Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.
This journal is © The Royal Society of Chemistry 2017

Supplementary Information

A small bandgap (3*E*,7*E*)-3,7-bis(2-oxoindolin-3-ylidene)benzo[1,2-*b*:4,5-*b'*]difuran-2,6(3*H*,7*H*)-dione (IBDF) based polymer semiconductor for near-infrared organic phototransistors

Yinghui He,[a‡] Jesse T. E. Quinn,[a‡] Dongliang Hou [a,b‡], Jenner H.L. Ngai[a] and Yuning Li[a]

[a] Department of Chemical Engineering, University of Waterloo, 200 University Avenue West, Waterloo, Ontario, Canada N2L 3G1

[b] Department of Computer Application Engineering, College of Engineering, Shanghai Polytechnic University, Shanghai, 201209, P.R. China

‡ These authors made equal contributions.

Acknowledgments

The authors thank the Natural Sciences and Engineering Research Council (NSERC) of Canada for the financial support (Discovery Grants #402566-2011) of this work.

Additional data

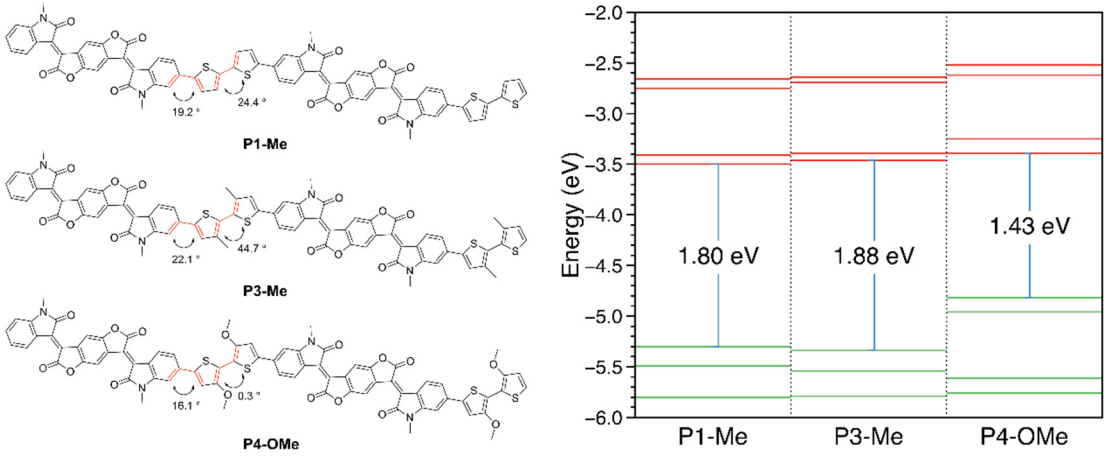

Figure S1. The molecular structures of dimers with theoretical comparison of bandgap energies and frontier energy levels for **P1-Me**, **P3-Me**, and **P4-Me**.

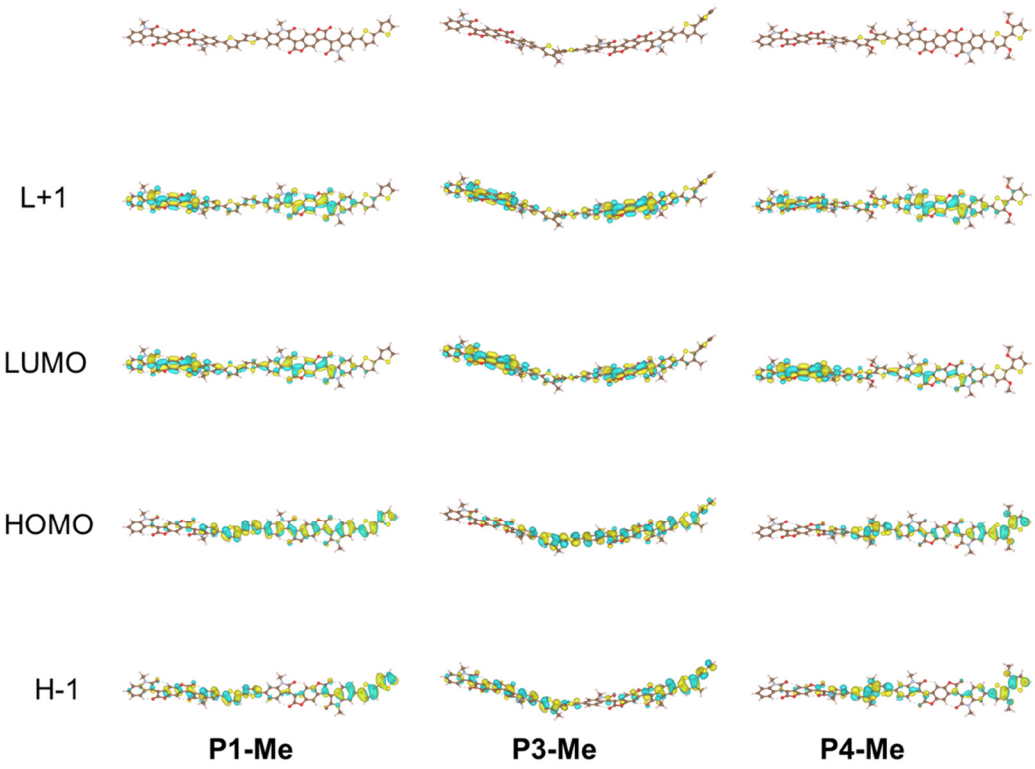

Figure S2. The optimized geometry and frontier energy levels of **P1-Me**, **P3-Me**, and **P4-Me**.

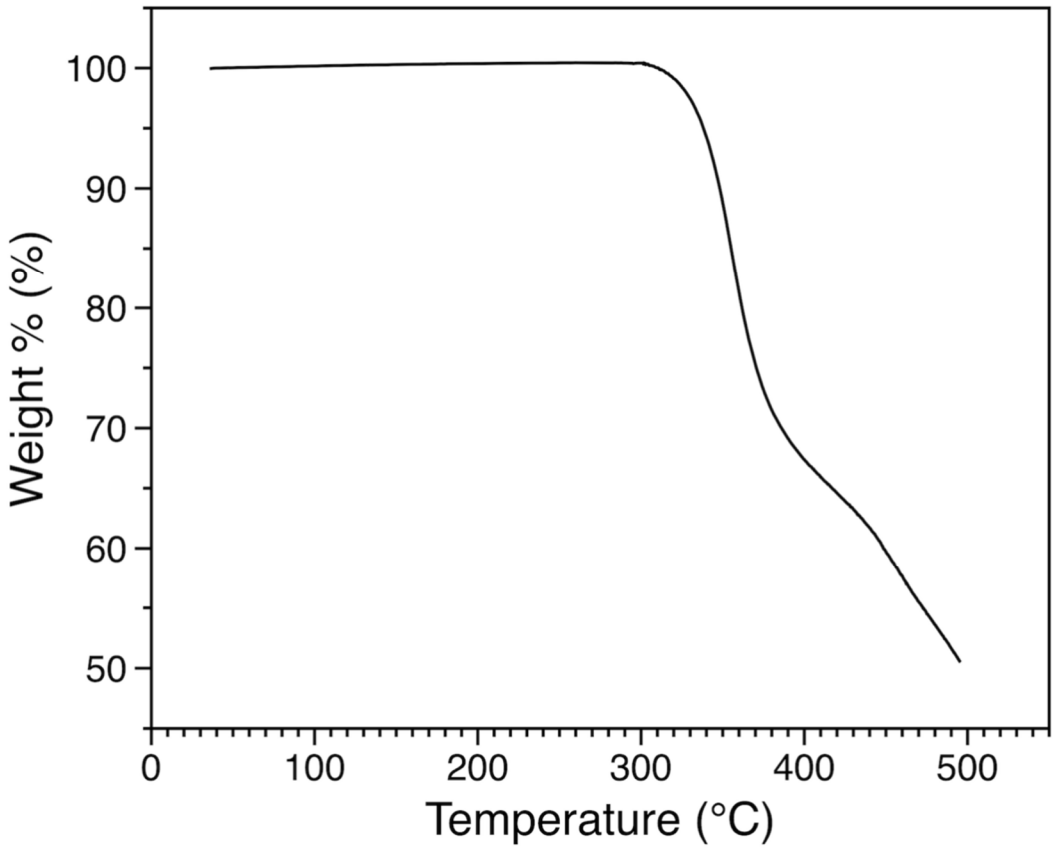

Figure S3. Thermogravimetric analysis (TGA) trace of **P4** (**PIBDFBTO-HH**) with a scan rate of 10 °C min^{-1} under nitrogen.

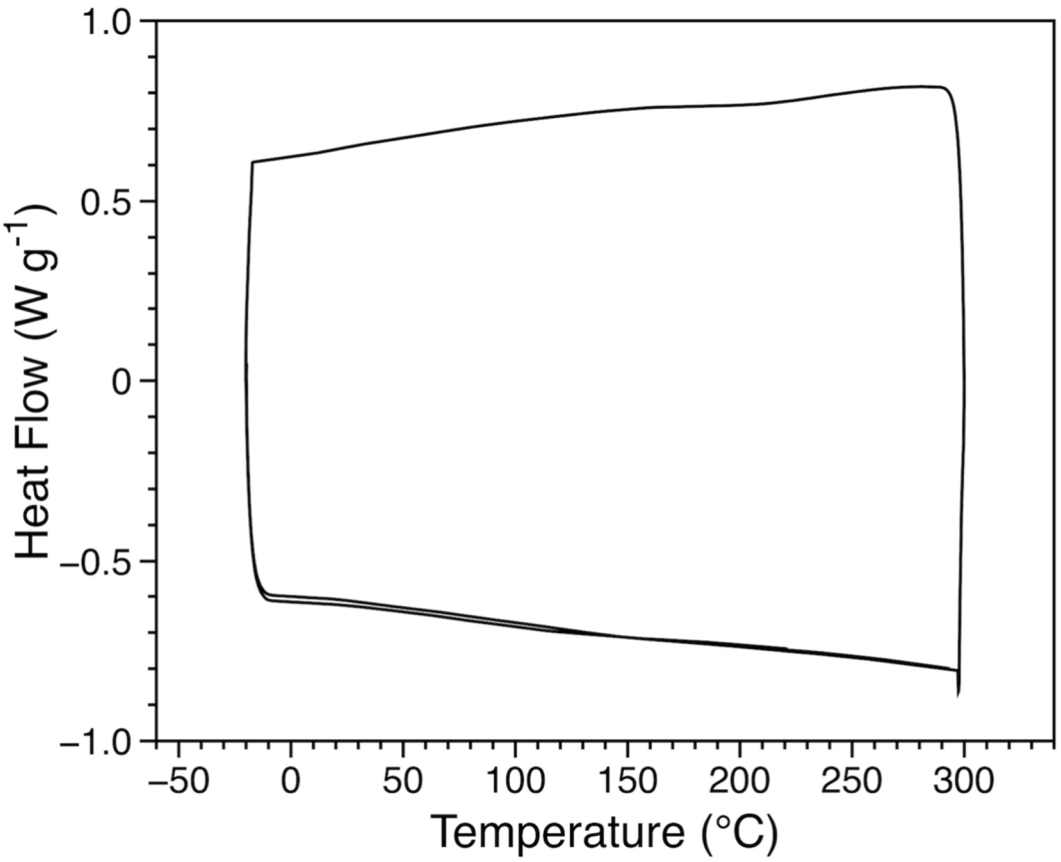

Figure S4. Differential scanning calorimetry (DSC) trace of **P4** (**PIBDFBTO-HH**) with a scan rate of 20 °C min^{-1} under nitrogen.

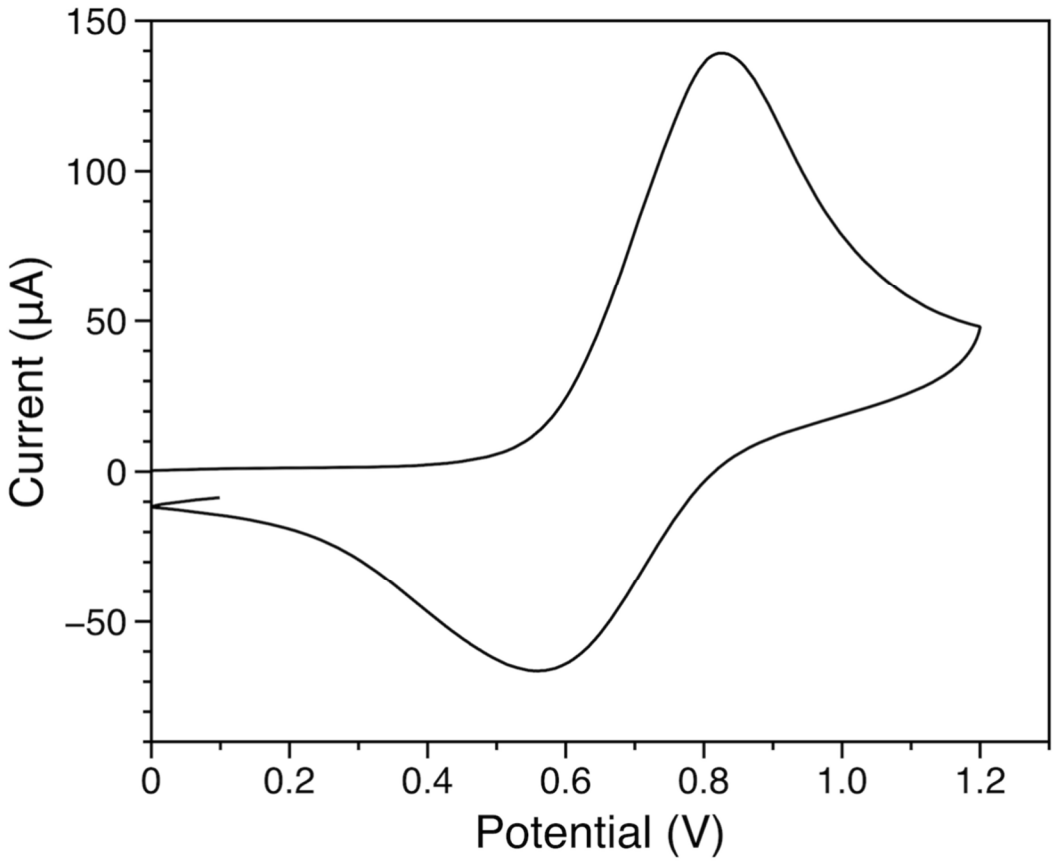

Figure S5. The cyclic voltammogram (CV) of a **P4** (**PIBDFBTO-HH**) thin film measured in the oxidation cycle under nitrogen in the first oxidation cycle at a scan rate of 0.050 V s^{-1}.

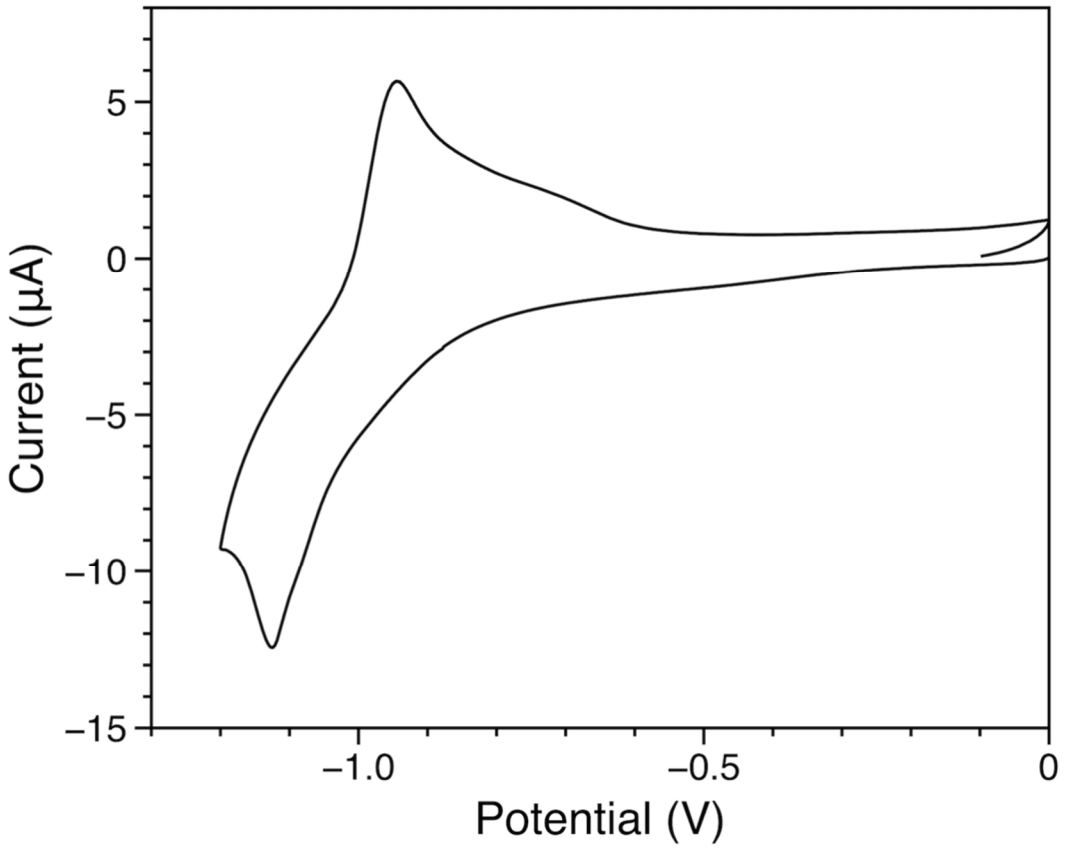

Figure S6. The cyclic voltammogram (CV) of a **P4** (**PIBDFBTO-HH**) thin film measured in the reduction cycle under nitrogen in the first reduction cycle at a scan rate of 0.050 V s^{-1}.

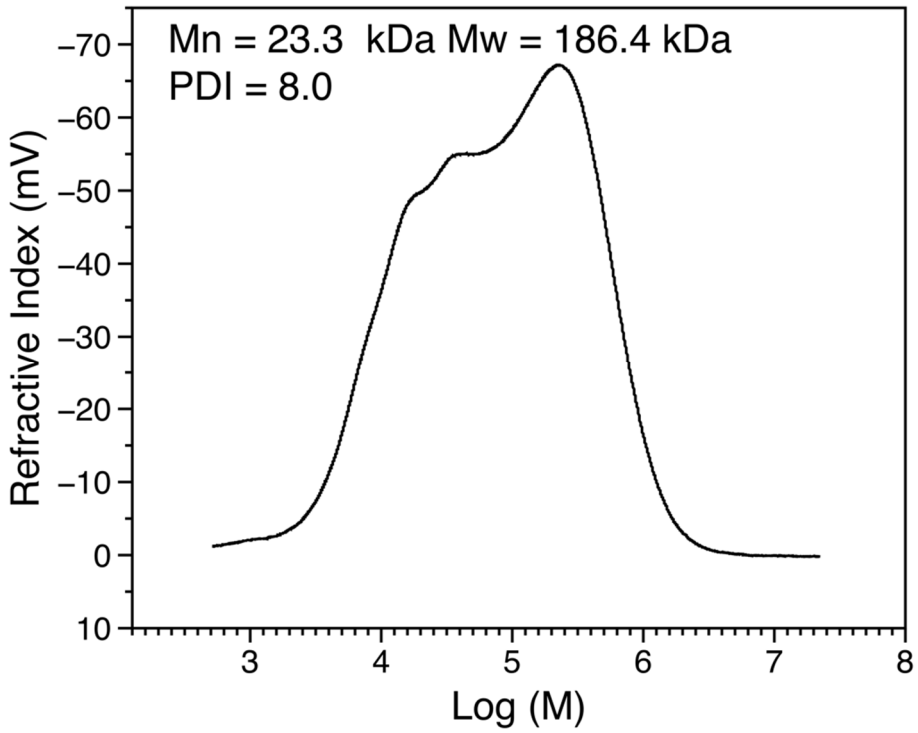

Figure S7. The molecular weight distribution of **P4** measured by HT-GPC at 140 °C.

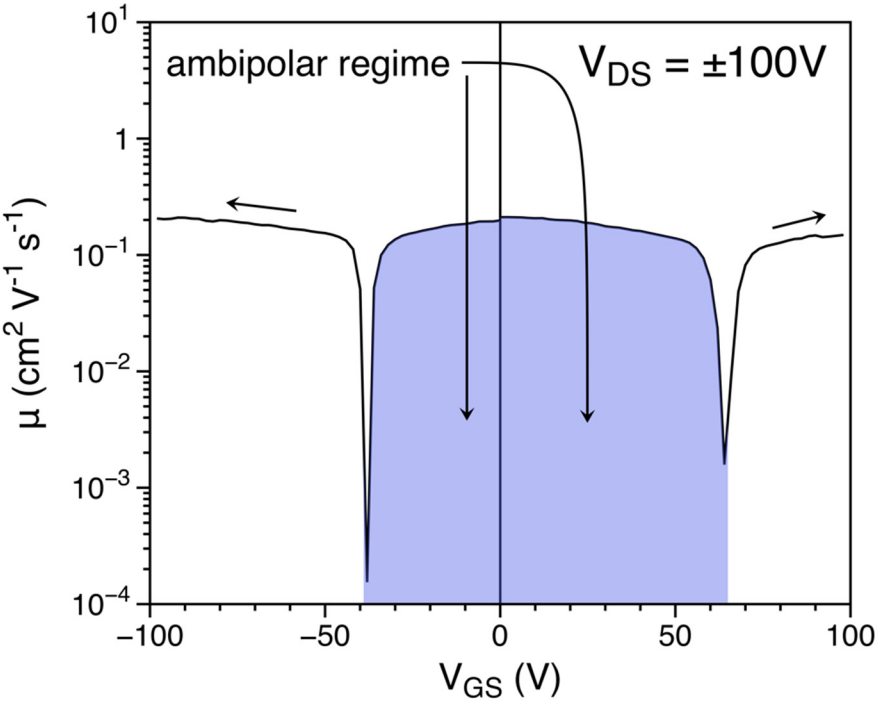

Figure S8. The mobility as a function of gate voltage (V_{GS}) for 150 °C-annealed **P4**.

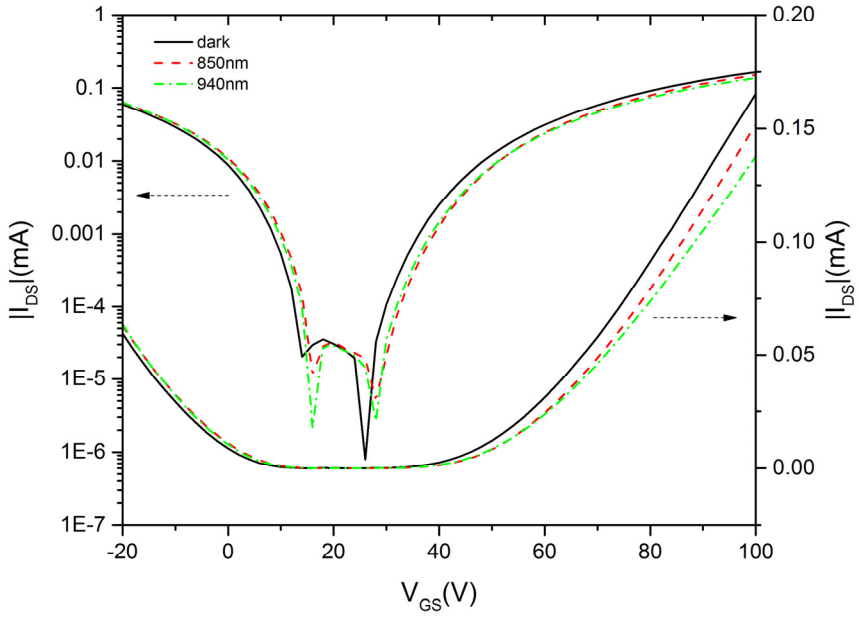

Figure S9. The transfer curves of a typical OPT based on 150 °C-annealed **P4** in the n-channel operation mode at V_{DS} = 10 V under illumination with 850 nm and 940 nm light sources.

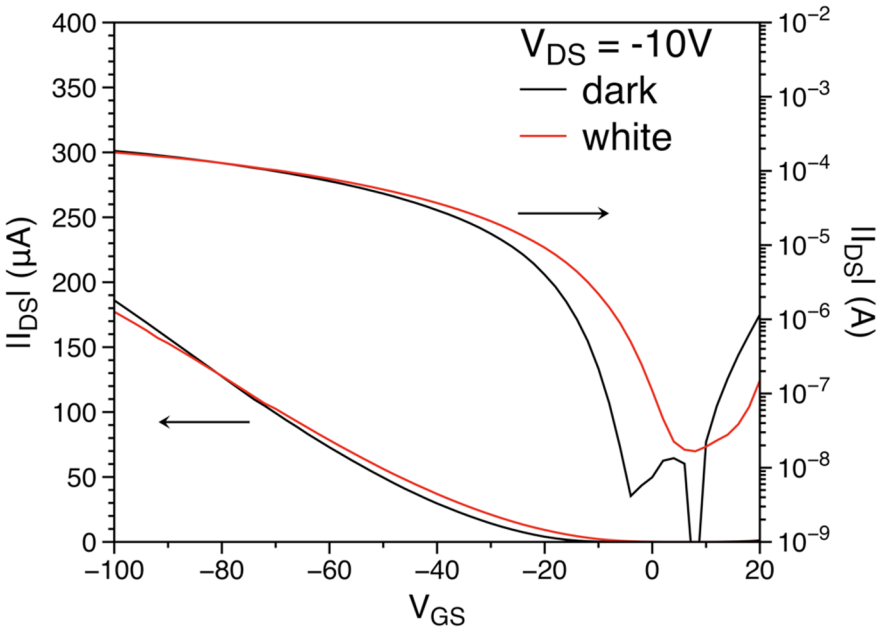

Figure S10. The transfer curves of a typical OPT based on 150 °C-annealed **P4** in the p-channel operation mode at V_{DS} = -10 V under illumination of a white LED (A 10W LED with a colour temperature of 3000 to 3500 K with an emission peak at 579 nm was used as the light source).[1]

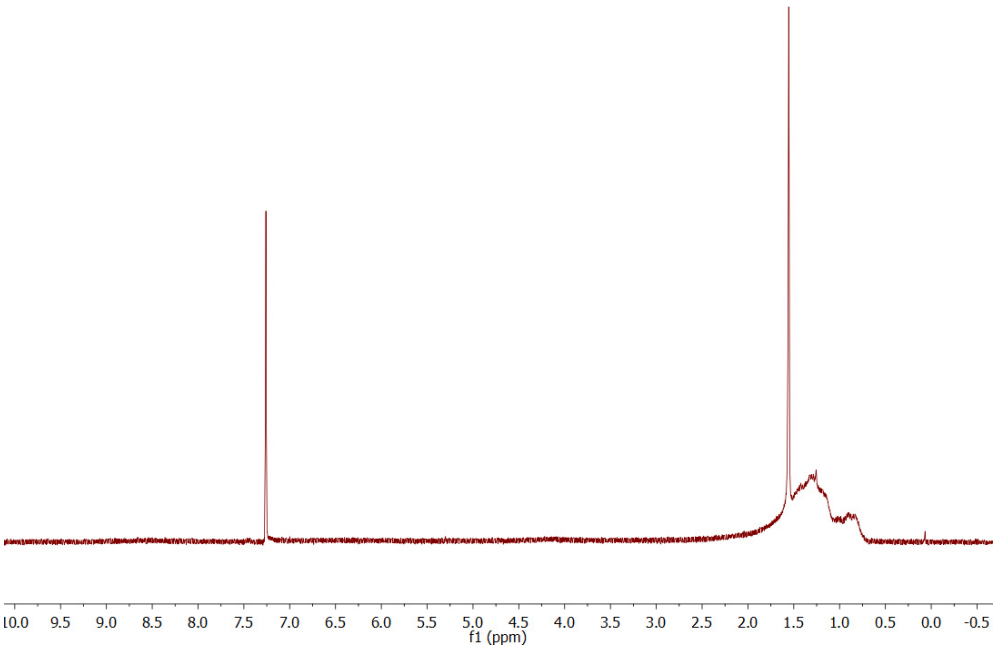

Figure S11. The 300 MHz ^{1}H-NMR spectrum of **P4** measured in a chloroform-d solution at room temperature.

References

1. J. T. E. Quinn, F. Haider, H. Patel, D. A. Khan, Z. Wang, and Y. Li, *J. Mater. Chem. C*, 2017, **5**, 8742-8748.