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Corresponding author(s): Tao Chen

Solar Cells Reporting Summary

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Experimental design

Please check: are the following details reported in the manuscript?

1. Dimensions

Area of the tested solar cells	☒ Yes ☐ No	The area of tested solar cells is 0.12 cm2 (described in Methods, fabrication of Sb2S3 solar cells)
Method used to determine the device area	☒ Yes ☐ No	The active area was determined by the mask

2. Current-voltage characterization

Current density-voltage (J-V) plots in both forward and backward direction	☐ Yes ☒ No	No current density-voltage plots in forward direction, since it is not the subject of the article
Voltage scan conditions *For instance: scan direction, speed, dwell times*	☒ Yes ☐ No	J-V curves were measured by reverse scan (0.75 V to -0.1 V) with a scanning rate of 32mV/s (voltage step of 10 mV) (Figure 3c, and Device Characterizations)
Test environment *For instance: characterization temperature, in air or in glove box*	☒ Yes ☐ No	Performance measurements were tested in air ambient environments under room temperature (Methods)
Protocol for preconditioning of the device before its characterization	☐ Yes ☒ No	No preconditioning was used before its characterization
Stability of the J-V characteristic *Verified with time evolution of the maximum power point or with the photocurrent at maximum power point; see ref. 7 for details.*	☐ Yes ☒ No	The stability of the J-V characteristics is not shown in this manuscript.

3. Hysteresis or any other unusual behaviour

Description of the unusual behaviour observed during the characterization	☐ Yes ☒ No	No measurements of hysteresis behaviour in this report, since it is not the subject of the article.
Related experimental data	☐ Yes ☒ No	No related experimental data in this manuscripts.

4. Efficiency

External quantum efficiency (EQE) or incident photons to current efficiency (IPCE)	☒ Yes ☐ No	The EQE was shown in Figure 3d
A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator	☒ Yes ☐ No	The integrated Jsc from EQE spectra agree well with the Jsc from J-V measurements (Figure 3c and Supplementary Figure 2f)
For tandem solar cells, the bias illumination and bias voltage used for each subcell	☐ Yes ☒ No	No tandem cells reported in this manuscript

5. Calibration

Light source and reference cell or sensor used for the characterization	☒ Yes ☐ No	A standard xenon-lamp-based solar simulator (Oriel Sol 3A, Japan) is used for the measurements (Methods, Devices Characterizations)
Confirmation that the reference cell was calibrated and certified	☒ Yes ☐ No	The solar simulator illumination intensity was calibrated by a monocrystalline silicon reference cell (Oriel P/N 91150 V, with KG-5 visible color filter) calibrated by the National Renewable Energy Laboratory (NREL) (Methods, Devices Characterizations)

Calculation of spectral mismatch between the reference cell and the devices under test	☒ Yes ☐ No	Mismatch factor of 1 was used in our measurements

6. Mask/aperture

Size of the mask/aperture used during testing	☒ Yes ☐ No	The size of the mask is 0.12 cm2 (Methods)
Variation of the measured short-circuit current density with the mask/aperture area	☐ Yes ☒ No	No measurement of the device with different the mask/aperture area was conducted

7. Performance certification

Identity of the independent certification laboratory that confirmed the photovoltaic performance	☐ Yes ☒ No	No performace certification was reported in this manuscript
A copy of any certificate(s) *Provide in Supplementary Information*	☐ Yes ☒ No	No copys of any cerficates in this manuscript

8. Statistics

Number of solar cells tested	☒ Yes ☐ No	40 independently fabricated devices were tested (Supplementary Figure 2a-e)
Statistical analysis of the device performance	☒ Yes ☐ No	The statistical analysis of device performance were shown in Supplementary Figure 2a-e

9. Long-term stability analysis

Type of analysis, bias conditions and environmental conditions *For instance: illumination type, temperature, atmosphere humidity, encapsulation method, preconditioning temperature*	☐ Yes ☒ No	No long-term stability measurement reported in this manuscript, since the little relevance to the subject.