Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

# SUPPLEMENTARY INFORMATION

# CsPbBr3 Nanocrystals Inks for Printable Light Harvesting Devices

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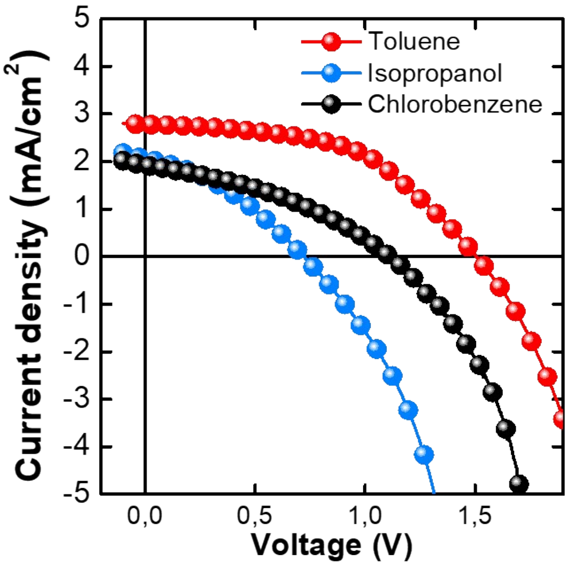

**Figure S.1:** J-V characteristics of spin coated solar cells obtained from different dispersant.

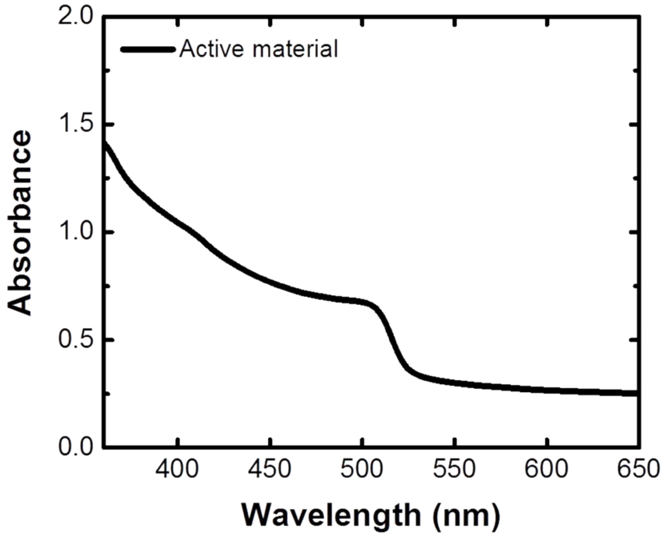

**Figure S.2:** Absorbance of the active layer.

## UV/Visible Spectrophotometer

UV-vis absorption spectra are recorded with a UV-vis Varian Cary 5000.

## X-Ray Diffraction (XRD)

The X-ray diffraction spectra were obtained using a BRUKER D8 ADVANCE diffractometer with Bragg-Brentano geometry equipped with a Cu K$\alpha$1 ($\lambda = 1.544060$ Å) anode; operating voltage 40 kV and operating current 40 mA. All the diffraction patterns were collected at room temperature over an angular range (2$\theta$) between 10° and 60°, step size 0.020° and acquisition time 1 second.

## High Resolution SEM

Ultra High vacuum Zeiss Supra 40 with GEMINI column FE-SEM. Electron Energy 3-5 kV, distance from the sample around 4 mm and magnification between 20k and 200k. High Efficiency In – Lens secondary electron detector was used during the images acquisition.

## Devices Fabrication

To produce the spin coated solar cells, FTO-coated glass substrates are etched with zinc powder and hydrochloric acid (2 M) to obtain the required electrode pattern. The substrates are cleaned in an ultra-sonicator bath, in sequence with detergent (Hellmanex, 2% v/v), distilled water, IPA, acetone and IPA again for 10 min each step. The substrates are dried with $N_2$ and treated with oxygen plasma for 10 minutes. To form the $TiO_2$ compact layer, a precursor solution is prepared by mixing 6 μL of 2 M hydrochloric acid in 1 mL of IPA to a titanium iso-propoxide solution in IPA. The solution is spin-casted at 2000 rpm for 60 s and subsequently sintered at 500°C for 45 min. Once the substrates are at room temperature, the previously synthetized $CsPbBr_3$ NCs dispersed in Toluene can be deposited by spin coating in ambient atmosphere, at 2000 rpm for 45 s with no further annealing or by bar coating with a speed of the bar at 30 mm/s and a groove of 4 μm. The samples are then transferred into a $N_2$-filled glove box for the deposition of the hole transporting material (HTM). The Spiro-OMeTAD molecule is spin coated at 1500 rpm for 40 s. The HTM solution is prepared by dissolving 75 mg of Spiro-OMeTAD, 32 μL 4-tert-butylpyridine, 18.8 μL of a stock solution of 520 mg/mL Li-TFSI salts in acetonitrile in 1 mL anhydrous chlorobenzene (CB). After 12 h of exposure to dry air to be oxidized, a 75 nm thick gold film is thermally evaporated through a shadow mask to prepare devices with active area of 0.0935 $cm^2$ or 1 $cm^2$.

The solar cell devices are tested under the solar simulator with 0.99 Sun intensity. The cells were tested both in forward-bias to short circuit (FB-SC) and short circuit to forward bias (SC-FB), also called reverse scan. The scan rate used is always 0.01 V/s, without any pre-bias of the sample and 10 s of light soaking. In all the J-V characteristics, no hysteretic behavior was found.

## Devices Characterization

The current density–voltage (J–V) characteristics were measured with a computer-controlled Keithley 2420 source meter in air without any device encapsulation. The simulated Air Mass 1.5

Global (AM 1.5G) irradiance was provided with a class AAA Newport solar simulator. The light intensity was calibrated with a silicon reference cell with a spectral mismatch factor of 0.99. For the J–V measurement, the scan rates were 0.01 V/s.

## Relative Photoluminiscence

Excitation was provided by an unfocused CW diode laser at 405nm (Oxxius). The emission spectra were collected in reflection geometry and focused into a fiber coupled to a spectrometer (Ocean Optics MAYA Pro 2000). Pump removal was achieved using a 500nm bandpass filter. The sample was excited with increasing and then decreasing values of fluence in the same spot. For each point, the sample was excited for less than five seconds and with intervals of 1 minute in between. The resulting relative PLQY was obtained according to the following formula:

$$Relative\ PLQY = \frac{Integrated\ PL}{Laser\ Power\ * Laser\ spot}$$

Where the PL emission was integrated in the range of 490-590nm, the laser power was taken in mW and the laser spot was ca. 0.02 $cm^2$. All measurements were taken at room temperature in a vacuum chamber at ~$10^{-6}$ mbar.