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Electronic Supporting Information

Large-Area High-efficiency Perovskite Solar Cell Based on Perovskite Film Dried by Multiflow Air Knife Method in Air

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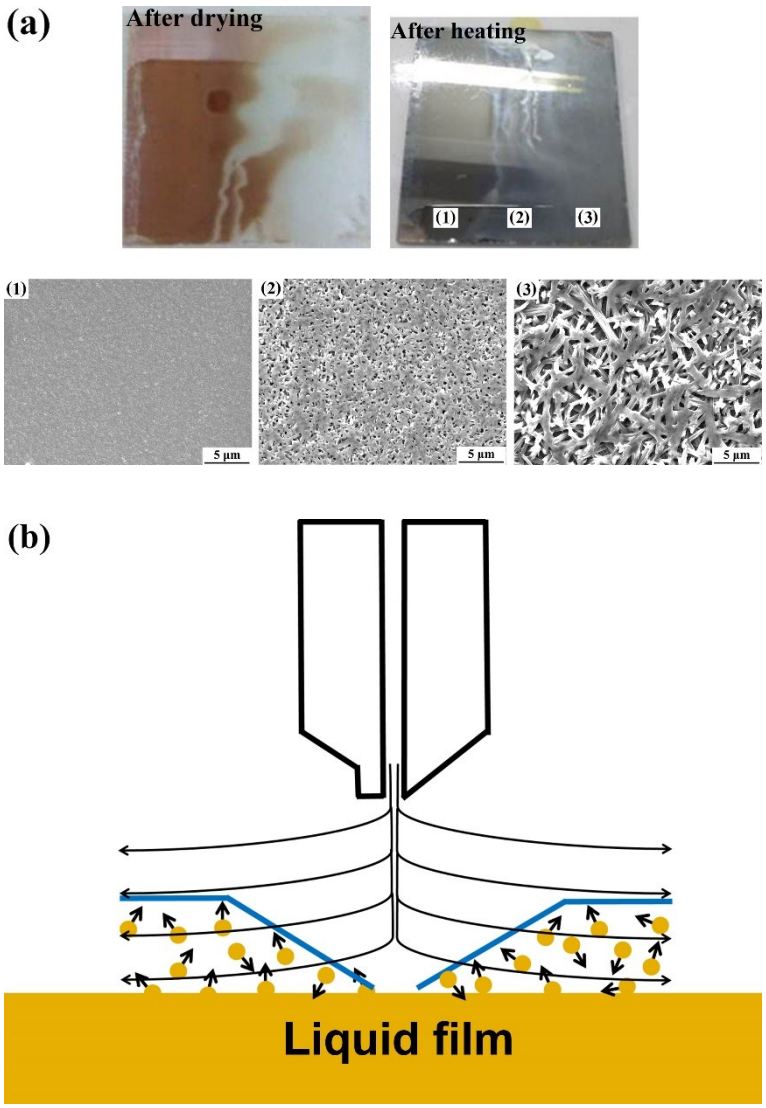

Fig. S1 (a) Photograph and scanning electron microscopy images of perovskite film dried by air-assisted method. (b) Schematic diagram showing the evaporation of liquid *N, N*-dimethylformamide film dried by air-assisted method.

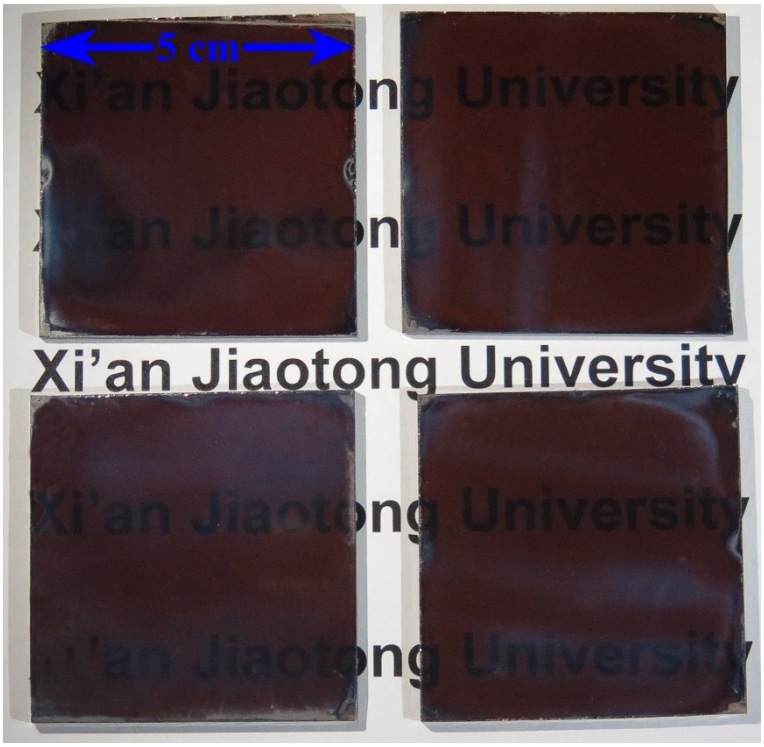

Fig. S2 Photograph of perovskite films dried by multiflow air knife method.

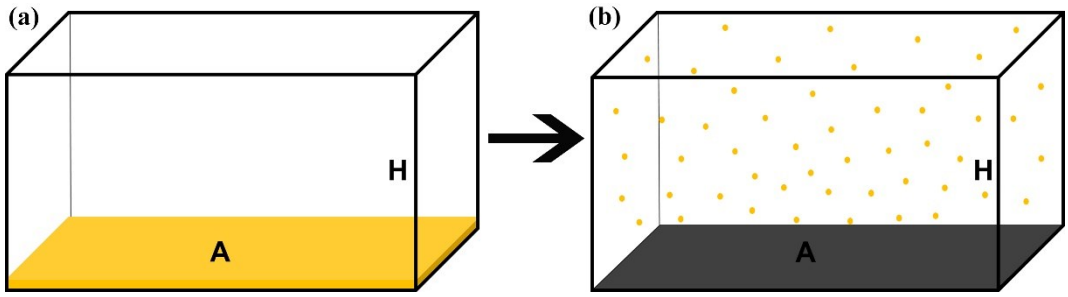

Fig. S3 Illustration of liquid N, N-dimethylformamide film evaporation. A refers to the bottom surface area (equal to the liquid film area), and H refers to the height of the gaseous phase.

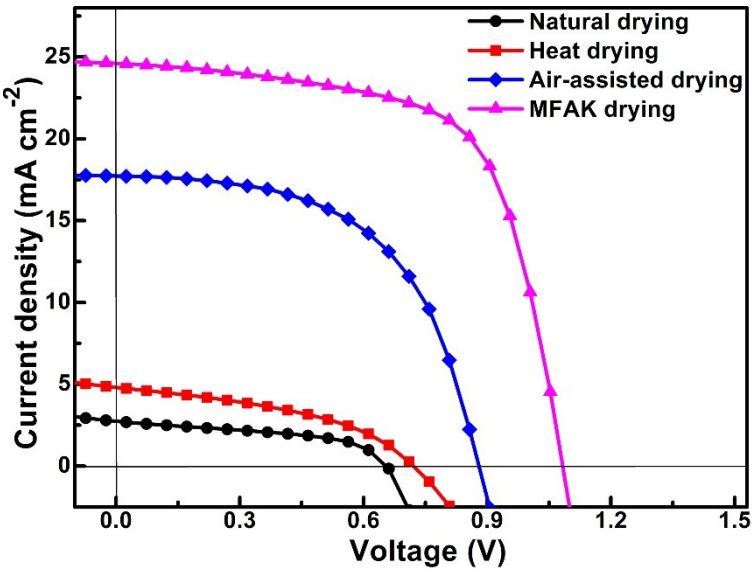

Fig. S4 Current–voltage curves of devices with perovskite films subjected to natural, heat, air-assisted, and MFAK drying, respectively.

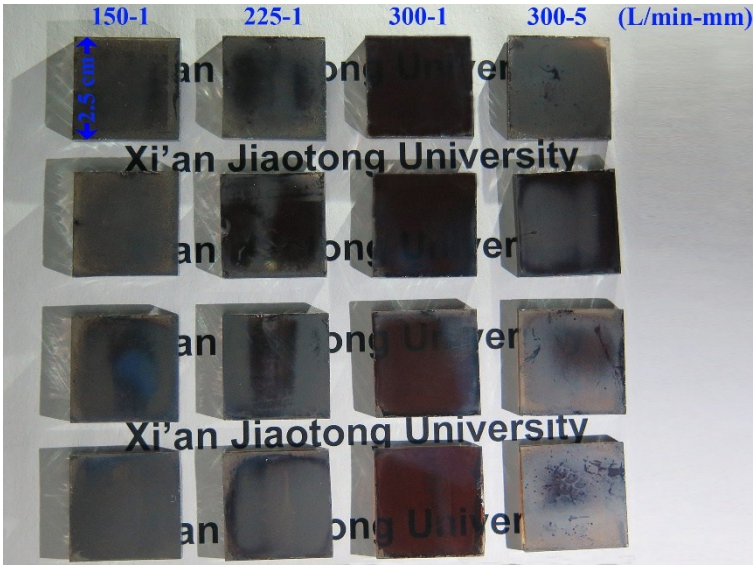

Fig. S5 Photograph of perovskite films dried upon exposure to different air flow rates.

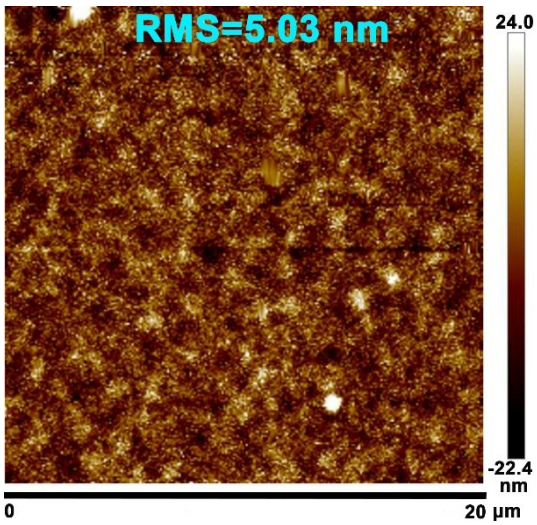

Fig. S6 Atomic force microscopy image showing the morphology of perovskite film dried by the multiflow air knife method with air flow rate of 300 L min^{-1} and distance of 1 mm, the scan area is 20 × 20 μm^2.

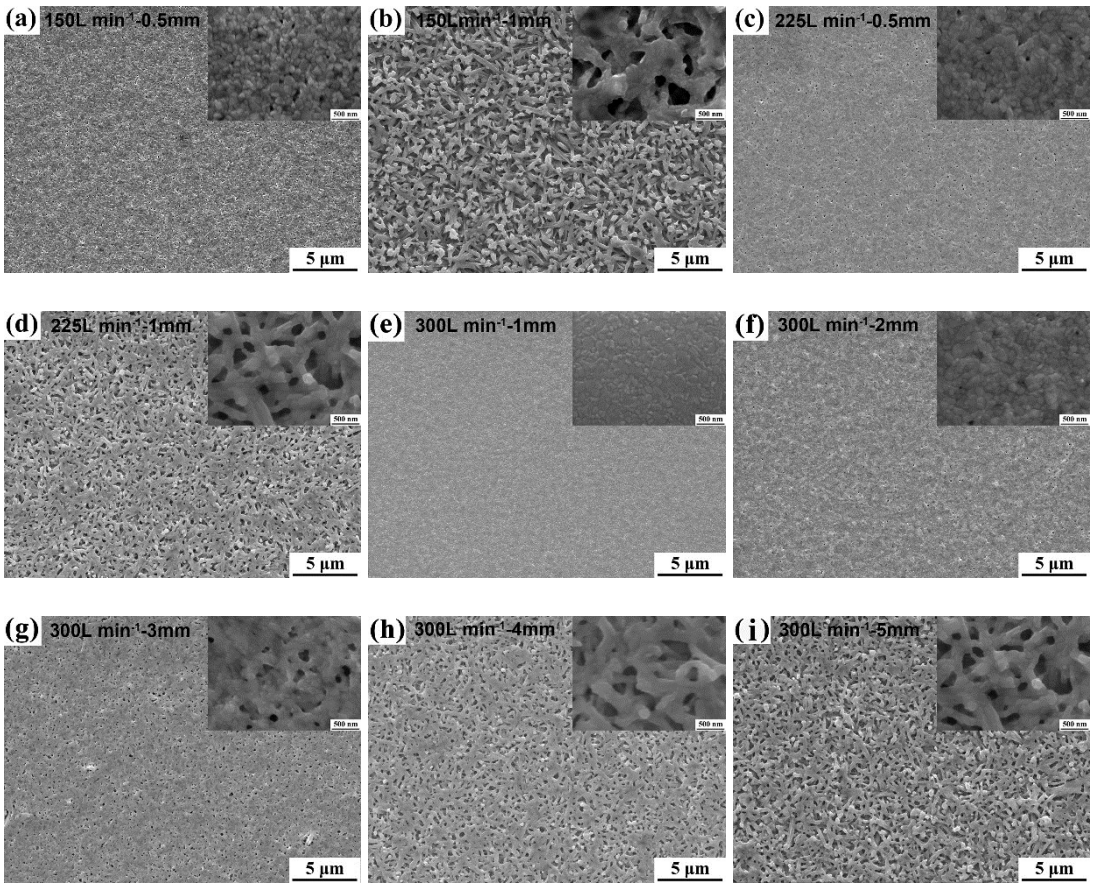

Fig. S7 Perovskite films dried by the multiflow air knife method at different air flow rates and multiflow-air-knife–film distances: (a) 150 L min^{-1} and 0.5 mm; (b) 150 L min^{-1} and 1 mm; (c) 225 L min^{-1} and 0.5 mm; (d) 225 L min^{-1} and 1 mm; (e–i) 300 L min^{-1} and 1, 2, 3, 4, and 5 mm, respectively.

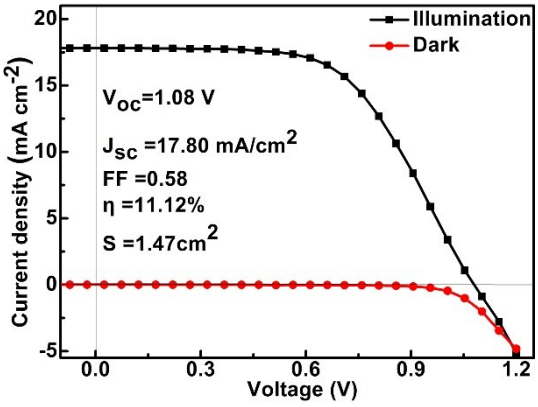

Fig. S8 Current–voltage curves of a device with active area of 1.47 cm^2.

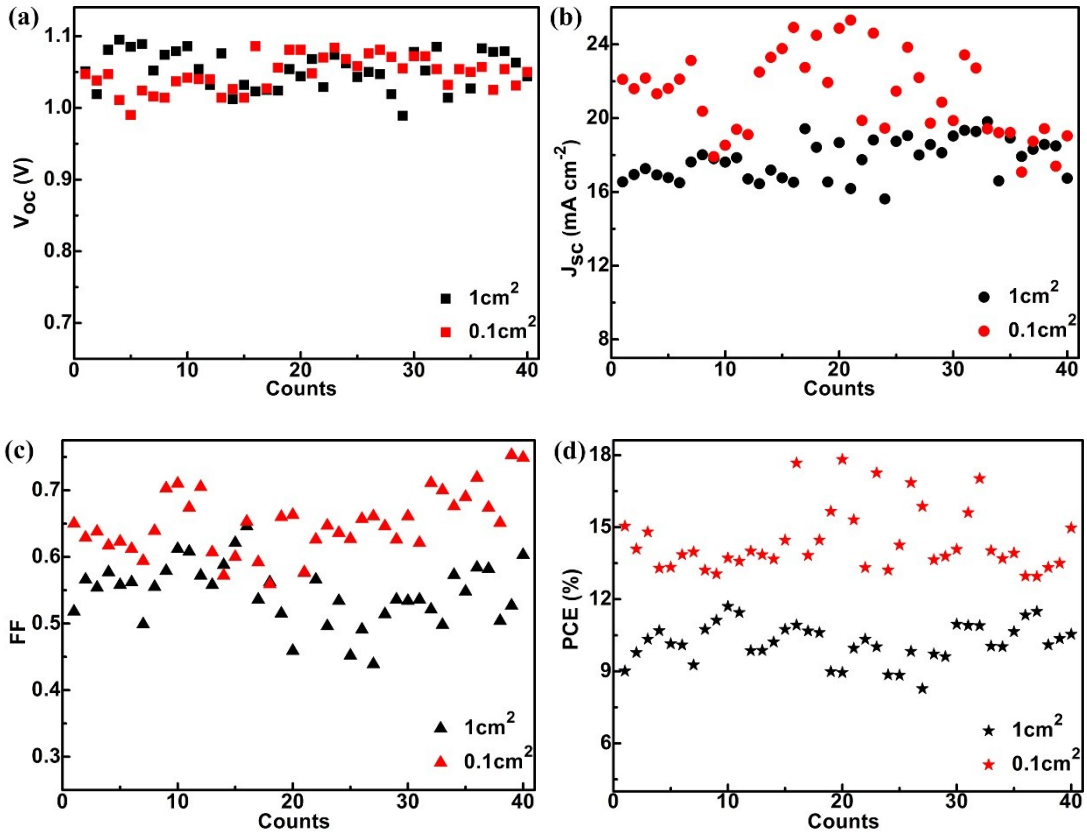

Fig. S9 Device parameter distributions. (a) Short-circuit photocurrent density (J_{sc}). (b) Open-circuit photovoltage (V_{oc}). (c) Fill factor (FF). (d) Power conversion efficiency (PCE).

Table S1. Device parameters for solar cells with area of 1 cm^2 employing perovskite films dried at different air flow rates and various multiflow-air-knife–film distances. [a]

Airflow - distance	V_{oc} (V)	J_{sc} (mA cm^{-2})	*FF*	*PCE* (%)
150 L min^{-1} - 1 mm	0.71 ± 0.05	11.48 ± 1.17	0.36 ± 0.05	3.12 ± 0.68
225 L min^{-1} - 1 mm	0.88 ± 0.08	11.27 ± 0.80	0.52 ± 0.07	5.13 ± 0.69
300 L min^{-1}- 1 mm	1.05 ± 0.03	17.76 ± 1.07	0.55 ± 0.05	10.20 ± 0.81
300 L min^{-1} - 5 mm	0.50 ± 0.10	10.59 ± 1.56	0.31 ± 0.06	1.74 ± 0.86

Table S2. Device parameters for solar cells with area of 0.1 cm^2 employing perovskite films dried at different air flow rates and various multiflow-air-knife–film distances. [a]

Airflow - distance	V_{oc} (V)	J_{sc} (mA cm^{-2})	*FF*	*PCE* (%)
150 L min^{-1} - 1 mm	0.84 ± 0.02	19.22 ± 1.53	0.48 ± 0.09	7.66 ± 1.10
225 L min^{-1} - 1 mm	0.92 ± 0.02	17.07 ± 1.97	0.63 ± 0.08	9.75 ± 0.88
300 L min^{-1} - 1 mm	1.05 ± 0.02	21.27 ± 2.24	0.65 ± 0.05	14.42 ± 1.34
300 L min^{-1} - 5 mm	0.59 ± 0.20	13.45 ± 2.70	0.35 ± 0.08	2.38 ± 2.00

[a] Data for the "300 L min^{-1} and 1 mm" sample were averaged over 40 devices, whereas the others were averaged over four devices.