

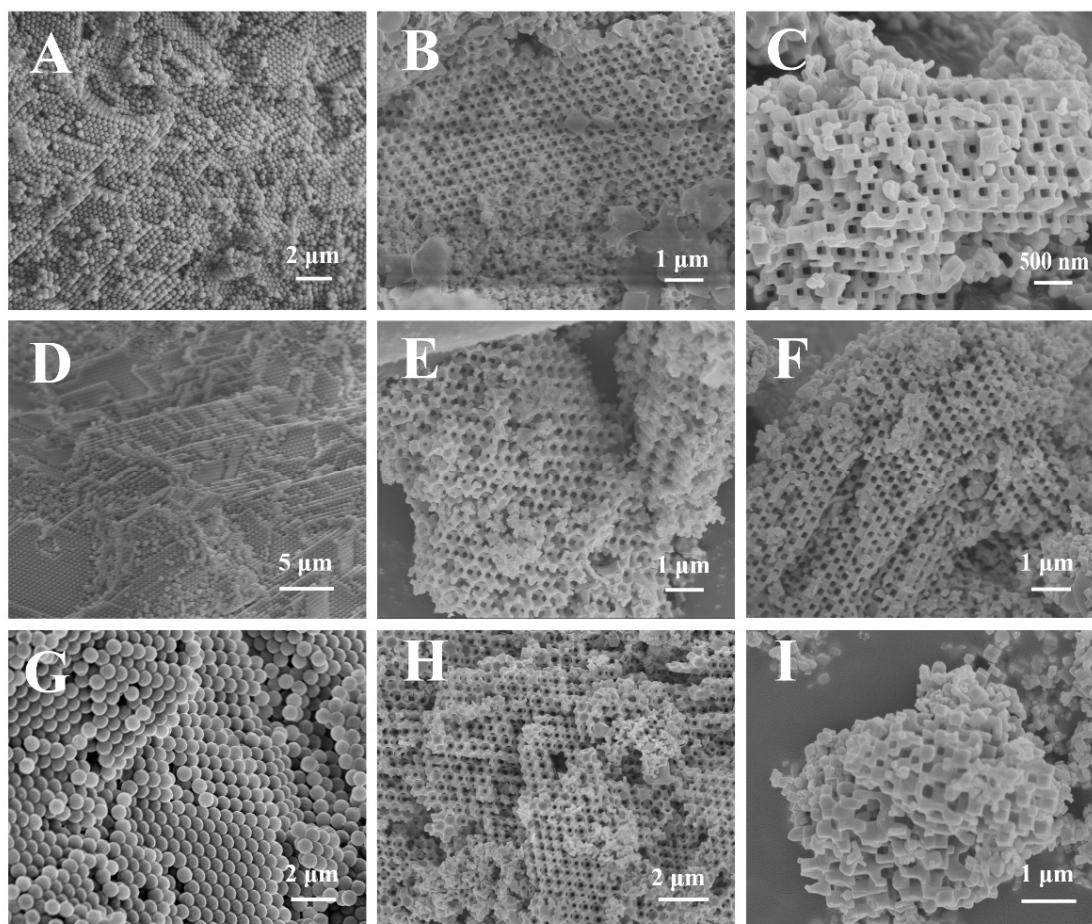
*Supporting Information*

*for*

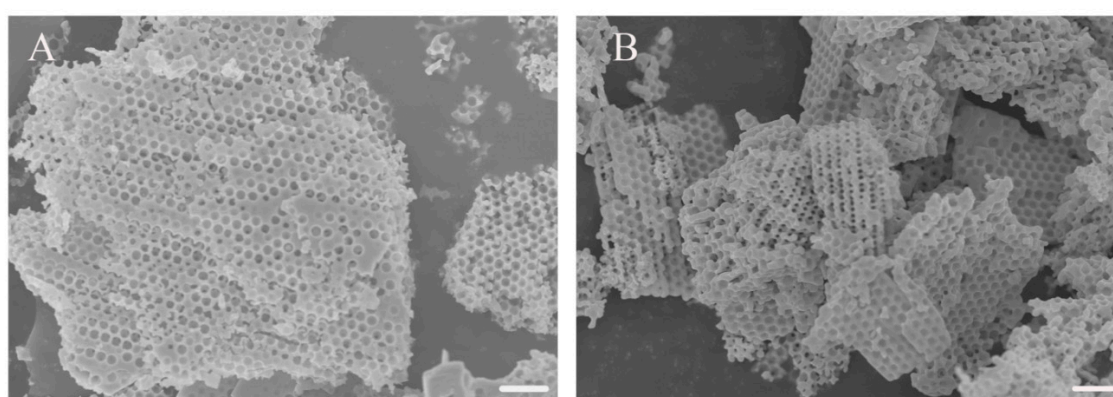
**Effects of Crystallinity on the Photocatalytic  
Polymerization of 3,4-Ethylenedioxythiophene over  
CsPbBr<sub>3</sub> Inverse Opals**

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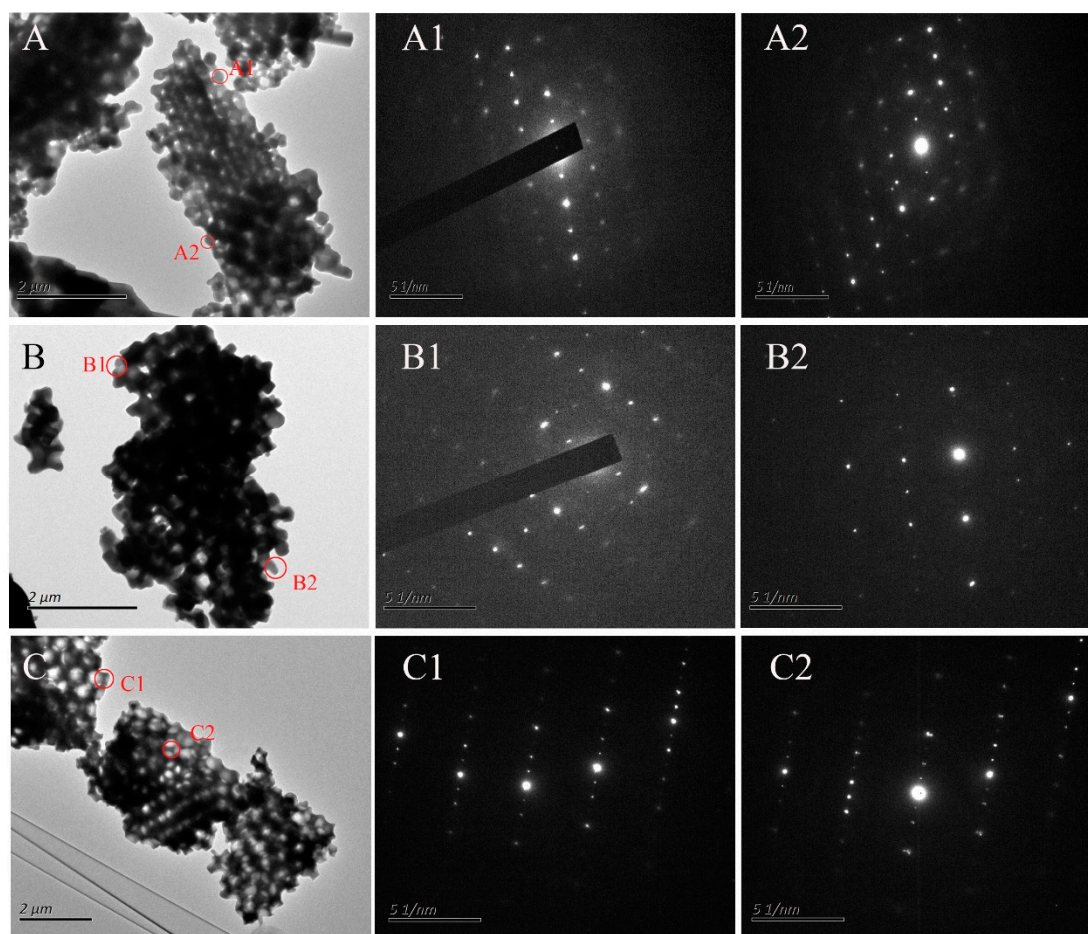
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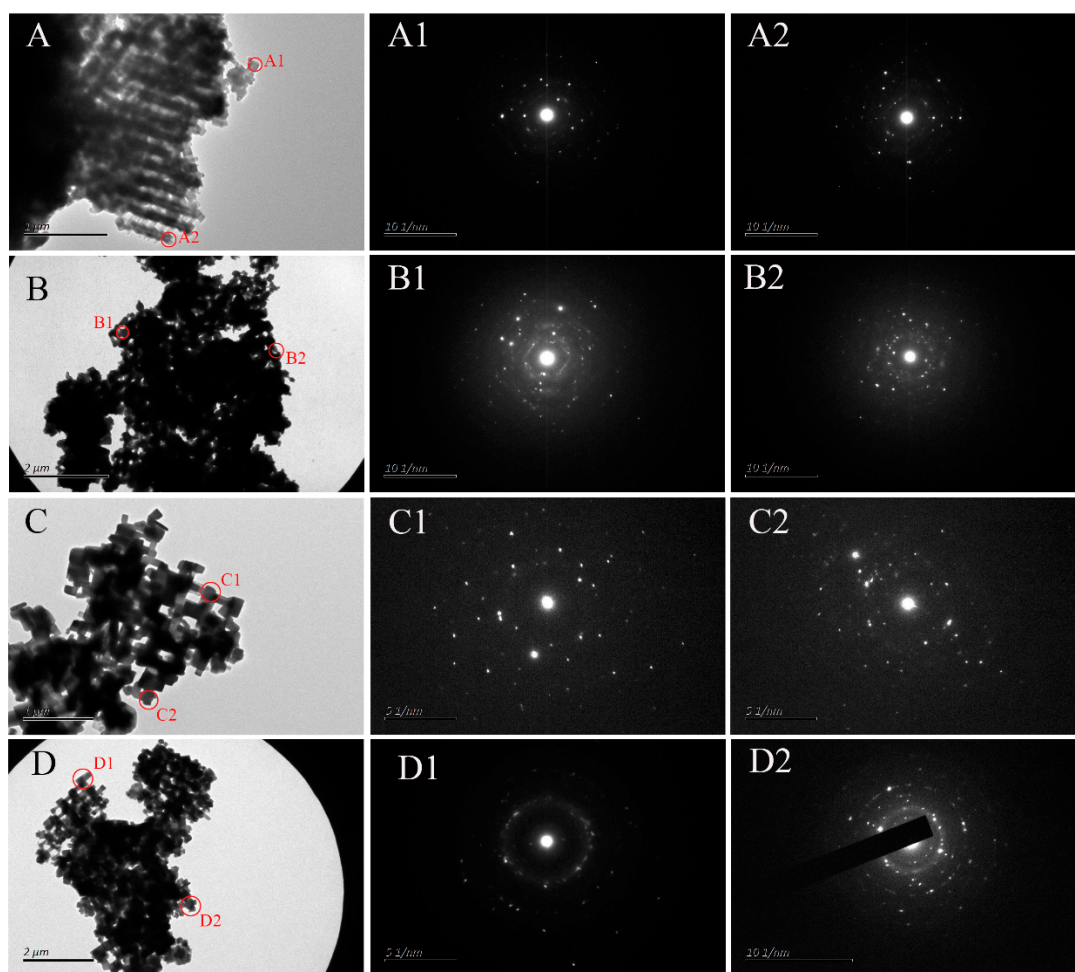
**Figure S1.** The SEM images of the face-centered cubic template with polystyrene sphere diameter of (A) 379 nm, (D) 433nm, (G) 501nm, and corresponding (B) 3/AS-IO-CsPbBr<sub>3</sub>, (C) 3/RS-IO-CsPbBr<sub>3</sub>, (E) 4/AS-IO-CsPbBr<sub>3</sub>, (F) 4/RS-IO-CsPbBr<sub>3</sub>, (H) 5/AS-IO-CsPbBr<sub>3</sub>, (I) 5/RS-IO-CsPbBr<sub>3</sub>.



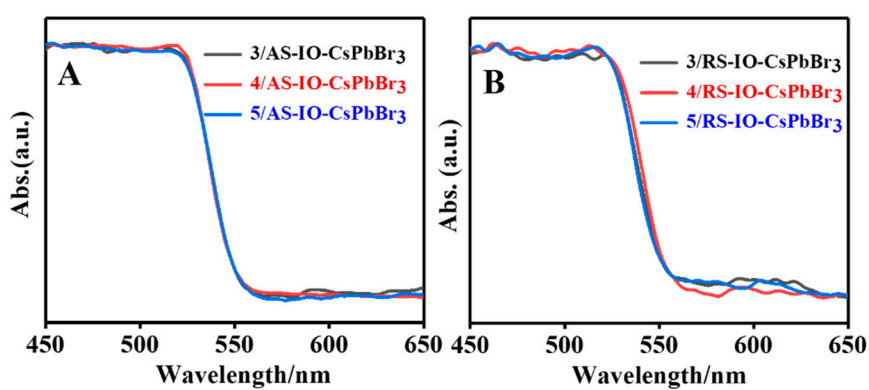
**Figure S2.** The SEM image of 2/AS-IO-CsPbBr<sub>3</sub> fabricated by different precursor concentration: 0.3M (A), 0.45M (B). Scale bar: 1μm.



**Figure S3.** The TEM image of (A) 3D AS-IO-CsPbBr<sub>3</sub>, (B) 4D AS-IO-CsPbBr<sub>3</sub>, (C) 5D AS-IO-CsPbBr<sub>3</sub>, and (A1), (A2), (B1), (B2), (C1), (C2) the SEAD images of the circle area in (A), (B), (C) respectively.

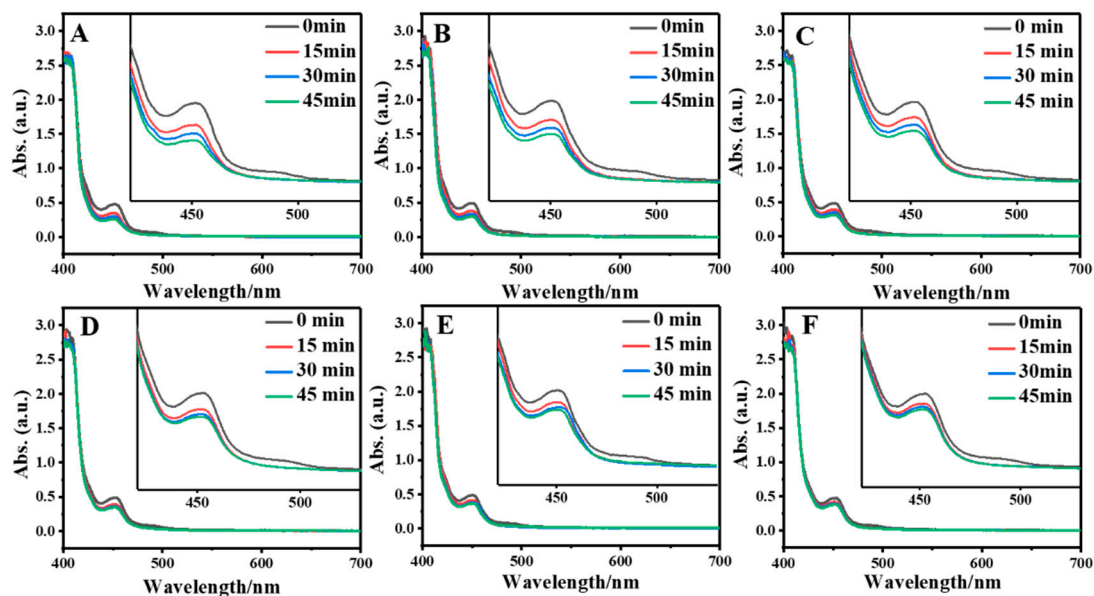


**Figure S4.** The TEM image of (A) 2/RS-IO-CsPbBr<sub>3</sub>, (B) 3/RS-IO-CsPbBr<sub>3</sub>, (C) 4/RS-IO-CsPbBr<sub>3</sub>, (D) 5/RS-IO-CsPbBr<sub>3</sub>, and (A1), (A2), (B1), (B2), (C1), (C2) (D1), (D2) the SAED images of the circle area in (A), (B), (C), (D) respectively.

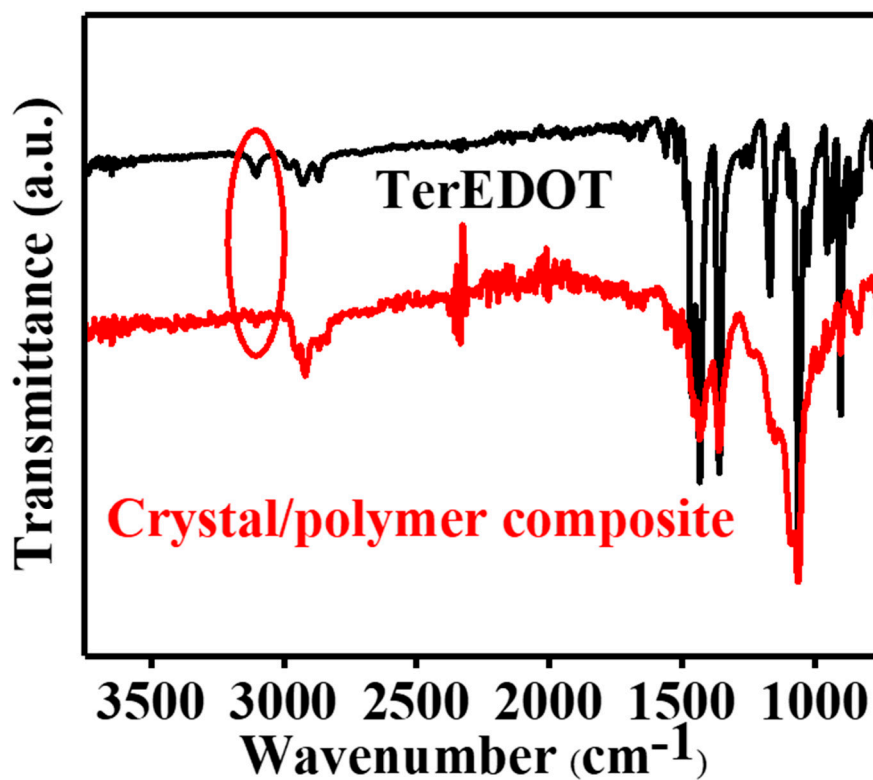


**Figure S5.** Normalised absorbance UV/Vis spectra of (A) AS-IO-CsPbBr<sub>3</sub> and (B) RS-IO-CsPbBr<sub>3</sub>.

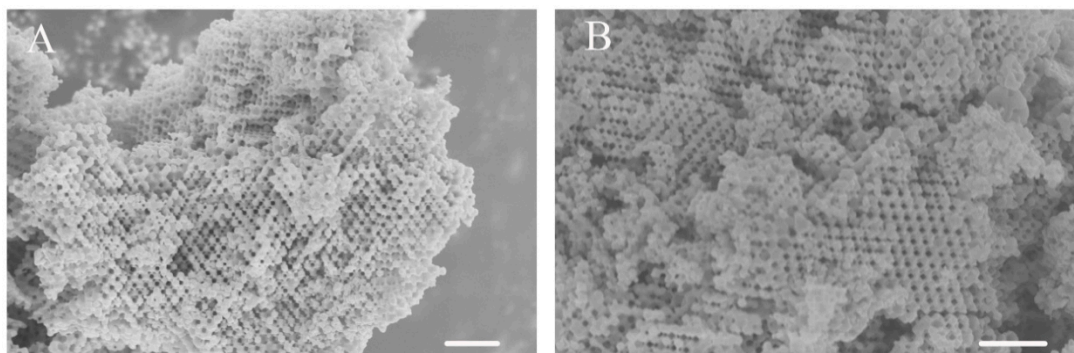




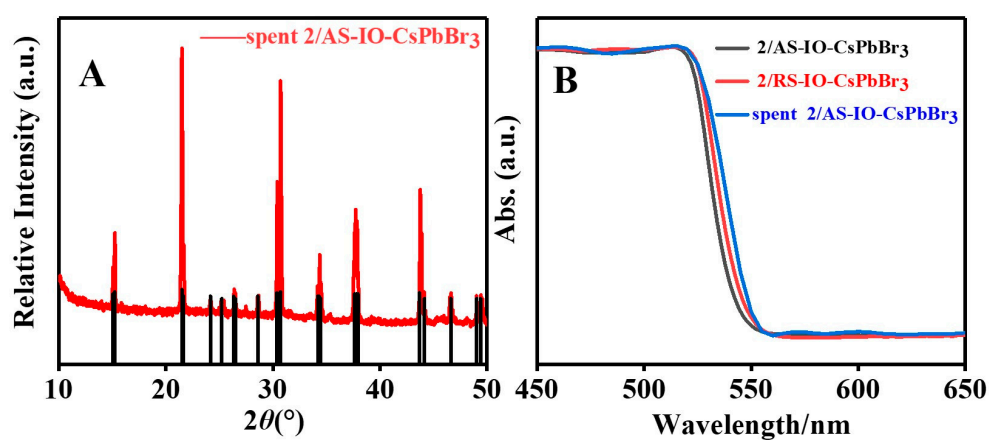
**Figure S6.** Time-dependent UV-vis spectra of the photocatalytic reaction of (A) 3/AS-IO-CsPbBr<sub>3</sub>, (B) 4/AS-IO-CsPbBr<sub>3</sub>, (C) 5/AS-IO-CsPbBr<sub>3</sub>, and (D) 3/RS-IO-CsPbBr<sub>3</sub>, (E) 4/RS-IO-CsPbBr<sub>3</sub>, (F) 5/RS-IO-CsPbBr<sub>3</sub>.



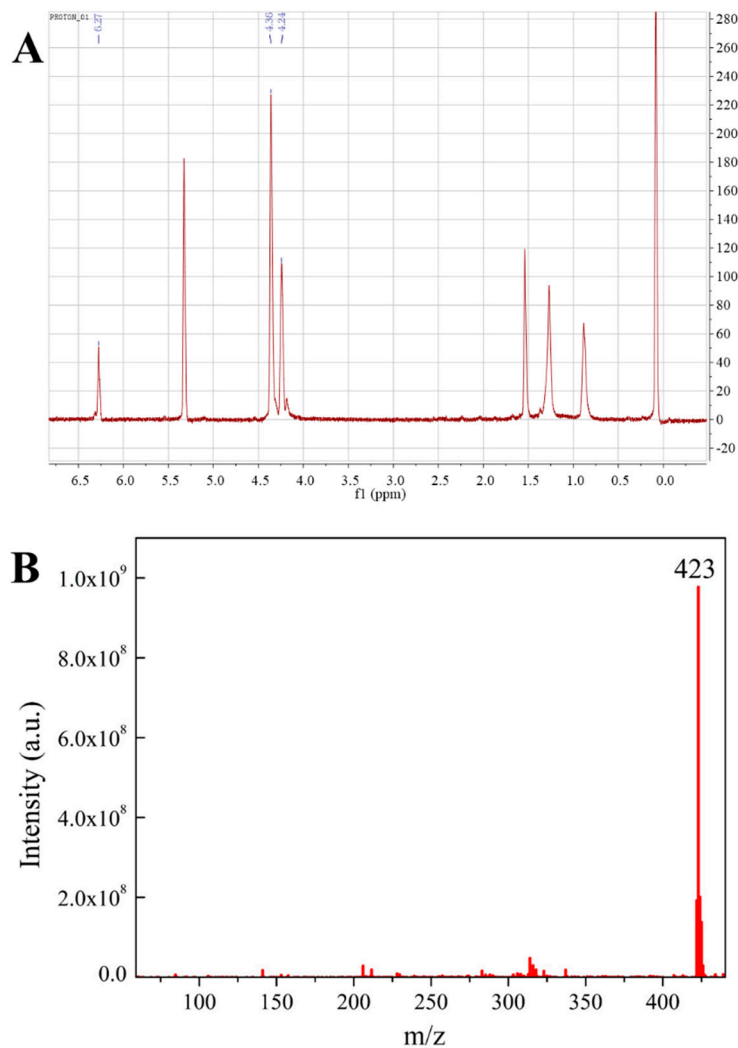
**Figure S7.** (A) the IR spectrum of TerEDOT and the crystal/polymer composite (the peak at 3104 cm<sup>-1</sup> is attributed to the C=C-H stretching vibration of TerEDOT, which could not be found in the crystal/polymer composite).



**Figure S8.** The SEM image of the spent 2/AS-IO-CsPbBr<sub>3</sub> in low magnification. Scale bar: 1 μm.



**Figure S9.** XRD patterns (A) and Normalised absorbance UV/Vis spectra (B) of the spent 2/AS-IO-CsPbBr<sub>3</sub>.



**Figure S10.** The  $^1\text{H}$ -NMR and HR-MS spectrum of TerEDOT (in  $^1\text{H}$ -NMR spectra, chemical shift at 5.33 ppm represent the dichloromethane; 1.54 ppm represent water; 1.27 and 0.88 ppm represent hexane. (The  $\text{CD}_2\text{Cl}_2$  contains trace amount of water, and the dichloromethane and hexane could come from the purification process))

**Table S1.** The surface area of AS-IO-CsPbBr<sub>3</sub> prepared from microspheres with different diameters.

Samples	Average Pore Diameter	Total pore area
2/AS-IO-CsPbBr <sub>3</sub>	243.8 nm	14.787 m <sup>2</sup> /g
3/AS-IO-CsPbBr <sub>3</sub>	325 nm	9.402 m <sup>2</sup> /g
4/AS-IO-CsPbBr <sub>3</sub>	380.0 nm	8.642 m <sup>2</sup> /g
5/AS-IO-CsPbBr <sub>3</sub>	569 nm	6.334 m <sup>2</sup> /g