

Supplementary Materials

Effects of Annealing Conditions on Mixed Lead Halide Perovskite Solar Cells and Their Thermal Stability Investigation

Haifeng Yang^{1,2}, Jincheng Zhang^{1,3}, Chunfu Zhang^{1,3,*}, Jingjing Chang^{1,*}, Zhenhua Lin^{1,3}, Dazheng Chen¹, He Xi¹ and Yue Hao¹

¹ Wide Bandgap Semiconductor Technology Disciplines State Key Laboratory, School of Microelectronics, Xidian University, Xi'an 710071, China; faircl@163.com (H.Y.); jchzhang@xidian.edu.cn (J.Z.); zhlin@xidian.edu.cn (Z.L.); dzchen@xidian.edu.cn (D.C.); hxi@xidian.edu.cn (H.X.); yhao@xidian.edu.cn (Y.H.)

² College of Physics and Optoelectronics Technology, Baoji University of Arts and Sciences, Baoji 721016

³ Shaanxi Joint Key Laboratory of Graphene, Xidian University, Xi'an 710071, China

* Correspondence: cfzhang@xidian.edu.cn (C.Z.); jjingchang@xidian.edu.cn (J.C.)

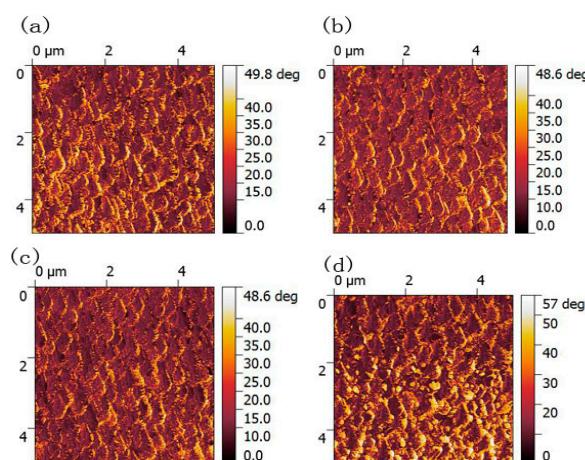


Figure S1. AFM phase images of $\text{MA}_{0.7}\text{FA}_{0.3}\text{Pb}(\text{I}_{0.9}\text{Br}_{0.1})_3$ perovskite films annealed at 100 °C for 10 (a), 20 (b), 30 (c) and 40 (d) min.

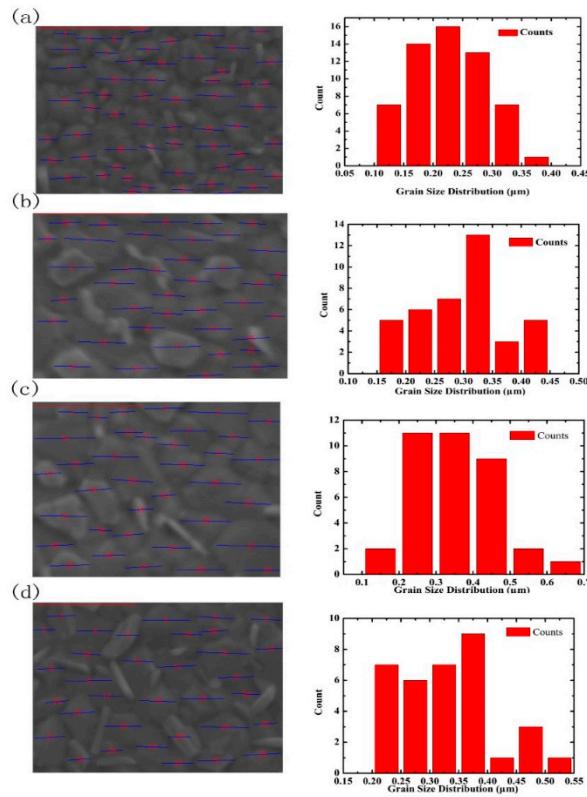


Figure S2. SEM images and grain size distribution histograms of $\text{MA}_{0.7}\text{FA}_{0.3}\text{Pb}(\text{I}_{0.9}\text{Br}_{0.1})_3$ perovskite films annealed at 100 °C for 10 (a), 20 (b), 30 (c) and 40 (d) minutes. Image size was 2.2 $\mu\text{m} \times 2.2 \mu\text{m}$. (The grain size was collected by software "Nano Measurer".)

Table S1. Photovoltaic parameters of $\text{MA}_{0.7}\text{FA}_{0.3}\text{Pb}(\text{I}_{0.9}\text{Br}_{0.1})_3$ perovskite solar cells annealed at 90 °C, 100 °C and 110 °C for 30 min.^a

Annealing Temperature (°C)	J_{SC} (mA/cm ²)	V_{OC} (V)	FF (%)	PCE (%)
90	17.01 ± 0.38	0.96 ± 0.10	77.88 ± 4.42	12.74 ± 0.93
100	19.65 ± 0.46	0.98 ± 0.09	82.43 ± 3.26	15.81 ± 0.58
110	16.97 ± 0.74	1.02 ± 0.14	73.03 ± 5.41	12.59 ± 1.11

^a Each value is derived from 5 cells made from the same batch.

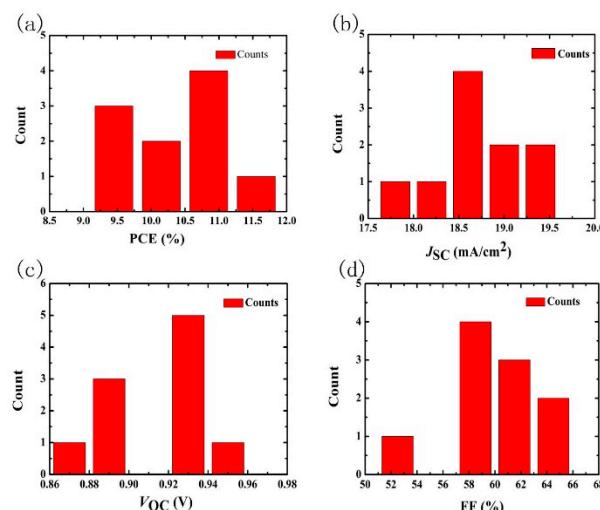


Figure S3. Statistics of PCE (a), J_{SC} (b), V_{OC} (c) and FF (d) distribution of 10 flexible devices based on 10 devices from the same batch.