Supporting Information

Achieving intrinsically stretchable high-performance n-type polymer semiconductors via flexible linker engineering

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1. General Measurements and Characterizations

^{1}H nuclear magnetic resonance (NMR) and ^{13}C NMR spectra are tested on a Bruker AVANCE 400 HD machine, using proper deuterated reagents (e.g., DMSO-d_6, $CDCl_3$, CD_2Cl_2, etc.). High resolution mass spectra (HR-EI) were recorded on a Shimadzu QP 2010 gas chromatograph mass spectrometer, and high-resolution matrix assisted laser desorption/ionization time-of-flight mass spectra (HR-MALDI-TOF) were performed on a 9.4T Solarix FT-ICR mass spectrometer. Elemental analyses were carried out by

using a CARLO ERBA 1106 Elemental Analyser. The number-average molecular weight (M_n), weight-average molecular weight (M_w), and polydispersity index (PDI) of polymers were obtained by using an Agilent Technologies PL-GPC220 series Gel permeation chromatography (GPC) with 1,2,4-trichlorobenzene (TCB) as eluent at 150°C, and calibrated by narrow-polydispersity polystyrene standards. Thermogravimetric analyses (TGA) were conducted on a DTG-60 instrument under nitrogen flow, heating from 50 °C to 550 °C with a heating rate of 20°C min^{-1}. The differential scanning calorimetry (DSC) tests were proceeded by DSC2-00881 (172.23.188.10) instrument, with circulation of 50 °C to 250 °C under heating/cooling rate of 10°C min^{-1}. UV-vis absorption spectra were acquired by UH5700 Spectrophotometer. Cyclic voltammetric (CV) measurements were tested on a CHI660F electrochemistry workstation with a scan rate of 50 mV s^{-1}. The atomic force microscope (AFM) images were acquired on a Digital Instruments Nanoscope V atomic force microscope, which operated in tapping mode. The 2D-GIXRD data were obtained by illuminating the thin film samples at a constant incidence angle of 0.2º.

2. Figures and Tables

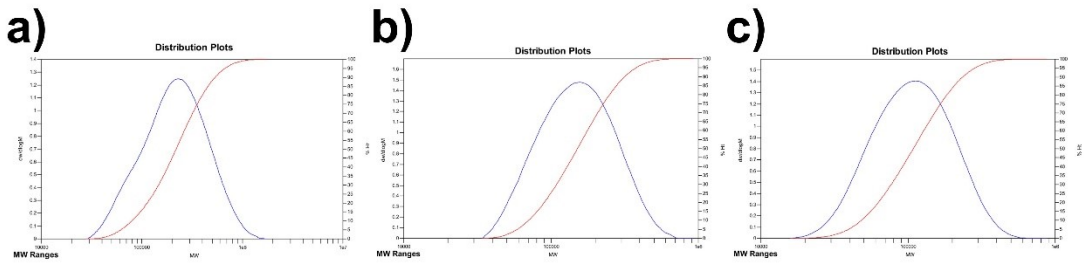

Fig. S1. GPC distribution plots of polymers a) **P0TVT**, b) **P1TVT** and c) **P2TVT**.

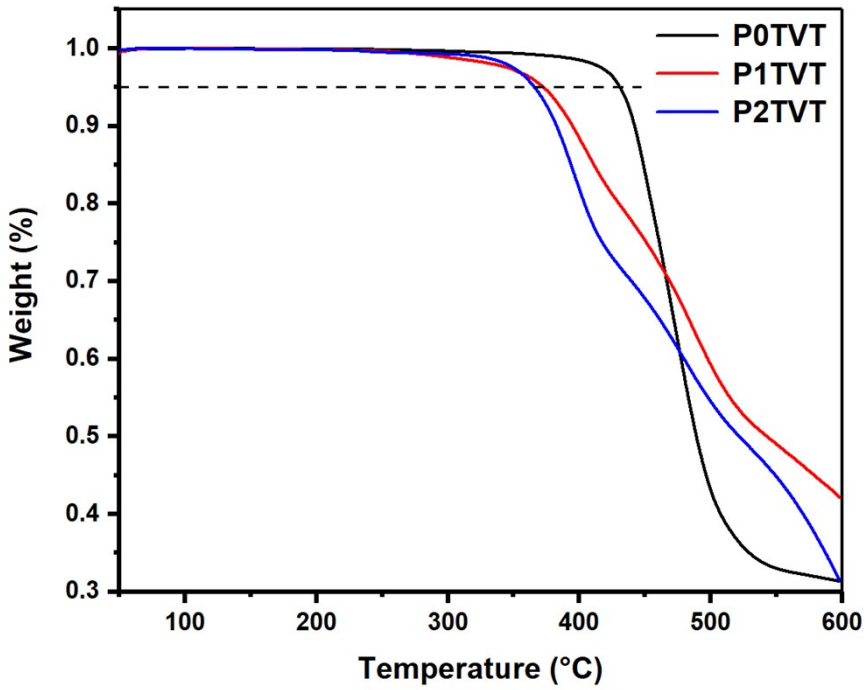

Fig. S2. TGA plots of polymers **P0TVT**, **P1TVT** and **P2TVT**.

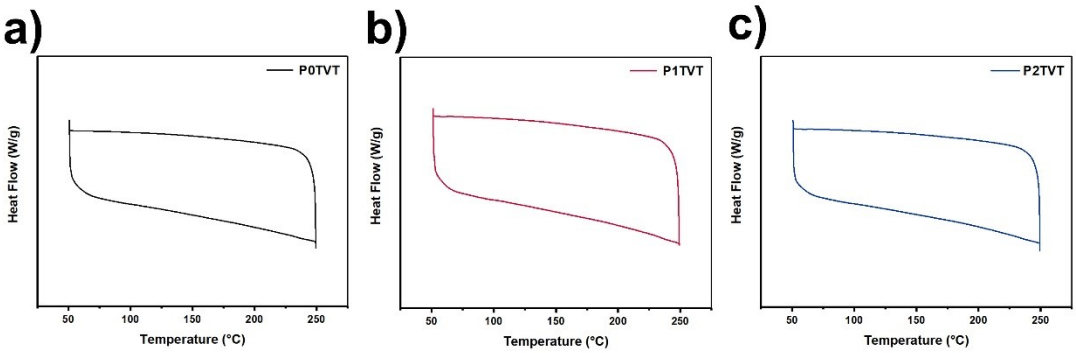

Fig. S3. DSC plots of the polymers a) **P0TVT**, b) **P1TVT** and c) **P2TVT**.

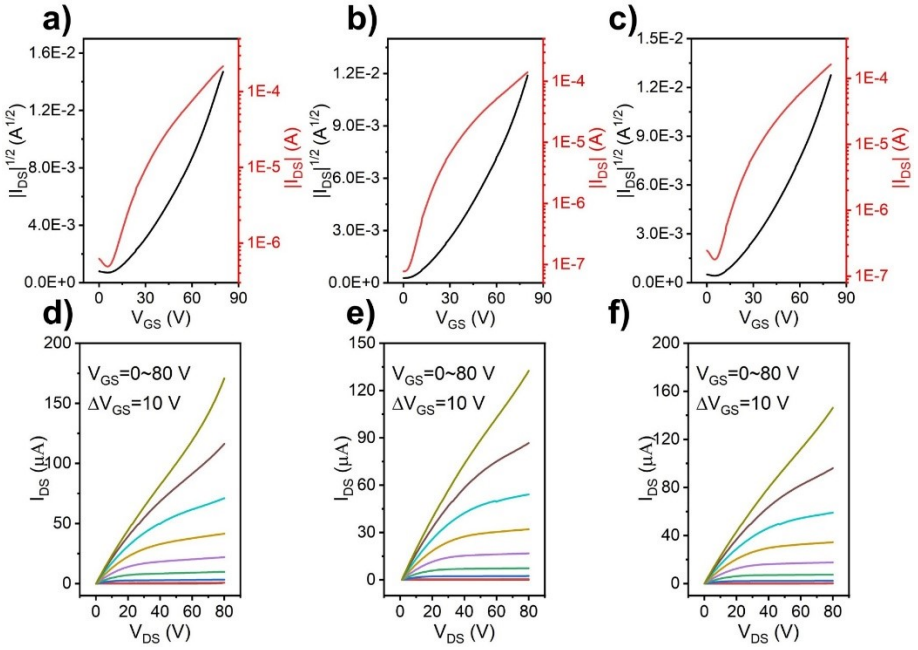

Fig. S4. Typical a-c) output and d-f) transfer curves of OFETs based on a, d) **P0TVT**, b, e) **P1TVT**, and c, f) **P2TVT** fabricated on PET substrates.

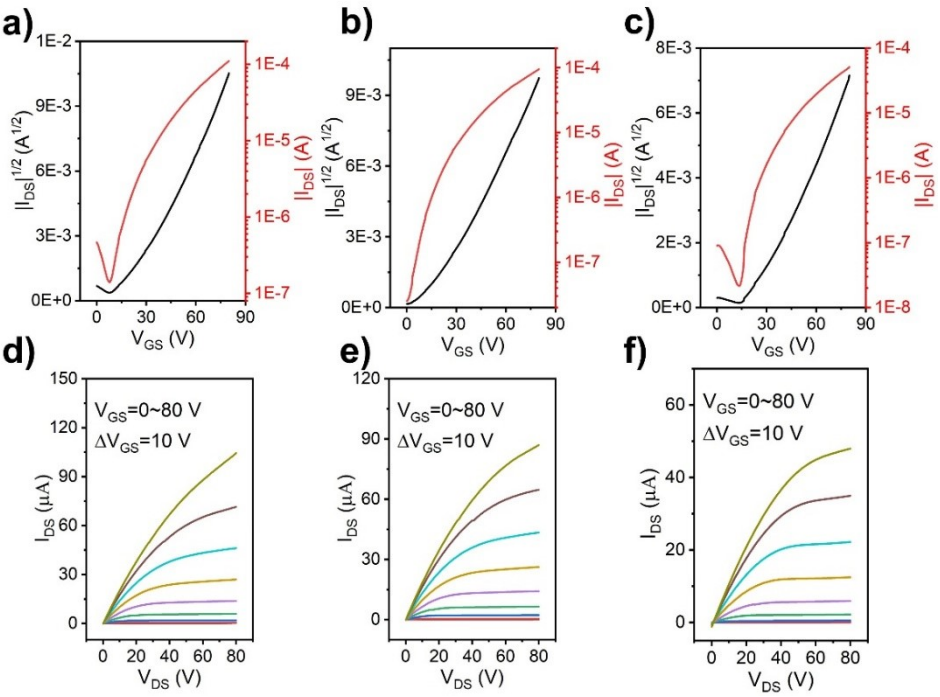

Fig. S5. Typical a-c) output and d-f) transfer curves of **P1TVT**-based stretchable OFETs under a, d) 0, b, e) 25% and c, f) 50% parallel strain.

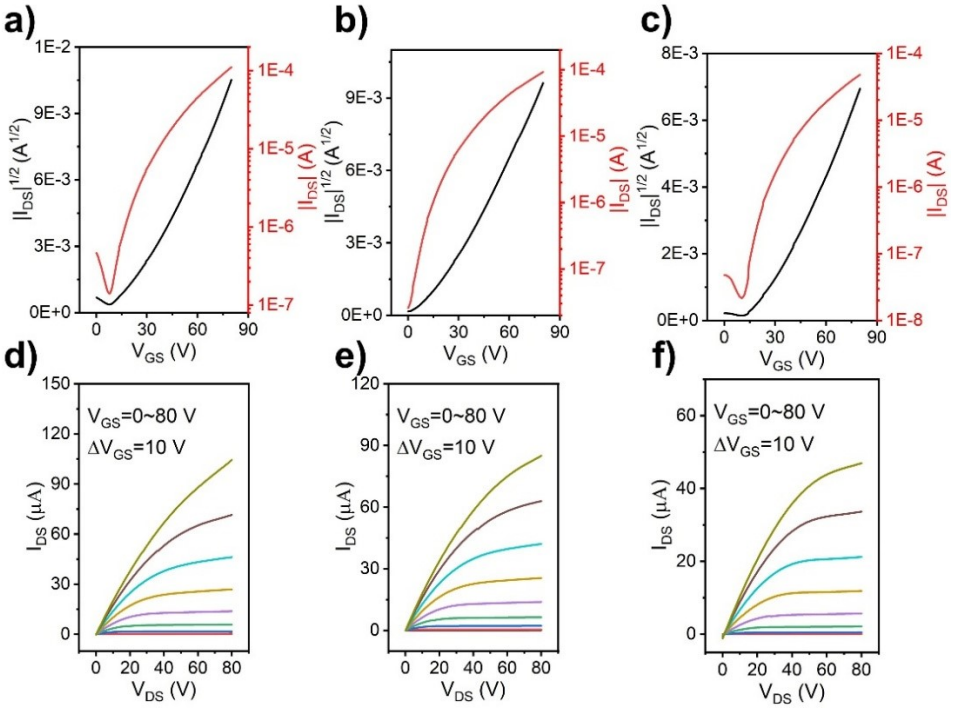

Fig. S6. Typical a-c) output and d-f) transfer curves of **P1TVT**-based stretchable OFETs under a, d) 0, b, e) 25% and c, f) 50% vertical strain.

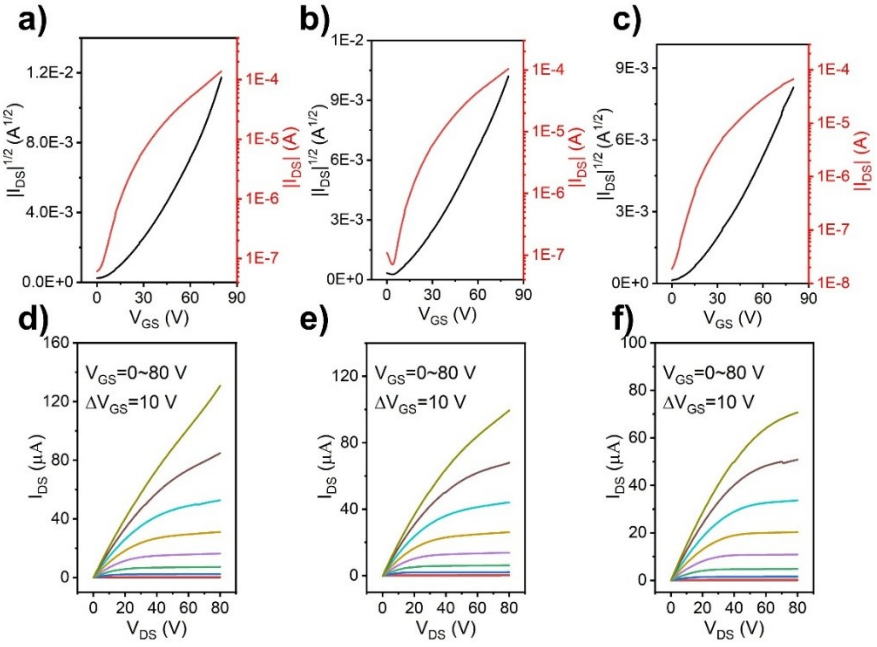

Fig. S7. Typical a-c) output and d-f) transfer curves of **P2TVT**-based stretchable OFETs under a, d) 0, b, e) 25% and c, f) 50% vertical strain.

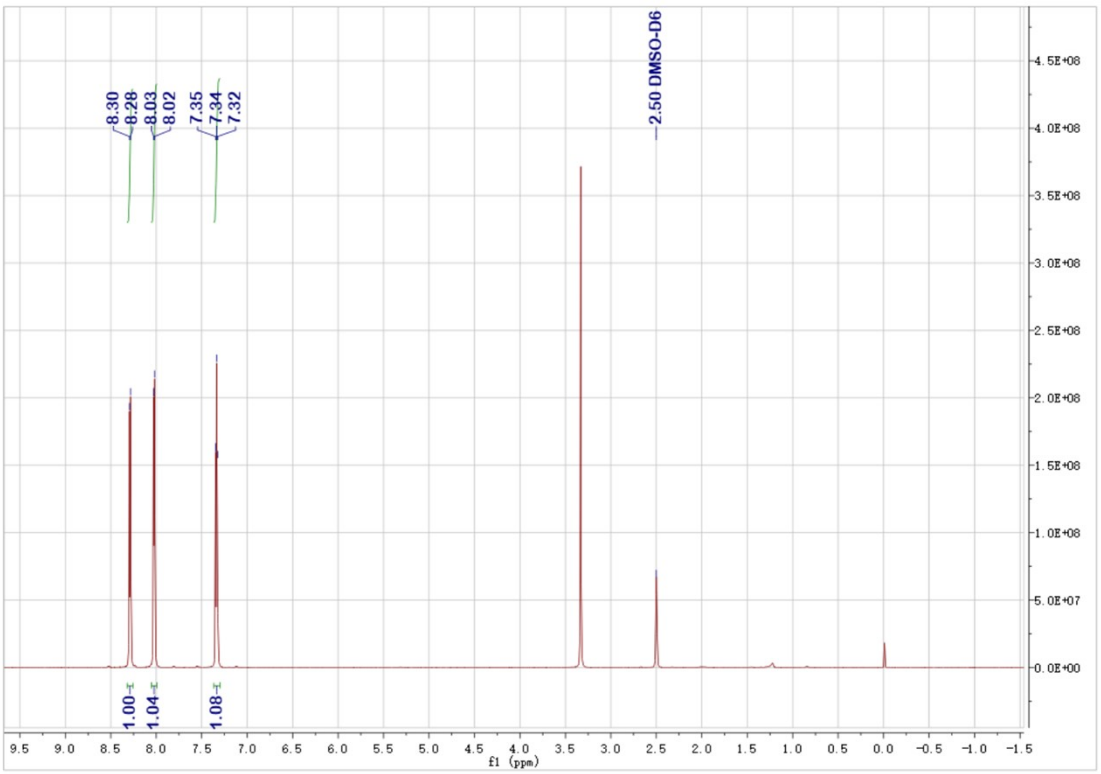

Fig. S8. [1]H NMR data of compound 1,2-di(thiophen-2-yl) ethane-1,2-dione (3).

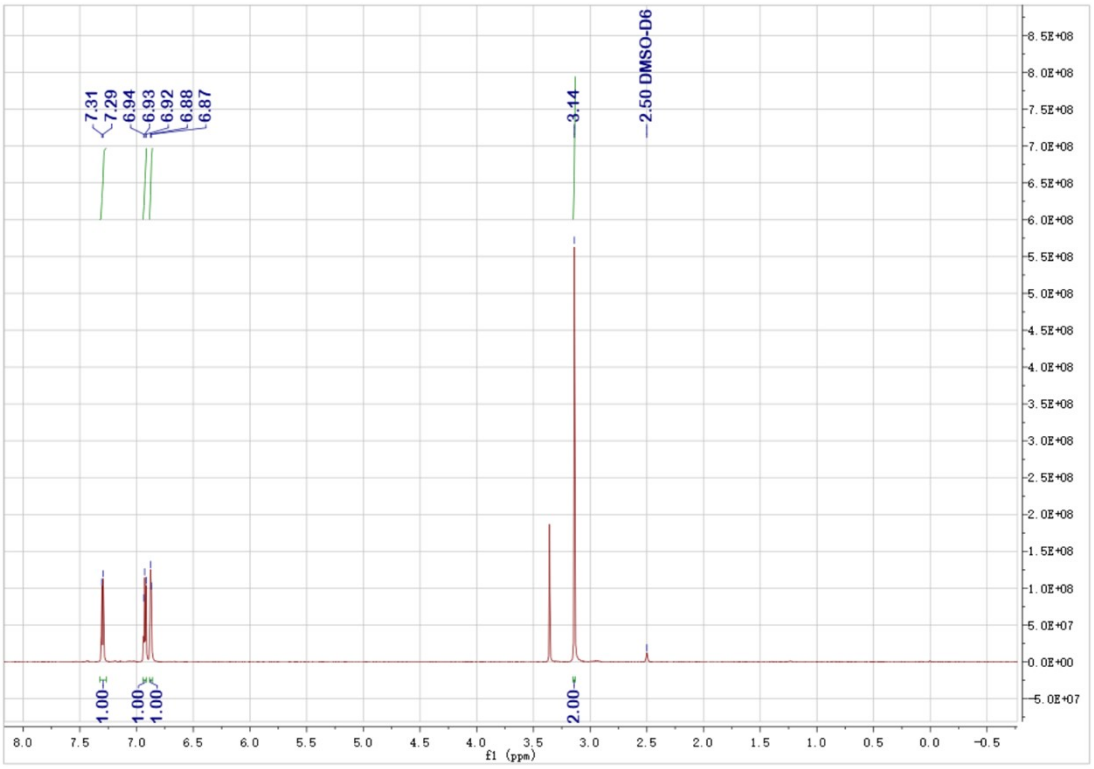

Fig. S9. [1]H NMR data of compound 1,2-di(thiophen-2-yl) ethane (4).

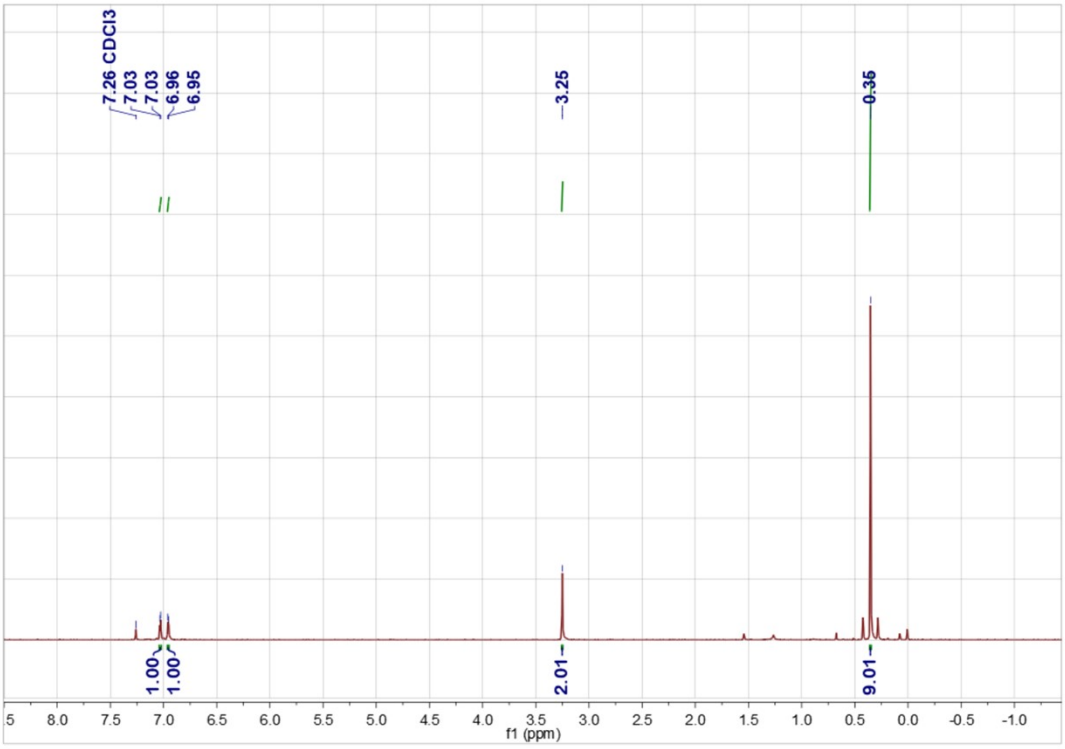

Fig. S10. [1]H NMR data of compound 1,2-bis(5-(trimethylstannyl) thiophen-2-yl) ethane (5).

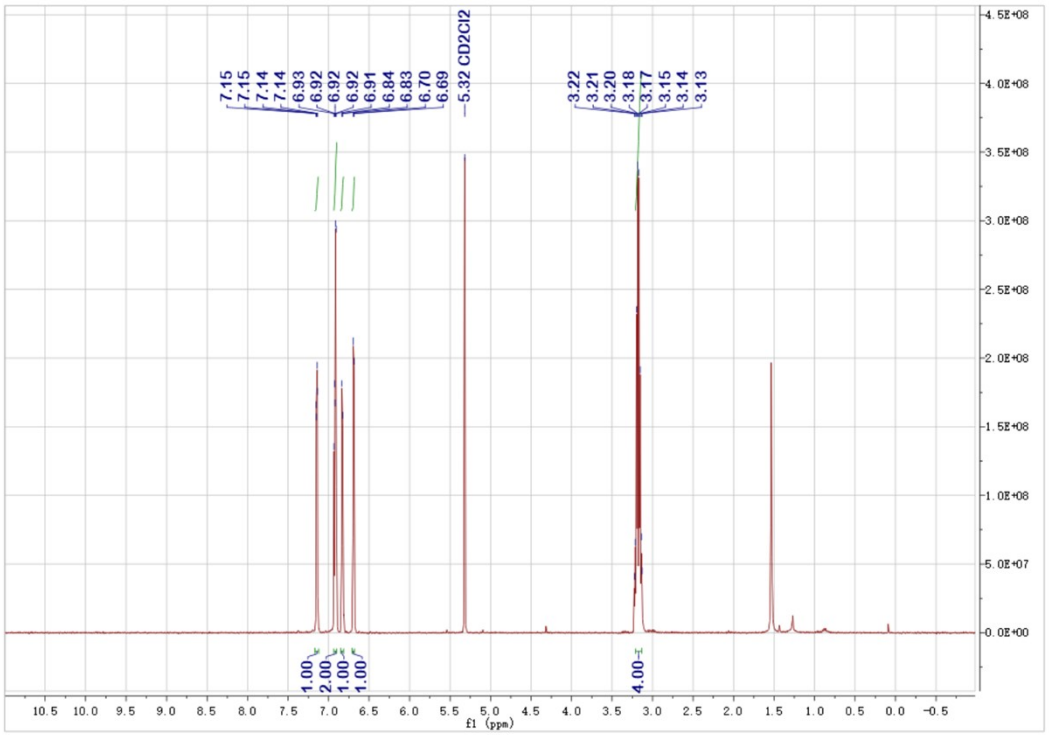

Fig. S11. [1]H NMR data of compound 5,5'-bis(2-(thiophen-2-yl)ethyl)-2,2'-bithiophene (6).

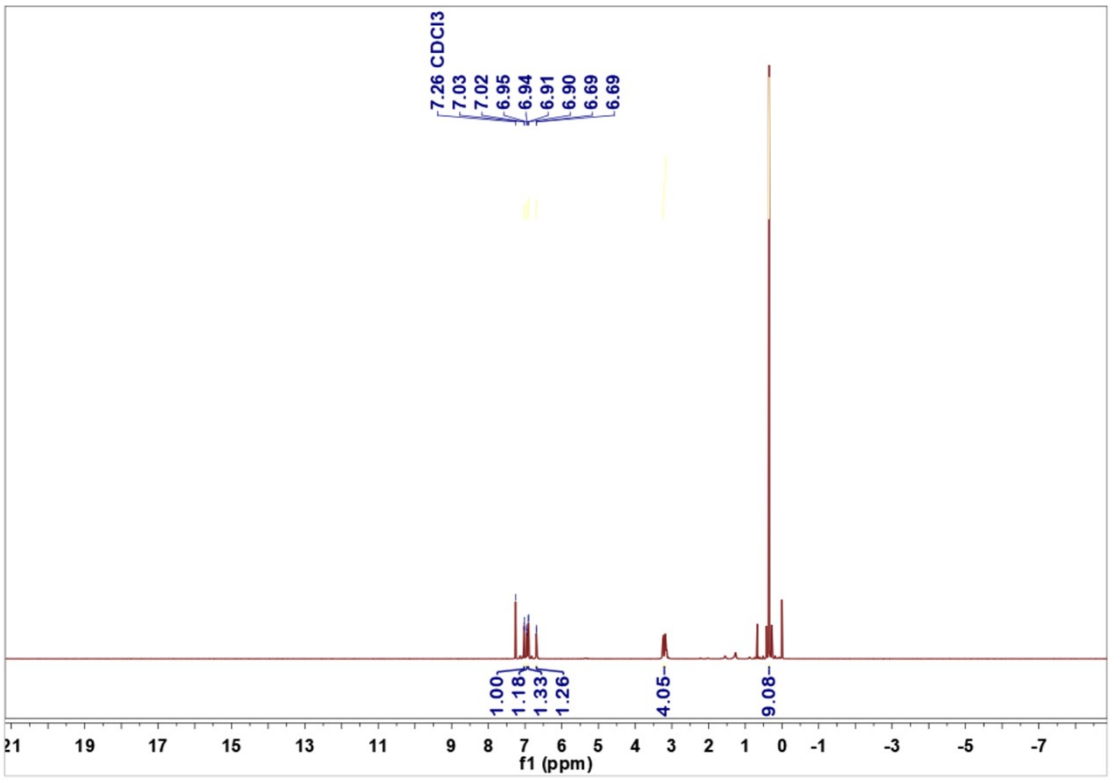

Fig. S12. ^{1}H NMR data of compound 5,5'-bis(2-(5-(trimethylstannyl) thiophen-2-yl) ethyl)-2,2'-bithiophene (7).

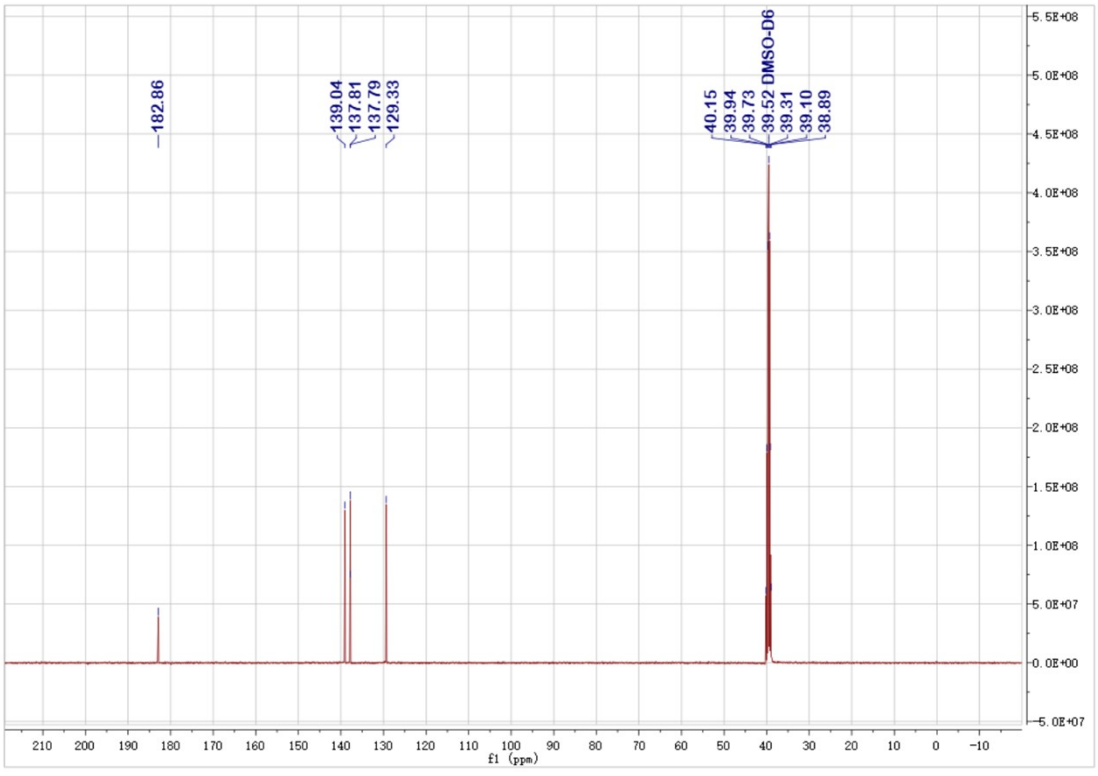

Fig. S13. ^{13}C NMR data of compound 3.

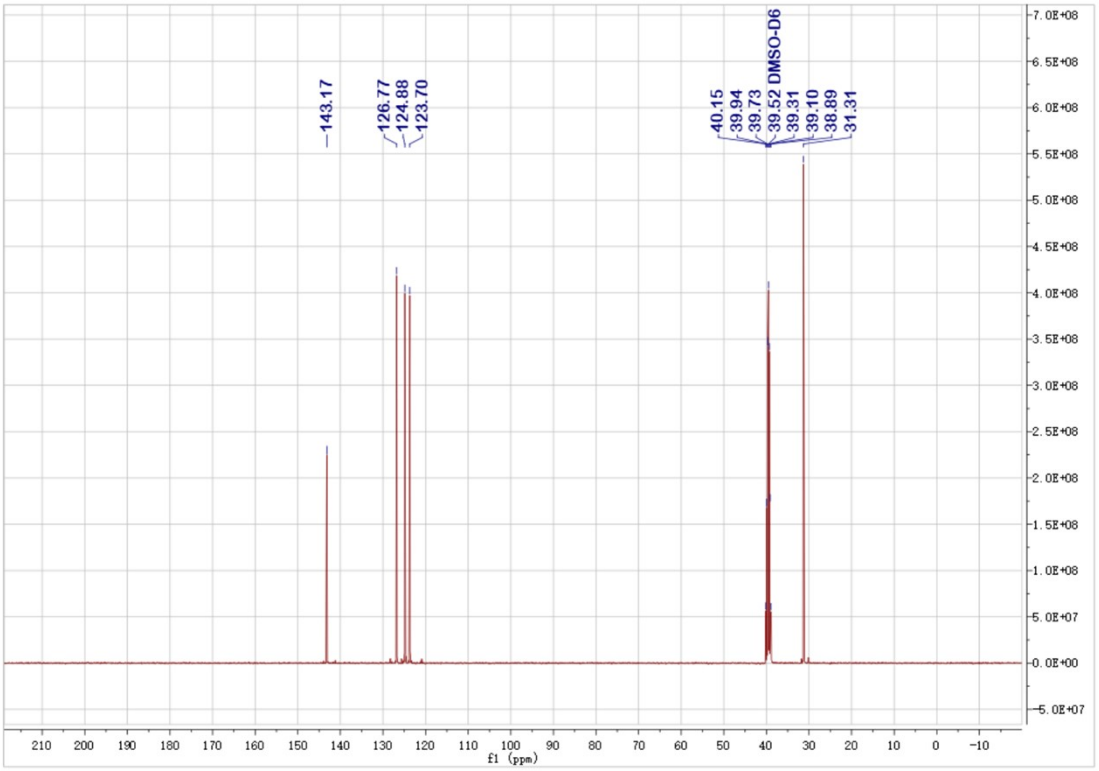

Fig. S14. ^{13}C NMR data of compound 4.

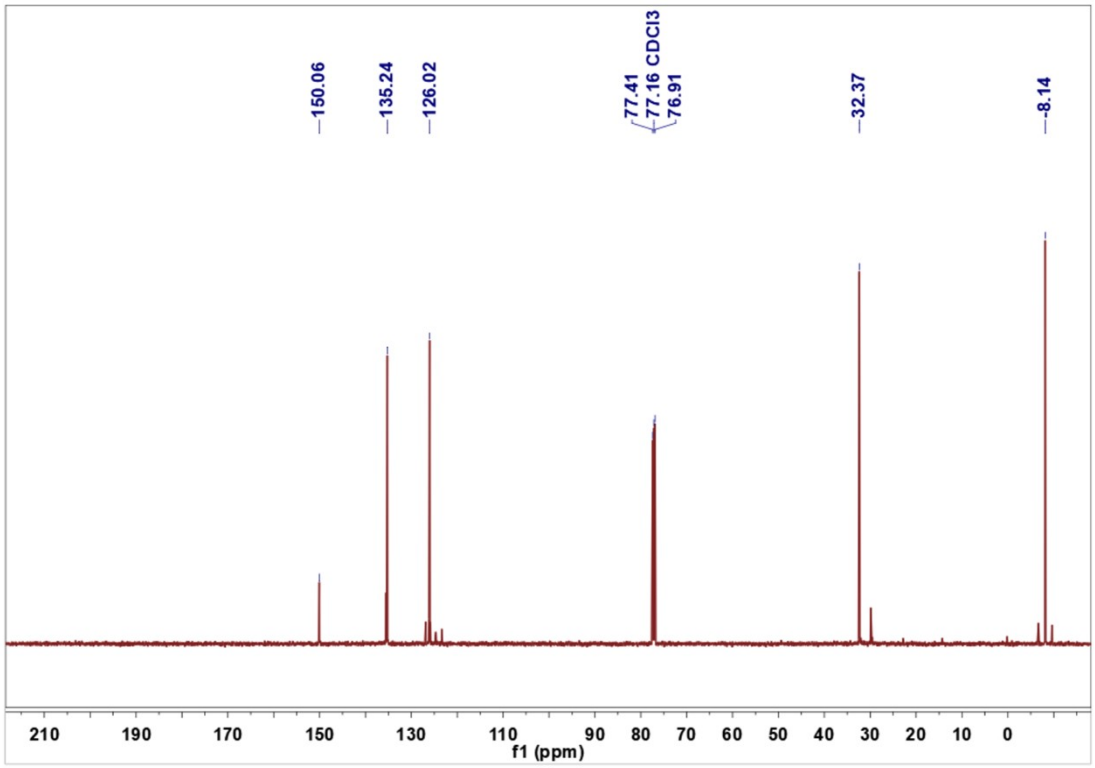

Fig. S15. ^{13}C NMR data of compound 5.

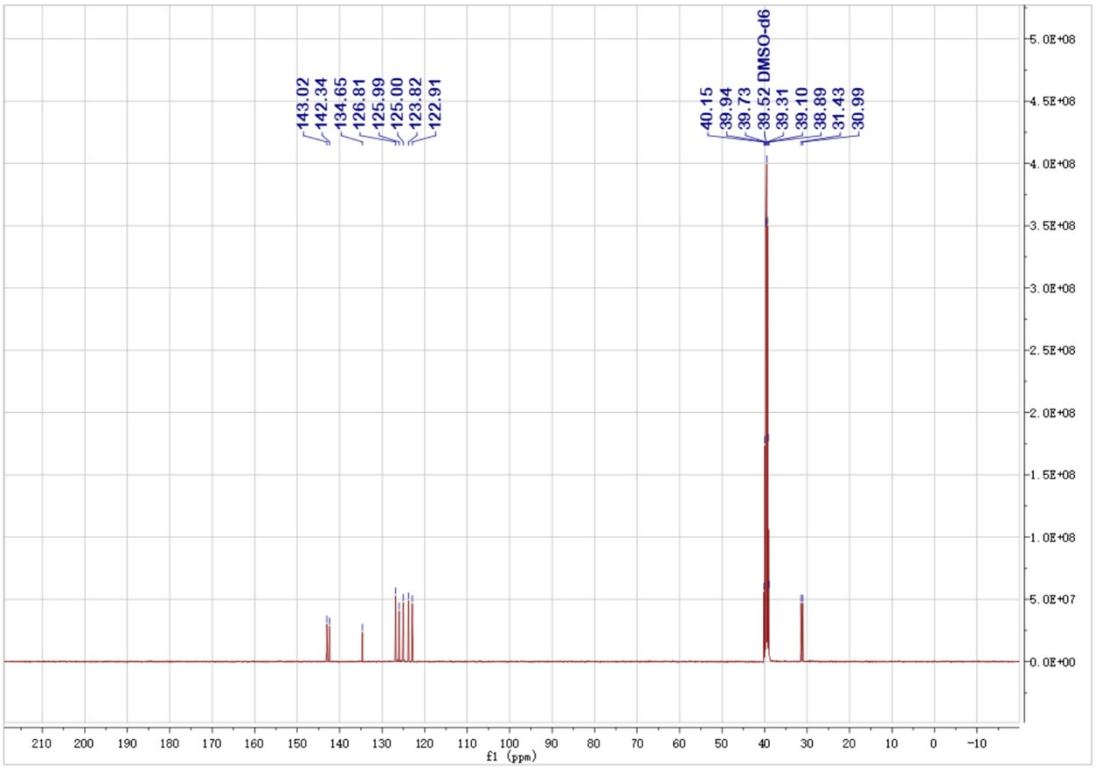

Fig. S16. ^{13}C NMR data of compound 6.

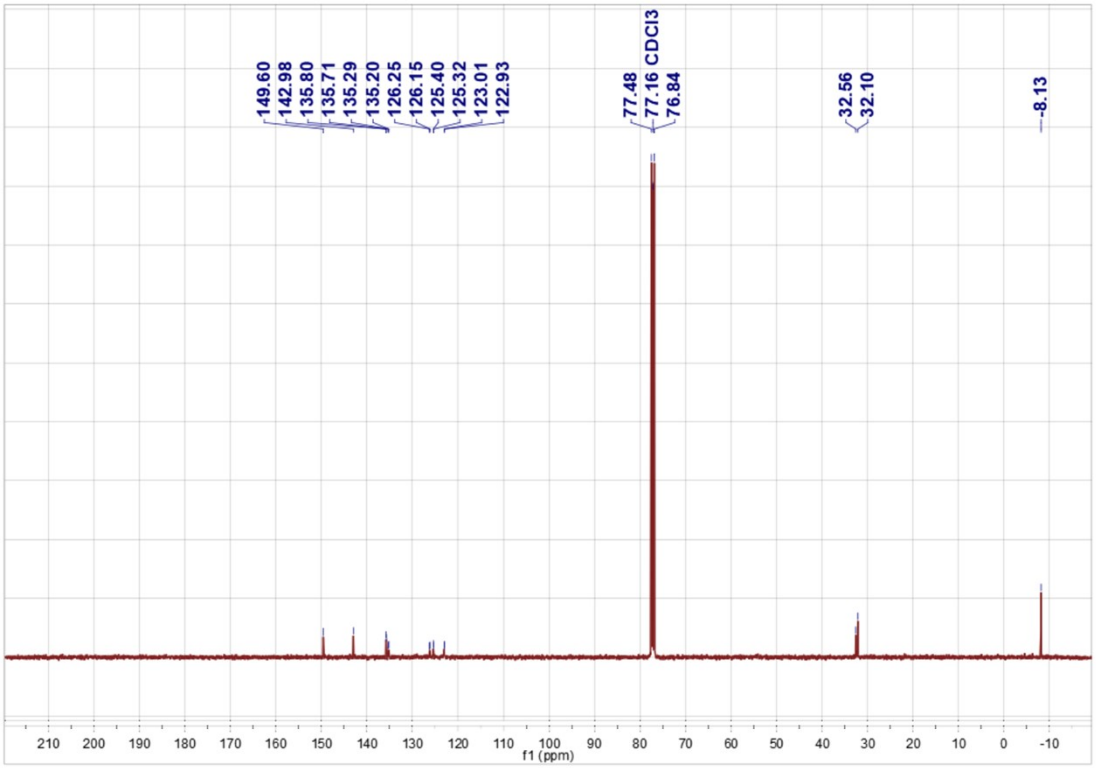

Fig. S17. ^{13}C NMR data of compound 7.