Supporting Information

Effective Improvement of the Photovoltaic Performance of Black Dye Sensitized Quasi-Solid-State Solar Cells

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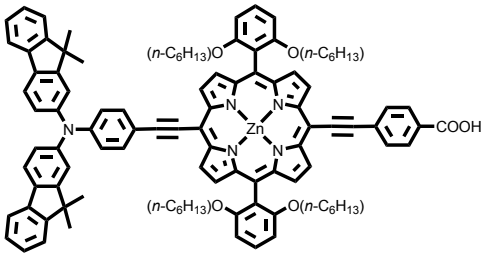
Fabrication and characterization of porphyrin and PT sensitized quasi-solid-state DSSCs

ZnP was synthesized according to our reported method.[1] The ZnP dye (0.2 mM) was dissolved in acetonitrile/tert-butyl alcohol (1:1, v/v) solution with an addition of 10 mM chenodeoxycholic acid (CDCA). For ZnP dye loading onto anode films (denoted as device **5**), the electrode was immersed into the dye bath for 10 h. For the ZnP and PT cosensitized device (deivce **6**), the electrode was firstly soaked in ZnP solution for 10 h, and then it was transferred into PT solution for 4 h. These electrodes were then rinsed with ethanol to remove the non-adsorbed dyes and dried in air. The electrolyte injection, sealing and characterization procedure of these devices are the same with the part in the experimental section in the main text. A device using cocktail dye loading method was also made for comparison (device **7**). Its IPCE in Fig S1b shows much lower conversion intensity around 570-760nm comparing to that at the same range of device **5** and **6**.



Scheme 1. Molecular structure of as-synthesized porpyrin (ZnP).

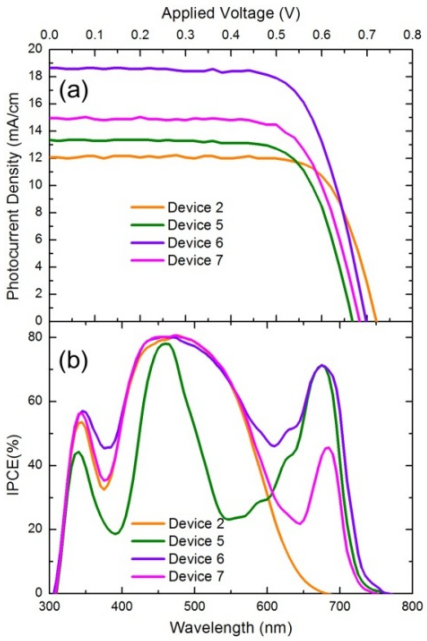


Fig. S1. (a) Photocurrent-voltage characteristics and (b) the corresponding incident photon-to-electron conversion efficiency spectra of device 5, 6 and 7; the IPCE spectra of device 2 is also depicted for reference.

Table S1 J_{sc}, V_{oc}, fill factor (*FF*) and PCE (η) parameters of device 2, 5, 6 and **7**.

Device[1]	*Dye*	*Dye-loading strategy*	J_{sc} (mA/cm^2)	V_{oc} (V)	*FF*(%)	η(%)
2	PT	N/A	12.08	0.721	75.1	6.5
5	ZnP	N/A	13.36	0.668	72.3	6.5
6	ZnP +PT	Stepwise	18.61	0.698	70.5	9.2
7	ZnP +PT	Cocktail	14.97	0.683	71.4	7.3

[1] the effective areas of all the devices are 0.196 cm^2;

Table S2. Simulated device parameters from the EIS data in Fig. 3a in main text

Device	R_{CT}(Ω)	*f*(Hz)	τ(ms)
1	287.2	19.29	8.25
2	1592.6	3.70	43.01
3	441.3	10.52	15.13

1. S. Chang, H. Wang, Y. Hua, Q. Li, X. Xiao, W.-K. Wong, W. Y. Wong, X. Zhu and T. Chen, *J. Mater. Chem. A*, 2013, **1**, 11553.