

Supplementary Materials

GABr Post-Treatment for High-Performance MAPbI₃ Solar Cells on Rigid Glass and Flexible Substrate

Tingting Chen ¹, Rui He ¹, Fan Zhang ², Xia Hao ^{2,3,*}, Zhipeng Xuan ², Yunfan Wang ², Wenwu Wang ^{1,3}, Dewei Zhao ^{1,3}, Jingquan Zhang ^{1,3} and Lili Wu ^{1,3,*}

¹ College of Materials Science and Engineering, Sichuan University, Chengdu 610065, China; chentingting1@stu.scu.edu.cn (T.C.); hrkbj@stu.scu.edu.cn (R.H.); www1492@scu.edu.cn (W.W.); dewei.zhao@scu.edu.cn (D.Z.); zhangjq@scu.edu.cn (J.Z.)

² Institute of New Energy and Low-Carbon Technology, Sichuan University, Chengdu 610065, China; zhangfan3@stu.scu.edu.cn (F.Z.); 2018226220003@stu.scu.edu.cn (Z.X.); wangyunfan@stu.scu.edu.cn (Y.W.)

³ Engineering Research Center of Alternative Energy Materials & Devices, Ministry of Education, Chengdu 610065, China

* Correspondence: hao.xia0808@scu.edu.cn, wulili@scu.edu.cn

Citation: Chen, T.; He, R.; Zhang, F.; Hao, X.; Xuan, Z.; Wang, Y.; Wang, W.; Zhao, D.; Zhang, J.; Wu, L.; et al. GABr Post-Treatment for High-Performance MAPbI₃ Solar Cells on Rigid Glass and Flexible Substrate. *Nanomaterials* **2021**, *11*, 750. <https://doi.org/10.3390/nano11030750>

Academic Editor: Jung-Ho Yun

Received: 1 February 2021

Accepted: 11 March 2021

Published: 16 March 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

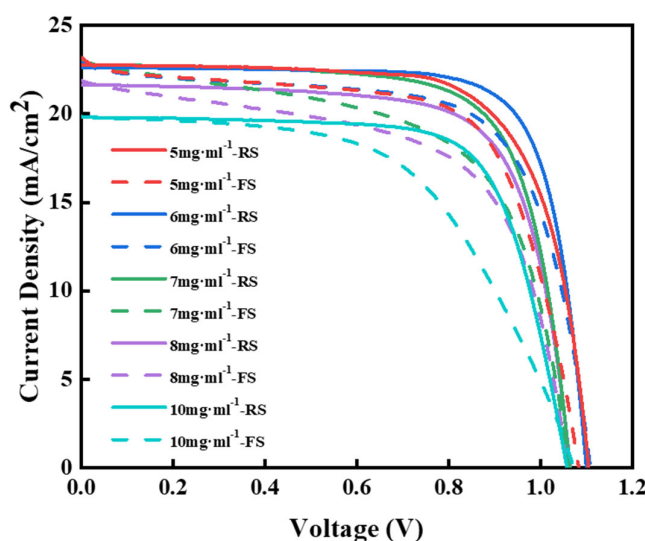


Figure S1. *J*-*V* curves of devices treated by high concentration of GABr measured under different scan directions.

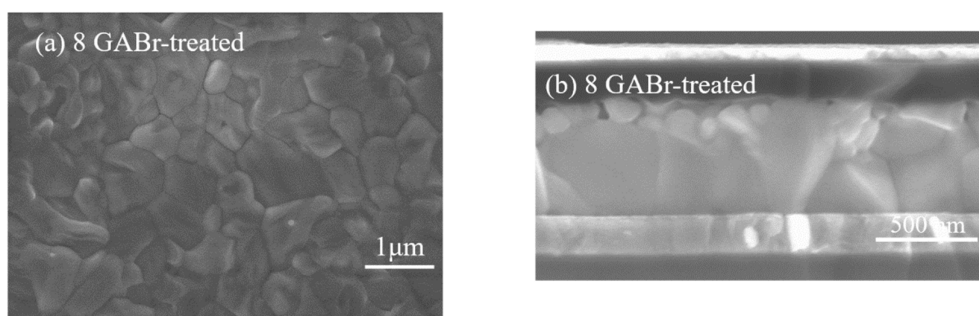


Figure S2. (a) SEM image of 8 mg·mL⁻¹ GABr treated MAPbI₃ and (b) the cross-sectional SEM image of 8 mg·mL⁻¹ GABr treated solar cell device.

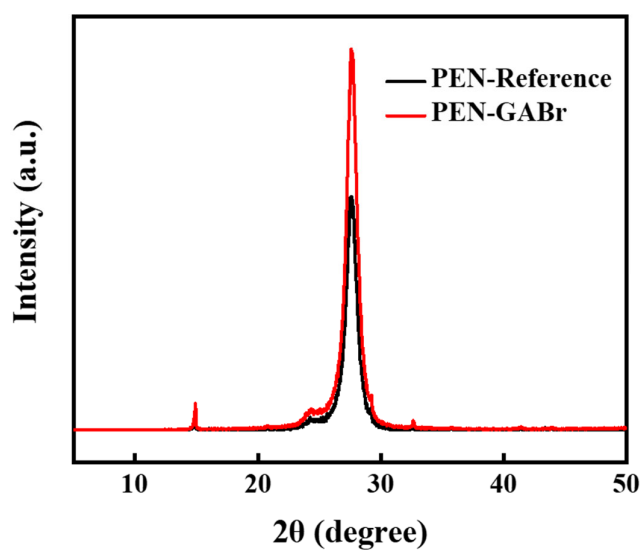


Figure S3. XRD spectra of MAPbI₃ and GABr treated MAPbI₃ deposited on flexible substrates.

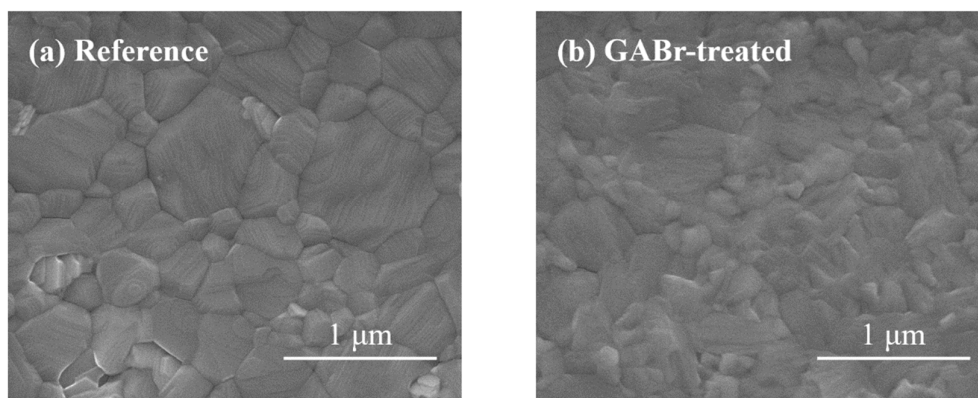


Figure S4. SEM images of (a) MAPbI₃ and (b) GABr treated MAPbI₃ deposited on flexible substrates.

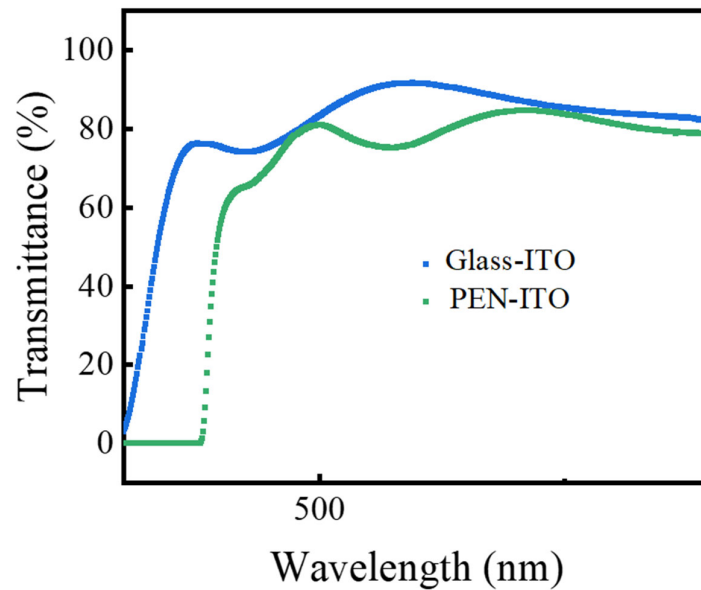


Figure S5. The transmittance spectra for both substrates for rigid and flexible devices.

Table S1. HI values of devices treated by different concentrations of GABr.

x value	0	1	2	3	4	5	6	7	8	10
HI (%)	30.49	29.9	11.08	5.25	2.46	13.29	17.36	19.63	19.19	28.42

Table S2. Atomic ratio of MAPbI₃ and GABr-treated film obtained from XPS data.

Elements	Atomic Ratio of Elements (%)	
	Reference	GABr
I 3d	66.69	68.34
Pb 4f	26.18	25.65
C 1s	5.58	3.37
N 1s	1.55	2.50
Br 3d	0	0.14

Table S3. *J*-*V* parameters of the champion devices based on MAPbI₃ and GABr-treated MAPbI₃ on rigid substrates.

Sample	<i>J</i> _{sc} (mA/cm ²)	<i>V</i> _{oc} (V)	FF (%)	PCE (%)
reference-forward	23.26	1.041	56.24	13.62
reference-reverse	22.93	1.055	74.21	17.95
GABr-forward	23.39	1.132	69.03	18.27
GABr-reverse	23.06	1.130	76.81	20.01

Table S4. *J*-*V* parameters and HI values of the champion devices based on MAPbI₃ and GABr-treated MAPbI₃ on flexible substrates.

Sample	<i>J</i> _{sc} (mA/cm ²)	<i>V</i> _{oc} (V)	FF (%)	PCE (%)	HI (%)
reference-forward	22.11	1.041	49.36	11.36	27.96
reference-reverse	21.29	1.055	70.21	15.77	
GABr-forward	22.0	1.078	64.43	15.28	13.03
GABr-reverse	21.71	1.09	74.25	17.57	