

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 Details are given in the Methods section.
- Method used to determine the device area Yes No Details are given in the Methods section.

2. Current-voltage characterization

- Current density-voltage (J-V) plots in both forward and backward direction Yes No Since no hysteresis is reported for small molecule organic solar cells, J-V measurements in both directions are not needed.
- Voltage scan conditions Yes No Since no hysteresis is reported for small molecule organic solar cells, scan direction, speed or dwell times are not relevant.
For instance: scan direction, speed, dwell times
- Test environment Yes No Details are given in the Methods section.
For instance: characterization temperature, in air or in glove box
- Protocol for preconditioning of the device before its characterization Yes No Since no hysteresis is reported for small molecule organic solar cells, no preconditioning is required.
- Stability of the J-V characteristic Yes No Small molecule organic solar cells are known to be stable.
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 usual behavior was observed.
- Related experimental data Yes No No usual behavior was observed.

4. Efficiency

- External quantum efficiency (EQE) or incident photons to current efficiency (IPCE) Yes No In the main text and the supplementary information.
- A comparison between the integrated response under the standard reference spectrum and the response measure under the simulator Yes No J-V measurements are performed with mismatch corrected illumination spectra. Details are given in the Methods section
- For tandem solar cells, the bias illumination and bias voltage used for each subcell Yes No No tandem solar cells are included in this work.

5. Calibration

- Light source and reference cell or sensor used for the characterization Yes No Details are given in the Methods section.
- Confirmation that the reference cell was calibrated and certified Yes No Details are given in the Methods section.

Calculation of spectral mismatch between the reference cell and the devices under test	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Details are given in the Methods section.
6. Mask/aperture		
Size of the mask/aperture used during testing	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Details are given in the Methods section.
Variation of the measured short-circuit current density with the mask/aperture area	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Not relevant for the scope of this work.
7. Performance certification		
Identity of the independent certification laboratory that confirmed the photovoltaic performance	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	A certified efficiency is not relevant for the scope of this work.
A copy of any certificate(s) <i>Provide in Supplementary Information</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No certificate. Please see above.
8. Statistics		
Number of solar cells tested	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Each fabricated sample contains 4 different pixels, which showed similar performance. The best pixel was selected and shown in this work.
Statistical analysis of the device performance	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Vacuum processed organic solar cells are known to be highly reproducible.
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	All devices were encapsulated. Moreover, small molecule organic solar cells are known to be stable. Long-term stability measurements are not in the scope of this work.