

*Supporting Information*

**All-round performance improvement of semitransparent  
perovskite solar cells by a pressure-assisted method**

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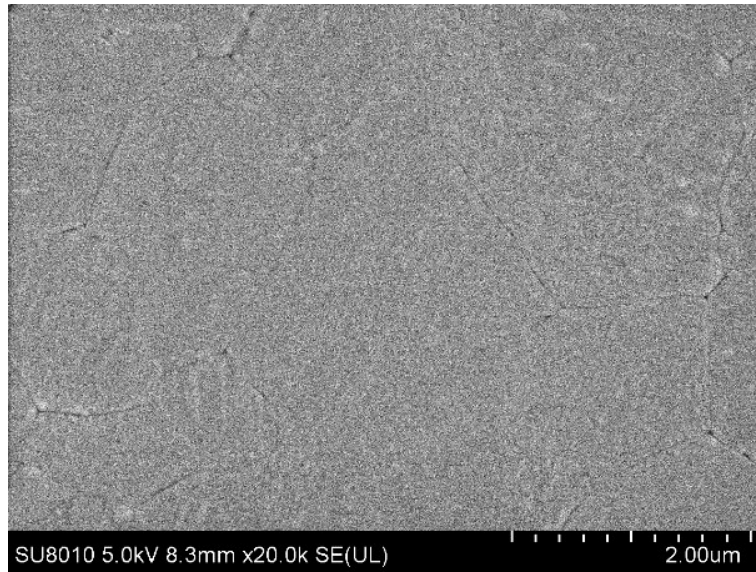
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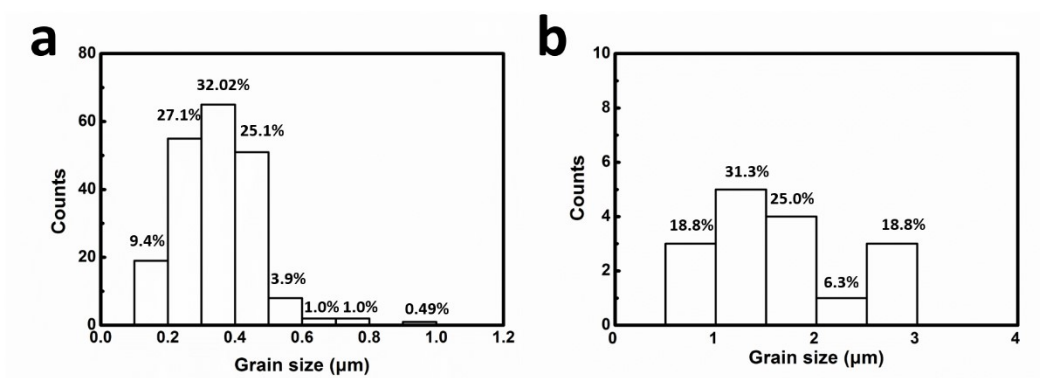
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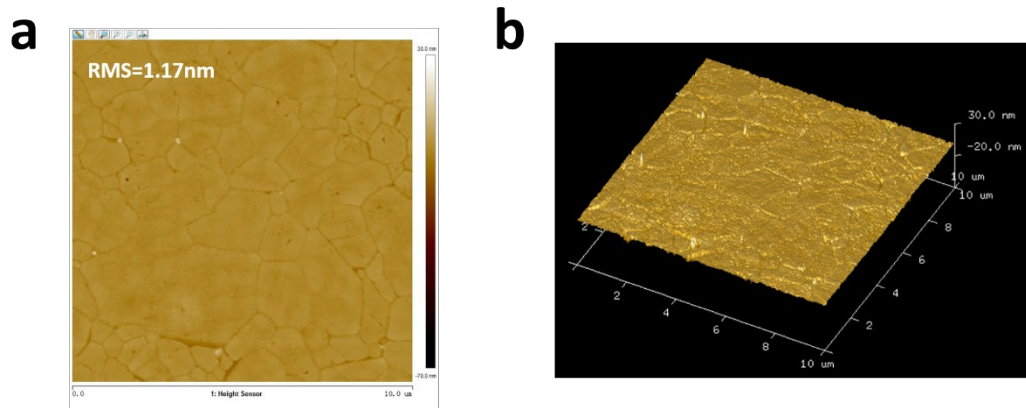
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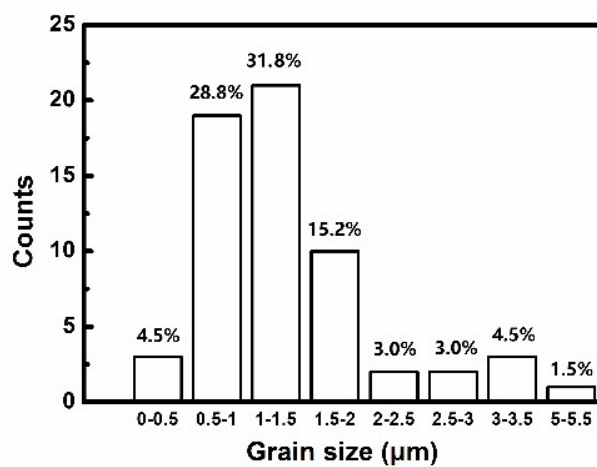
**Fig. S1** The original SEM image of Fig. 2b.



**Fig. S2** Grain distribution statistics of (a) Fig. 2a and (b) Fig. 2b.



**Fig. S3** (a) AFM topographic image and (b) three-dimensional topographic image of the TPR film.



**Fig. S4** Grain distribution statistics of Figure S3.

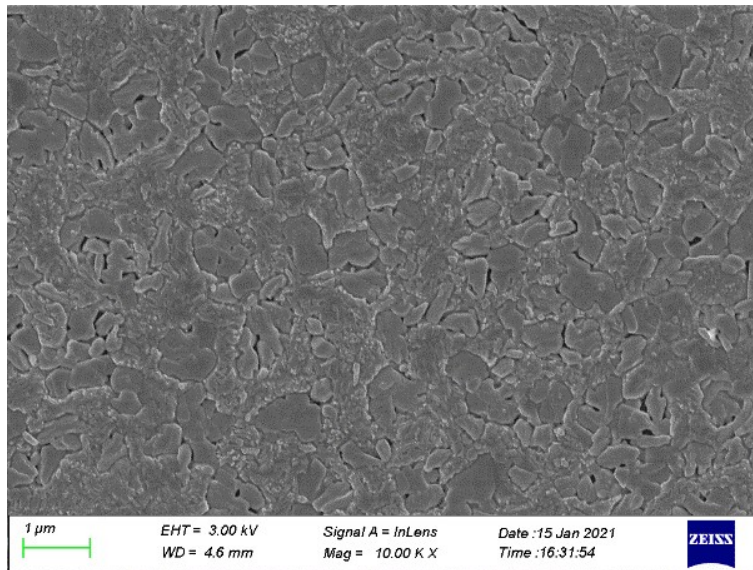


Fig. S5 Top view SEM image of the MAPbI<sub>3</sub> film annealed at 100 °C for 6 h at atmospheric pressure.

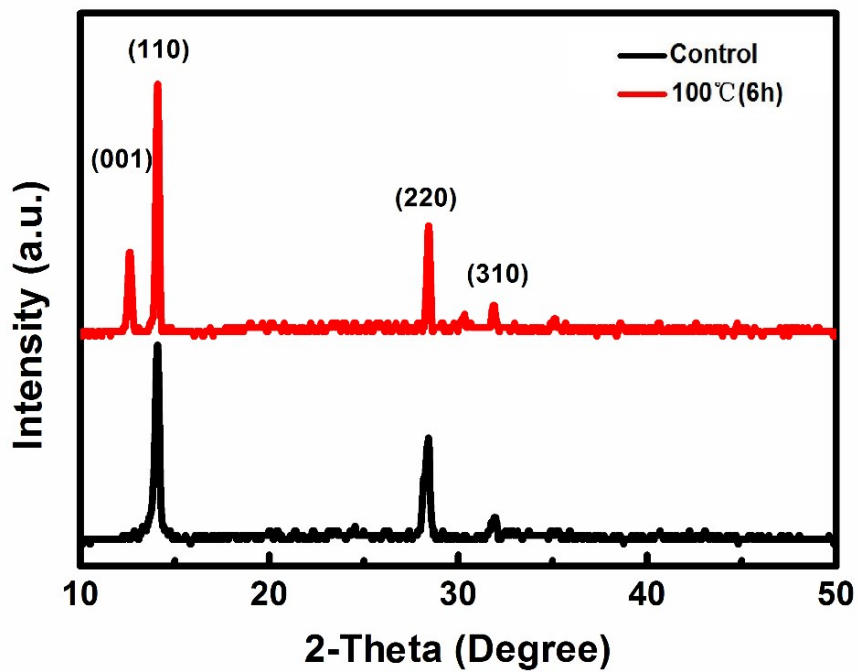
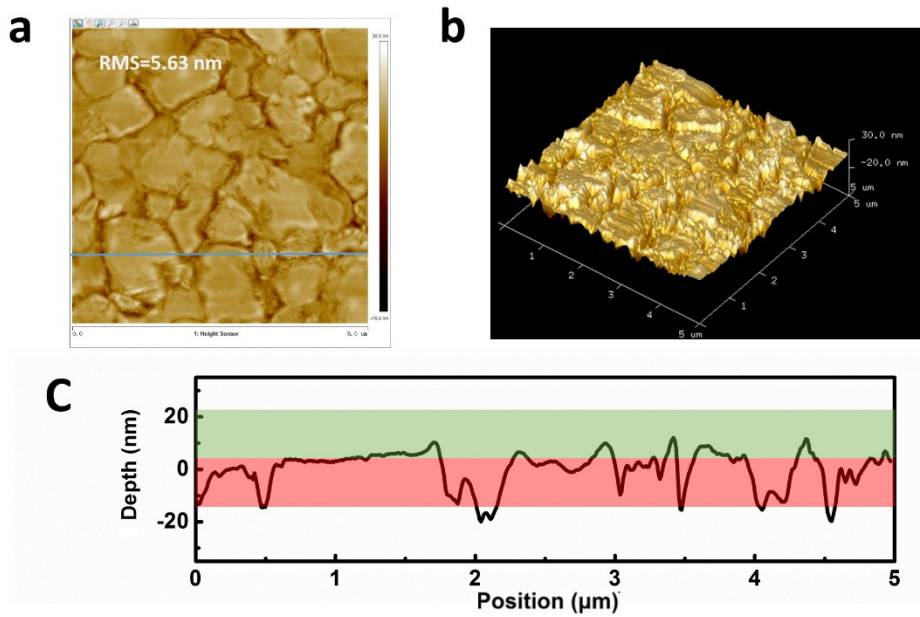
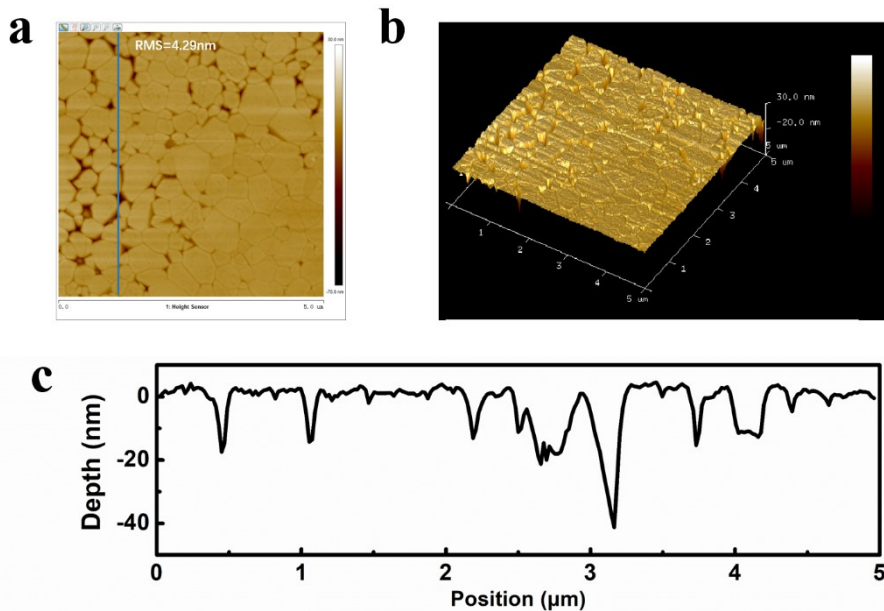


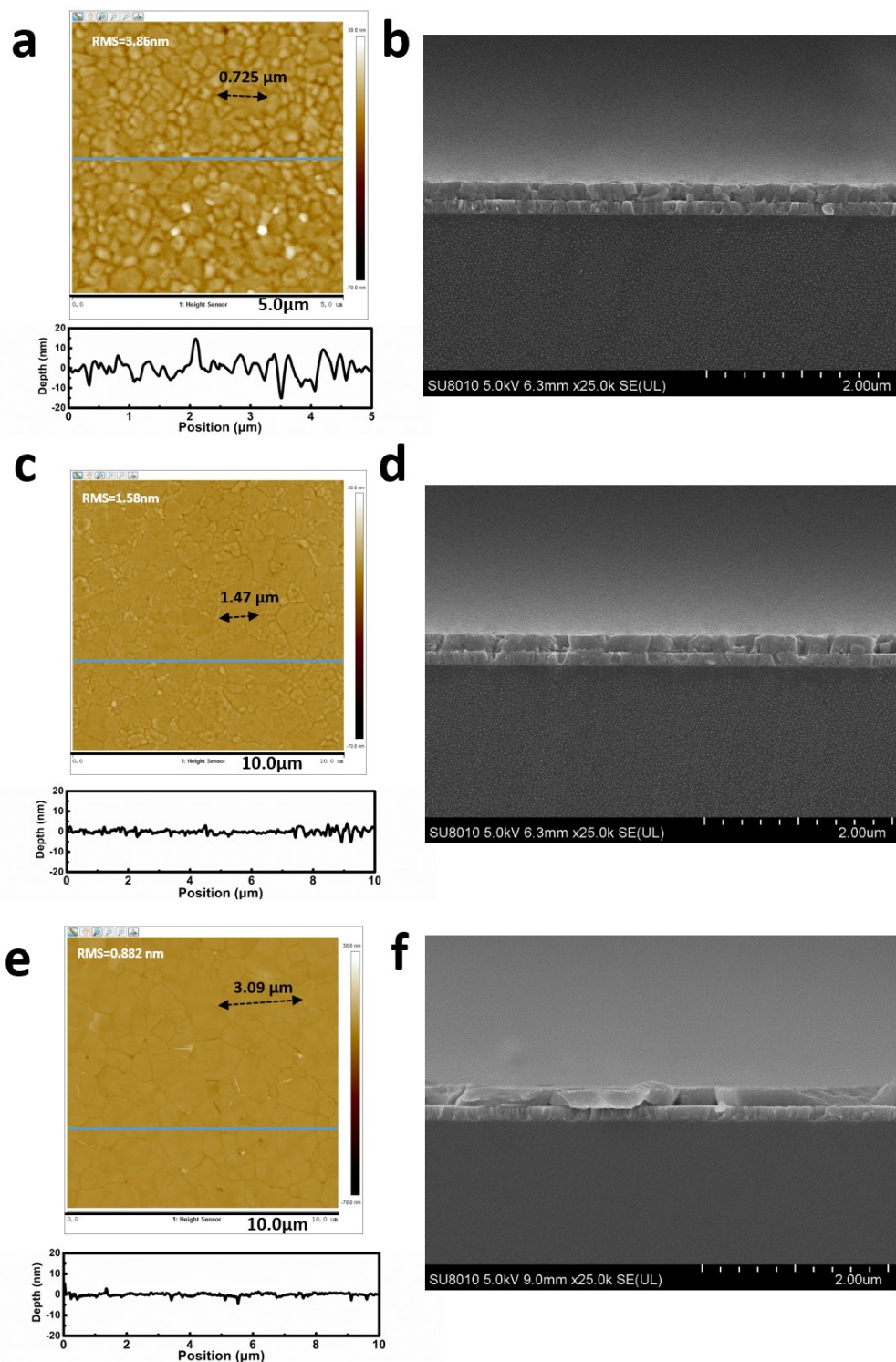
Fig. S6 XRD patterns of the precursor film and the MAPbI<sub>3</sub> film annealed at 100 °C for 6 h at atmospheric pressure.



**Fig. S7** (a) AFM topographic image, (b) three-dimensional topographic image and (c) surface profile of the MAPbI<sub>3</sub> film when 150 MPa used at room temperature for 6 h.



**Fig. S8** (a) AFM topographic image, (b) three-dimensional topographic AFM image and (c) surface profile of MAPbI<sub>3</sub> film annealed at 100 °C with the pressure of 100 MPa for 6 h.



**Fig. S9** (a) Top-view AFM image, (b) cross-sectional SEM images of the MAPbI<sub>3</sub> film with TPR treatment (100 °C, 150 Mpa for 1 h); (c) Top-view AFM image, (d) cross-sectional SEM images of the MAPbI<sub>3</sub> film with TPR treatment (100 °C, 150 Mpa for 3 h); (e) Top-view AFM image, (f) cross-sectional SEM images of the MAPbI<sub>3</sub> film with TPR treatment (100 °C, 150 Mpa for 5 h)

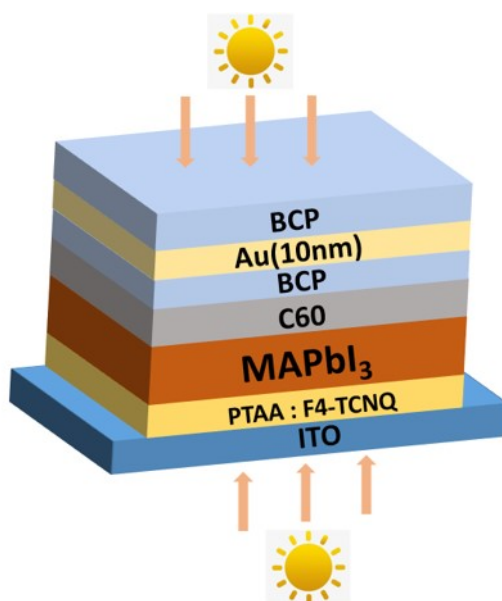


Fig. S10 Schematic device structure of SPSCs

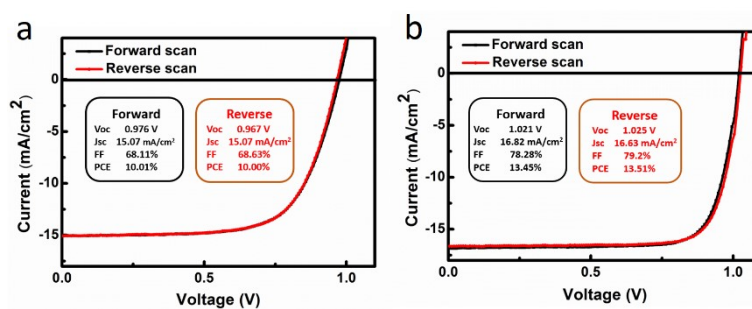
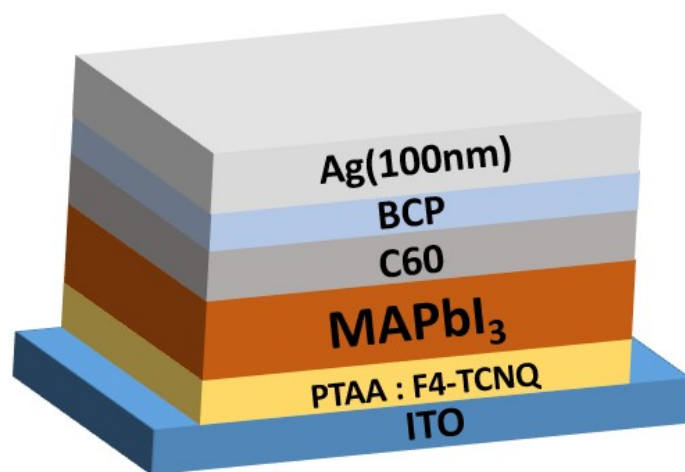
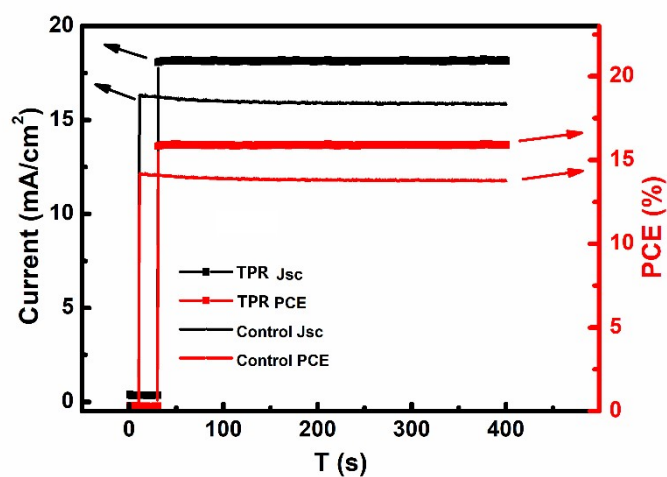


Fig. S11 Forward and reverse J-V scans at a 110 mV s<sup>-1</sup> scan rate of (a) control SPSC, and (b) TPR SPSC.

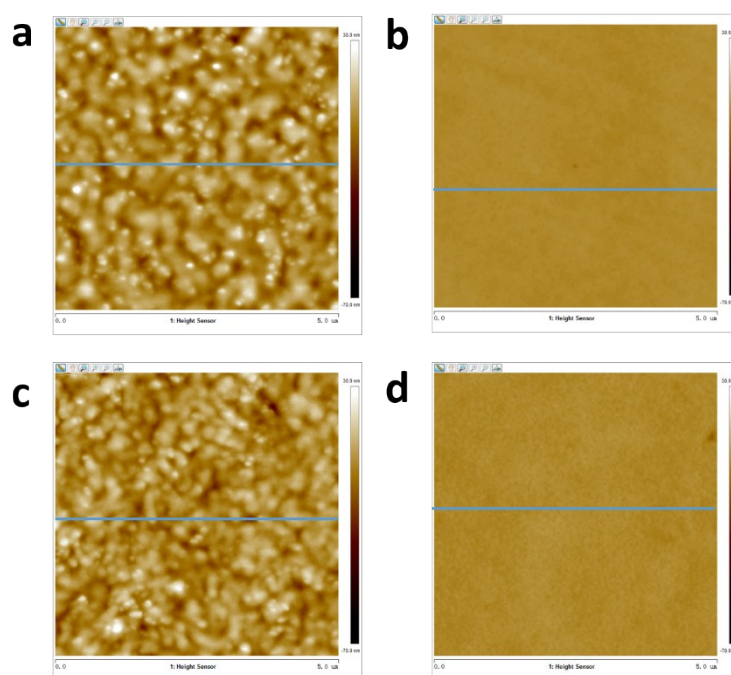


**Fig. S12** Schematic device structure of Opaque PSCs.

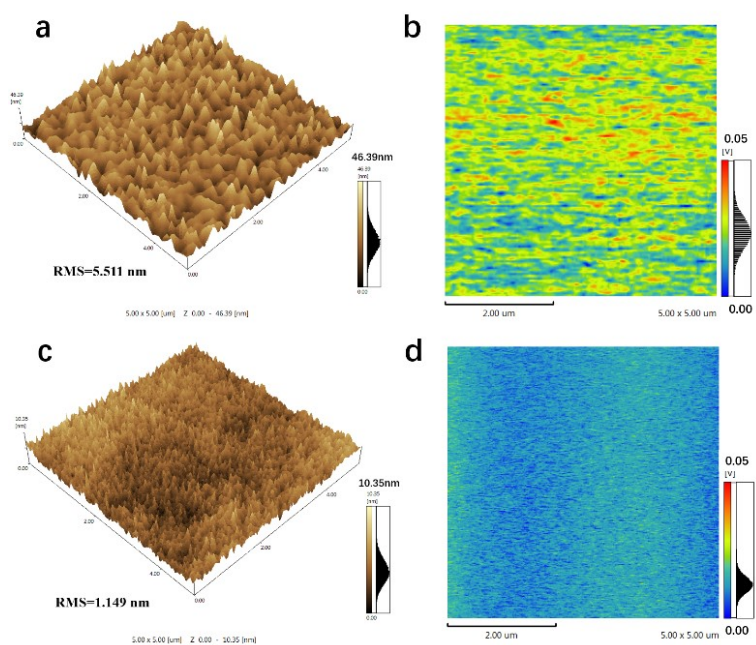


**Fig. S13** 400s steady-state photocurrent and power output at maximum power point of control PSCs and TPR PSCs.





**Fig. S14** AFM topographic images of composite films (ITO/PTAA/MAPbI<sub>3</sub>/C<sub>60</sub>/BCP) based on (a) precursor film and (b) TPR film; and Au electrodes (ITO/PTAA/MAPbI<sub>3</sub>/C<sub>60</sub>/BCP/Au) of (c) control SPSC and (d) TPR SPSC.



**Fig. S15** (a) Three-dimensional topographic AFM image and (b) KFM image of Au electrode (ITO/PTAA/MAPbI<sub>3</sub>/C<sub>60</sub>/BCP/Au) based on control film; (c) Three-dimensional topographic AFM image and (d) KFM image of Au electrode (ITO/PTAA/MAPbI<sub>3</sub>/C<sub>60</sub>/BCP/Au) based on TPR film.

Table S1. Transmittance of control films and TPR films (PTAA/MAPbI<sub>3</sub>) averaged over 5 films.

<b>Sample number</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Average</b>
<b>Control</b>	<b>25.85 %</b>	<b>26.71 %</b>	<b>26.53 %</b>	<b>25.74 %</b>	<b>25.41 %</b>	<b>26.05 %</b>
<b>TPR</b>	<b>26.83 %</b>	<b>28.17 %</b>	<b>28.75 %</b>	<b>26.11 %</b>	<b>27.82 %</b>	<b>27.54 %</b>

Table S2. Sheet resistance of Au films based on the control films and TPR films

<b>Sheet resistance (<math>\Omega/\text{Sq}</math> uare)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>Average</b>
<b>Control</b>	<b>16.3</b>	<b>16.4</b>	<b>18.2</b>	<b>17.5</b>	<b>17.1</b>
<b>TPR</b>	<b>27.4</b>	<b>25</b>	<b>26.5</b>	<b>26.8</b>	<b>26.4</b>