

Electronic Supplementary Information for:

**A non-fullerene electron acceptor modified by thiophene-2-carbonitrile for
solution-processed organic solar cells**

Shuixing Li,^a Jieli Yan,^a Chang-Zhi Li,^a Feng Liu,^{*b,c} Minmin Shi,^{*a} Hongzheng
Chen^{*a} and Thomas P. Russell^d

^a MOE Key Laboratory of Macromolecular Synthesis and Functionalization, State
Key Laboratory of Silicon Materials, & Department of Polymer Science and
Engineering, Zhejiang University, Hangzhou 310027, P. R. China.

^b Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA
94720, USA.

^c Department of Physics and Astronomy, Shanghai jiao tong University, Shanghai,
200240, P. R. China.

^d Department of Polymer Science and Engineering, University of Massachusetts,
Amherst, MA 01003, USA.

Supporting Information

Contents

Instrument, Materials.....	S2
TGA curve of F8-DPPTCN.....	S3
DSC curve of F8-DPPTCN, <i>J-V</i> curves at different temperatures.....	S4
<i>J-V</i> curves at different weight ratios / amounts of DIO additives.....	S5
¹ H NMR / ¹³ C NMR spectrum of F8-DPPTCN solution in CDCl ₃	S6
AFM images, References.....	S7

Instrument

^1H NMR and ^{13}C NMR spectra were obtained on a Bruker Advance III 400 (400 MHz) nuclear magnetic resonance spectroscope. UV-vis absorption spectra were taken on a Shimadzu UV-2450 spectrophotometer. MALDI-TOF MS spectra were measured on a Walters Maldi Q-TOF Premier mass spectrometry. Thermogravimetric analysis (TGA) was carried out on a WCT-2 thermal balance under protection of nitrogen at a heating rate of 10 °C/min. Differential scanning calorimetry (DSC) was recorded on a Pekin-Elmer Pyris 1 differential scanning calorimeter. Cyclic voltammetry (CV) was done on a CHI600A electrochemical workstation with Pt disk, Pt plate, and standard calomel electrode (SCE) as working electrode, counter electrode, and reference electrode, respectively, in a 0.1 mol/L tetrabutylammonium hexafluorophosphate (Bu_4NPF_6) CH_2Cl_2 solution. The CV curves were recorded versus the potential of SCE, which was calibrated by the ferrocene-ferrocenium (Fc/Fc^+) redox couple (4.8 eV below the vacuum level). Topographic images of the films were obtained on a Veeco MultiMode atomic force microscopy (AFM) in the tapping mode using an etched silicon cantilever at a nominal load of ~ 2 nN, and the scanning rate for a $10\ \mu\text{m} \times 10\ \mu\text{m}$ image size was 1.5 Hz.

Materials

All reagents and solvents, unless otherwise specified, were purchased from Aladdin, Aldrich and J&K Scientific Ltd. and were used without further purification. P3HT (96% H-T regioregularity, $M_n = 26$ kg/mol, polydispersity = 2.0) was

purchased from Merck Co. Poly [(9,9-bis(3'-(N,N-dimethylamino)propyl)-2,7-fluorene)-alt-2,7-(9,9-dioctylfluorene)] (PFN, $M_n = 20.0$ kg/mol, polydispersity = 2.1) was synthesized in our lab according to the published procedure.¹

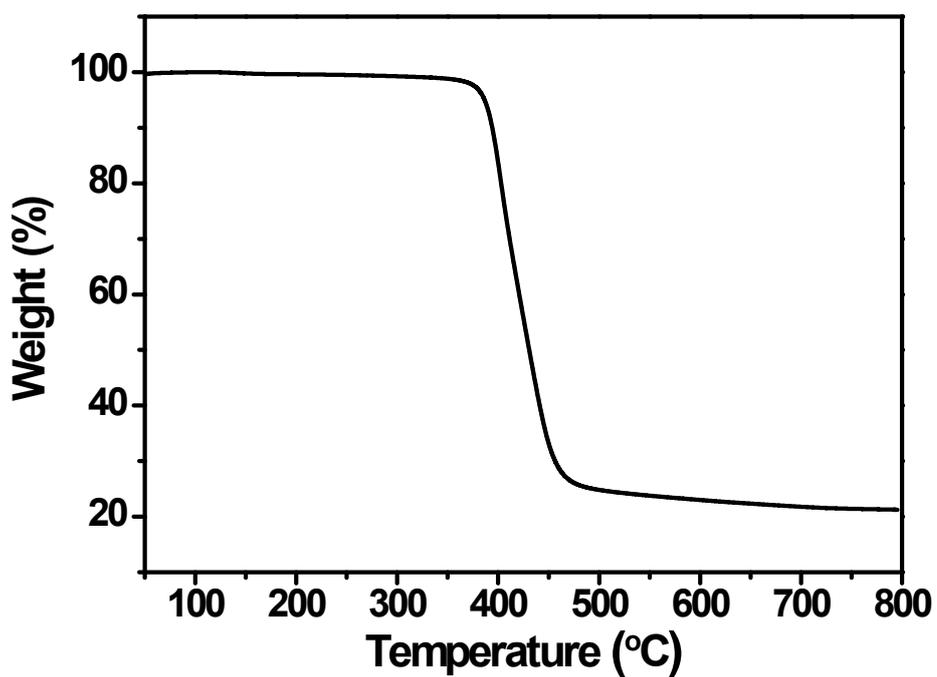


Fig. S1 TGA curve of F8-DPPTCN.

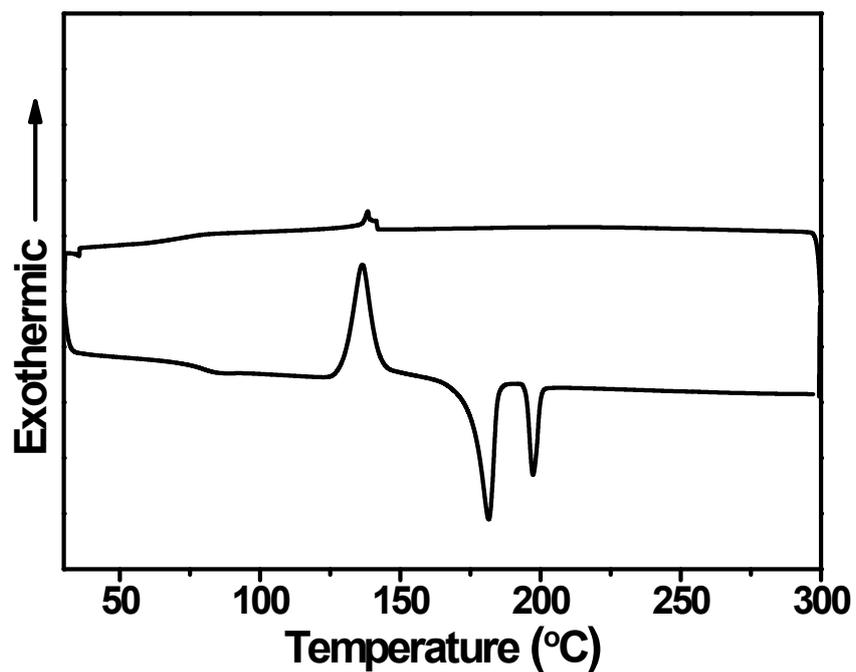


Fig. S2 DSC curve of F8-DPPTCN.

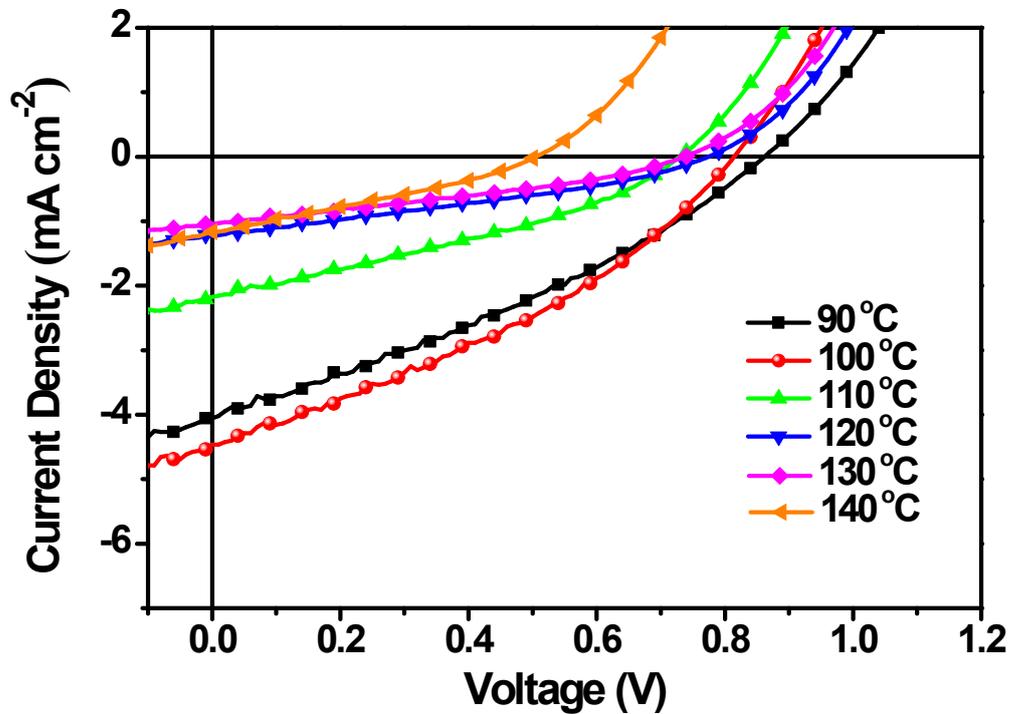


Fig. S3 $J-V$ curves at different annealing temperatures (Blend ratio: 1:2).

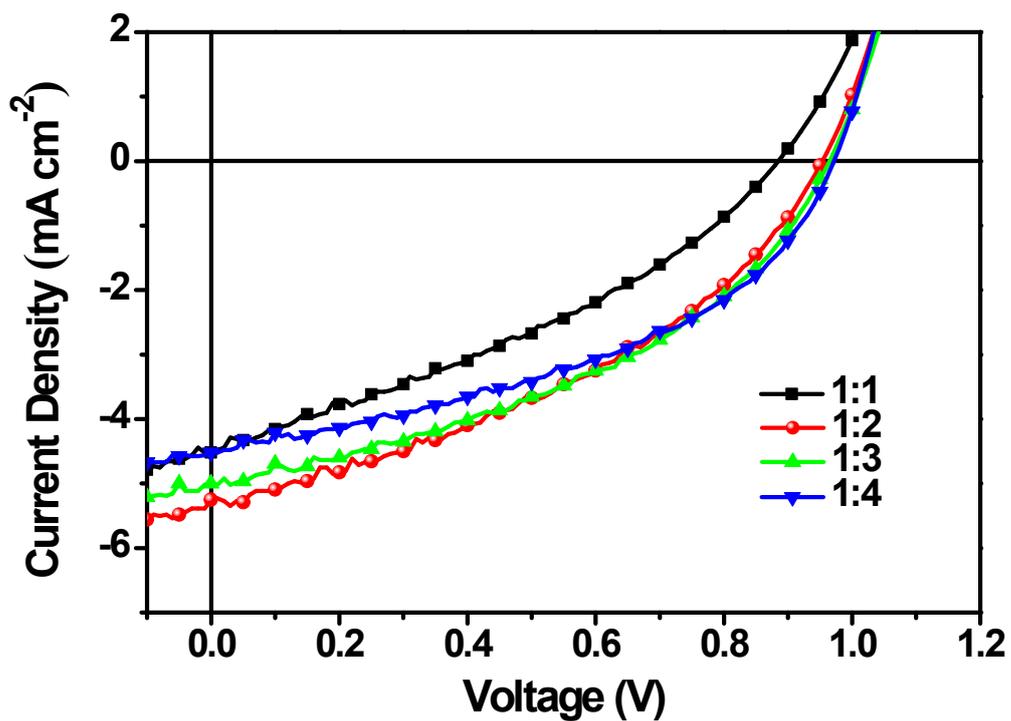


Fig. S4 *J-V* curves at different weight ratios (annealed at 95 °C).

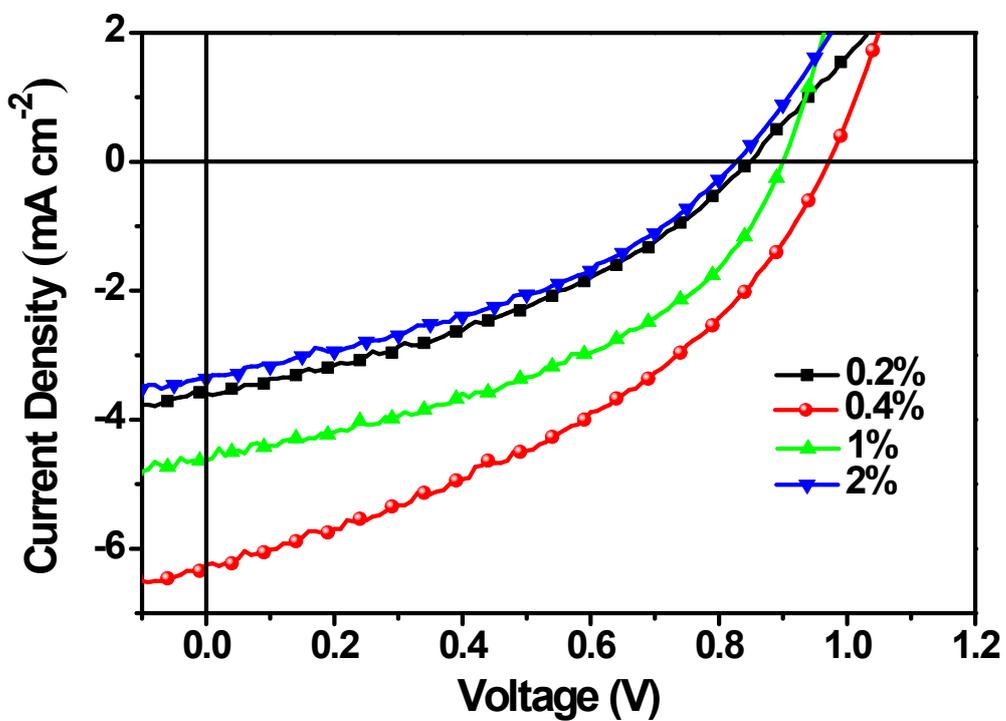


Fig. S5 *J-V* curves at different amounts of DIO additives (Blend ratio: 1:3).

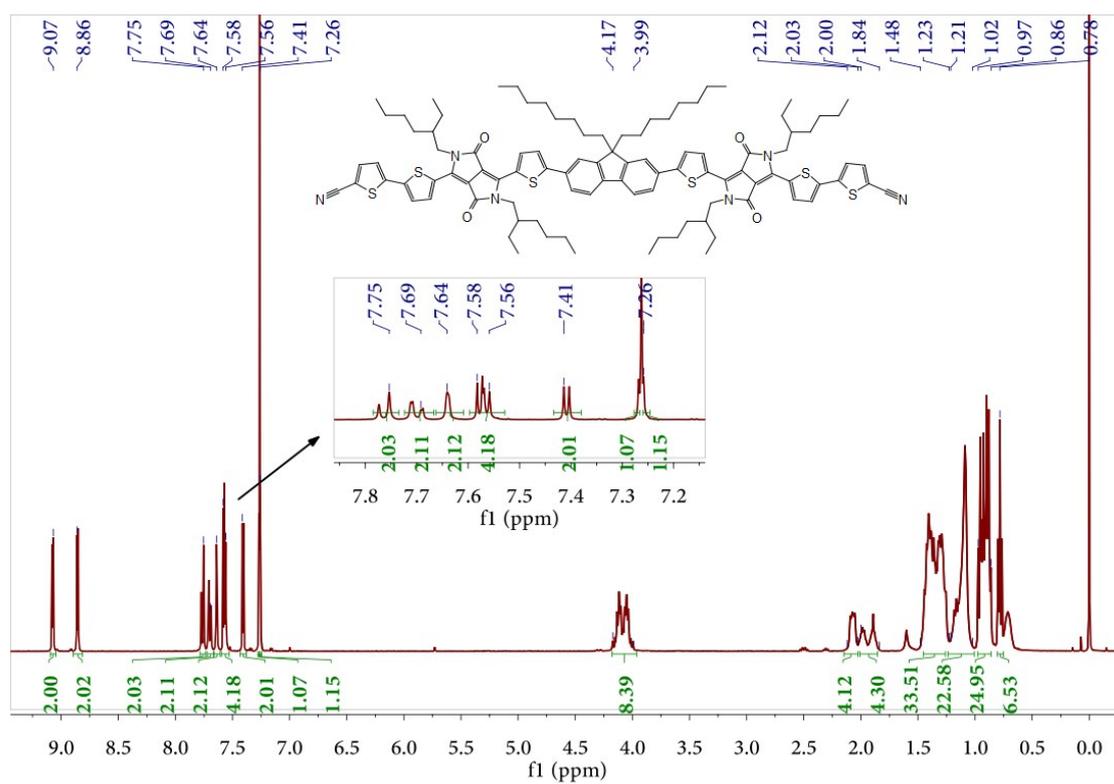


Fig. S6 ¹H NMR spectrum of F8-DPPTCN solution in CDCl₃.

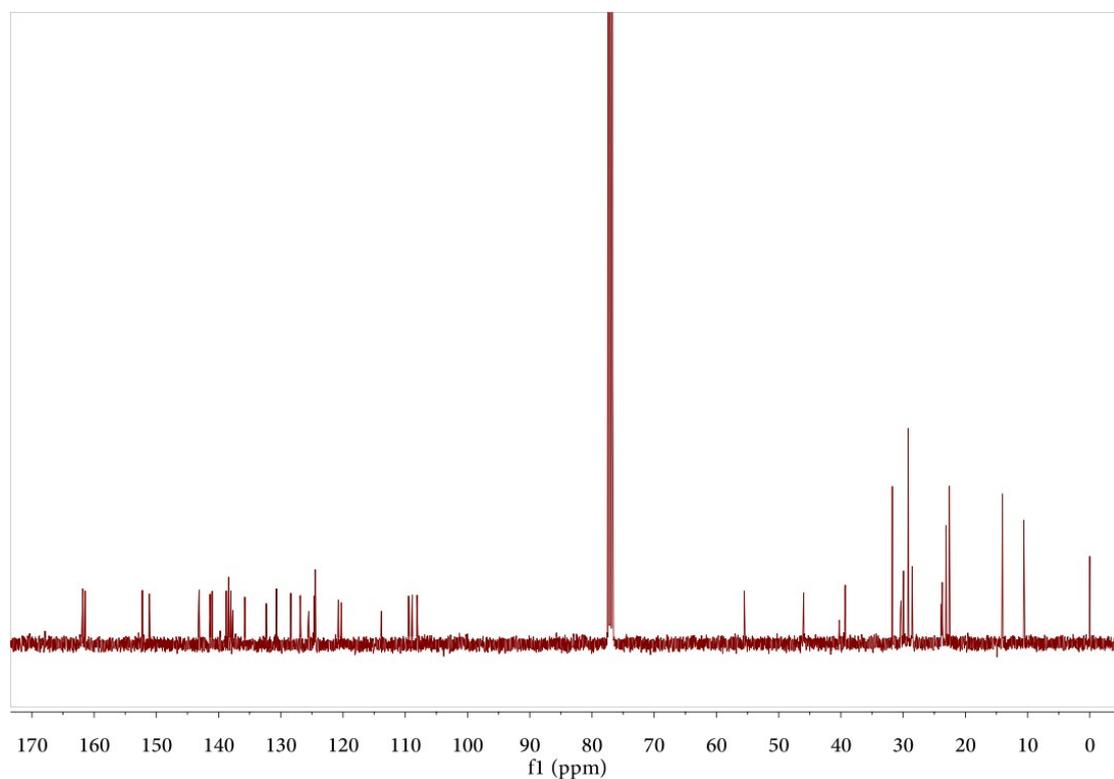


Fig. S7 ¹³C NMR spectrum of F8-DPPTCN solution in CDCl₃.

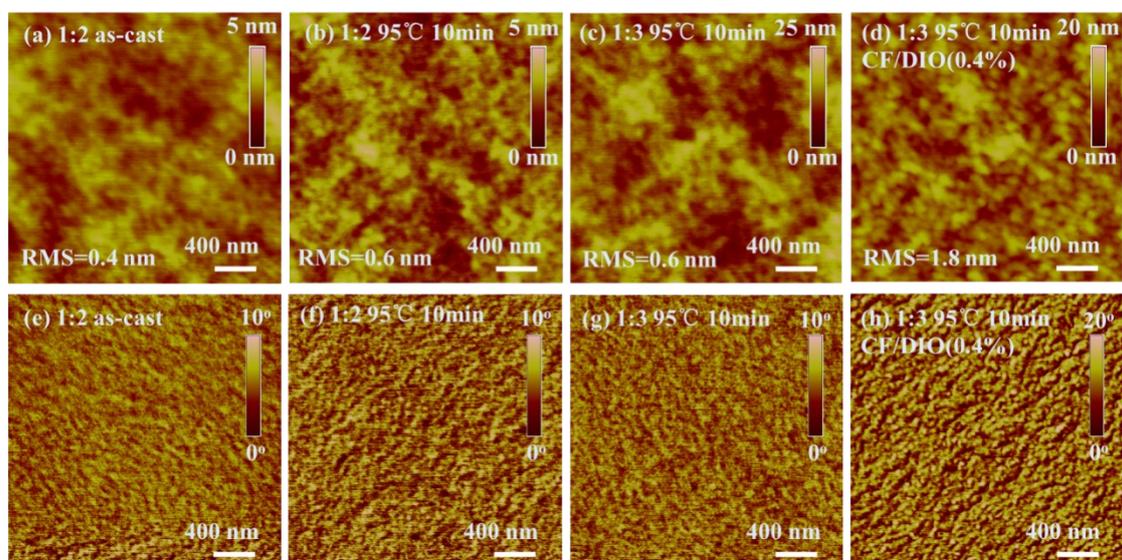


Fig. S8 AFM height images (a, b, c and d) and phase images (e, f, g and h) of 1:2 as-cast (a, e), 1:2 annealed (b, f), 1:3 annealed (c, g) and 1:3 annealed DIO (d, h) films.

References

1. F. Huang, H. Wu, D. Wang, W. Yang and Y. Cao, *Chem. Mater.*, 2004, **16**, 708-716.