Supporting Information

Covering effect of conductive glass: a facile route to tailor the grain growth of the hybrid perovskite for highly efficient solar cells

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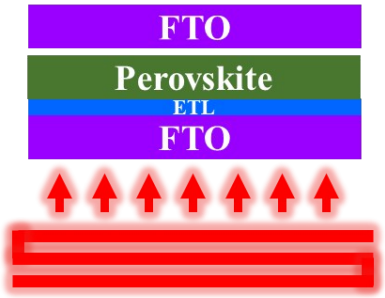

Novel Annealing-2

Scheme S1. Schematic of experimental process of another conductive glass-assisted annealing route.

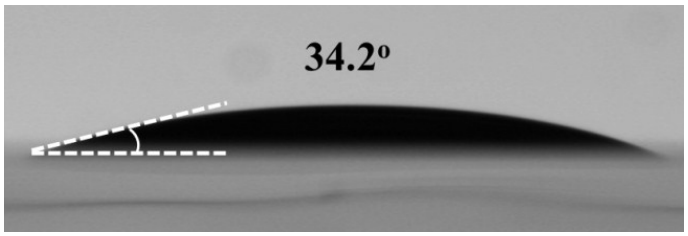

Fig. S1 The contact angle of perovskite precursor solution on the assisted-conductive glass.

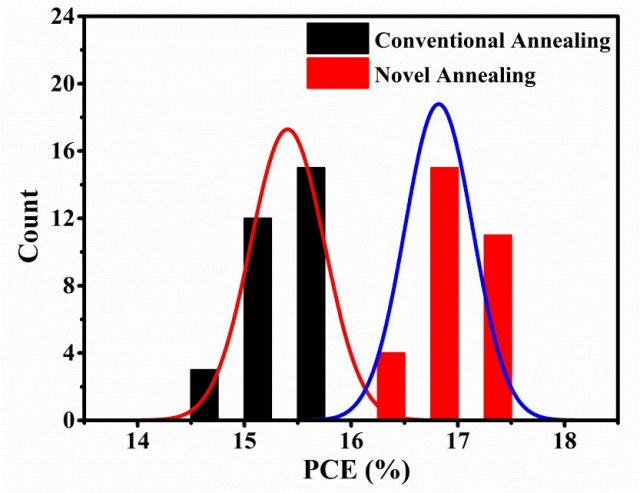

Fig. S2 Statistical PCE (30 devices) of the PSCs based on CA (black) and NA (red) routes, respectively.

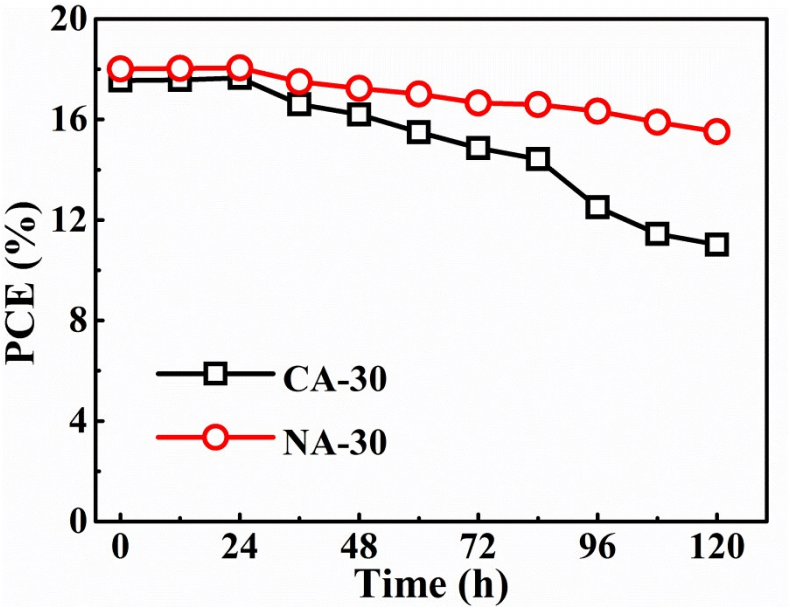

Fig. S3 Stability test of the unsealed CA-30 and NA-30 based PSCs and the devices were stored in the dark condition with the ambient air at ~10% humidity.

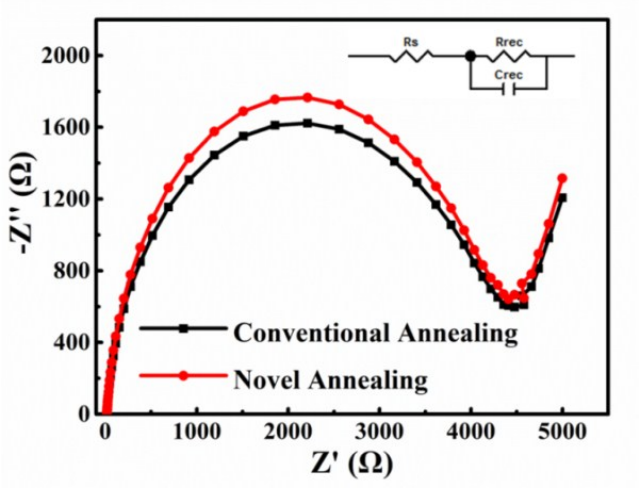

Fig. S4 Nyquist plots of perovskite solar cells which were based on CA (black) and NA (red) routes, respectively, and the devices were measured at -0.7 V under dark conditions.

Table S1. EIS parameters of PSCs which were based on CA (black) and NA (red) routes, respectively.

Annealing Route	R_s/Ω	R_{rec}/Ω
Conventional	14.59	2694
Novel	11.20	3509

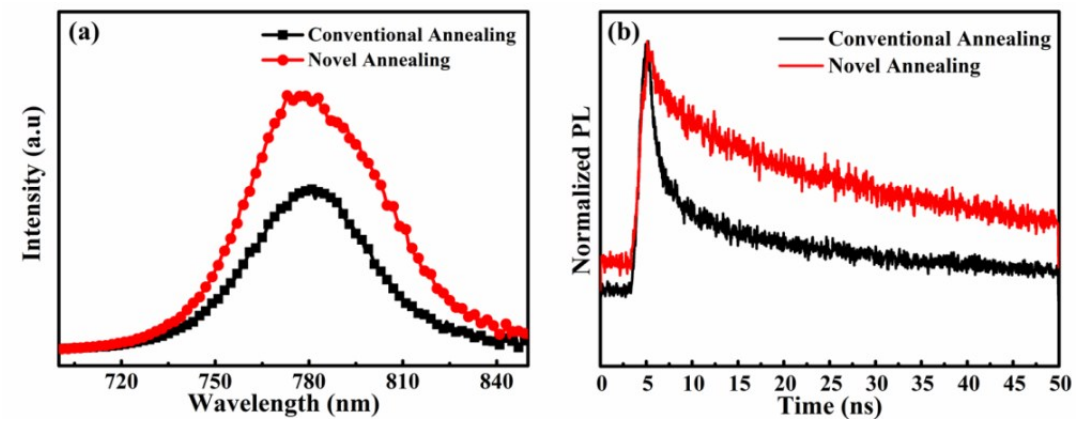

Fig. S5 (a) Photoluminescence (PL) spectra (excitation at 406 nm) and (b) time-resolved photoluminescence (TR-PL) (excitation at 406 nm and emission at 780 nm) of the bare perovskite films prepared based on CA (black) and NA (red) routes, respectively.

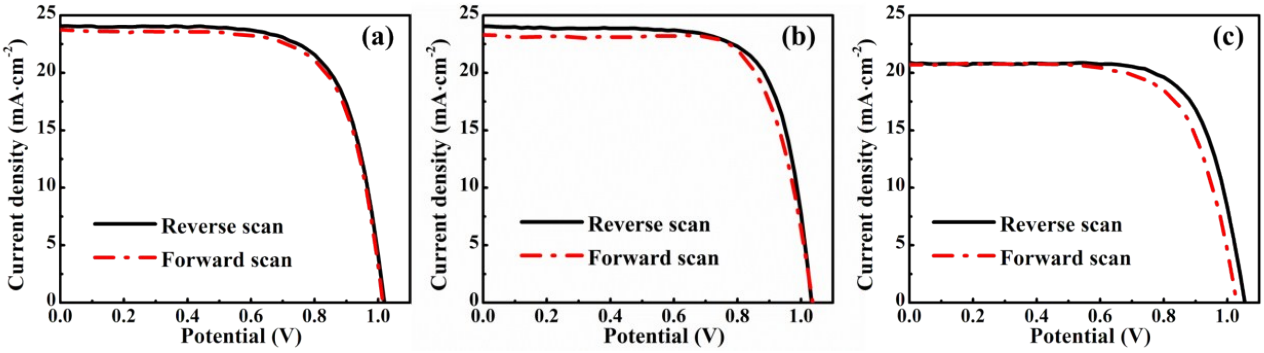

Fig. S6 Current-voltage hysteresis curves of (a) NA-15, (b) NA-30 and (c) NA-60 based PSCs , respectively, starting from the reverse scan and continuing to the forward scan.

Table S2 Comparison of the (a) NA-15, (b) NA-30 and (c) NA-60 based devices' performance parameters obtained from the reverse scan and forward scan, respectively.

Novel Annealing time/ min	Scan direction	J_{sc}/mA·cm^{-2}	V_{oc}/V	FF	PCE/%
15	reverse	24.06	1.02	0.70	17.26
	forward	23.67	1.02	0.70	16.90
30	reverse	24.05	1.03	0.73	18.08
	forward	23.32	1.03	0.72	17.29
60	reverse	20.89	1.05	0.72	15.82
	forward	20.71	1.02	0.70	14.78

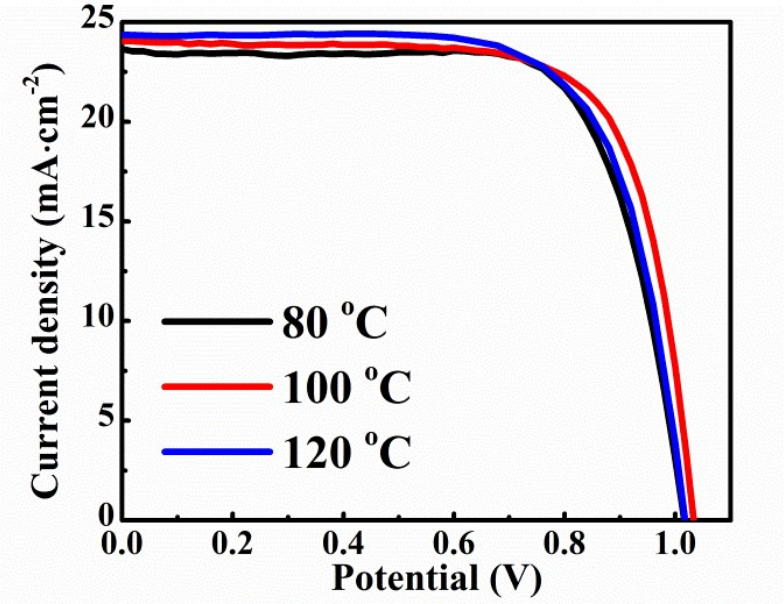

Fig. S7 Current-voltage curves of NA-30 based PSCs that the developed perovskite films were annealed at 80, 100 and 120 °C, respectively.

Table S3 Summary of the photovoltaic parameters of NA-30 based PSCs that the developed perovskite films were annealed at 80, 100 and 120 °C, respectively.

Novel Annealing Temperature/ °C	J_{sc}/mA·cm^{-2}	V_{oc}/V	FF	PCE/%
80	23.65	1.02	0.72	17.35
100	24.04	1.03	0.73	18.06
120	24.11	1.02	0.71	17.46

Table S4. EIS parameters of PSCs which were fabricated based on different novel annealing times.

Novel annealing time/ min	R_s/Ω	R_{ct}/Ω
15	8.59	198
30	7.90	171
60	10.04	239