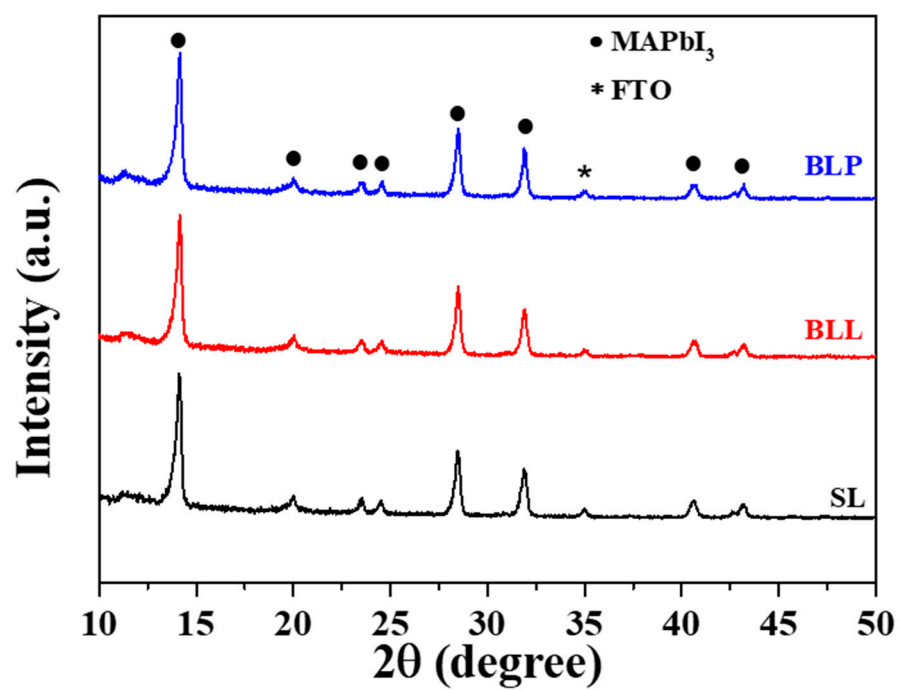
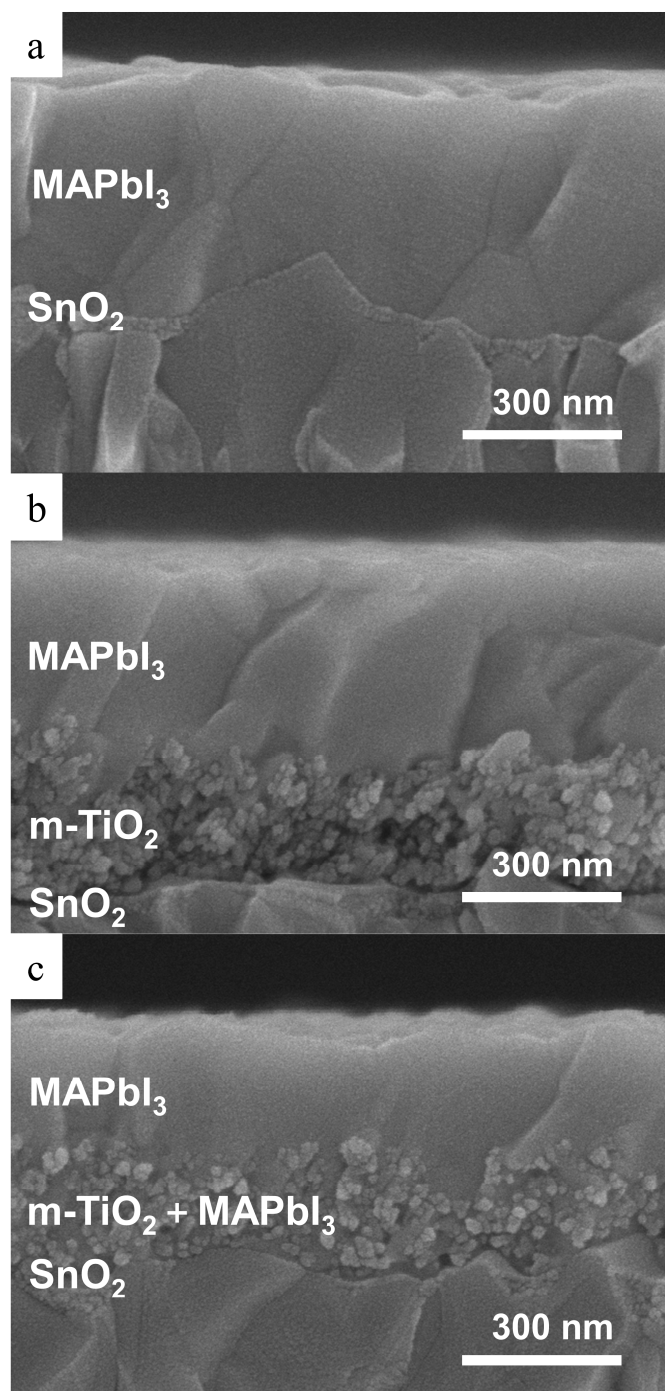


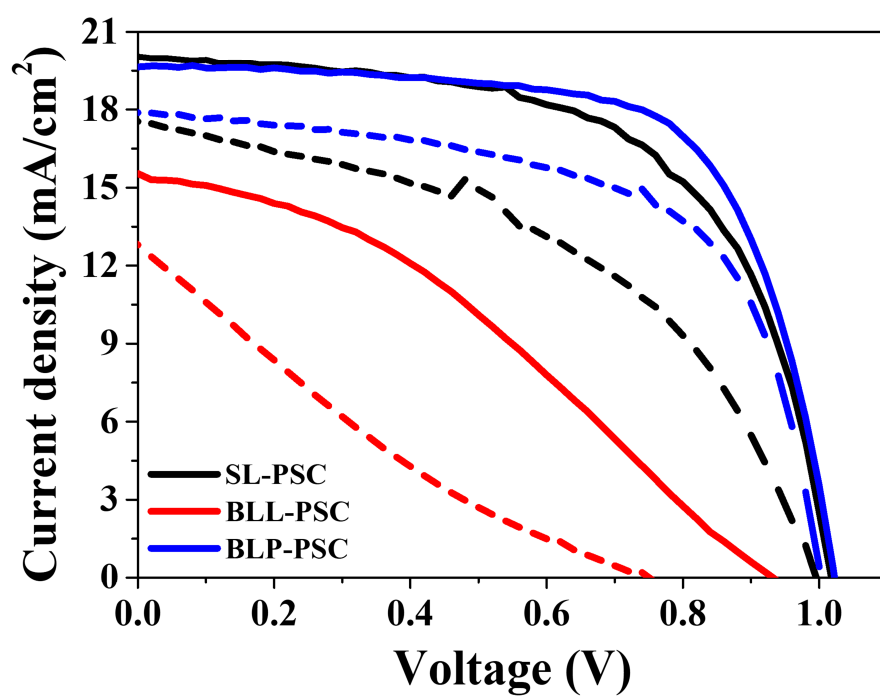
**Figure S1.** Top view SEM images and grain size distribution histograms (inset) of MAPbI<sub>3</sub> layer on (a) SL, (b) BLL, (c) BLP, and (d) BLH.



**Figure S2.** XRD pattern of MAPbI<sub>3</sub> layer on BLP, BLL, and SL.



**Figure S3.** Cross-section SEM image of glass/FTO/(a) SL, (b) BLL, and (c) BLP/ $\text{MAPbI}_3$ .



**Figure S4.** Reverse scan (solid line) and forward scan (dotted line) current density-voltage curves of SL-PSC, BLL-PSC, and BLP-PSC.



**Table S1.** Summary of the photovoltaic parameters of PSCs based on SnO<sub>2</sub> ETL annealed at 200 °C, 300 °C, and 400 °C.

Temperature	J <sub>sc</sub> (mA/cm <sup>2</sup> )	V <sub>oc</sub> (V)	FF (%)	PCE (%)
200 °C	19.77	0.99	70.22	13.68
300 °C	20.00	0.99	61.68	12.19
400 °C	16.08	1.01	55.00	8.90

**Table S2.** Summary of EIS data.

Sample	R <sub>s</sub> Value (Ω)	R <sub>ct</sub> Value (Ω)
SL-PSC	27.13	350
BLL-PSC	27.85	1900
BLP-PSC	27.30	230

**Table S3.** Summary of the photovoltaic parameters of SL-PSC, BLL-PSC, and BLP-PSC according to scan direction.

Samples	J <sub>sc</sub> (mA/cm <sup>2</sup> )	V <sub>oc</sub> (V)	FF (%)	PCE (%)	Hysteresis index
SL-PSCs (R)	20.18	1.03	61.81	12.80	0.39
SL-PSCs (F)	17.55	1.00	46.44	8.11	
BLL-PSCs (R)	15.54	0.93	34.99	5.07	0.65
BLL-PSCs (F)	12.80	0.75	19.35	1.86	
BLP-PSCs (R)	19.65	1.02	67.85	13.63	0.17
BLP-PSCs (F)	17.88	1.00	61.71	11.06	

\* Hysteresis index =  $\frac{J_{RS}(0.8V_{OC}) - J_{FS}(0.8V_{OC})}{J_{RS}(0.8V_{OC})}$