

Study on Optical and Electrical Properties of Thermally Evaporated Tin Oxide Thin Films for Perovskite Solar Cells

Wen-Man Bin [†], Wen-Han Huang [†], Wei-Chun Lin ^{*} and Hyeonseok Lee ^{*}

Department of Photonics, National Sun Yat-sen University, Kaohsiung 80424, Taiwan;
binnwenmann@gmail.com (W.-M.B.); versati499@gmail.com (W.-H.H.)

^{*} Correspondence: wclin@mail.nsysu.edu.tw (W.-C.L.); hslee611@mail.nsysu.edu.tw (H.L.)

[†] These authors contributed equally to this work.

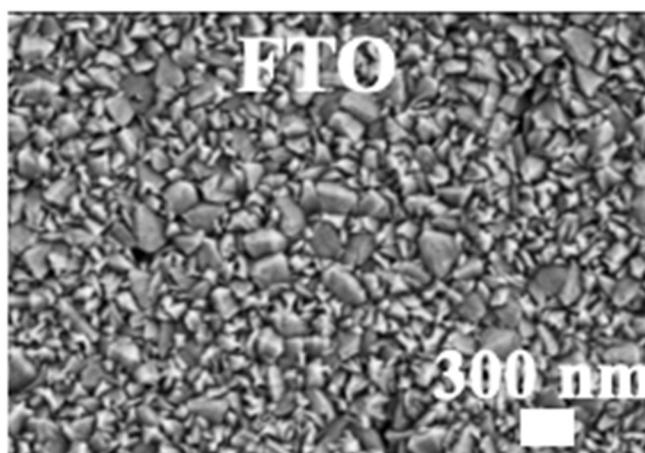


Figure S1. Surface morphology of FTO substrate by SEM.

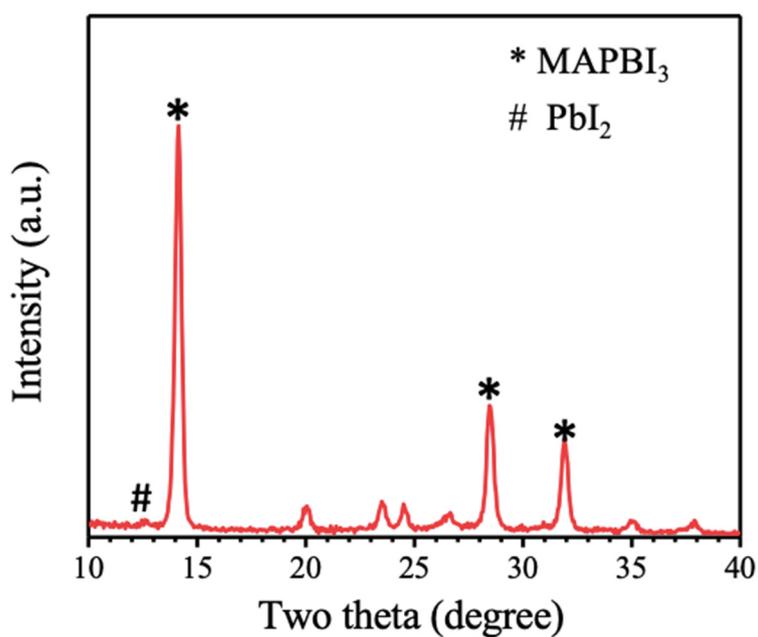


Figure S2. X-ray diffraction pattern for the perovskite films on the 100nm-thick SnO₂ films annealed at 300°C.

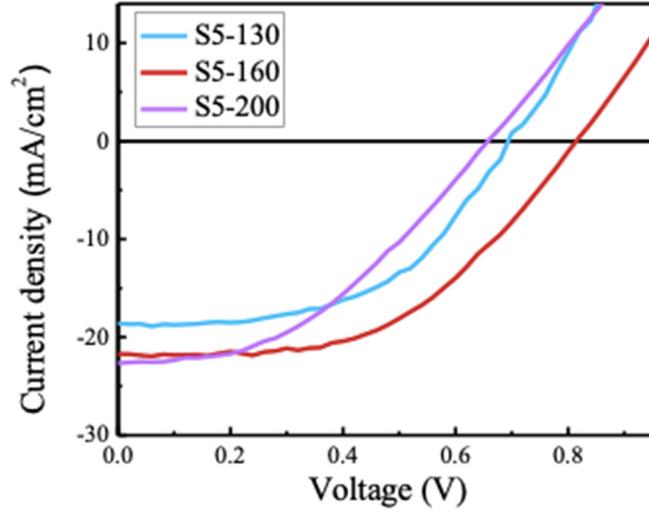


Figure S3. The J-V curve of PSCs with 500 °C annealed SnO₂ with varied thickness.

Table S1. The performance of PSCs with 500 °C annealed SnO₂ with varied thickness.

Sample Names	Thickness of SnO _x	J _{sc} (mA/cm ²)	V _{oc} (mV)	Fill Factor	PCE(%)	R _s (Ω)	R _{sh} (Ω)
S5-130	130nm	18.59	695	0.53	6.87	116	1620
S5-160	160nm	21.71	816	0.51	9.05	134	1451
S5-200	200nm	22.66	658	0.42	6.3	145	4106