Supporting information

Enhanced Planar Perovskite Solar Cells Efficiency Exceeding 16% via Reducing the Oxygen Vacancy Defect State in Titanium Oxide Electrode

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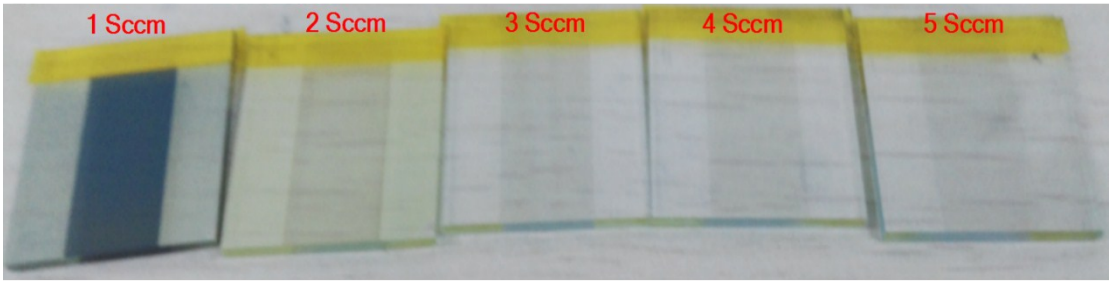

Fig.S1 Some practical pictures for c-TiO_2 via sputtering with different oxygen flux value;

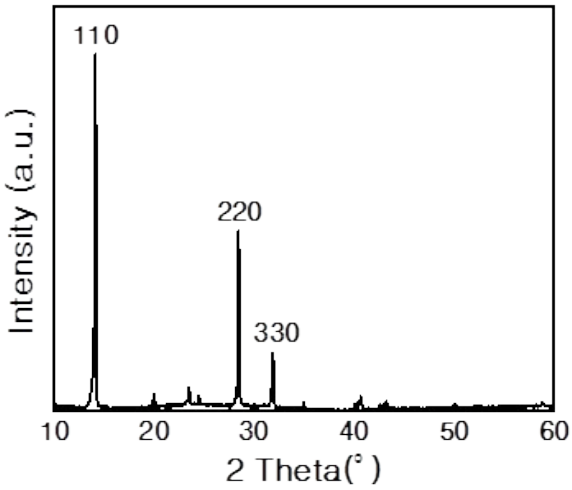

Fig.S2 XRD pattern for $CH_3NH_3PbI_{3-x}Cl_x$ deposited on c-TiO_2/FTO substrate.

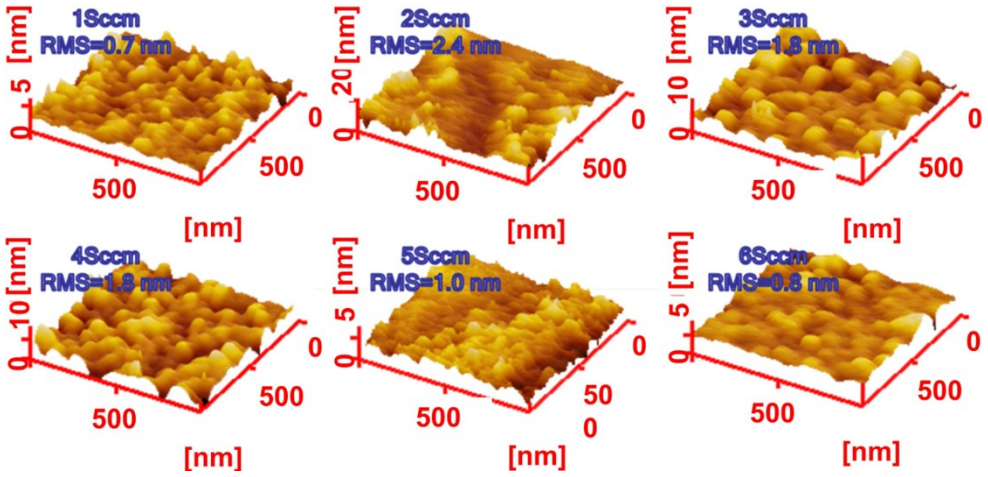

Fig.S3 Three dimensional AFM images of the sputtered c-TiO_2 films with increasing the oxygen flux value from 1 Sccm to 6 Sccm.

Table S1. The thickness value for c-TiO_2 prepared by 6 Sccm oxygen flux as the function of sputtering time				
Samples	c-TiO_2(1 min)	c-TiO_2(2 min)	c-TiO_2(3 min)	c-TiO_2(4 min)
Thickness (nm)	15	47	89	128

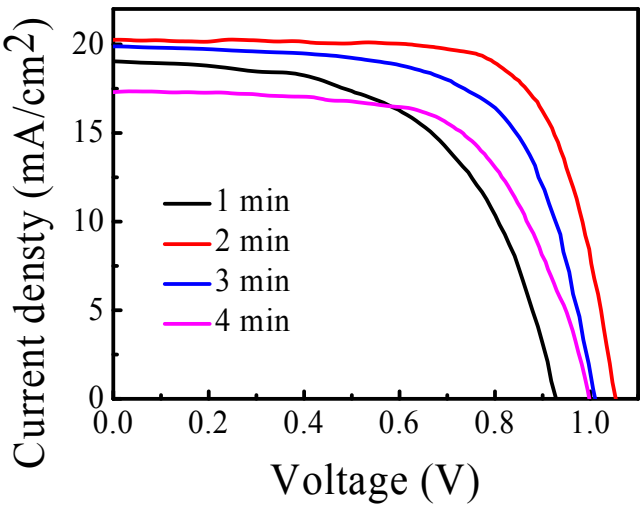

Fig.S4 J-V curves performance in light for p-PSCs based on sputtered c-TiO_2 as the function of sputtering time.

Table S2. The photovoltaic parameters extracted from Fig.S4

Samples	V_{oc} (V)	J_{sc} (mA/cm^2)	FF (%)	PCE (%)
1 min	0.92	19.05	57.17	10.02
2 min	1.05	20.30	72.25	15.40
3 min	1.01	19.86	65.50	13.14
4 min	0.99	17.37	63.32	10.89

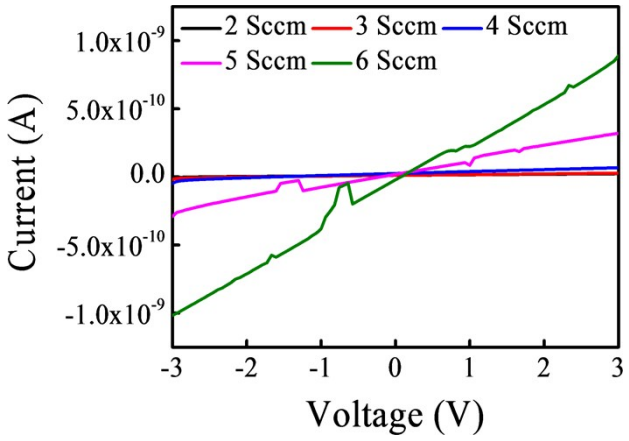

Fig.S5 The current-voltage curves measurement in dark for sputtered c-TiO_2 on glass substrate as the function of oxygen flux value during the process of sputtering.

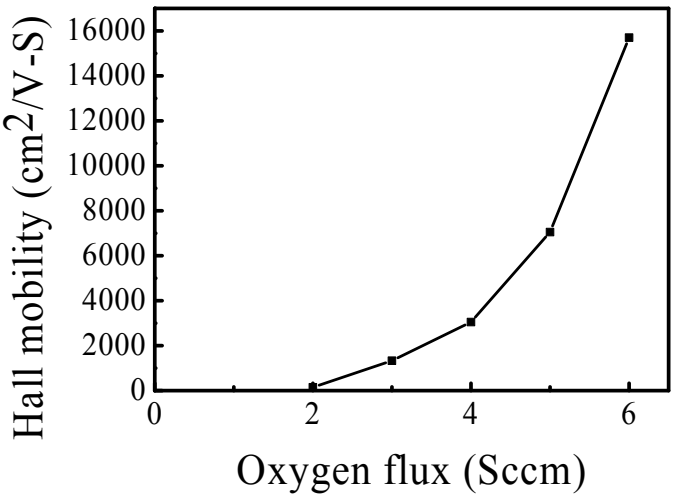

Fig.S6 The hall mobility measurement for the FTO/c-TiO_2 electrodes prepared by different oxygen flux.

Table S3. The work function (WF) value for c-TiO_2 measured by kelvin probe measurement			
Samples	c-TiO_2(2 Sccm)	c-TiO_2(4 Sccm)	c-TiO_2(6 Sccm)
WF (eV)	5.0	4.6	3.8

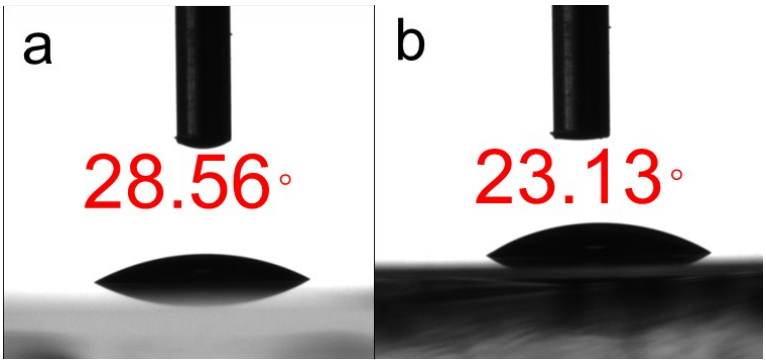

Fig.S7 Contact angles measurement between H_2O and c-TiO_2. (a) c-TiO_2 prepared by 6 Sccm oxygen flux; (b) c-TiO_2 prepared by 6 Sccm oxygen flux and UVO treatment.