

Highly Efficient and Stable Perovskite Solar Cells Proceeded by Maximizing Additive Engineering

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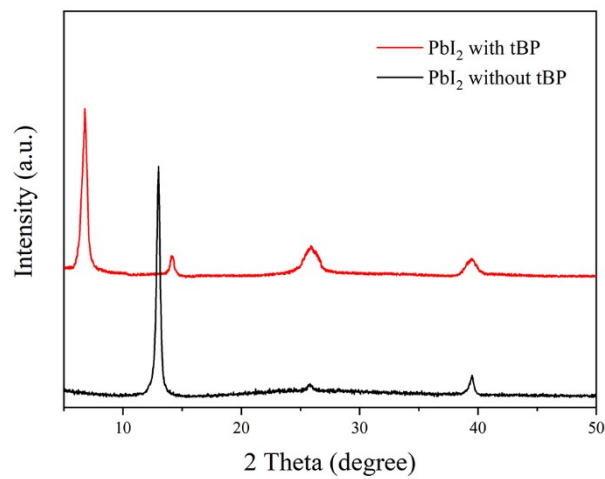


Figure S1. The XRD patterns of PbI_2 film with and without tBP.

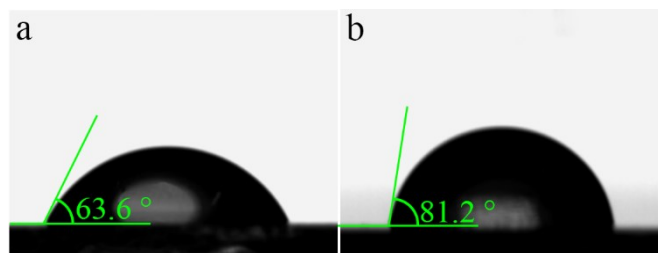


Figure S2. The water contact angle of PbI_2 film with and without tBP.

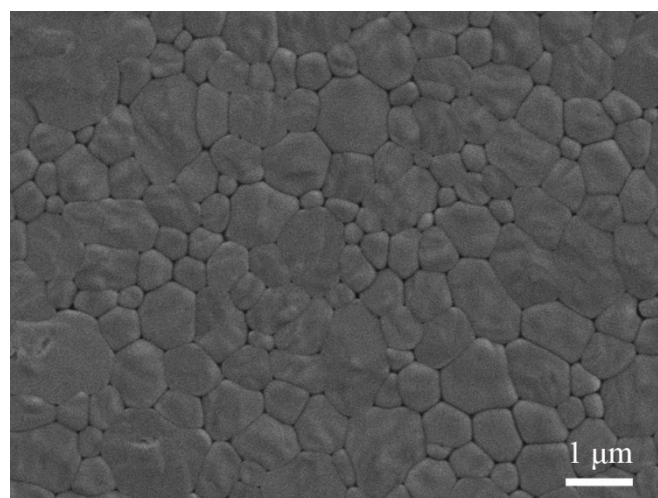


Figure S3. Lower magnification SEM top-view image of $\text{CH}_3\text{NH}_3\text{PbI}_3$ -tBP film.

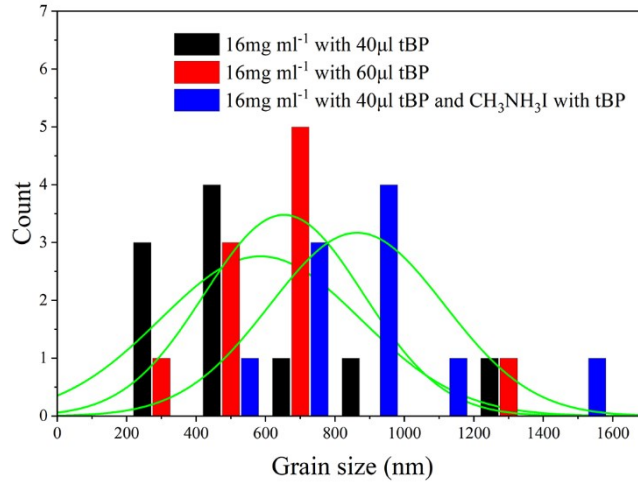


Figure S4. The grain sizes distribution statistics corresponding to Figure 3a, b and c.

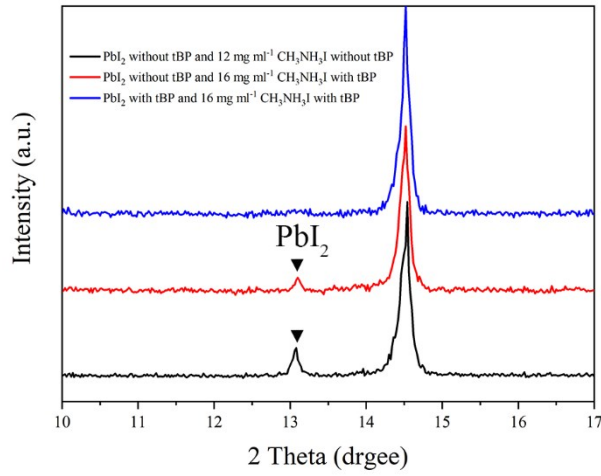


Figure S5. The XRD patterns of perovskite prepared from different conditions.

Table s1. The full photovoltaic parameters for fabricated PSCs corresponding to Figure 4(b).

Sample	J (mA/cm ²)	V (V)	FF (%)	PCE (%)
Control	9.28	0.75	42	2.91
12 mg ml ⁻¹ CH ₃ NH ₃ I without tBP	20.65	0.99	80	16.27
16 mg ml ⁻¹ CH ₃ NH ₃ I without tBP	21.58	1.00	81	17.45
16 mg ml ⁻¹ CH ₃ NH ₃ I with tBP	23.15	1.01	81	18.91

Table s2. Fitted parameters of TRPL spectra corresponding to Figure 5(d).

Sample	A_1 (%)	τ_1 (ns)	A_2 (%)	τ_2 (ns)	τ_{avg} (ns)
Control	76	9.2	24	39.4	26.5
12 mg ml ⁻¹ CH ₃ NH ₃ I without tBP	71	6.6	29	32.4	23.8
16 mg ml ⁻¹ CH ₃ NH ₃ I with tBP	79	4.3	21	24.5	16.5

Table s3. The full photovoltaic parameters for fabricated flexible PSCs corresponding to Figure 7(a).

Sample	J (mA/cm ²)	V (V)	FF (%)	PCE (%)
Initial	21.21	0.97	73	14.92
10 times bending	20.78	0.95	68	13.33
15 times bending	20.45	0.93	64	12.15
20 times bending	19.98	0.92	62	11.39