

Supporting Information

A facile room temperature solution synthesis of SnO₂ quantum dots for perovskite solar cells

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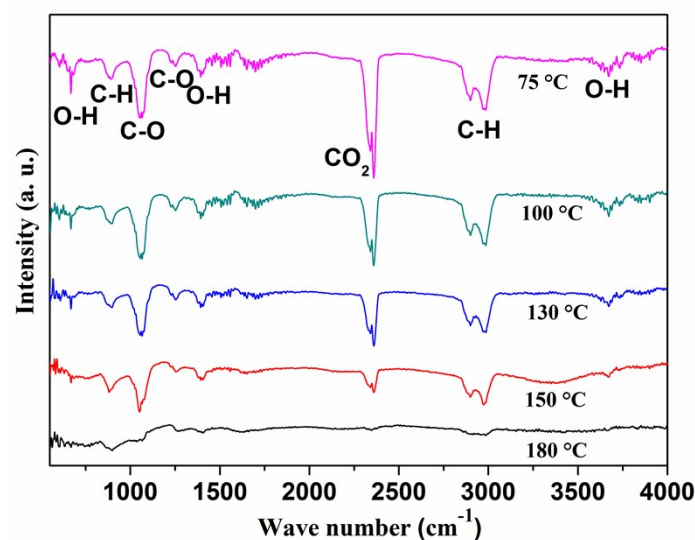


Fig. S1 FTIR spectra of Q-ETL annealed at 75 °C, 100 °C, 130 °C, 150 °C, and 180 °C for 1h.

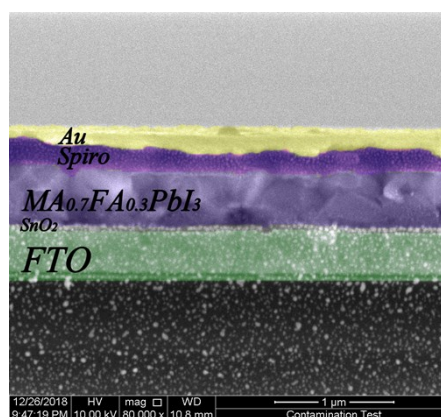


Fig. S2 Cross-sectional SEM image of a PSC fabricated on Q-ETL.

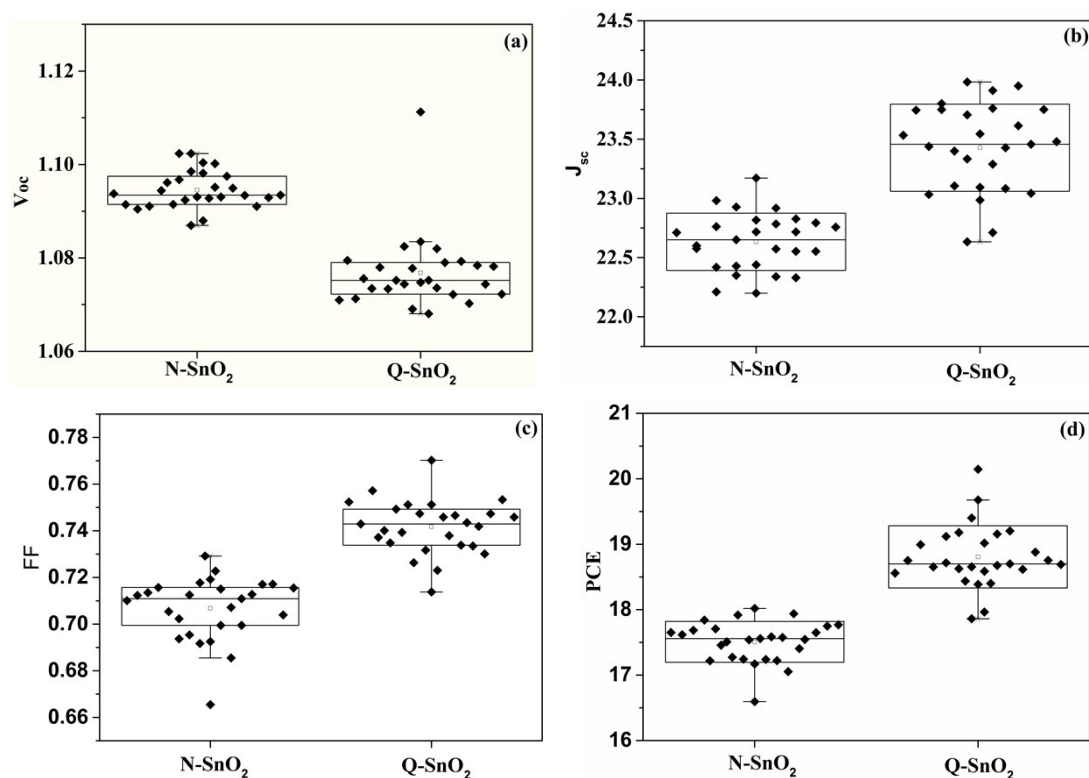


Fig. S3 Statistical parameters of devices based on 180° C annealed ETLs (a) open-circuit voltage, (b) J_{SC} , (c) fill factor, (d) power conversion efficiency (PCE).

C60-sam process method: 1 mg C₆₀-sam was dissolved in chlorobenzene by an ultrasonication process and stirring for 1 h in sequence to obtain the precursor solution. Before the deposition of perovskite, the precursor solution was deposited on SnO₂ ETLs by spin coating with 3000 r/min for 30 s.

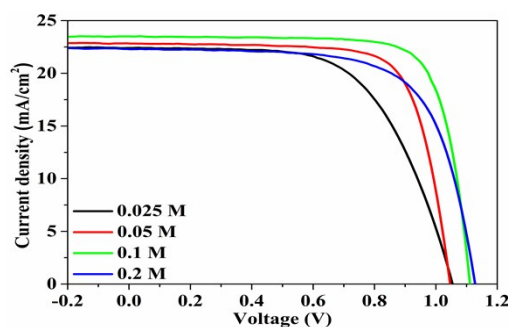


Fig. S4 J-V curves of the cells prepared on FTO substrate coated with SnO₂ETLs prepared using Q-SnO₂ colloidal solutions with different concentrations.

Table S1 Photovoltaic parameters of the cells based on the Q-SnO₂ ETLs coated on FTO substrates with different concentrations. The data are received from Fig. S5

concentration	Voc	Jsc	FF	PCE (%)
0.025M	1.05	21.92	0.61	14.07
0.05 M	1.05	22.83	0.74	17.71
0.1 M	1.11	22.99	0.77	20.11
0.2 M	1.13	22.29	0.68	17.23

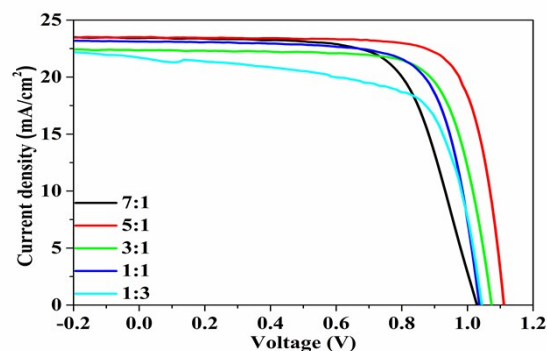


Fig. S5 J-V curves of the cells prepared on FTO/Q-ETLs with different ratio of anhydrous alcohol to deionized water.

Table S2 Photovoltaic parameters of the cells based on the Q-SnO₂ ETLs coated on FTO substrates using Q-SnO₂ colloidal solution with different ratio of anhydrous alcohol to deionized water. The data are received from Fig. S5.

ratio	Voc	Jsc	FF	PCE (%)
7:1	1.03	23.42	0.67	16.18
5:1	1.11	22.99	0.77	20.11
3:1	1.07	21.86	0.74	17.40
1:1	1.04	22.61	0.73	17.15
1:3	1.04	21.23	0.68	15.06

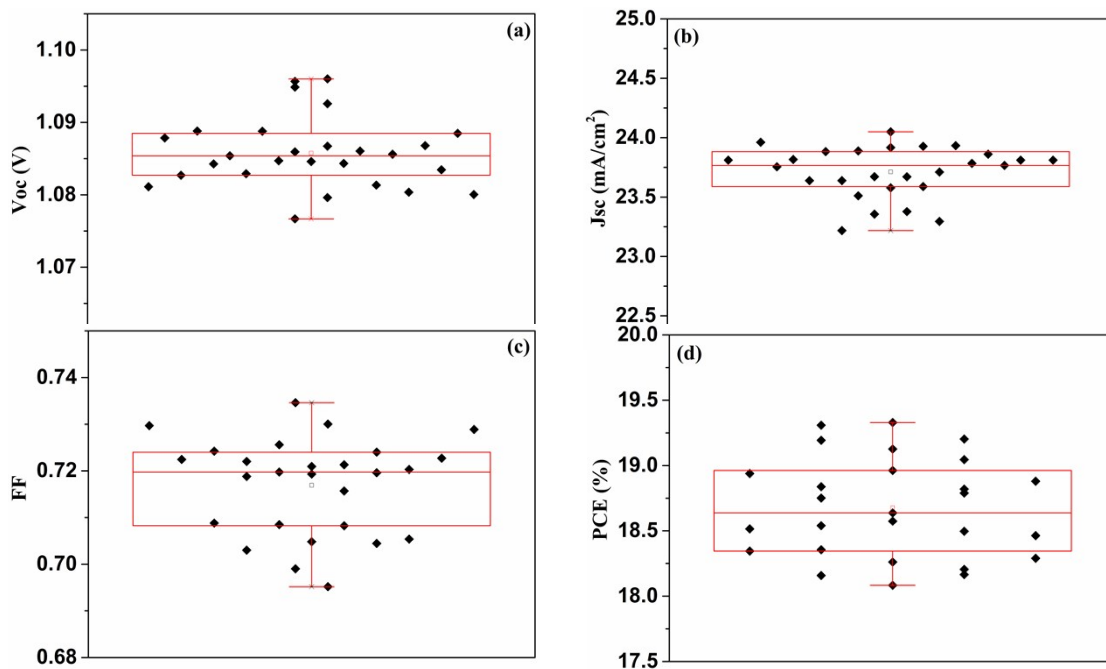


Fig.S6 Statistical parameters of PSCs deposited on Q-ETLs annealed at 100° C (a) open-circuit voltage, (b) J_{SC}, (c) fill factor,(d) PCE.

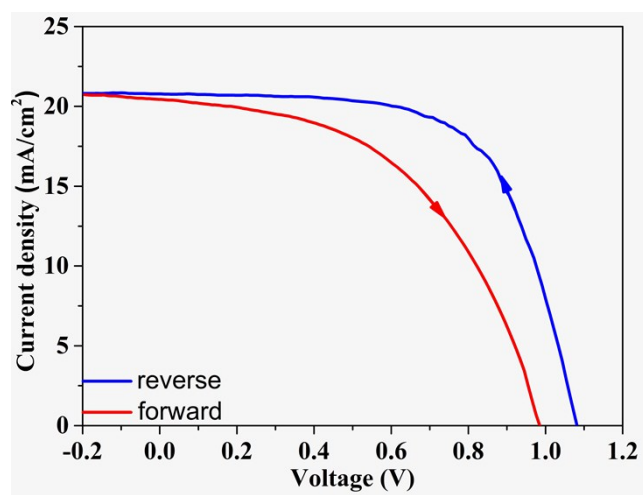


Fig.S7 J-V curves of a device prepared on PEN flexible substrate with Q-ETL annealing at 100°C.