**Supplementary Information**

**Propylamine hydrobromide passivated tin-based perovskites to efficient solar cells**

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**Fig. S1.** Grain size distribution of control and PABr perovskite films.



**Fig. S2.** (100) XRD peak of different perovskite films.

 

**Fig. S3.** Steady-state *J*SC output curves (measured at a bias of 0.47 V under AM 1.5 G illumination of 100 mW·cm−2) of the PABr device.



**Fig. S4.**  Short-term stability of *J*SC under continuous illumination (AM 1.5 G illumination of 100 mW·cm−2).



**Fig. S5.** Short-term stability of *V*OC under continuous illumination (AM 1.5 G illumination of 100 mW·cm−2).



**Fig. S6.** PCE degradation of control and PABr devices stored in nitrogen glovebox.



**Fig. S7.** Dark *J–V* characteristics of the hole-only devices.

 

**Fig. S8.** Dark transient photovoltage test of control device and PABr device.

**Table S1.** Intensity ratio of XRD peaks of various crystal facets

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample | (100)/(102) | (100)/(200) | (100)/(122) | (100)/(222) | (100)/(213) |
| Control |  0.34 |  1.11 |  0.35 |  0.28 |  1.29 |
| w/PABr |  0.77 |  0.99 |  0.97 |  0.56 |  2.55 |

**Table S2.** FWHM of XRD peaks of different perovskite films

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sample | XRD data | (100) | (102) | (200) | (122) | (222) | (213) |
| Control | Angle / (°) | 14.02 | 24.49 | 28.25 | 31.66 | 40.38 | 42.97 |
| FWHM / (°) | 0.131 | 0.127 | 0.120 | 0.123 | 0.139 | 0.129 |
| w/PABr | Angle / (°) | 14.04 | 24.49 | 28.27 | 31.68 | 40.42 | 42.99 |
| FWHM / (°) | 0.127 | 0.126 | 0.131 | 0.126 | 0.135 | 0.140 |

**Table S3.** Bi-exponential fitting parameters of TRPL from FASnI3 films without and with PABr

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample | *τ*1 / ns | *B*1 / % | *τ*2 / ns | *B*2 / % | *τ*avg / ns |
| Control | 2.27 | 84.27 | 6.70 | 12.78 | 2.86 |
| w/PABr | 6.06 | 70.44 | 9.72 | 16.93 | 6.77 |