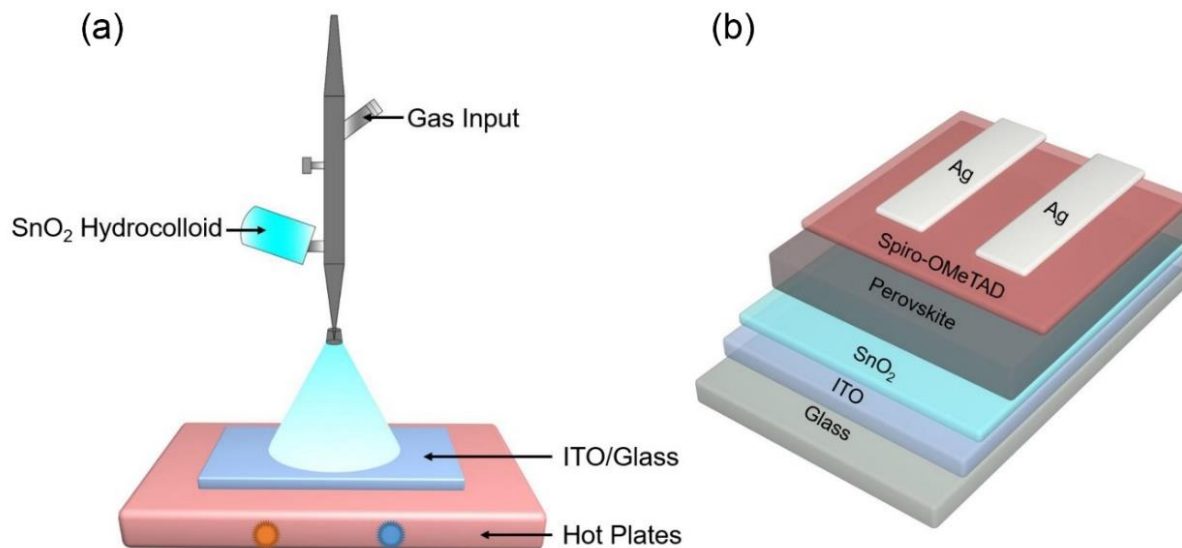
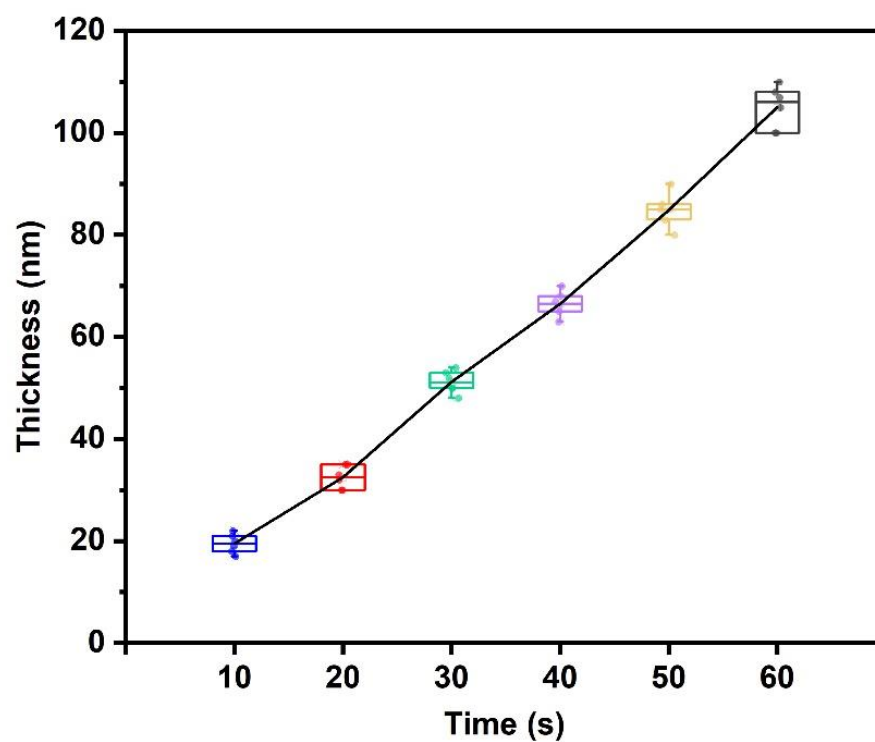


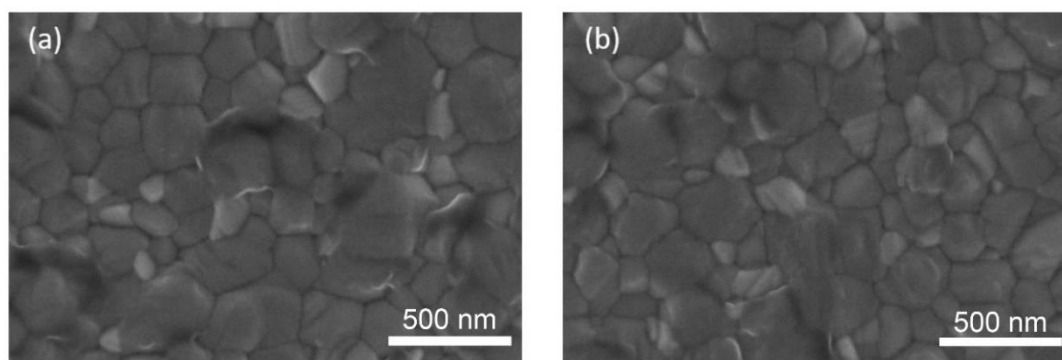
# Electronic Supplementary Material



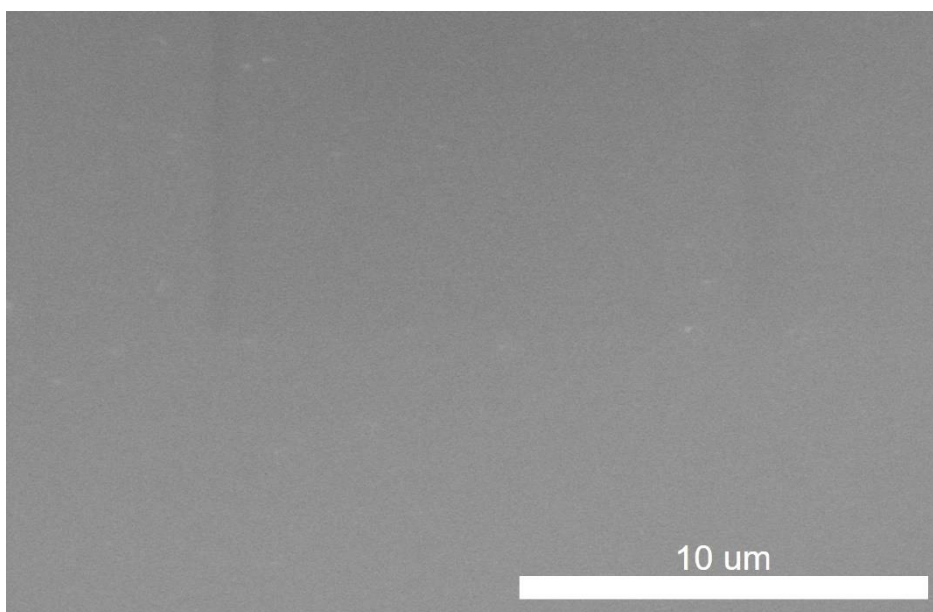
**Figure S1.** Schematic representation of (a) spray coating process to form the SnO<sub>2</sub> film and (b) device architecture.



**Figure S2.** Thickness of SnO<sub>2</sub> films at different spraying time.



**Figure S3.** SEM images of perovskite films deposited on SnO<sub>2</sub> films prepared by (a) spray coating and (b) spin coating.



**Figure S4.** SEM images of SnO<sub>2</sub> films prepared by spray coating.

**Table S1.** Photovoltaic parameters of twelve PSCs based on the same batch of spray-coated SnO<sub>2</sub> films under the same conditions.

	$J_{sc} / \text{mA cm}^{-2}$	$V_{oc} / \text{V}$	FF	PCE / %
1	23.22	1.143	0.639	16.94
2	23.93	1.137	0.633	17.20
3	23.54	1.130	0.592	15.73
4	24.20	1.137	0.594	16.34
5	23.18	1.150	0.668	17.74
6	23.12	1.139	0.612	16.10
7	23.33	1.137	0.599	15.87
8	22.52	1.152	0.679	17.54
9	23.31	1.148	0.623	16.66
10	23.53	1.142	0.580	15.56
11	22.82	1.140	0.616	16.01
12	22.96	1.138	0.608	15.84