Supporting Information

Benzobisthiadiazole-based conjugated donor-acceptor polymers for organic thin film transistors: effects of π-conjugated bridges on ambipolar transport

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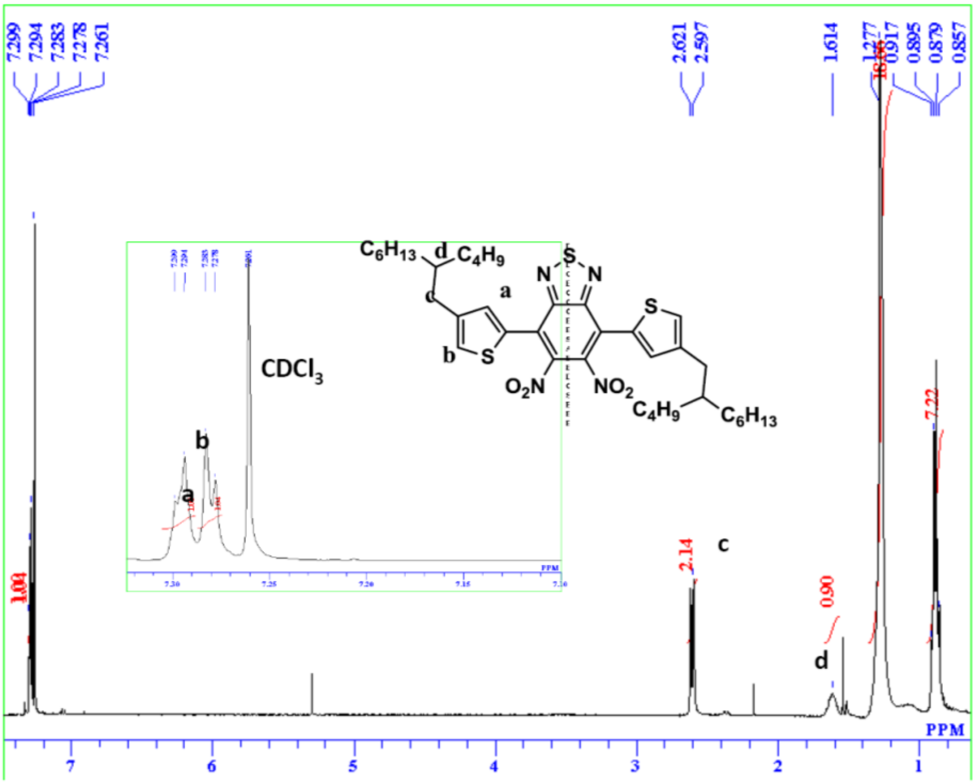

Fig. S1 ^{1}H NMR spectrum of compound **1**.

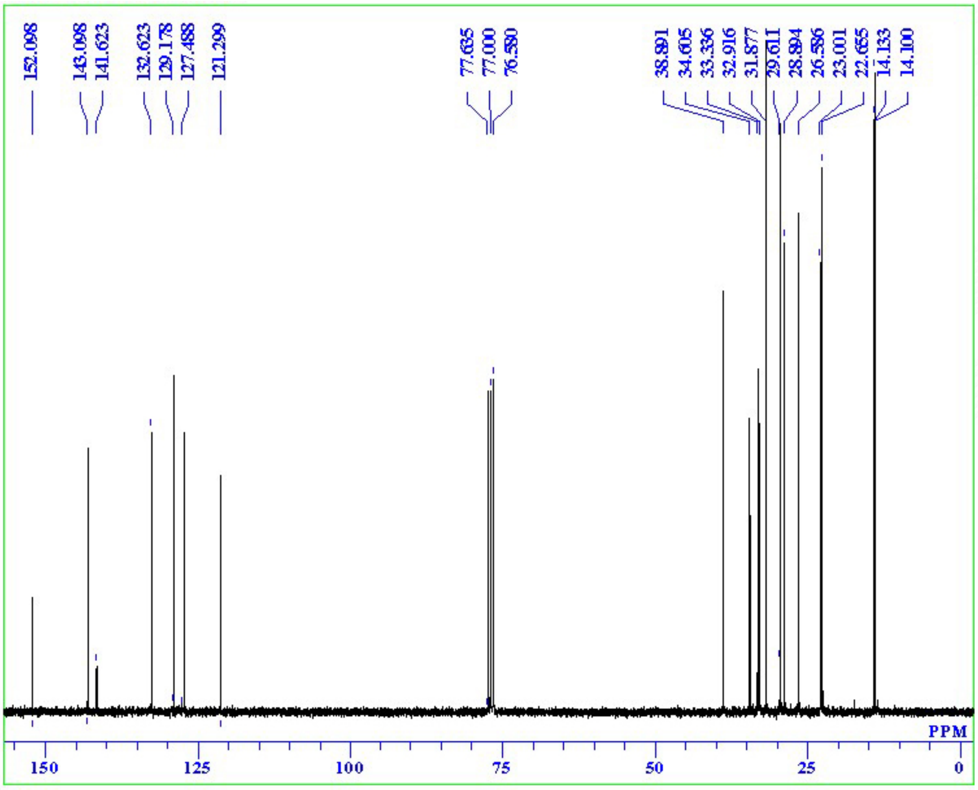

Fig. S2 ^{13}C NMR spectrum of compound **1**.

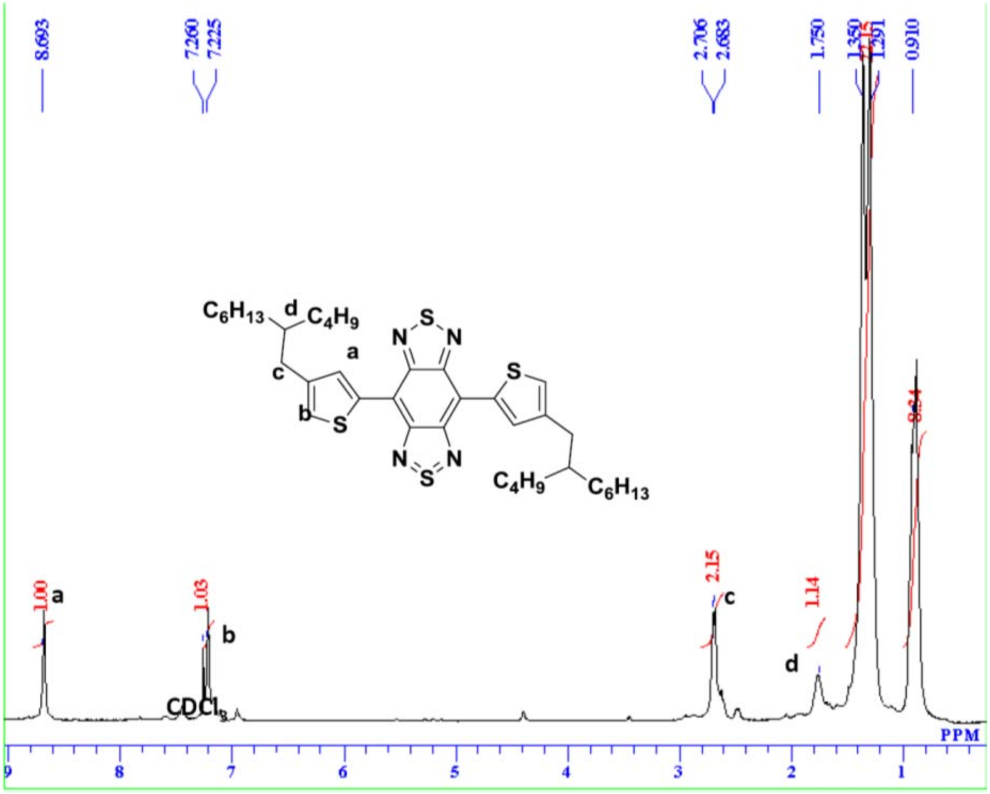

Fig. S3 ^{1}H NMR spectrum of compound **2**.

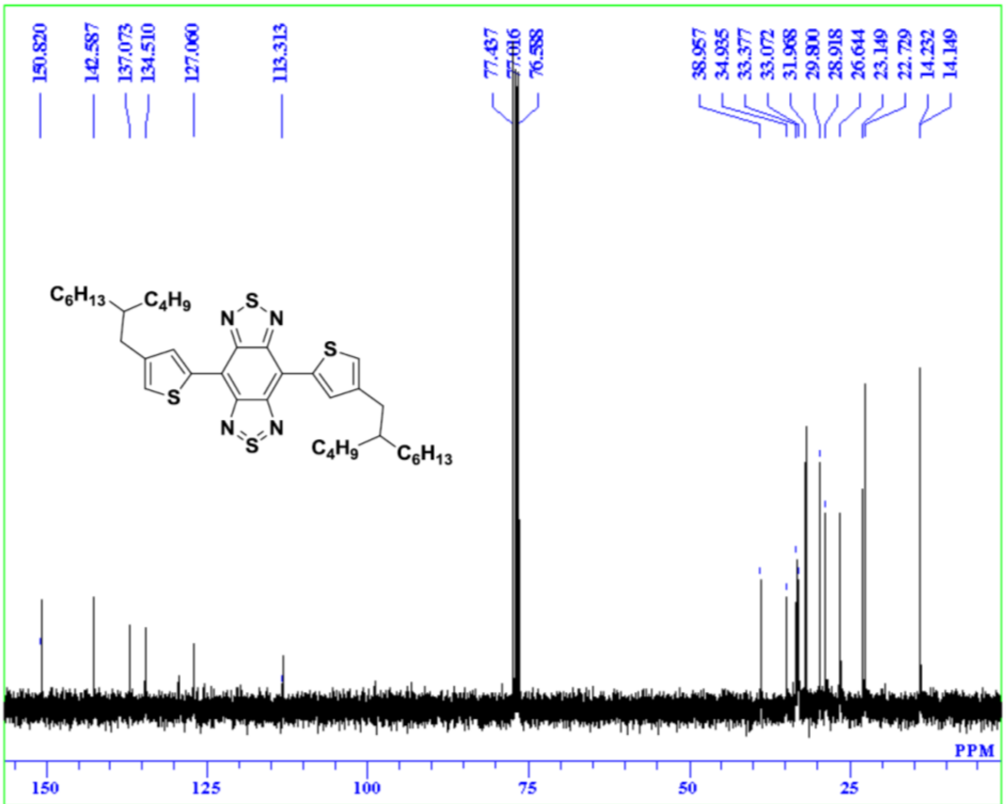

Fig. S4 ^{13}C NMR spectrum of compound **2**.

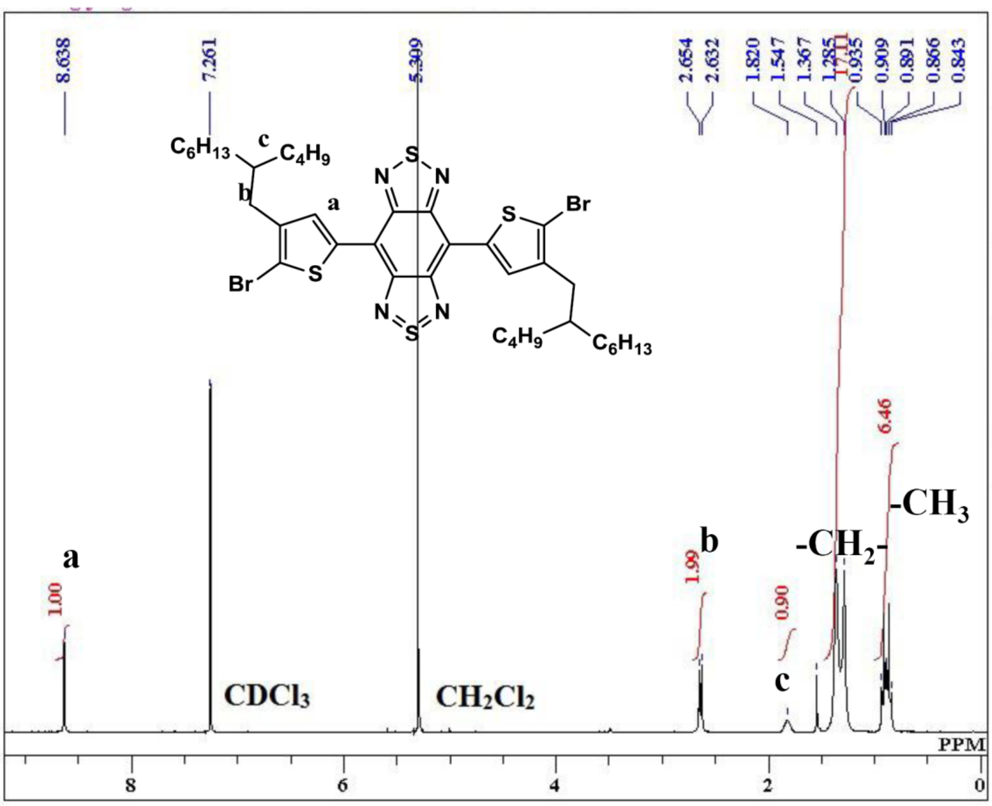

Fig. S5 ^{1}H NMR spectrum of compound **3**.

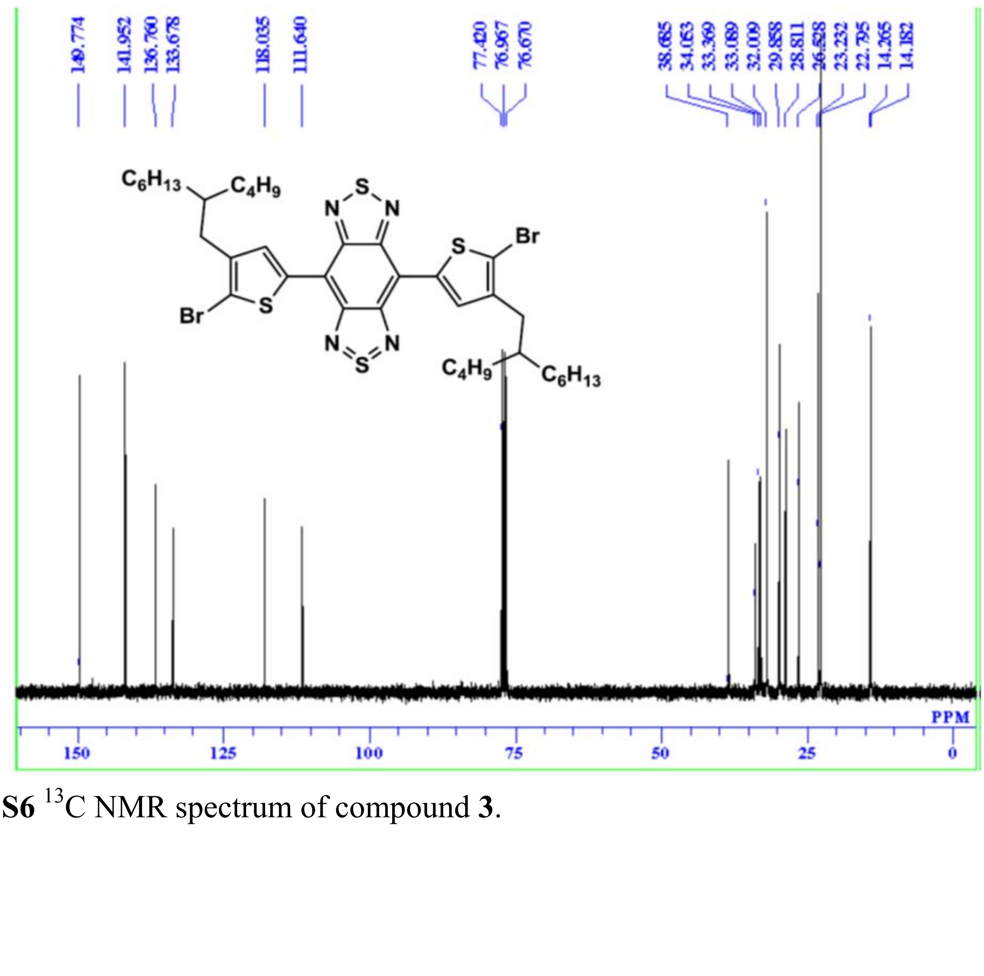

Fig. S6 ^{13}C NMR spectrum of compound **3**.

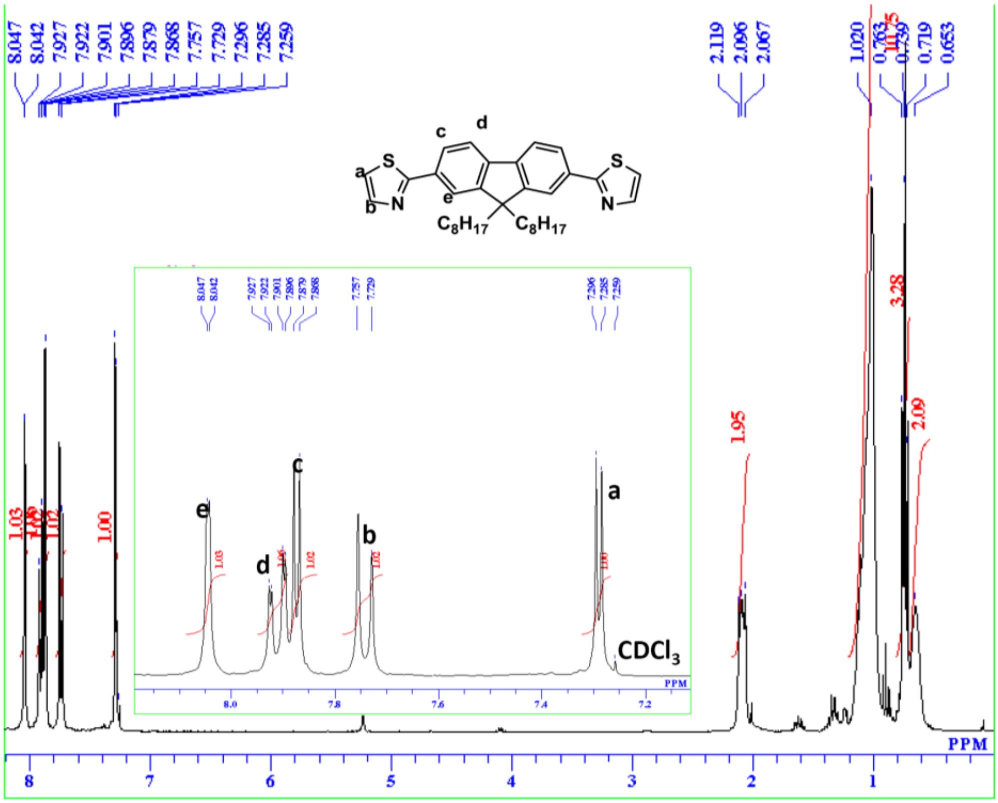

Fig. S7 ^{1}H NMR spectrum of compound **4**.

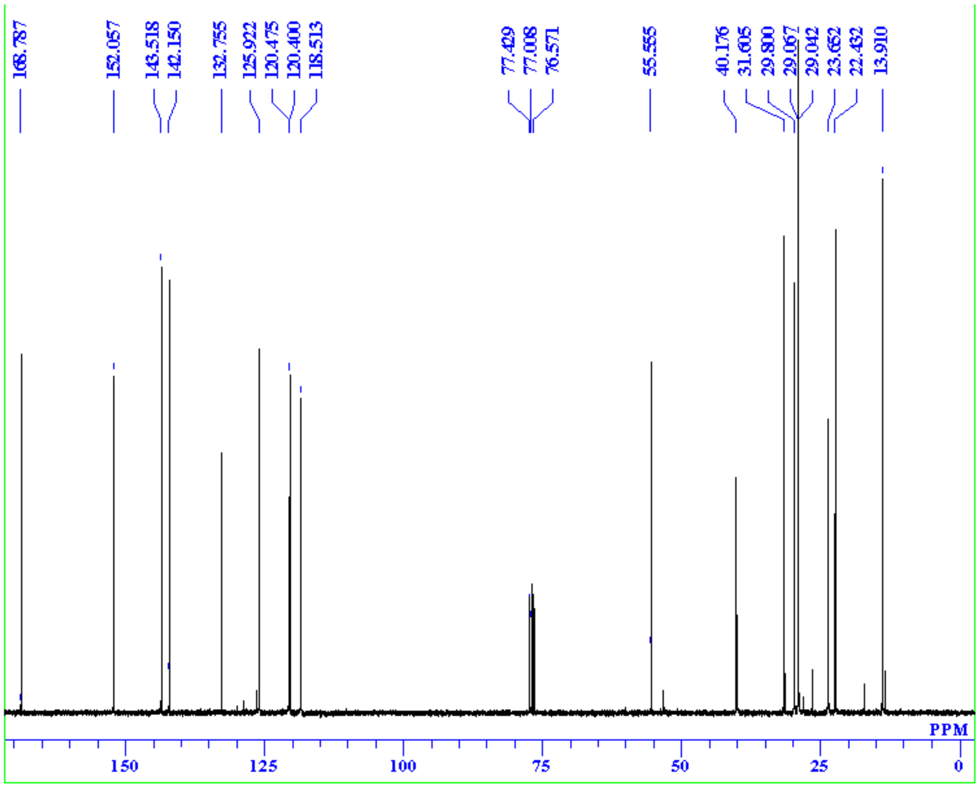

Fig. S8 ^{13}C NMR spectrum of compound **4**.

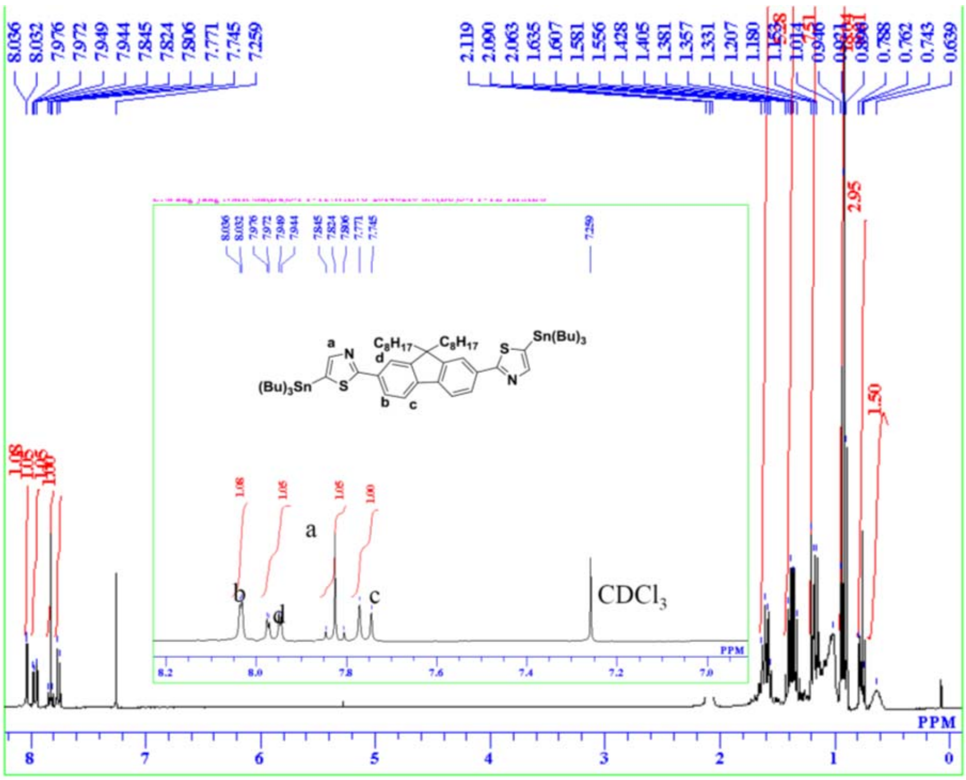

Fig. S9 ^{1}H NMR spectrum of compound **5**.

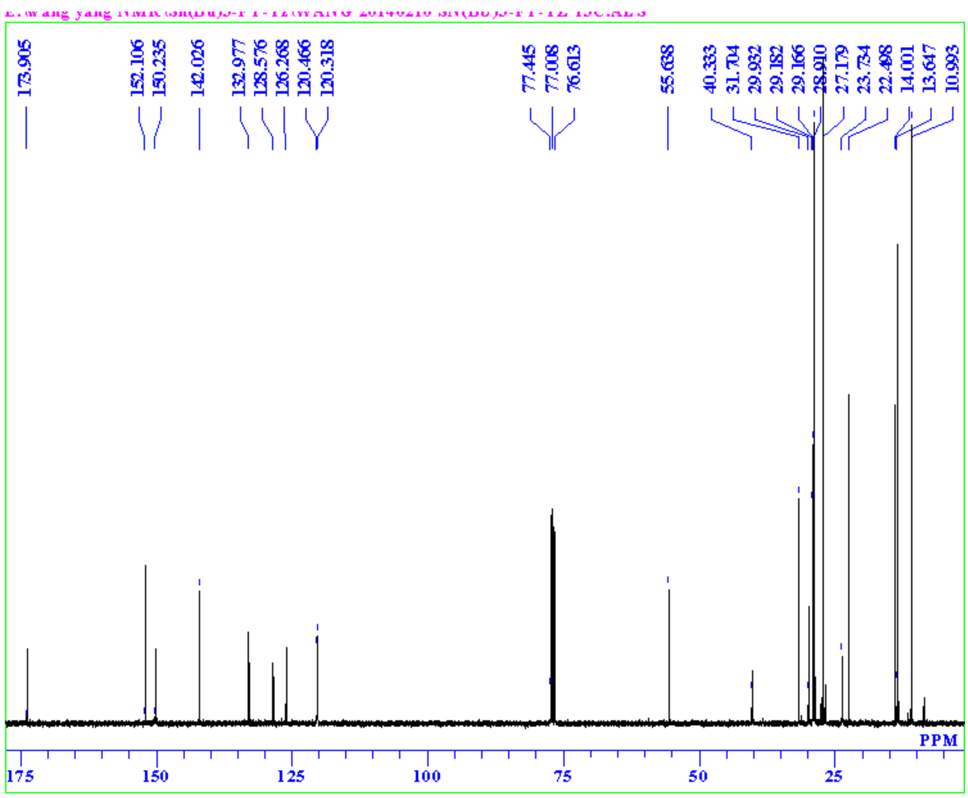

Fig. S10 ^{13}C NMR spectrum of compound **5**.

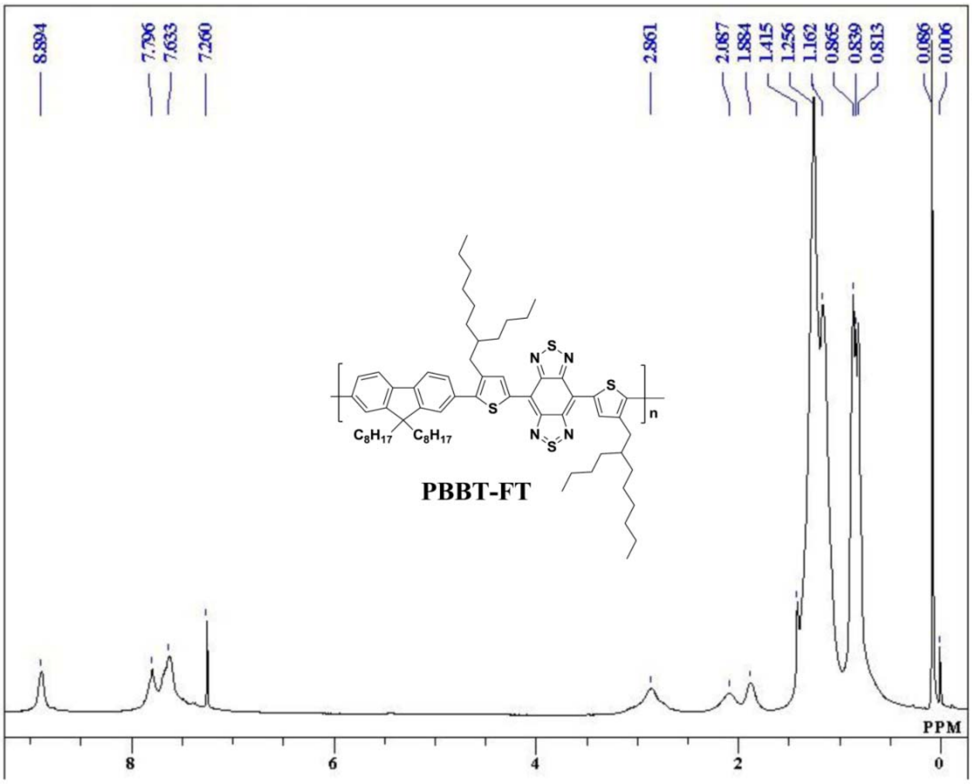

Fig. S11 ^{1}H NMR spectrum of PBBT-FT.

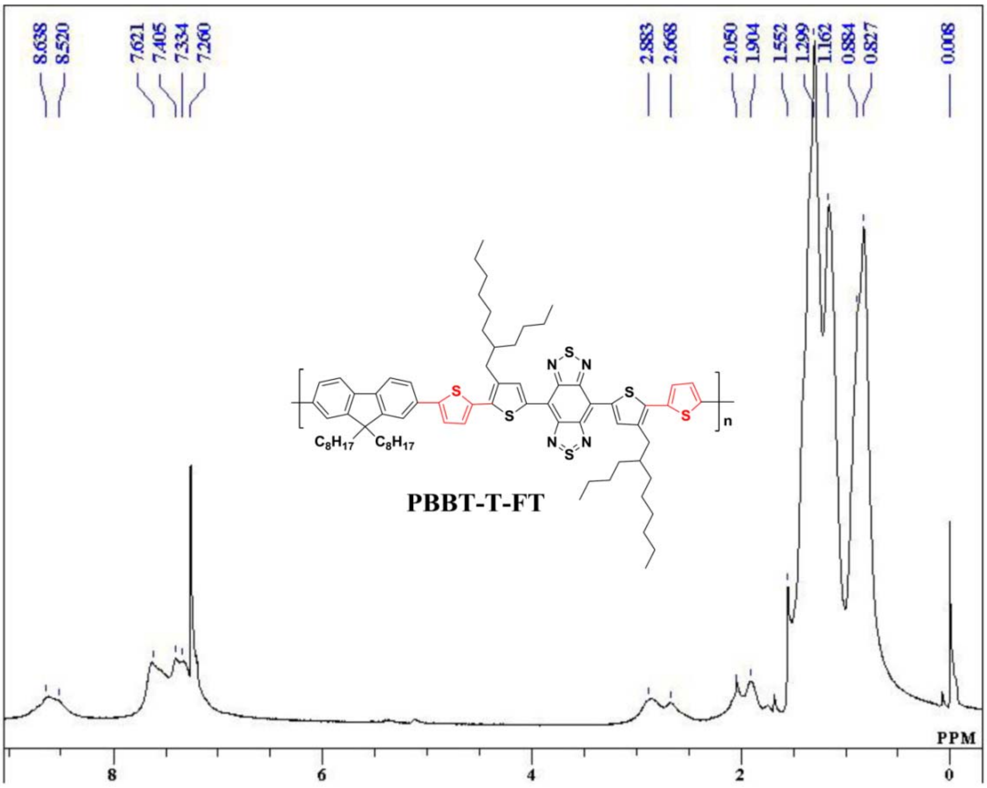

Fig. S12 ^{1}H NMR spectrum of PBBT-T-FT.

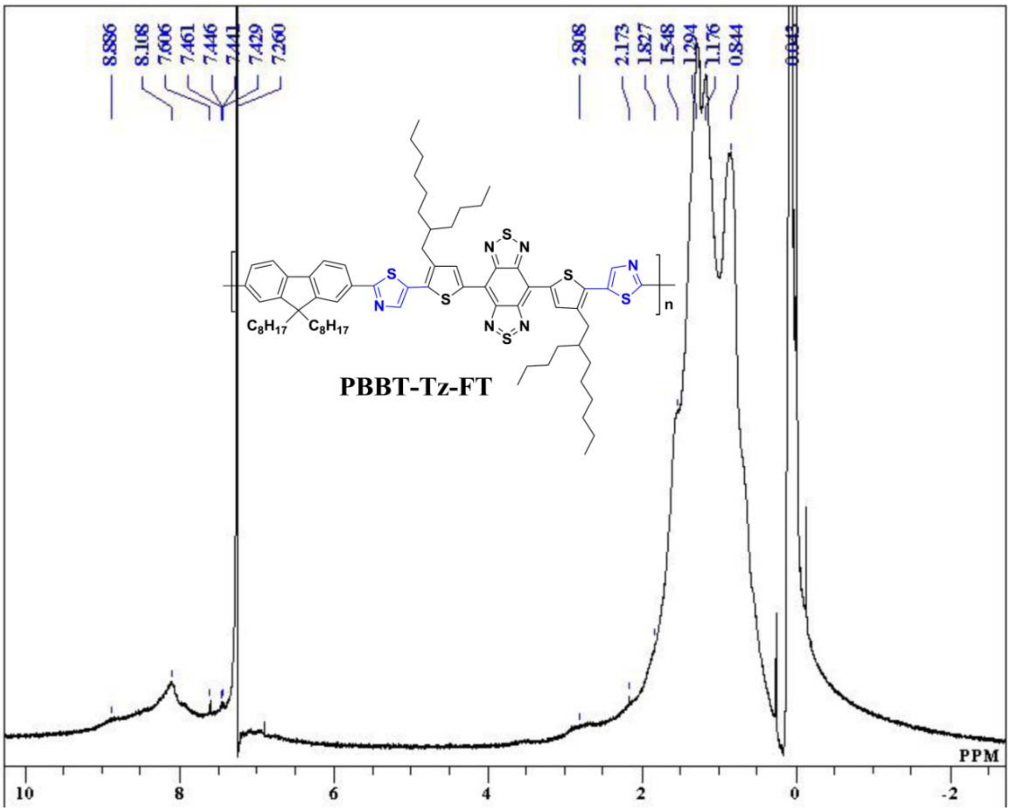

Fig. S13 ^{1}H NMR spectrum of PBBT-Tz-FT.

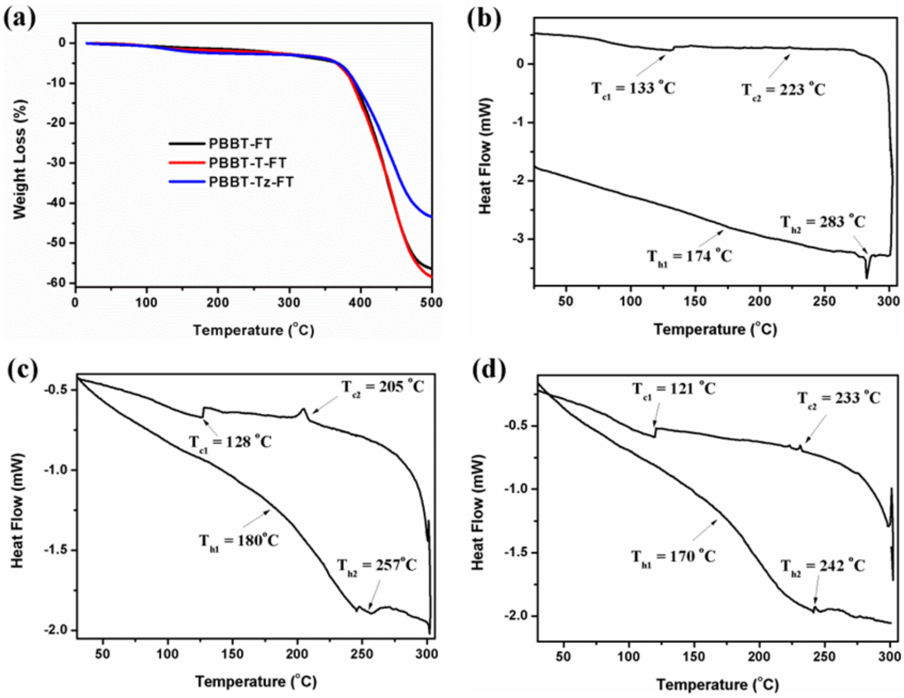

Fig. S14 (a) TGA of the polymers under nitrogen flow (50 mL min^{-1}) at the heating rate of 10 °C min^{-1} and DSC curves of (b) PBBT-FT, (c) PBBT-T-FT, and (d) PBBT-Tz-FT. All the DSC curves are the second heating and cooling processes under nitrogen flow (50 mL min^{-1}) at the scan rate of 10 °C min^{-1}.

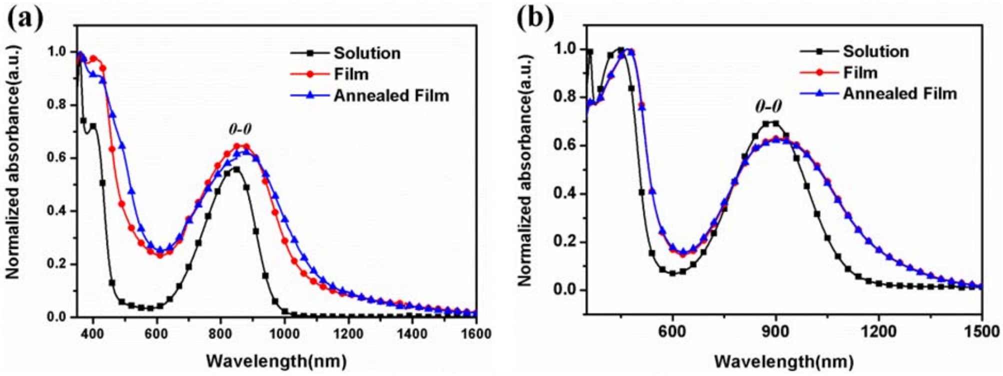

Fig. S15 Normalized absorption spectra of (a) PBBT-FT and (b) PBBT-T-FT in dilute $CHCl_3$, as-cast thin film, and annealed film at 150 °C for 30 min.

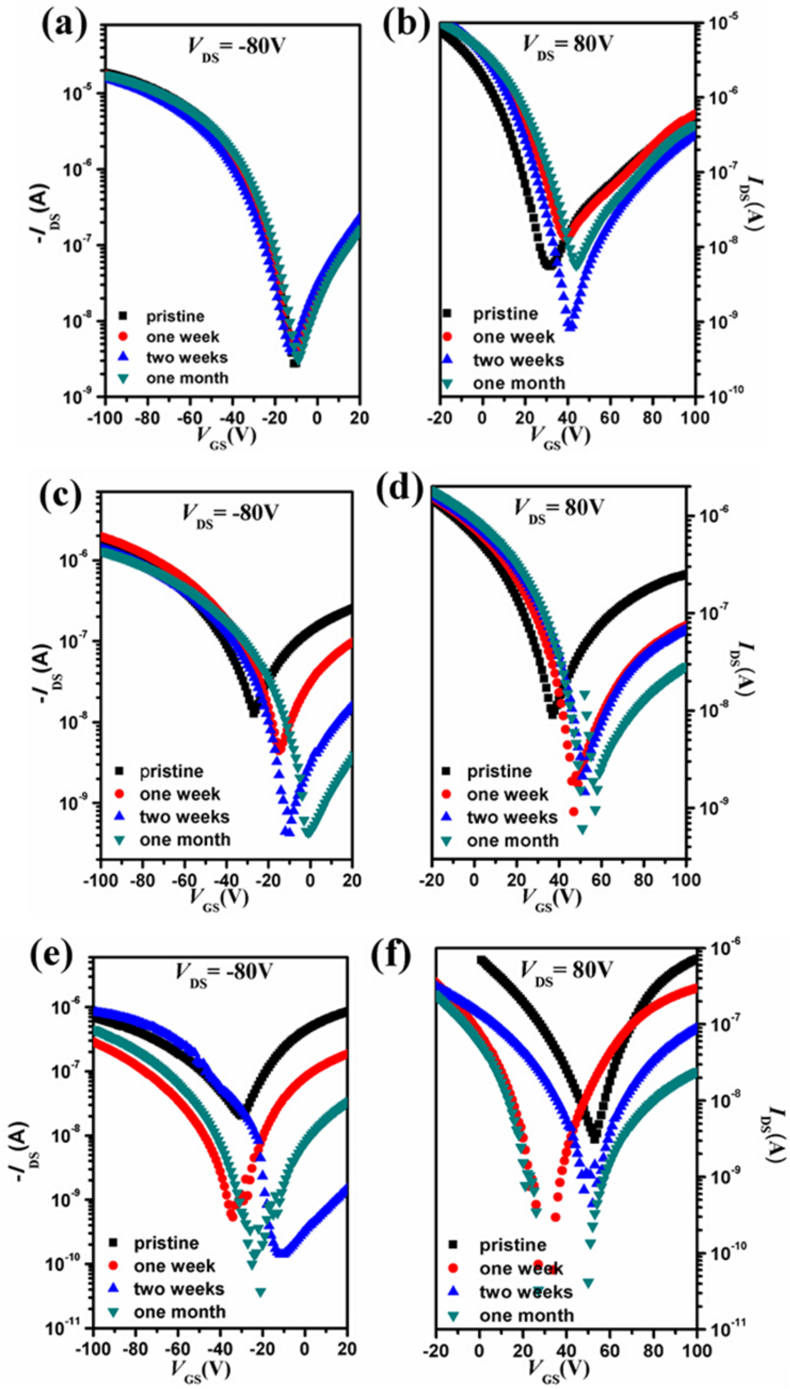

Fig. S16 (a) Current−voltage (*I*−*V*) characteristics of TFTs fabricated by spin-coating in air. Comparison of transfer characteristics for (a),(b) PBBT-FT; (c),(d) PBBT-T-FT; (e),(f) PBBT-Tz-FT films under optimized conditions stored in air (hole-enhancement operation with V_{DS} = -80 V and electron-enhancement operation with V_{DS} = 80 V; L = 100 μm and W = 1 mm).

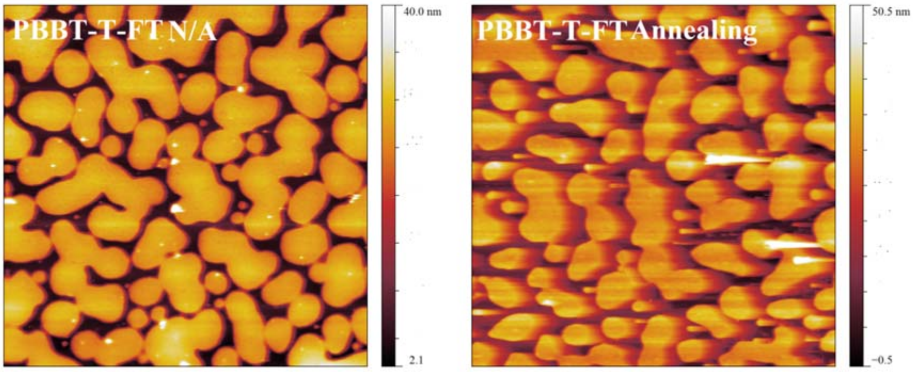

Fig. S17 Tapping-mode AFM topography images (left: as-cast, right: after thermal annealing at 200 ^{o}C for 10 min) of the PBBT-T-FT films spin-cast from a chloroform solution. AFM size: 10 × 10 μm^2.

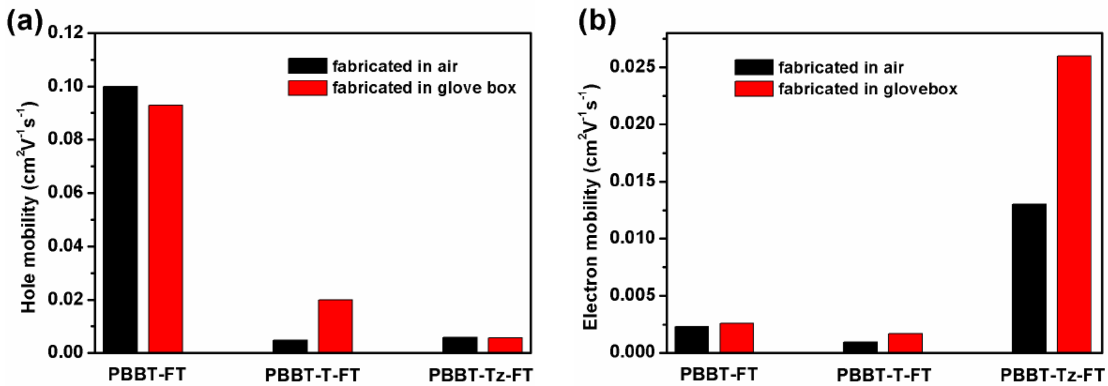

Fig. S18 Comparison of the TFT performances (a: average hole mobility values from 5 to 10 devices, b: average electron mobility values from 5 to 10 devices) of the devices fabricated in air and in a glove box under optimized conditions.

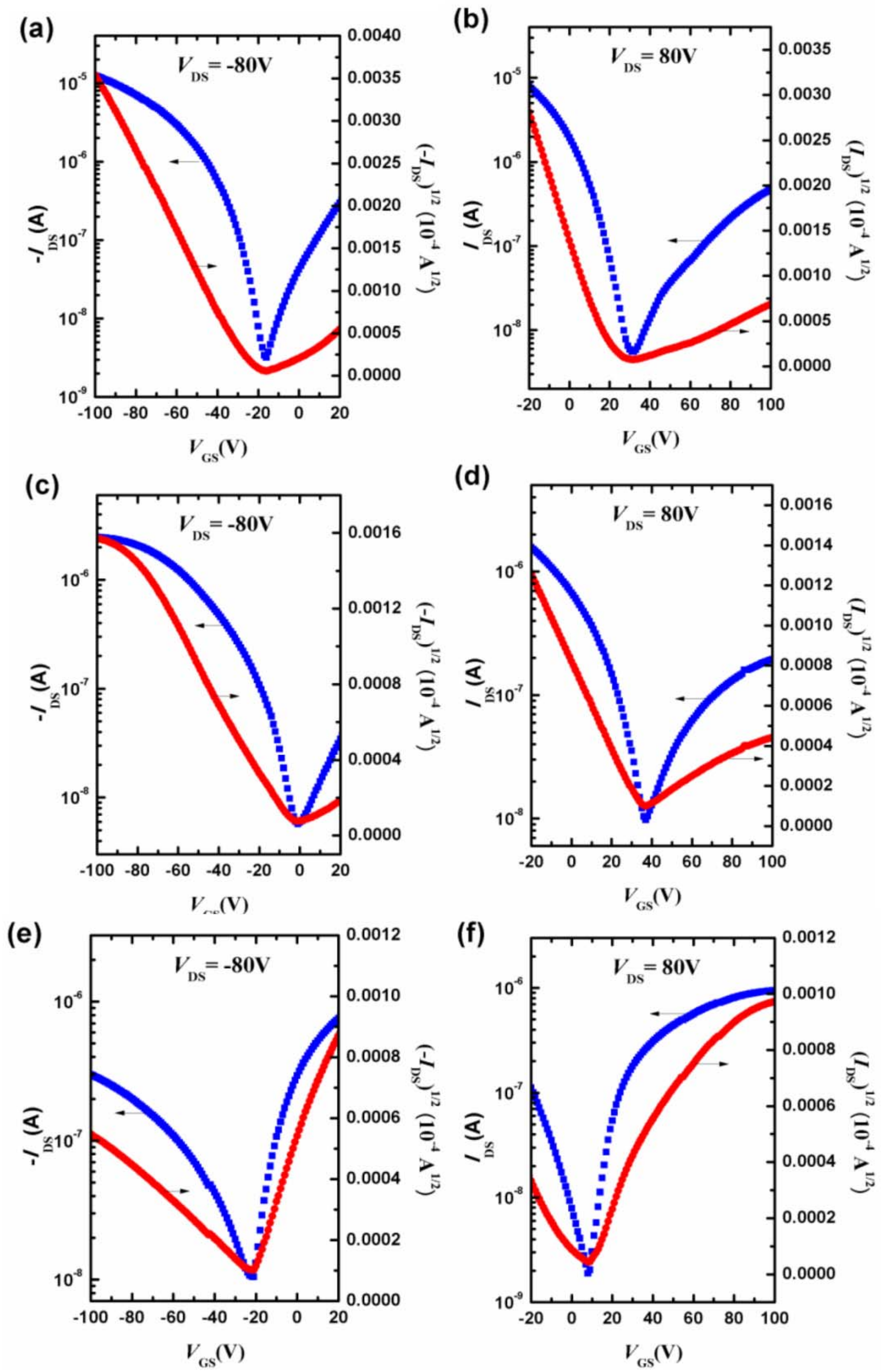

Fig. S19 Current−voltage ($I-V$) characteristics of TFTs fabricated by spin-coating in a glove box under optimized conditions. Transfer characteristics for PBBT-FT films (a: hole, b: electron), for PBBT-T-FT films (c: hole, d: electron), and for PBBT-Tz-FT films (e: hole, f: electron) at the carrier-enhancement operation with V_{DS} = −80 and +80 V, respectively (L = 100 μm and W = 1 mm, all the measurements were done under vacuum (10^{-4}-10^{-5} mbar)).

Table S1 Summary of TFT device performances stored in air

Polymer	μ_h (cm^2 V^{-1} s^{-1})	μ_e (cm^2 V^{-1} s^{-1})	I_{on}/I_{off}
PBBT-FT	1.3×10^{-1} (9.2×10^{-2})	3.1×10^{-3} (2.3×10^{-3})	p:10^4-10^5; n:10^2-10^3
One week	1.0×10^{-1} (5.9×10^{-2})	2.6×10^{-3} (2.0×10^{-3})	p:10^4-10^5; n:10^1-10^2
Two weeks	9.5×10^{-2} (5.6×10^{-2})	2.4×10^{-3} (1.9×10^{-3})	p:10^4-10^5; n:10^2-10^3
Four weeks	9.0×10^{-2} (5.5×10^{-2})	2.1×10^{-3} (1.6×10^{-3})	p:10^4-10^5; n:10^1-10^2
PBBT-T-FT	6.5×10^{-3} (4.8×10^{-3})	1.2×10^{-3} (8.3×10^{-4})	p:10^2-10^3; n:10^1-10^2
One week	6.0×10^{-3} (5.6×10^{-3})	7.7×10^{-4} (5.1×10^{-4})	p:10^2-10^3; n:10^1-10^2
Two weeks	4.8×10^{-3} (3.7×10^{-3})	6.0×10^{-4} (3.8×10^{-4})	p:10^3-10^4; n:10^1-10^2
Four weeks	4.4×10^{-3} (3.5×10^{-3})	3.8×10^{-4} (1.5×10^{-4})	p:10^3-10^4; n:10^1-10^2
PBBT-Tz-FT	6.8×10^{-3} (5.8×10^{-3})	1.5×10^{-2} (1.3×10^{-2})	p:10^1-10^2; n:10^2-10^3
One week	3.8×10^{-3} (2.0×10^{-3})	1.6×10^{-3} (1.4×10^{-3})	p:10^2-10^3; n:10^3-10^4
Two weeks	2.9×10^{-3} (1.9×10^{-3})	6.8×10^{-4} (4.1×10^{-4})	p:10^2-10^3; n:10^2-10^3
Four weeks	1.7×10^{-3} (1.3×10^{-3})	5.5×10^{-4} (3.0×10^{-4})	p:10^2-10^3; n:10^2-10^3

[a] Maximum values of the hole/electron mobilities measured under vacuum (10^{-4}-10^{-5} Pa). The average values are in parentheses (from 5 to 10 devices).