# Electronic Supplementary Information

# Enhancing Photovoltaic Performance of Quinoxalino[2,3-b′]porphyrinatozinc-Based Donor−Acceptor Copolymers by Using 4,4′-Bipyridine as a Linear Bidentate Ligand Additive

*Liwei Wang,* [1,2] *Di Ma,* [1]*Shaowei Shi,* [1] *Song Chen,* [4] *Yongfang Li,* [3]* *Xiaoyu Li,*[1,2]* *and Haiqiao Wang*[1,2]*

1. State Key Laboratory of Organic-Inorganic Composite, Beijing University of Chemical Technology, Beijing 100029, China

2. Key Laboratory of Carbon Fiber and Functional Polymers, Ministry of Education, Beijing University of Chemical Technology, Beijing 100029, China

3. Beijing National Laboratory for Molecular Sciences, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, China

4. China Textile Academy, Beijing 100025, China

* Corresponding author: e-mail: wanghaiqiao@mail.buct.edu.cn (H. Wang); liyf@iccas.ac.cn (Y. Li); lixy@mail.buct.edu.cn (X. Li)

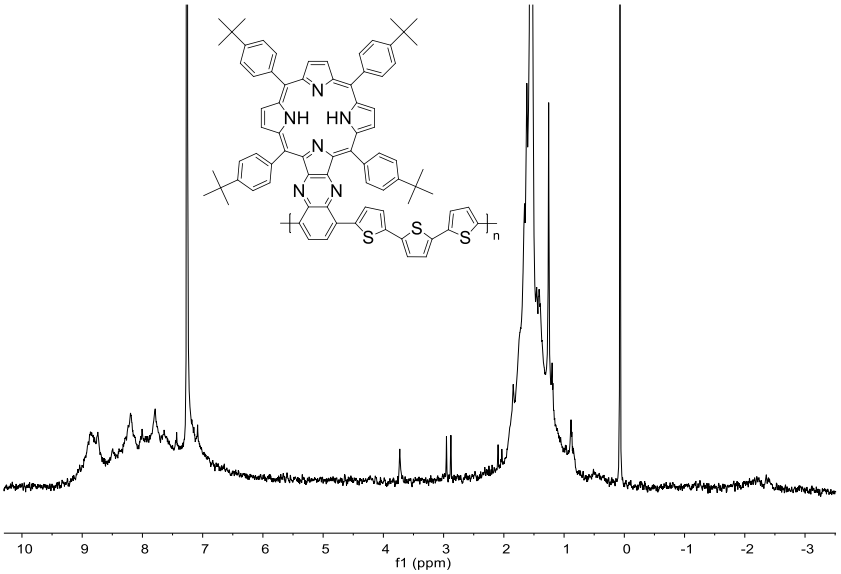


**Figure S1.** $^{1}$H NMR of P(QP-TT).

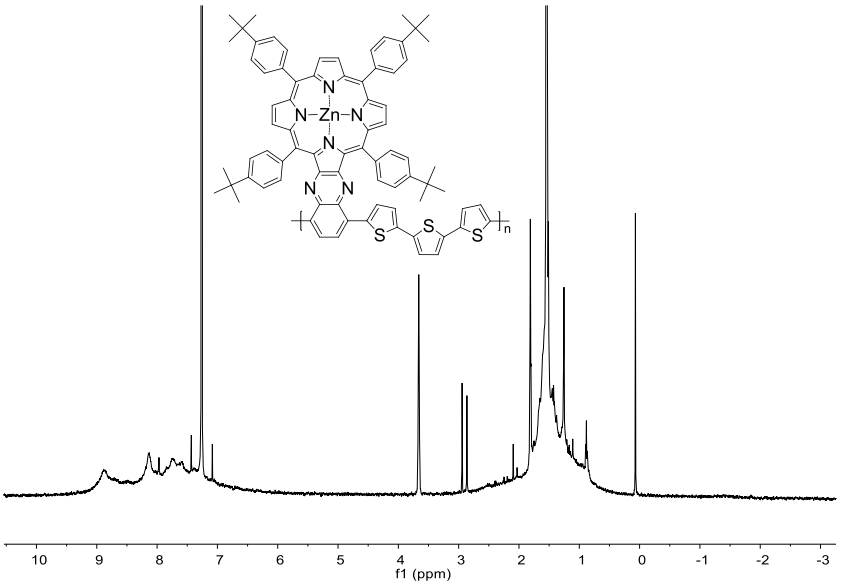


**Figure S2.** $^{1}$H NMR of P(QP-TT-Zn).

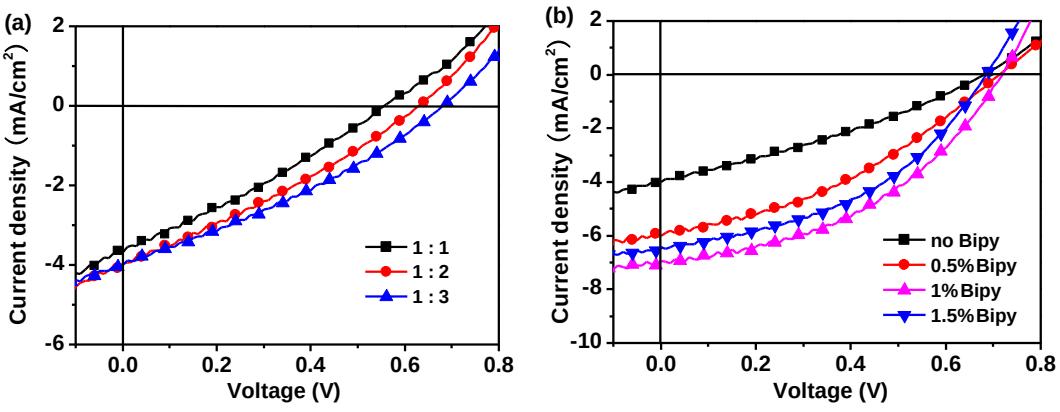

**Figure S3.** Current density−voltage characteristics of PSCs based on (a) P(QP-TT-Zn):$PC_{71}BM$ with different weight ratios and (b) P(QP-TT-Zn):$PC_{71}BM$ (1:3, w/w) with different amount of Bipy additive.

**Table S1.** Photovoltaic Properties of the PSCs Based on P(QP-TT-Zn):$PC_{71}BM$ under Illumination of AM1.5G, 100 mW/cm$^2$

| polymer:$PC_{71}BM$ (w/w) | Additive | $V_{oc}$ (V) | $J_{sc}$ (mA/cm$^2$) | FF | PCE (%) |
|---|---|---|---|---|---|
| 1 : 1 | no Bipy | 0.56 | 3.68 | 0.29 | 0.59 |
| 1 : 2 | no Bipy | 0.63 | 3.96 | 0.30 | 0.74 |
| 1 : 3 | no Bipy | 0.68 | 4.00 | 0.31 | 0.85 |
| 1 : 3 | 0.5% Bipy | 0.71 | 6.02 | 0.36 | 1.56 |
| 1 : 3 | 1% Bipy | 0.72 | 6.95 | 0.43 | 2.17 |
| 1 : 3 | 1.5% Bipy | 0.69 | 6.45 | 0.42 | 1.92 |

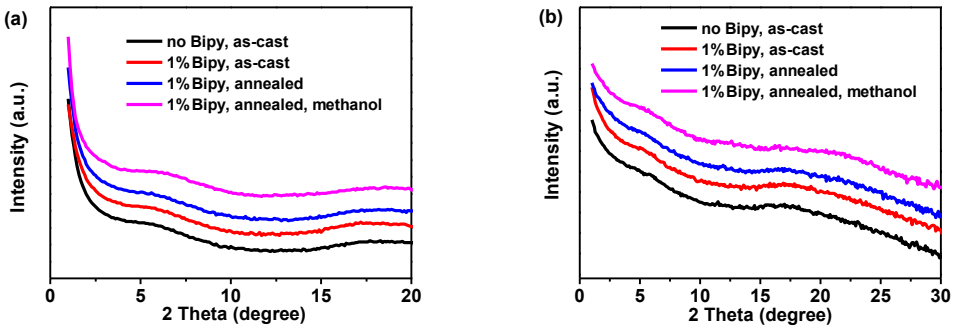


**Figure S4.** (a) Out-of-plane and (b) in-plane XRD patterns of P(QP-TT) films under different optimized conditions.

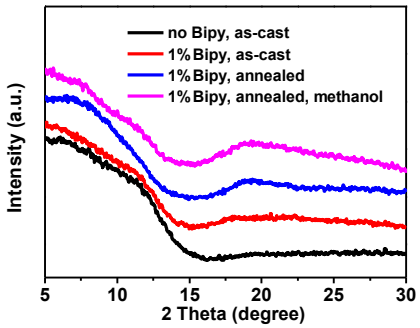


**Figure S5.** XRD patterns of P(QP-TT-Zn):$PC_{71}BM$ (1:3, w/w) blend films under different optimized conditions.

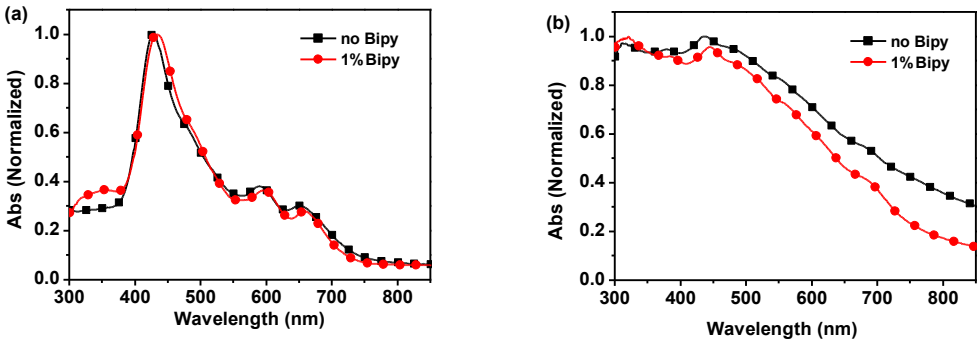


**Figure S6.** UV−vis absorption spectra of (a) pristine P(QP-TT-Zn) thin film and (b) P(QP-TT-Zn):$PC_{71}BM$ (1:3, w/w) blends with or without Bipy.