Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Regioisomerism of alkyl-substituted bithiophene comonomer in (3*E*,8*E*)-3,8-bis(2-oxoindolin-3-ylidene)naphtho-[1,2-*b*:5,6-*b'*]difuran-2,7(3*H*,8*H*)-dione (INDF) based D-A polymers for organic thin film transistors

Jesse T. E. Quinn,‡ Chang Guo,‡ Fezza Haider , Haritosh Patel, Daid A. Khan and Yuning Li*

Department of Chemical Engineering and Waterloo Institute for Nanotechnology (WIN), University of Waterloo, 200 University Ave W, Waterloo, Ontario, N2L 3G1, Canada

* Corresponding author. Tel.: +1 519 888 4567x31105
E-mail address: yuning.li@uwaterloo.ca (Y. Li)

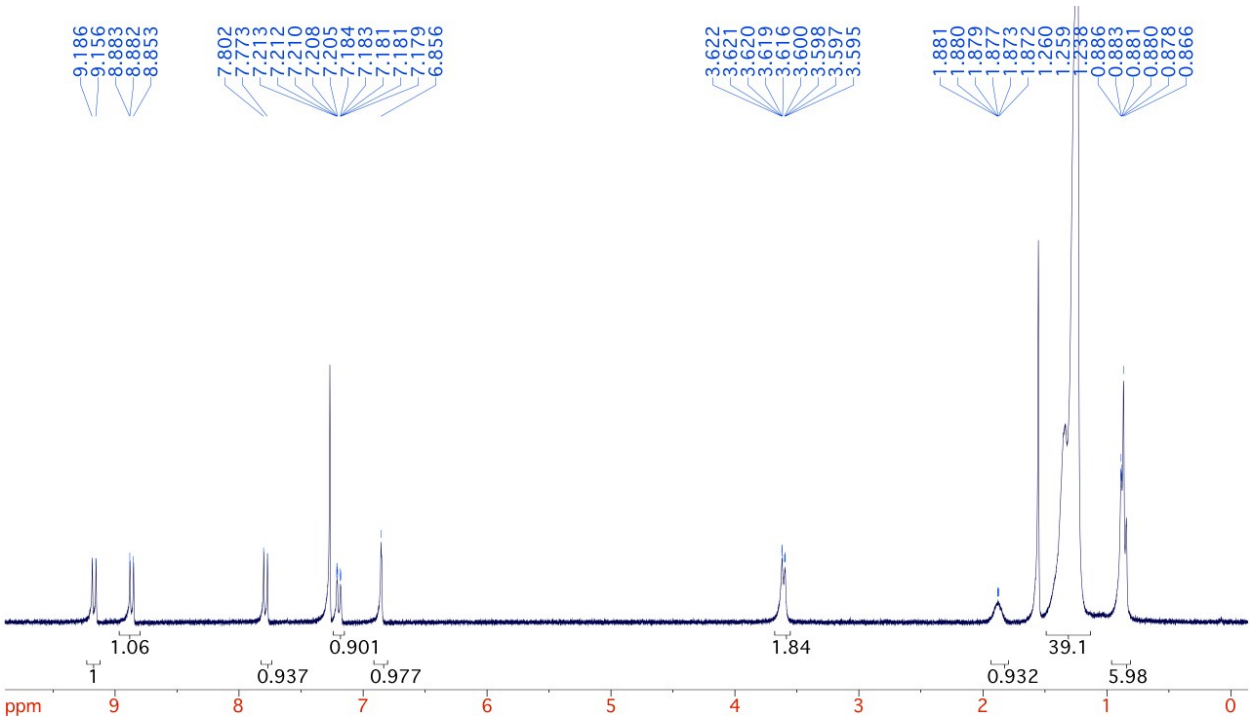

Fig. S1 ^{1}H NMR spectrum of 1,6-bis((*E*)-6-bromo-1-(2-decyltetradecyl)-2-oxoindolin-3-ylidene)-1,6-dihydronaphtho[1,2-*b*:5,6-*b*′]difuran-2,7-dionein $CDCl_3$.

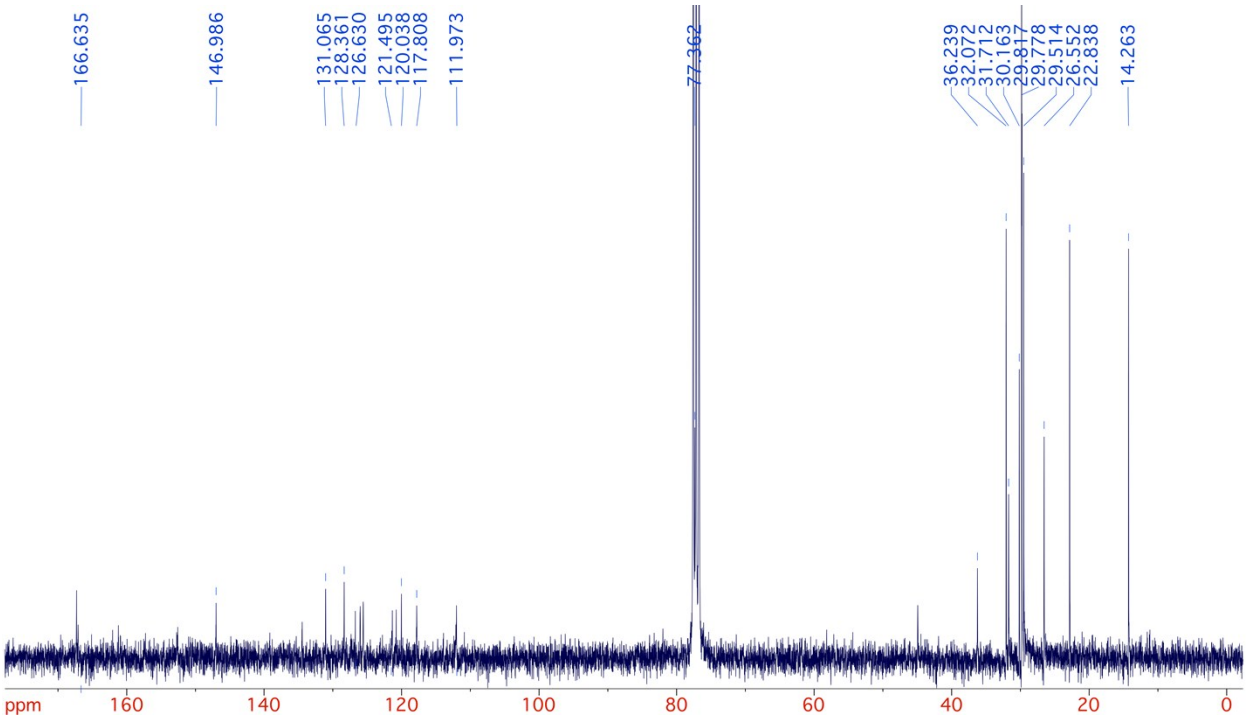

Fig. S2 ^{13}C NMR spectrum of 1,6-bis((*E*)-6-bromo-1-(2-decyltetradecyl)-2-oxoindolin-3-ylidene)-1,6-dihydronaphtho[1,2-*b*:5,6-*b*′]difuran-2,7-dionein $CDCl_3$.

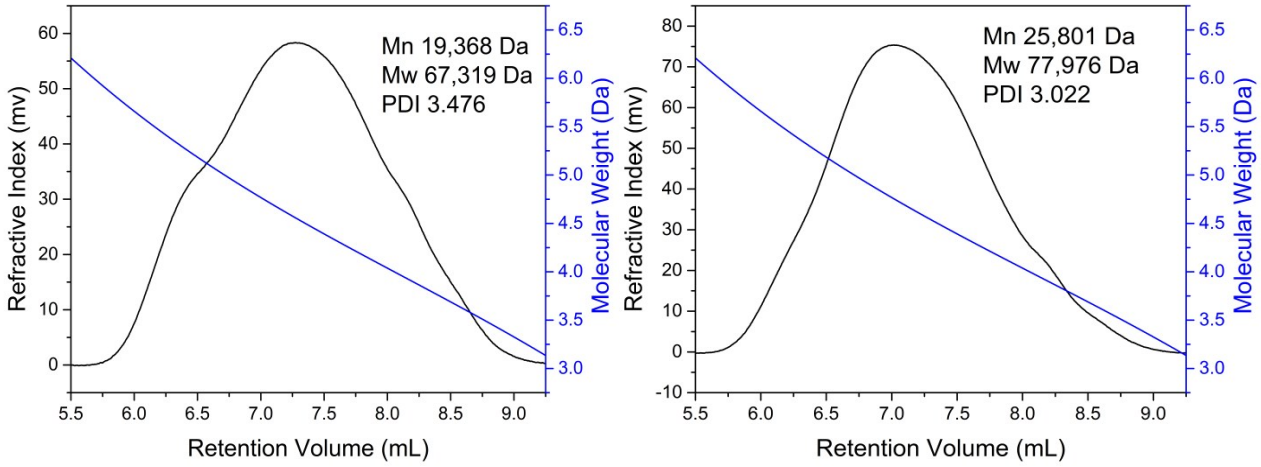

Fig. S3 GPC traces of **PINDFBT-(TT)** (left) and **PINDFBT-(HH)** (right) measured at 1,2,4-trichlorobenzene at 140 °C with polystyrene as standards.

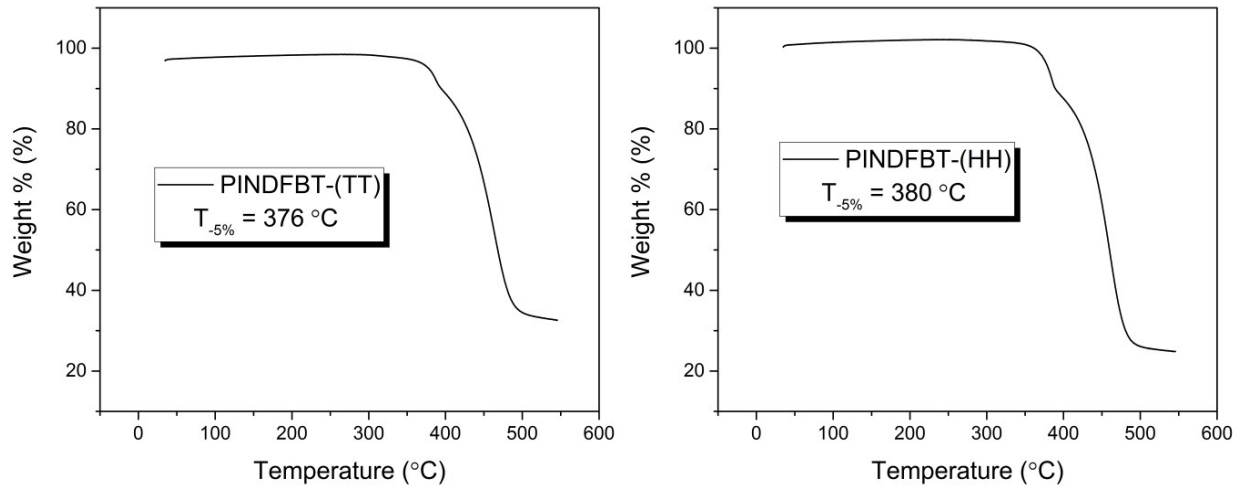

Fig. S4 TGA traces of **PINDFBT-(TT)** (left) and **PINDFBT-(HH)** (right) with a heating rate of 20 °C min^{-1} under nitrogen.

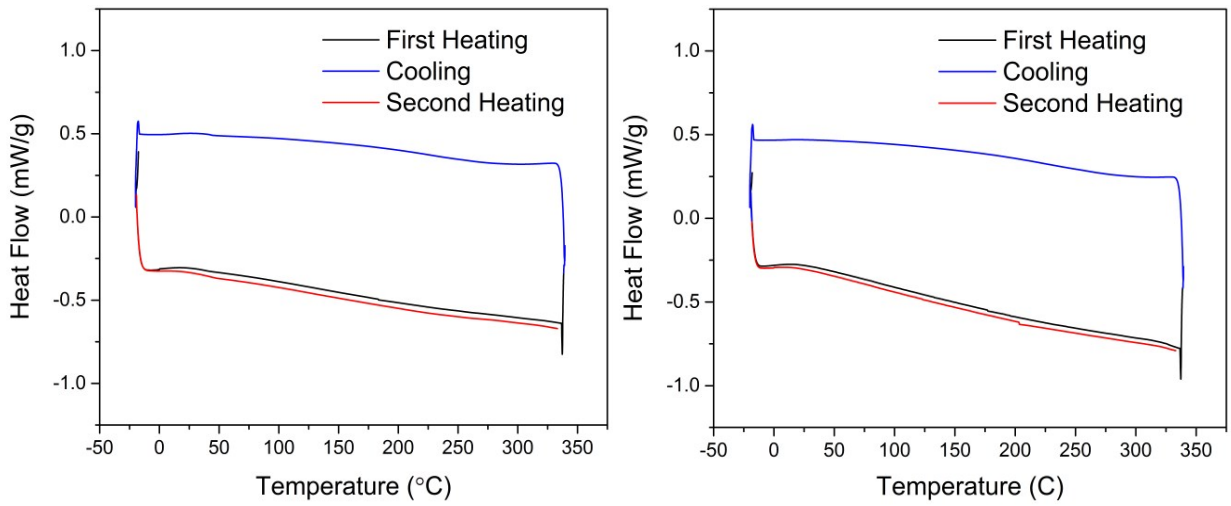

Fig. S5 DSC traces of **PINDFBT-(TT)** (left) and **PINDFBT-(HH)** (right) measured at a rate of 20 °C min^{-1} under nitrogen.

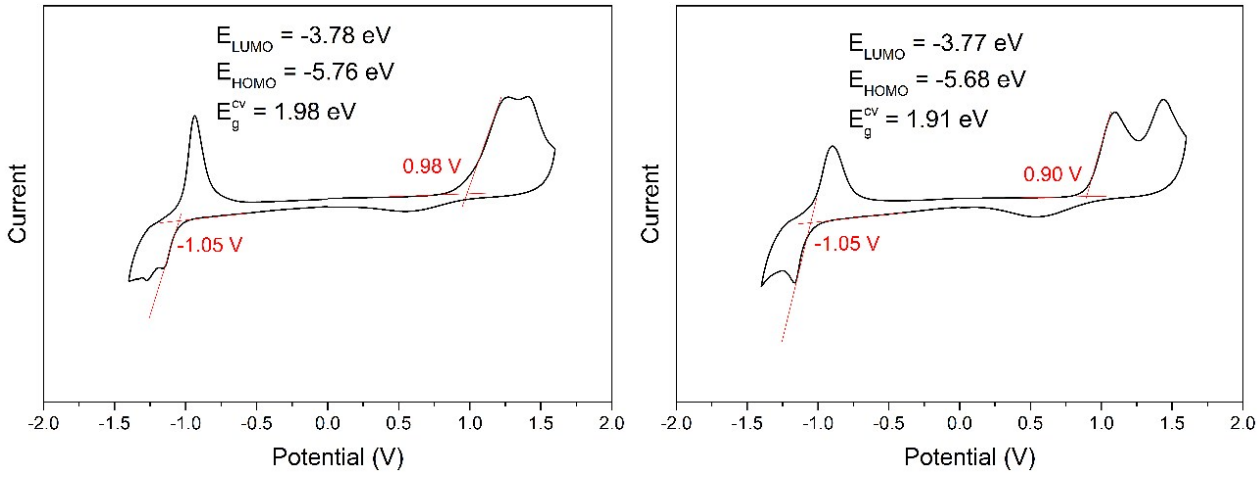

Fig. S6 Cyclic voltammograms of **PINDFBT-(TT)** (left) and **PINDFBT-(HH)** (right) thin films measured in dry acetonitrile containing 0.1 M *n*-Bu_4NPF_6 as an electrolyte under nitrogen atmosphere at a scan rate of 50 mV s^{-1}. The frontier energy levels are -3.78 (LUMO) and -5.76 eV (HOMO) for TT and -3.77 (LUMO) and -5.68 eV (HOMO) for HH. Ferrocene (Fc) was used as the reference, which has a HOMO energy value of -4.8 eV.[1]

Table S1 The summary of OTFT device performances for polymers **PINDFBT-(TT)** and **PINDFBT-(HH)**.

Polymer	Annealing Temperature (°C)	Hole			Electron		
		Mobility[a] (10^{-2} cm² V^{-1} s^{-1})	Average V_{th} (V)	I_{ON}/I_{OFF}	Mobility[a] (10^{-2} cm² V^{-1} s^{-1})	Average V_{th} (V)	I_{ON}/I_{OFF}
PINDFBT-(TT)	100	2.17 (2.06 ± 0.11)	-33.16	~10²	5.41 (5.01 ± 0.28)	26.87	~10²
	150	2.04 (1.90 ± 0.12)	-40.90	~10²	6.51 (6.09 ± 0.28)	26.39	~10²
	200	2.13 (1.88 ± 0.18)	-42.71	~10²	6.31 (5.80 ± 0.39)	25.37	~10²
	250	2.17 (2.08 ± 0.09)	-47.19	~10²	7.17 (6.61 ± 0.52)	29.57	~10²
	300	2.62 (2.49 ± 0.11)	-53.05	~10²	5.09 (4.81 ± 0.24)	32.87	~10³
PINDFBT-(HH)	100	11.08 (10.3 ± 0.68)	-28.86	~10²	24.94 (20.6 ± 2.59)	36.19	~10²
	150	12.68 (11.6 ± 0.91)	-31.05	~10-10²	26.66 (24.2 ± 1.94)	32.61	~10²
	200	14.30 (13.0 ± 1.08)	-32.64	~10-10²	29.71 (27.4 ± 2.29)	35.03	~10²
	250	14.72 (13.4 ± 1.05)	-36.13	~10²	33.20 (30.5 ± 2.78)	39.01	~10²
	300	15.50 (14.1 ± 1.16)	-40.43	~10²	33.16 (29.6 ± 4.02)	39.67	~10²

[a] The maximum (average ± standard deviation) mobility was calculated from the saturated regime of at least five devices for each condition.

References

1 J. Pommerehne, H. Vestweber, W. Guss, R. F. Mahrt, H. Bässler, M. Porsch and J. Daub, *Adv. Mater.*, 1995, **7**, 551–554.