig. S2 (a) The SEM image of the perovskite film on PTAA HTL. The blue lines that labeled in figure are used to count the grain sizes, (b) Histogram of MAPbI₃ grain size distribution derived from the SEM image. The detailed grain size value are given in Table S1.

Table S1. The grain size of the perovskite crystals derived from the SEM image for the perovskite film upon PTAA HTL. The table gives the average of grain size and the number “1, 2, 3...” correspond to the grain number labeled in SEM image shown in Fig. S1a.

No.	Grain Size (μm)	No.	Grain Size (μm)	No	Grain Size (μm)
1	2.71	25	4.8	49	2.64
2	2.81	26	3.32	50	3.12
3	1.25	27	3.48	51	2.06
4	2.95	28	4.41	52	4.73
5	2.25	29	1.97	53	2.58
6	2.76	30	1.26	54	2.15
7	1.29	31	5.74	55	1.8
8	3.85	32	2.43	56	2.38
9	1.76	33	3.83	57	1.45
10	3.14	34	4.38	58	3.58
11	2.65	35	1.6	59	3.92
12	1.96	36	4.09	60	2.15
13	2.9	37	3.52	61	1.64
14	1.74	38	1.75	62	2.41
15	1.24	39	2.02	63	2.13
16	1.46	40	1.47	64	4.19
17	1	41	3.62	65	2.52
18	1.16	42	2.83	66	1.2
19	2.09	43	3.88	67	0.92
20	5.1	44	1.51	68	1.74
21	1.92	45	6.78	69	2.39
22	4	46	2.57	70	2.07
23	2.59	47	2.38	71	1.29
24	2.48	48	2.35	72	1.13
Average	2.63 μm				

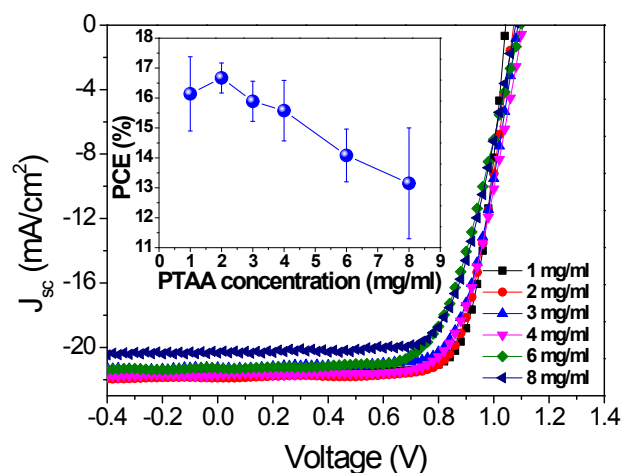


Fig. S3 The typical J-V curves of the best inverted PSCs with PTAA prepared from different concentration solution. The inset image is the average PCE of the PSCs prepared with different PTAA concentration. The statistical average PCE is cunt from 10 devices.

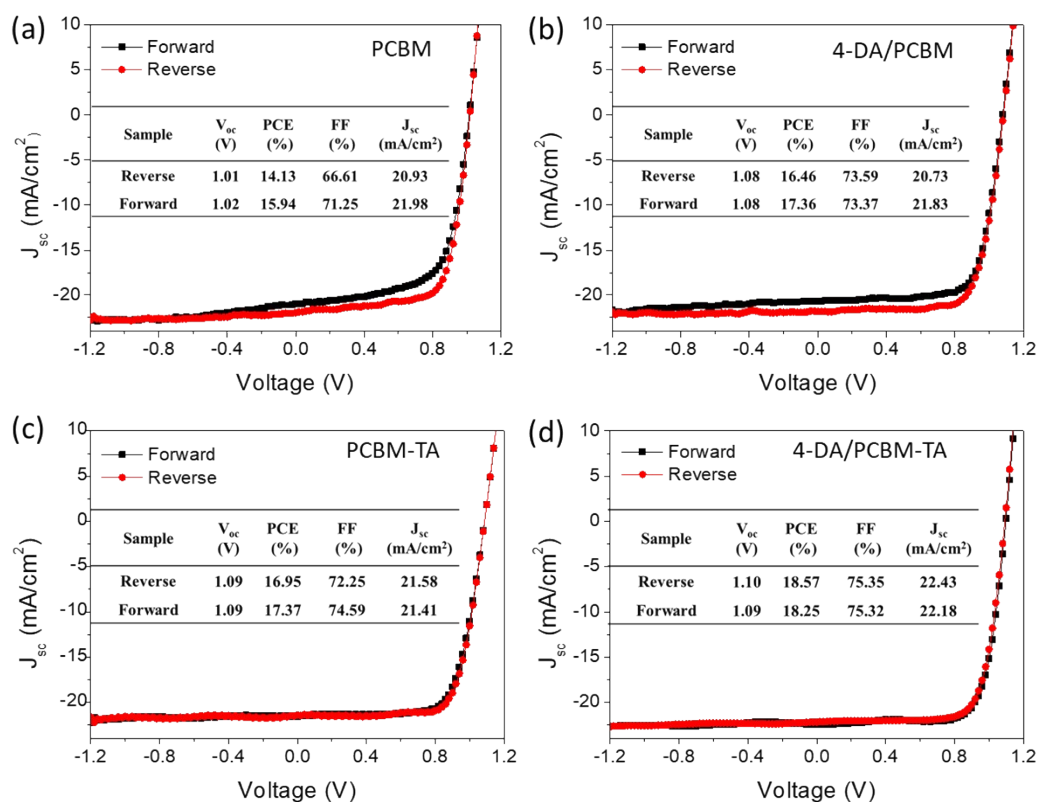


Fig. S4 The typical J-V curves of the different kinds of PSCs based on different scan direction. The inset table of Fig. S4 are the performance parameters of each kind of the devices.

Table S2 Average photovoltaic performance parameters of the inverted PSCs based on PTAA prepared from different concentration and the parameters of the best devices of each kind of PSCs are listed in bracket. The statistical average parameters are cunt from 10 devices.

PTAA (mg/mL)	V _{oc} (V)	PCE (%)	FF (%)	J _{sc} (%)
1	1.02±0.05(1.04)	16.14±1.24(17.38)	74.21±3.00(76.98)	21.39±0.68(21.64)
2	1.08±0.03(1.07)	16.67±0.50(17.14)	71.69±3.37(73.07)	21.52±0.37(21.89)
3	1.07±0.02(1.09)	15.89±0.67(16.39)	69.45±2.11(70.96)	21.29±0.85(21.24)
4	1.09±0.02(1.11)	15.58±1.01(16.57)	66.46±2.79(69.01)	21.45±0.52(21.71)
6	1.09±0.02(1.10)	14.08±0.88(14.96)	62.10±2.37(63.94)	20.73±0.78(21.30)
8	1.08±0.03(1.08)	13.15±1.85(15.00)	59.75±8.59(68.34)	20.37±0.73(20.35)

Table S3 Average photovoltaic performance parameters of the inverted PSCs with 4-DA by TA process for different time and the parameters of the best devices for each kind of PSCs are listed in bracket. The statistical average parameters are cunt based on more than 4 devices.

TA (min)	V _{oc} (V)	PCE (%)	FF (%)	J _{sc} (mA/cm ²)
0	1.07±0.03(1.10)	16.81±1.49(18.07)	73.21±2.01(75.02)	21.49±0.86(22.00)
20	1.09±0.01(1.10)	17.91±0.48(18.26)	74.54±1.74(76.28)	22.08±0.28(21.80)
30	1.09±0.02(1.09)	18.29±0.86(19.15)	75.45±2.19(75.01)	22.30±1.04(23.34)
40	1.09±0.01(1.10)	18.08±1.10(19.18)	72.37±3.13(75.50)	22.97±0.67(23.20)
50	1.08±0.01(1.09)	17.78±0.99(18.77)	72.25±2.82(71.75)	22.82±0.35(22.94)

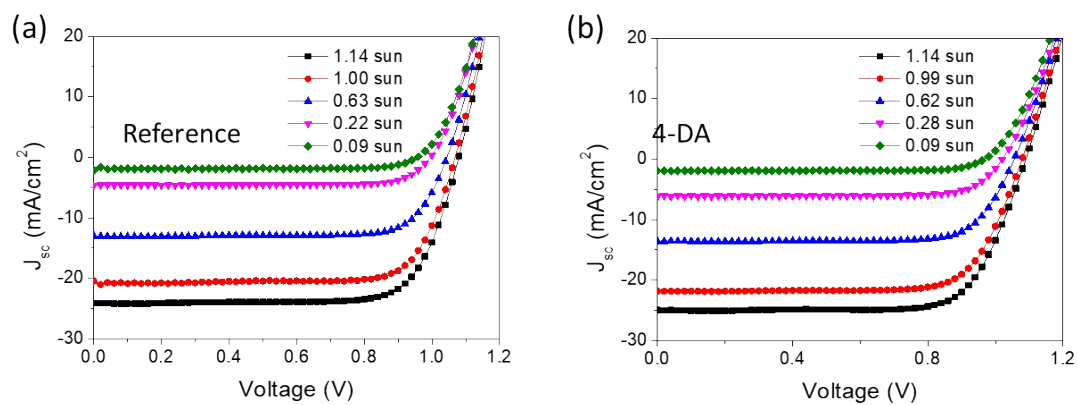


Fig. S5 The J-V curves of the reference device (a) and 4-DA device (b) under different light intensities.