

Solar Cells Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted papers reporting the characterization of photovoltaic devices and provides structure for consistency and transparency in reporting. Some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

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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 Supporting Information
- Method used to determine the device area Yes No Supporting Information

2. Current-voltage characterization

- Current density-voltage (J-V) plots in both forward and backward direction Yes No No difference observed for the JV curves measured in forward and backward directions
- Voltage scan conditions Yes No Supporting Information
For instance: scan direction, speed, dwell times
- Test environment Yes No Supporting Information
For instance: characterization temperature, in air or in glove box
- Protocol for preconditioning of the device before its characterization Yes No Supporting Information
- Stability of the J-V characteristic Yes No This work does not report high power conversion efficiency values, but focuses on the device operation mechanism.
Verified with time evolution of the maximum power point or with the photocurrent at maximum power point; see [ref. 7](#) for details.

3. Hysteresis or any other unusual behaviour

- Description of the unusual behaviour observed during the characterization Yes No No unusual behavior observed during the measurement
- Related experimental data Yes No No unusual behavior observed during the measurement

4. Efficiency

- External quantum efficiency (EQE) or incident photons to current efficiency (IPCE) Yes No Supporting Information
- A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator Yes No Supporting Information
- For tandem solar cells, the bias illumination and bias voltage used for each subcell Yes No No tandem solar cells studied in this work

5. Calibration

- Light source and reference cell or sensor used for the characterization Yes No Supporting Information
- Confirmation that the reference cell was calibrated and certified Yes No Supporting Information

Calculation of spectral mismatch between the reference cell and the devices under test	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Supporting Information
6. Mask/aperture		
Size of the mask/aperture used during testing	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Supporting Information
Variation of the measured short-circuit current density with the mask/aperture area	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The reported short-circuit current density values are corrected by the current density derived from the sensitive EQE measurements (measured with a bias illumination intensity of 100 mW cm ⁻²).
7. Performance certification		
Identity of the independent certification laboratory that confirmed the photovoltaic performance	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	This work does not report high power conversion efficiency values, but focuses on the device operation mechanism.
A copy of any certificate(s) <i>Provide in Supplementary Information</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	This work does not report high power conversion efficiency values, but focuses on the device operation mechanism.
8. Statistics		
Number of solar cells tested	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Supporting Information
Statistical analysis of the device performance	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Supporting Information
9. Long-term stability analysis		
Type of analysis, bias conditions and environmental conditions <i>For instance: illumination type, temperature, atmosphere humidity, encapsulation method, preconditioning temperature</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	This work focuses on the device operation mechanism.