

Supporting Information

Side-chain Sequence Enabled Regioisomeric Acceptors for Conjugated Polymers

Xuyi Luo,[†] Dung T. Tran,[†] Natalie M. Kadlubowski,[†] Carr Hoi Yi Ho,[‡] Parand Riley,[‡] Franky So,[‡]
and Jianguo Mei^{*†}

[†]Department of Chemistry, Purdue University, 560 Oval Drive, West Lafayette, Indiana 47907, United States

[‡]Department of Materials Science and Engineering, North Carolina State University, Raleigh, North Carolina 27606, United States

Table of Contents

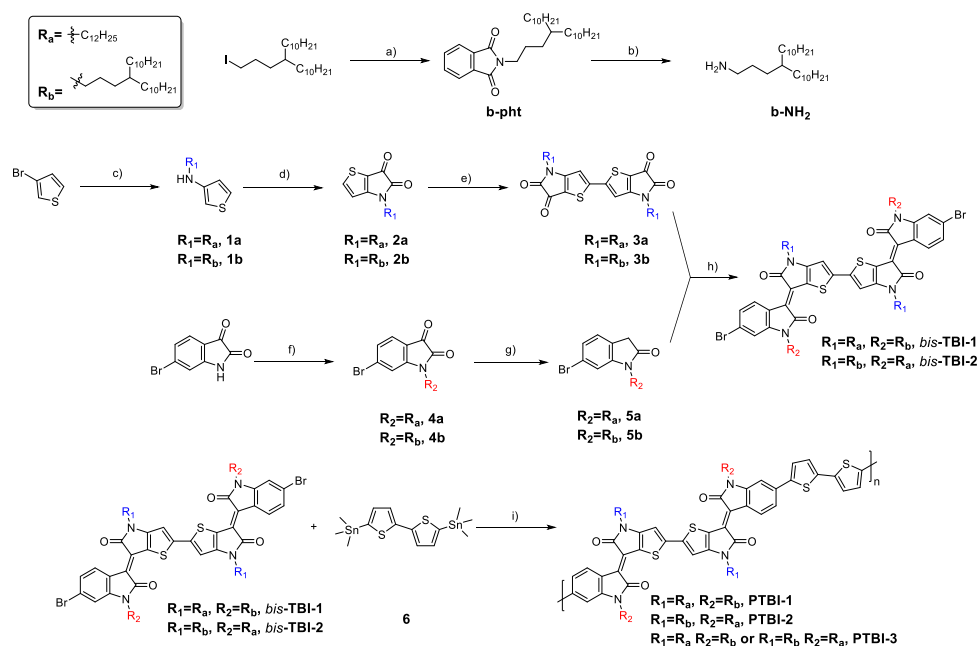
I. General Information.....	S2
II. Synthetic Procedures	S2
III. Characterizations.....	S9
IV. OFET Device Fabrication.....	S15
V. ¹ H- and ¹³ C-NMR spectra.....	S16

I. General Information

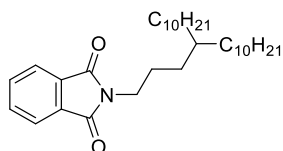
All reagents purchased from suppliers were used without further purification. ^1H - and ^{13}C -NMR spectra were recorded using Varian Inova 300, Bruker ARX 400 or Bruker Avance-III-800 in deuterated chloroform at 298 K. GPC was performed by high-temperature gel permeation chromatography at 150 °C using 1,2,4-trichlorobenzene (TCB) as eluent based on polystyrene standards. Differential scanning calorimetry (DSC) measurements were acquired using a TA Q1000 calorimeter at a heating rate of 10 °C min⁻¹ with nitrogen as purge gas. UV-vis-NIR spectra were measured with an Agilent Technologies Cary 6000i UV-Vis-NIR spectrophotometer (400 – 1200 nm). All the electrochemistry related experiments (CV, DPV) were performed by BioLogic SP-150, using a three-electrode system in propylene carbonate with 0.2 M *n*-Bu₄NPF₆ as supporting electrolyte (scan rate: 20 mV s⁻¹). The working electrode is a platinum bottom coated by the polymer thin film; the pseudoreference electrode is an Ag wire coated by AgCl; the counter electrode is a platinum wire. The oxidation potential of ferrocene/ferrocenium (Fc/Fc⁺) was measured under the same conditions to calibrate the reference, which was 0.38 V versus Ag/AgCl. 2D-GIXRD measurement was carried out in Argonne National Laboratory. AFM measurement was carried out using Asylum Cypher ES AFM. FET device characterization was carried out using Keithley 4200 in ambient air.

II. Synthetic Procedures

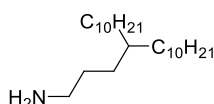
Scheme S1. Synthetic routes to PTBI-1, PTBI-2 and PTBI-3.



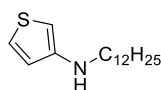
a) potassium phthalimide, DMF, 80 °C, overnight, 90%; b) Hydrazine hydrate, MeOH, reflux, 12 h, 95%; c) alkylamine, CuI, K₃PO₄, DMEA, 80 °C, 48 h; d) Oxalyl chloride, NEt₃, DCM, 0 °C to RT, overnight, 26% (**2a**) / 17% (**2b**) over two steps; e) AgF, Pd (OAc)₂, DMSO/dioxane, 90 °C, 24 h, 47% (**3a**) / 60% (**3b**); f) K₂CO₃, alkyl halide, DMF, 100 °C, overnight, 69% (**4a**) / 83% (**4b**); g) Hydrazine hydrate, DMSO, 130 °C, 24 h, 61% (**5a**) / 71% (**5b**); h) PTSA, Toluene, 110 °C, 12 h, 76% (**bis-TBI-1**) / 86% (**bis-TBI-2**); i) Pd₂(dba)₃, P(*o*-tol)₃, Toluene, 110 °C, 1 h, 79%-85%.



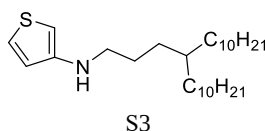
Compound b-pht: 11-(3-iodopropyl)henicosane (10.0 g, 21.5 mmol) and potassium phthalimide (4.78 g, 25.8 mmol) were added to DMF (60 mL). The mixture was stirred under N₂ at 80 °C overnight before being allowed to cool to room temperature. The reaction mixture was poured into water, extracted with hexanes and dried over Na₂SO₄. After removal of solvent under reduced pressure, the residue was purified by silica chromatography (hexanes:EtOAc = 30:1) to give the product (**b-pht**) as a colorless oil (9.4 g, 90%). ¹H NMR (400 MHz, CDCl₃, ppm) δ: 7.84 (dd, *J* = 5.4, 3.0 Hz, 2H), 7.70 (dd, *J* = 5.4, 3.0 Hz, 2H), 3.65 (t, *J* = 7.4 Hz, 2H), 1.70 – 1.59 (m, 2H), 1.39 – 1.14 (m, 39H), 0.86 (t, *J* = 6.6 Hz, 6H). ¹³C NMR (100 MHz, CDCl₃, ppm) δ: 168.34, 133.69, 132.09, 123.02, 38.39, 37.02, 33.38, 31.82, 30.66, 29.98, 29.58, 29.54, 29.25, 26.54, 25.73, 22.58, 14.01.



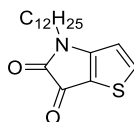
Compound b-NH₂: **b-pht** (9.4 g, 19.4 mmol) and hydrazine hydrate (2.92 g, 58.3 mmol) were added to CH₃OH (100 mL). The mixture was heated under N₂ at reflux for 12 h. After removal of MeOH under reduced pressure, the residue was diluted with hexanes and washed with 10% KOH twice. The combined aqueous layer was extracted with hexanes. The combined hexanes solutions were washed with brine and dried over Na₂SO₄. Removal of solvent under reduced pressure gives **b-NH₂** as a colorless oil. The product was used without further purification (6.5 g, 95%). ¹H NMR (400 MHz, CDCl₃, ppm) δ: 2.67 (m, 2H), 1.76 (br, 2H), 1.42 (m, 2H), 1.42 – 1.18 (m, 39H), 0.87 (t, *J* = 6.7 Hz, 6H). ¹³C NMR (100 MHz, CDCl₃, ppm) δ: 42.59, 37.18, 33.52, 31.82, 30.71, 30.03, 29.61, 29.56, 29.25, 26.58, 22.58, 14.01.



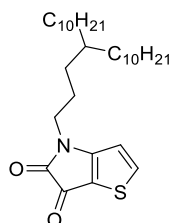
Compound 1a: 3-bromothiophene (5.03 g, 30.8 mmol), dodecan-1-amine (6.86 g, 37.0 mmol), tribasic potassium phosphate (13.1 g, 61.7 mmol) and copper (I) iodide (0.588 g, 3.08 mmol) were added to N,N-dimethylaminoethanol (60 mL). The mixture was stirred under N₂ at 80 °C for 48 h before being allowed to cool to room temperature. The reaction mixture was poured into saturated NH₄Cl aqueous solution, extracted three times with hexanes. The combined hexane solutions were washed with brine and dried over Na₂SO₄. After removal of solvent under reduced pressure, the residue was purified by flash silica chromatography (CH₂Cl₂) to give an air-sensitive crude product **1a** (4.00 g, crude yield) as a brown oil. The crude product was used without further purification.



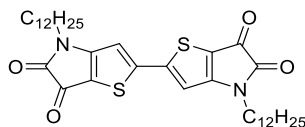
Compound 1b: Synthesized with the same procedure that was used for **1a** except that 3-bromothiophene (2.73 g, 16.7 mmol), **b-NH₂** (7.10 g, 20.1 mmol), tribasic potassium phosphate (7.10 g, 33.5 mmol) and copper (I) iodide (0.319 g, 1.67 mmol) were used. An air-sensitive crude product **1b** (2.51 g, crude yield) was obtained as a brown oil. The crude product was used without further purification.



Compound 2a: A solution of oxalyl chloride (2.47 g, 19.4 mmol) in dichloromethane (20 mL) was cooled to 0 °C. **1a** (4.00 g, 15.0 mmol) in 20 mL dichloromethane was added dropwise via an addition funnel. The solution was stirred at 0 °C for 30 min before dropwise addition of triethylamine (10 mL) in dichloromethane (10 mL). The mixture was stirred at room temperature overnight, after which it was poured into water, extracted with dichloromethane and dried over Na₂SO₄. After removal of solvent under reduced pressure, the residue was purified by silica chromatography (CH₂Cl₂) to give the product **2a** as a red crystalline solid. (2.57 g, 26% over two steps) ¹H NMR (300 MHz, CDCl₃, ppm) δ: 8.01 (d, *J* = 4.9 Hz, 1H), 6.79 (d, *J* = 4.9 Hz, 1H), 3.60 (t, *J* = 7.0 Hz, 2H), 1.65-1.59 (m, 2H), 1.43-1.05 (m, 18H), 0.80 (t, *J* = 6.4 Hz, 3H). ¹³C NMR (75 MHz, CDCl₃, ppm) δ: 172.82, 165.04, 161.33, 144.68, 113.04, 110.81, 42.16, 31.96, 29.65, 29.39, 28.25, 26.83, 22.77, 14.32.

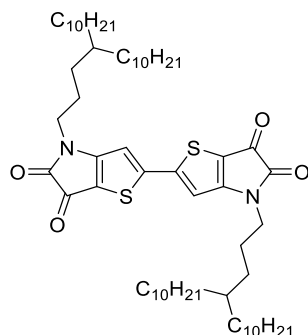


Compound 2b: Synthesized with the same procedure that was used for **2a** except that **1b** (2.50 g, 5.74 mmol), oxalyl chloride (0.947 g, 7.46 mmol) and triethylamine (4 mL) were used. Purification by silica chromatography (Hexanes:EtOAc = 20:1) provided the product **2b** as an orange oil. (1.37 g, 17% over two steps) ¹H NMR (300 MHz, CDCl₃, ppm) δ: 7.99 (d, *J* = 4.9 Hz, 1H), 6.78 (d, *J* = 5.0 Hz, 1H), 3.63 (t, *J* = 7.3 Hz, 2H), 1.70 – 1.59 (m, 2H), 1.37 – 1.13 (m, 39H), 0.87 (t, *J* = 7.1 Hz, 6H). ¹³C NMR (75 MHz, CDCl₃, ppm) δ: 172.80, 165.01, 161.31, 143.94, 113.00, 110.90, 42.56, 37.09, 33.50, 32.00, 30.65, 30.15, 29.76, 29.44, 26.69, 25.40, 22.79, 14.25.

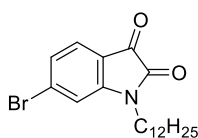


Compound 3a: **2a** (950 mg, 2.96 mmol), Silver Fluoride (825 mg, 6.50 mmol) and Palladium(II) acetate (66.3 mg, 0.296 mmol) were added to 30 mL of DMSO. The mixture was stirred under N₂

at 90 °C for 24 h before being allowed to cool to room temperature. The reaction mixture was poured into water, extracted with dichloromethane and dried over Na₂SO₄. After removal of solvent under reduced pressure, the residue was purified by silica chromatography (CH₂Cl₂) to give the product (**3a**) as a dark purple solid (446 mg, 47%). ¹H NMR (400 MHz, CDCl₃, ppm) δ: 6.99 (s, 2H), 3.69 (t, *J* = 7.2 Hz, 4H), 1.71 (m, 4H), 1.40-1.24 (m, 36H), 0.88 (t, *J* = 6.7 Hz, 6H). ¹³C NMR (100 MHz, CDCl₃, ppm) δ: 172.20, 164.24, 160.28, 151.50, 111.58, 110.58, 42.26, 31.73, 29.42, 29.35, 29.29, 29.13, 28.97, 28.06, 26.64, 22.47, 13.84.

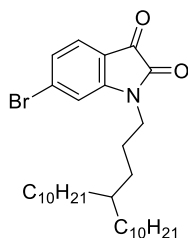


Compound 3b: Synthesized with the same procedure that was used for **3a** except that **2b** (729 mg, 1.49 mmol), Silver Fluoride (415 mg, 3.27 mmol) and Palladium(II) acetate (33.4 mg, 0.149 mmol) were added to a mixture of 15 mL DMSO and 15 mL dioxane (dioxane improves the solubility of **2b**). Purification by silica chromatography (CHCl₃) provided the product (**3b**) as a dark purple solid (440 mg, 60%). ¹H NMR (300 MHz, CDCl₃, ppm) δ: 7.00 (s, 2H), 3.68 (t, *J* = 7.2 Hz, 4H), 1.68 (m, 4H), 1.43 – 1.11 (m, 78H), 0.87 (t, *J* = 6.8 Hz, 12H). ¹³C NMR (75 MHz, CDCl₃, ppm) δ: 172.24, 164.28, 160.31, 151.71, 111.51, 110.74, 42.78, 37.12, 33.50, 32.01, 30.73, 30.19, 29.80, 29.75, 29.45, 26.71, 25.50, 22.80, 14.25.



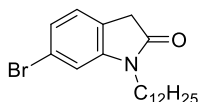
Compound 4a: 6-Bromoisatin (1.13 g, 5.02 mmol), potassium carbonate (1.04 g, 7.52 mmol) and 1-bromododecane (1.50 g, 6.02 mmol) were added into 50 mL DMF. The mixture was stirred under N₂ at 100 °C overnight before being allowed to cool to room temperature. The reaction mixture was extracted with dichloromethane and dried over Na₂SO₄. After removal of solvent under reduced pressure, the residue was purified by silica chromatography (hexanes:CH₂Cl₂ = 1:3) to give the product (**5a**) as a yellow solid (1.37 g, 69%). ¹H NMR (400 MHz, CDCl₃, ppm) δ: 7.44 (d, *J* = 7.9 Hz, 1H), 7.26 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.05 (d, *J* = 1.5 Hz, 1H), 3.68 (t, *J* = 7.3 Hz, 2H), 1.66 (m, 2H), 1.50 – 1.12 (m, 18H), 0.86 (t, *J* = 6.8 Hz, 3H).

*Spectroscopic data is supported by the literature.*¹

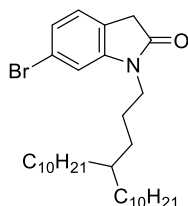


Compound 4b: Synthesized with the same procedure that was used for **4a** except that 11-(3-iodopropyl)henicosane (2.47 g, 5.31 mmol), 6-Bromoisatin (1.00 g, 4.42 mmol), potassium carbonate (0.917 g, 6.64 mmol) were added to a mixture of 25 mL DMF and 25 mL THF. Purification by silica chromatography (hexanes:CH₂Cl₂ = 1:1) provided the product (**4b**) as an orange solid (2.07 g, 83%). ¹H NMR (400 MHz, CDCl₃, ppm) δ: 7.46 (d, *J* = 7.9 Hz, 1H), 7.27 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.06 (d, *J* = 1.2 Hz, 1H), 3.68 (t, *J* = 7.3 Hz, 2H), 1.66 (m, 2H), 1.40 – 1.13 (m, 39H), 0.87 (t, *J* = 6.7 Hz, 6H).

*Spectroscopic data is supported by the literature.*²

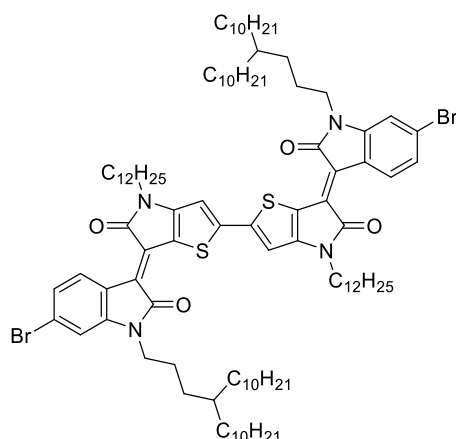


Compound 5a: **4a** (1.37 g, 3.9 mmol) and hydrazine monohydrate (10 mL) were added to 10 mL of DMSO. The mixture was stirred under N₂ at 130 °C for 24 h before being allowed to cool to room temperature. The reaction was poured into water, extracted with dichloromethane and dried over Na₂SO₄. After removal of the solvent under reduced pressure, the residue was purified by silica chromatography (hexanes:CH₂Cl₂ = 2:3) to give the product (**5a**) as a yellow oil (811 mg, 61%). ¹H NMR (400 MHz, CDCl₃, ppm) δ: 7.14 (d, *J* = 7.9 Hz, 1H), 7.08 (d, *J* = 7.8 Hz, 1H), 6.94 (s, 1H), 3.65 (t, *J* = 7.5 Hz, 2H), 3.44 (s, 2H), 1.64 (m, 2H), 1.43 – 1.15 (m, 18H), 0.87 (t, *J* = 6.6 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃, ppm) δ: 174.56, 145.95, 125.52, 124.70, 123.35, 121.21, 111.58, 40.09, 35.26, 31.80, 29.51, 29.46, 29.40, 29.23, 29.16, 27.22, 26.82, 22.58, 14.02.

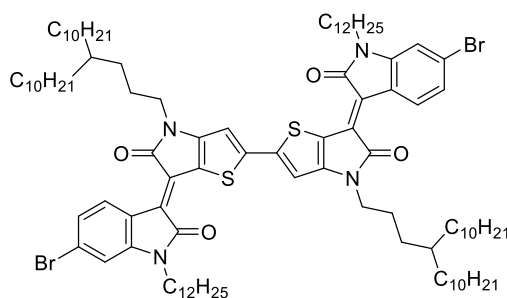


Compound 5b: Synthesized with the same procedure that was used for **5a** except that **4b** (2.07 g, 3.68 mmol) was used. Purification by silica chromatography (hexanes:CH₂Cl₂ = 1:1) provided the product (**5b**) as a yellow oil (1.43 mg, 71%). ¹H NMR (400 MHz, CDCl₃, ppm) δ: 7.15 (d, *J* = 8.0 Hz, 1H), 7.08 (d, *J* = 7.8 Hz, 1H), 6.94 (s, 1H), 3.63 (t, *J* = 7.5 Hz, 2H), 3.45 (s, 2H), 1.62 (t, *J* = 7.5 Hz, 2H), 1.23 (m, 39H), 0.87 (t, *J* = 6.4 Hz, 6H).

*Spectroscopic data is supported by the literature.*³

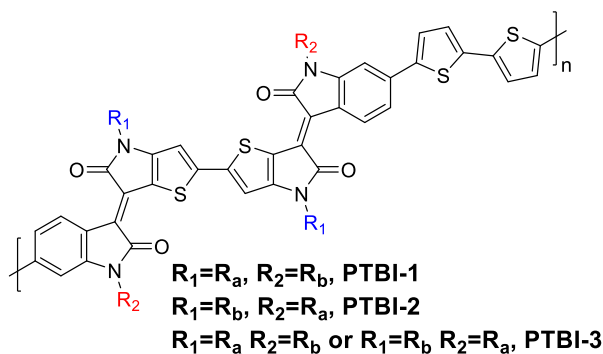


Compound *bis*-TBI-1: *p*-Toluenesulfonic acid monohydrate (16.2 mg, 0.0854 mmol) was added to a solution of **3a** (137 mg, 0.213 mmol) and **5b** (246 mg, 0.448 mmol) in Toluene (15 mL). The mixture was stirred under N₂ at 110 °C for 12 h before being allowed to cool to room temperature. After removal of the solvent under reduced pressure, the residue was purified by silica chromatography (hexanes:chloroform = 2:1) to give the product (*bis*-TBI-1) as a dark green solid (275 mg, 76%). ¹H NMR (800 MHz, CDCl₃, ppm) δ: 8.83 (d, *J* = 8.3 Hz, 2H), 7.04 (d, *J* = 8.3 Hz, 2H), 6.98 (s, 2H), 6.86 (s, 2H), 3.77 (t, *J* = 7.5 Hz, 4H), 3.72 (t, *J* = 7.9 Hz, 4H), 1.73 (m, 4H), 1.66 (m, 4H), 1.49 – 1.09 (m, 114H), 0.86 (m, 18H). ¹³C NMR (200 MHz, CDCl₃, ppm) δ: 169.76, 168.64, 153.15, 147.15, 144.34, 129.58, 128.64, 125.10, 125.03, 120.68, 119.95, 116.46, 111.22, 107.13, 42.00, 40.61, 37.29, 33.58, 31.94, 30.91, 30.15, 29.73, 29.67, 29.65, 29.62, 29.46, 29.38, 28.60, 27.07, 26.72, 24.79, 22.70, 14.13. HRMS (APCI) calcd. for C₁₀₀H₁₅₇Br₂N₄O₄S₂⁺ ([M+H]⁺): 1700.0008; found 1700.0000.



Compound *bis*-TBI-2: Synthesized with the same procedure that was used for *bis*-TBI-1 except that *p*-Toluenesulfonic acid monohydrate (11.67 mg, 0.0614 mmol) was added to a solution of **3b** (150 mg, 0.154 mmol) and **5a** (128 mg, 0.338 mmol) in Toluene. Purification by silica chromatography (hexanes:chloroform = 2:1) provided the product (*bis*-TBI-2) as a dark green solid (225 mg, 86%). ¹H NMR (800 MHz, CDCl₃, ppm) δ: 8.82 (d, *J* = 8.5 Hz, 2H), 7.04 (d, *J* = 8.5 Hz, 2H), 6.98 (s, 2H), 6.87 (s, 2H), 3.81 – 3.66 (m, 8H), 1.80 – 1.65 (m, 8H), 1.45 – 1.09 (m, 114H), 0.87 (t, *J* = 7.2 Hz, 6H), 0.84 (t, *J* = 7.3 Hz, 12H). ¹³C NMR (200 MHz, CDCl₃, ppm) δ: 169.80, 168.67, 153.17, 147.18, 144.36, 129.63, 128.64, 125.12, 124.99, 120.68, 119.99, 116.43, 111.17, 107.15, 42.34, 40.33, 37.36, 33.59, 31.93, 30.96, 30.16, 29.74, 29.67, 29.65, 29.63, 29.60, 29.44, 29.38, 27.73, 27.12, 26.73, 25.78, 22.69, 14.13, 14.12. HRMS (APCI) calcd. for C₁₀₀H₁₅₇Br₂N₄O₄S₂⁺ ([M+H]⁺): 1700.0008; found 1699.9986.

General procedure for Polymerization



To a Schlenk tube charged with a stir bar, *bis*-**TBI-1** or *bis*-**TBI-2** (1.0 equiv.), diti Compound **6** (1.0 equiv.), Pd₂(dba)₃ (2.5 mol%), P(*o*-tol)₃ (4 mol%) and 15 mL of toluene were added. The resulting solution was bubbled with argon for 20 min, and the mixture was stirred for 1 h at 110 °C. After the polymerization was complete, the mixture was taken up and precipitated into methanol. The solids were collected by a soxhlet thimble, which was purified by Soxhlet extraction successively with acetone, hexane, dichloromethane and chloroform. To remove residual catalyst, *N,N*-diethyl-2-phenyldiazene-carbothioamide was added to the chloroform fraction, and the mixture was stirred for 30 min at 60 °C before being precipitated into methanol. The collected polymer was dried at 60 °C under vacuum.

PTBI-1: 69.91 mg (0.04107 mmol) of *bis*-**TBI-1** and 20.20 mg of (0.04107 mmol) **6** were used. Precipitation provided 63.8 mg (85% yield) of a dark solid. $M_n = 9.8$ KDa, PDI = 1.5.

PTBI-2: 75.79 mg (0.04452 mmol) of *bis*-**TBI-2** and 21.90 mg (0.04452 mmol) of **6** were used. Precipitation provided 67.4 mg (83% yield) of a dark solid. $M_n = 8.6$ KDa, PDI = 1.4.

PTBI-3: 36.34 mg (0.02134 mmol) of *bis*-**TBI-1**, 36.34 mg *bis*-**TBI-2** (0.02134 mmol) and 21.00 mg (0.04269 mmol) of **6** were used. Precipitation provided 61.0 mg (79% yield) of a dark solid. $M_n = 8.9$ KDa, PDI = 1.5.

III. Characterizations and DFT Calculations

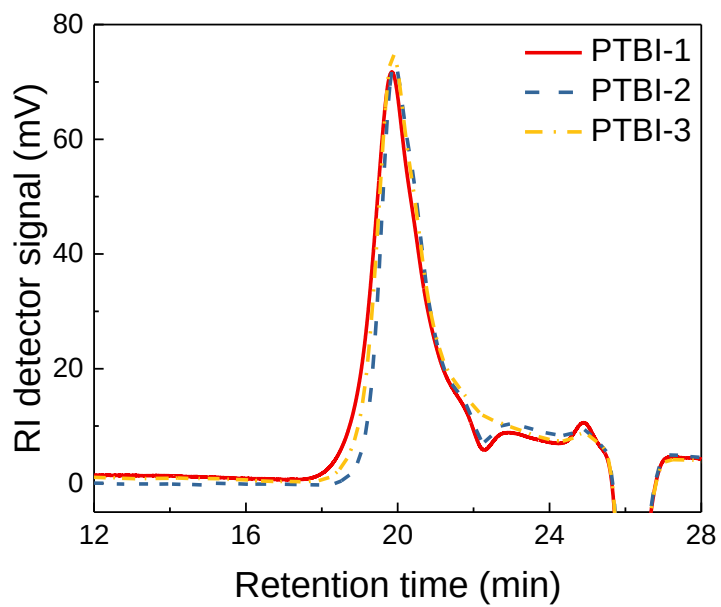


Figure S1. Gel permeation chromatograms of three PTBI polymers by gel permeation chromatography at 150 °C using 1,2,4-trichlorobenzene (TCB) as eluent.

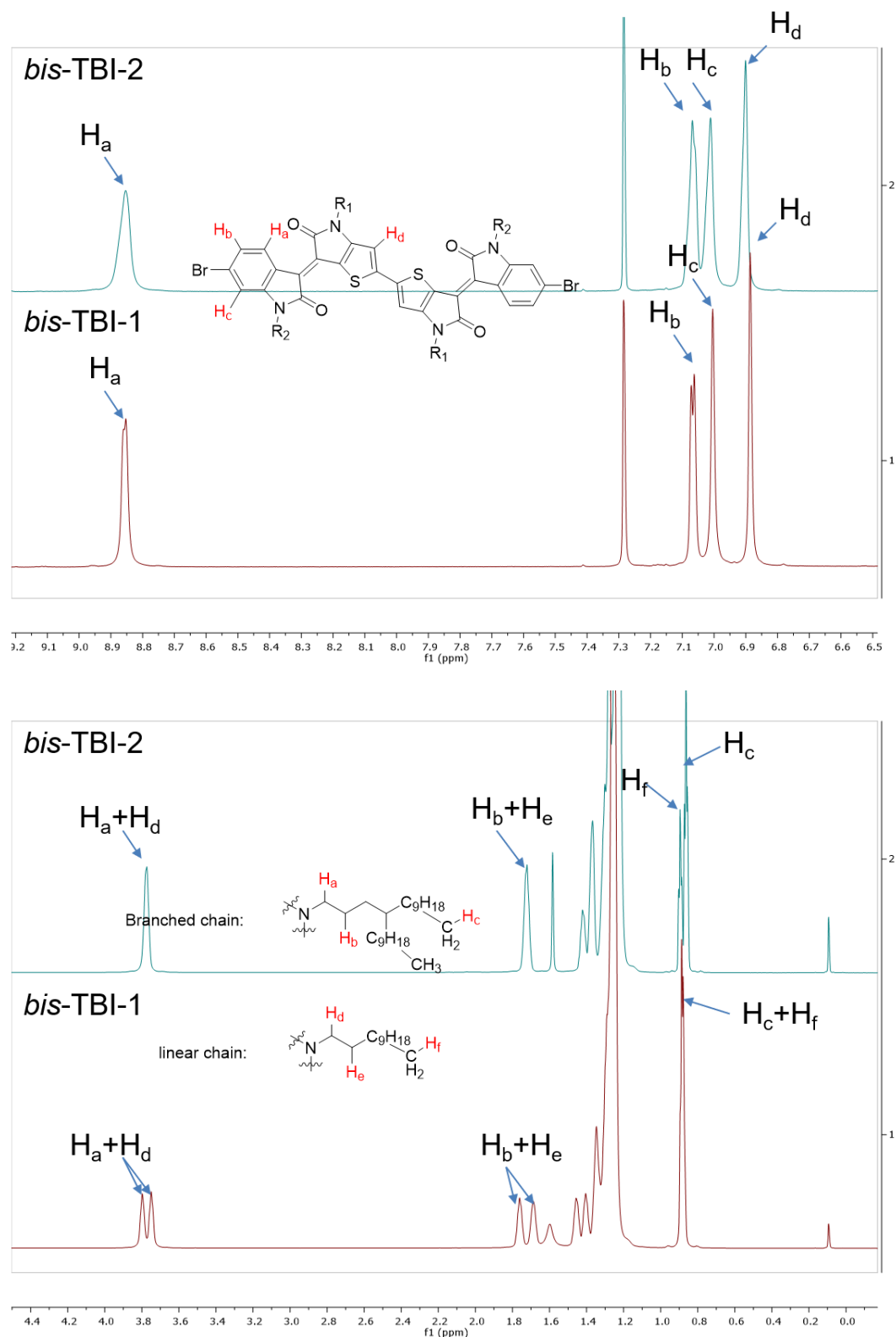


Figure S2. ¹H – NMR spectra comparison of *bis*-TBI-1 and *bis*-TBI-2 in the aromatic region (top) and aliphatic region (bottom). NMR spectra were collected with 20 mg/mL CDCl₃ solution at room temperature. *bis*-TBI-2 only showed slightly broader peaks than *bis*-TBI-1 in the aromatic region, and their corresponding aromatic hydrogens basically share the same chemical shifts. The small discrepancy could be a shimming issue, or subtle change on the backbone chemical environment.

The peaks of *bis*-TBI-2 and *bis*-TBI-1 in the aliphatic region are more distinguishable. It is worth noting that even the terminal methyl hydrogens (H_f) of branched C3C10C10 alkyl chains have different chemical shifts, showing the two substitution positions (namely R_1 and R_2) have distinct chemical environments.

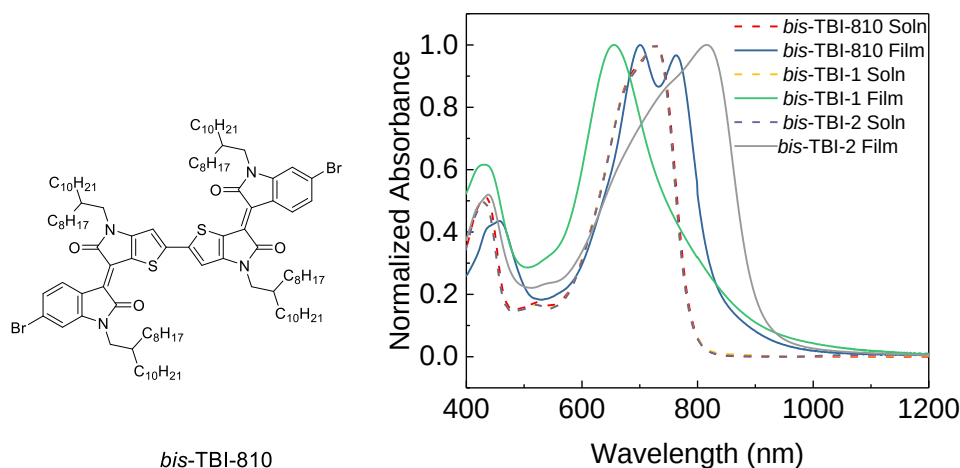


Figure S3. chemical structure of *bis*-TBI-810 and normalized absorption spectra of *bis*-TBI-810, *bis*-TBI-1 and *bis*-TBI-2 in chloroform solution (dashed line) and as films (solid line).⁴ *bis*-TBI-810 also shares the same backbone with *bis*-TBI-1 and *bis*-TBI-2 but bearing four identical branched side chains. In diluted chloroform, absorption spectrum of *bis*-TBI-810 also shows a backbone controlled electronic behavior, overlapping with spectra of *bis*-TBIs. However, the absorption spectrum of *bis*-TBI-810 film doesn't show predominant J- or H- aggregates. The example of three molecules demonstrate strong tuning capability of side chains towards interchain interaction of bis-TBI moiety.

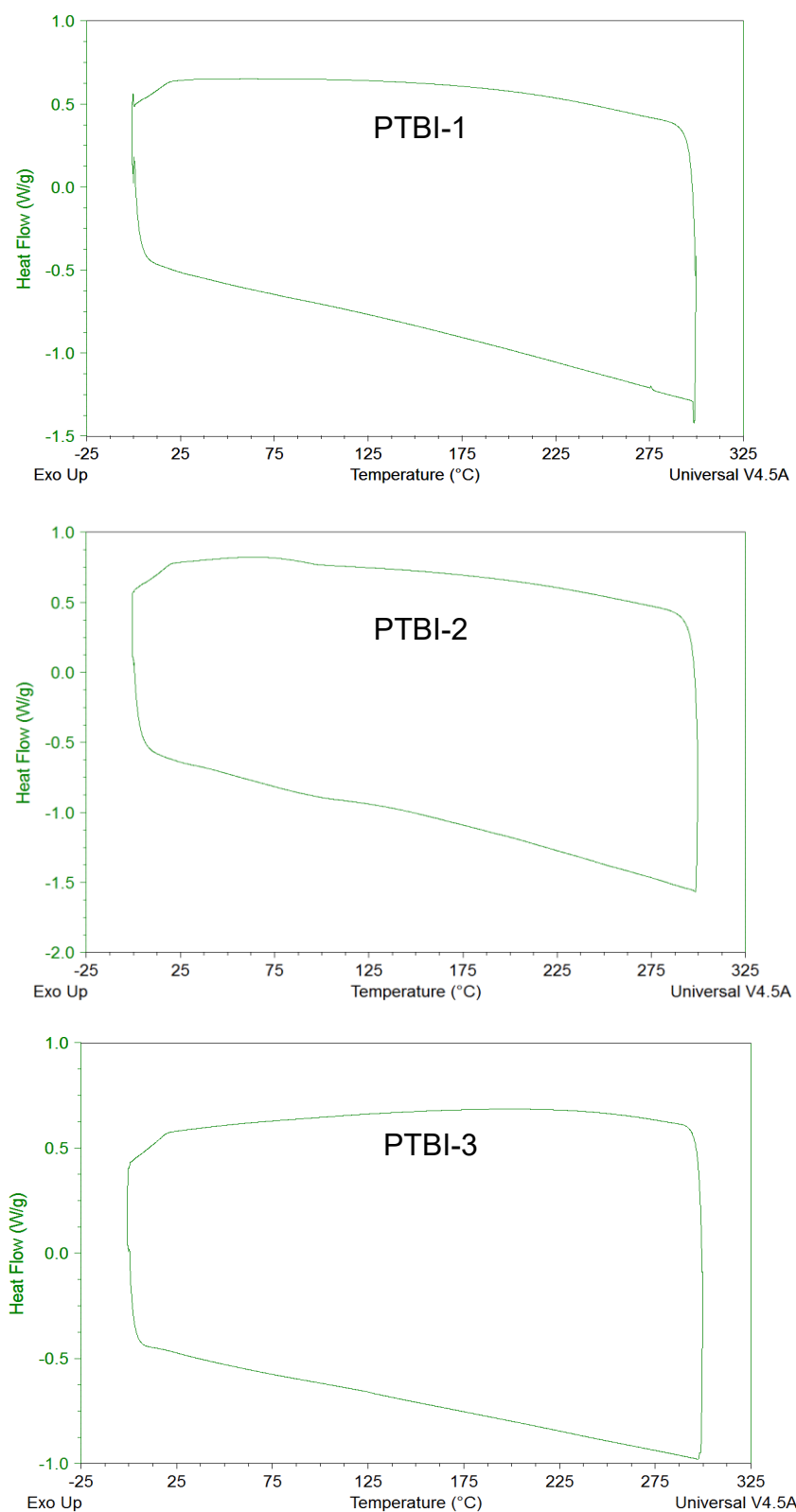


Figure S4. Differential scanning calorimetry (DSC) plots of PTBI-1, PTBI-2 and PTBI-3. No significant peak was found.

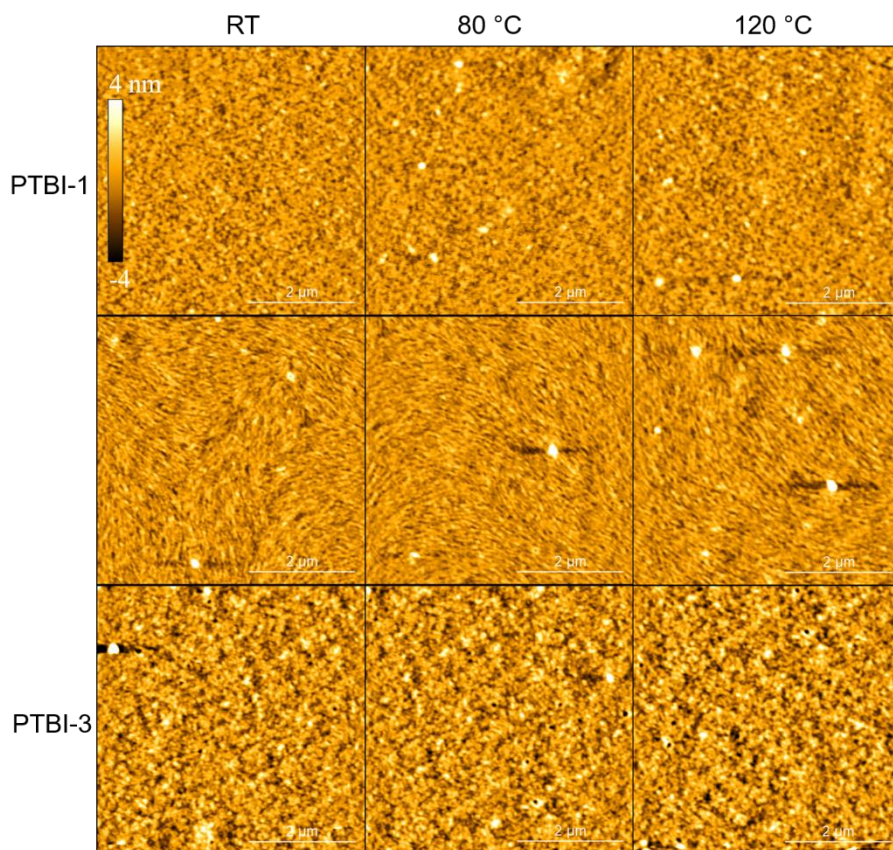


Figure S5. AFM height images of PTBI polymer thin films at different temperature. No change of morphology feature was observed from room temperature to 120 °C (device annealing temperature) *o*-DCB solutions.

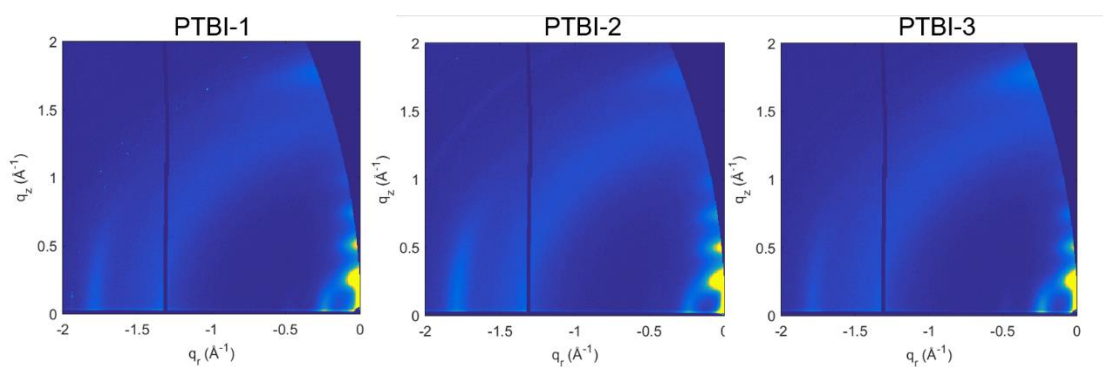


Figure S6. GIXRD images of PTBI polymer thin films annealed at 120 °C from *o*-DCB solutions.

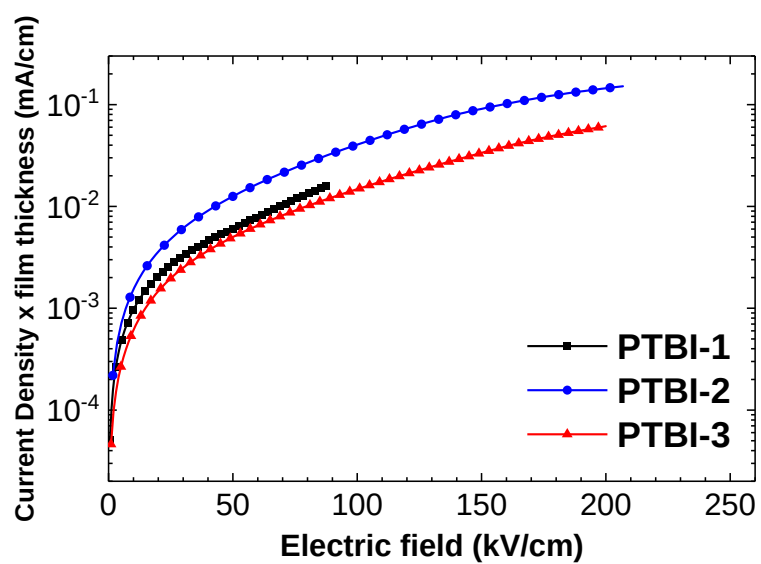
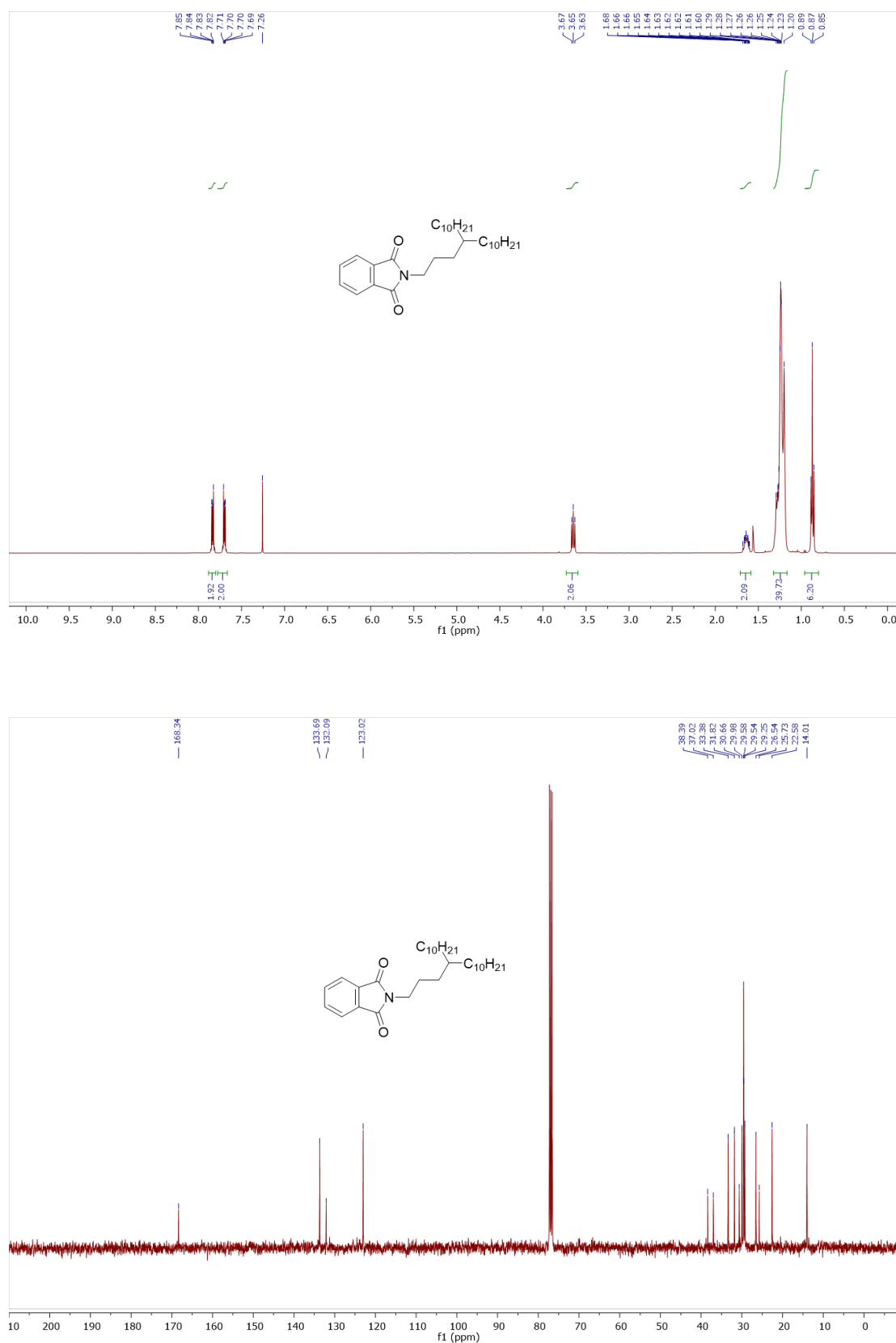


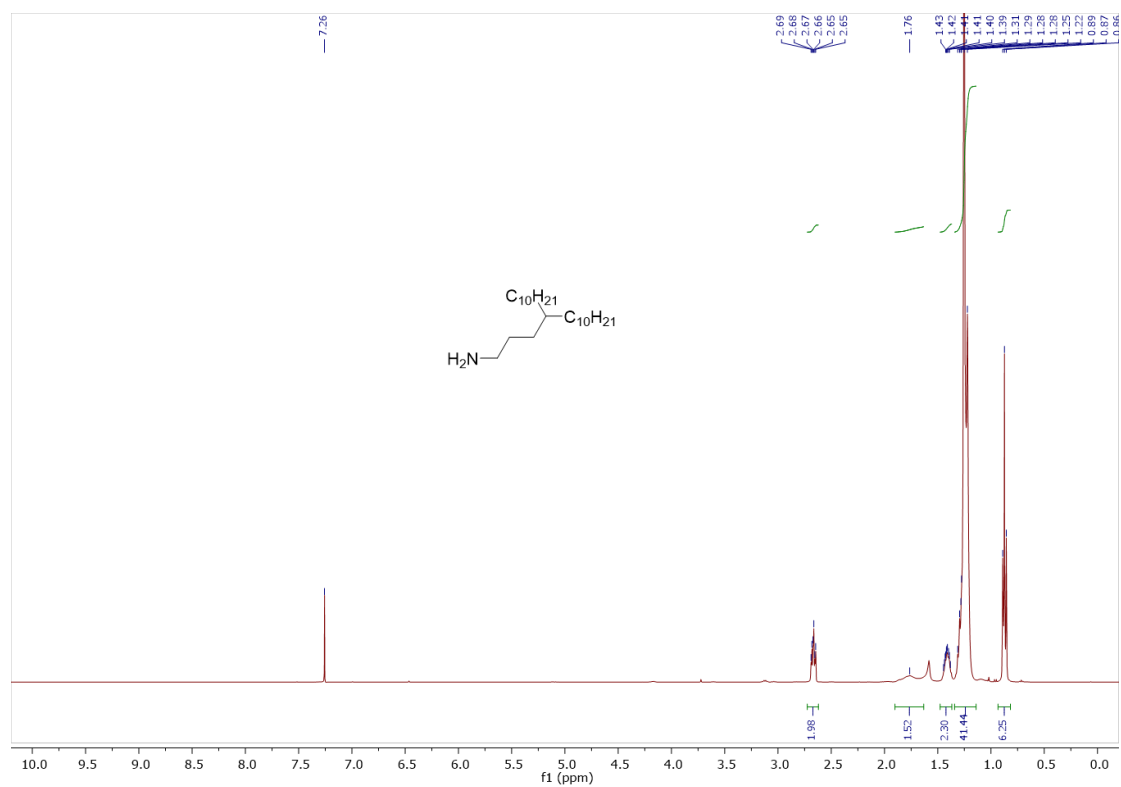
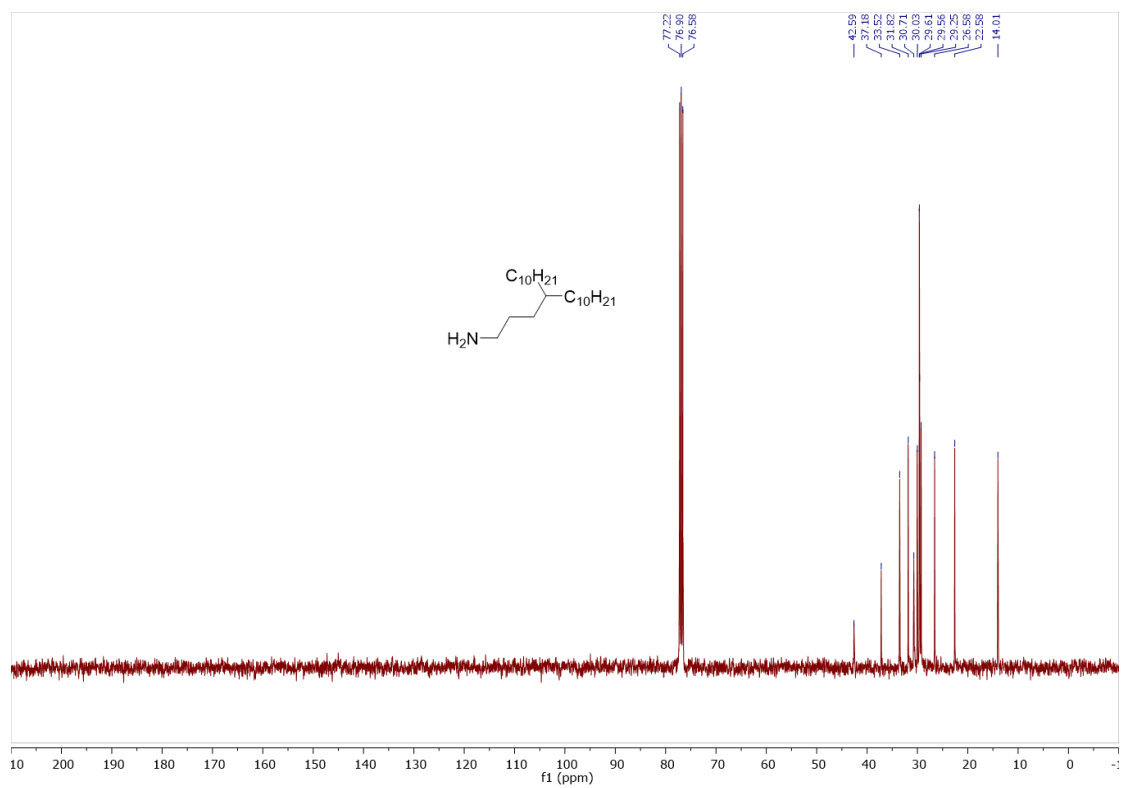
Figure S7. J-V characteristics of hole-only diodes of three PTBI polymers. Device structure: ITO/MoO_x/polymer/MoO_x/Ag.

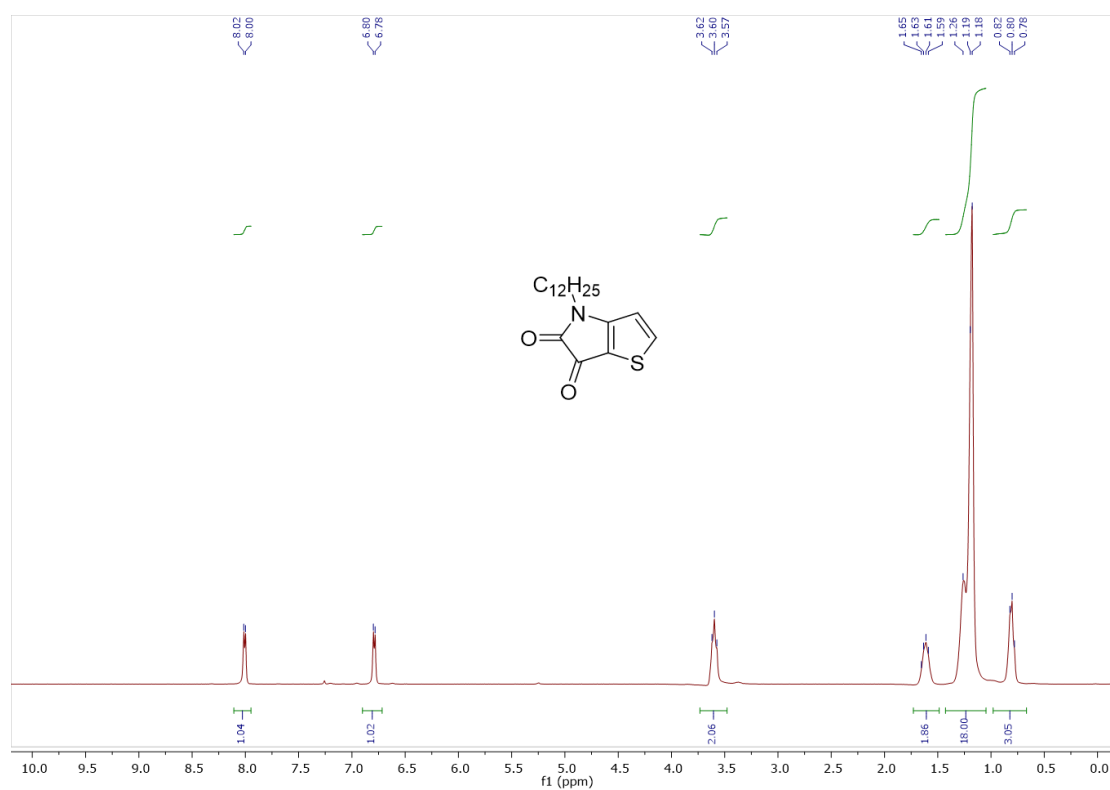
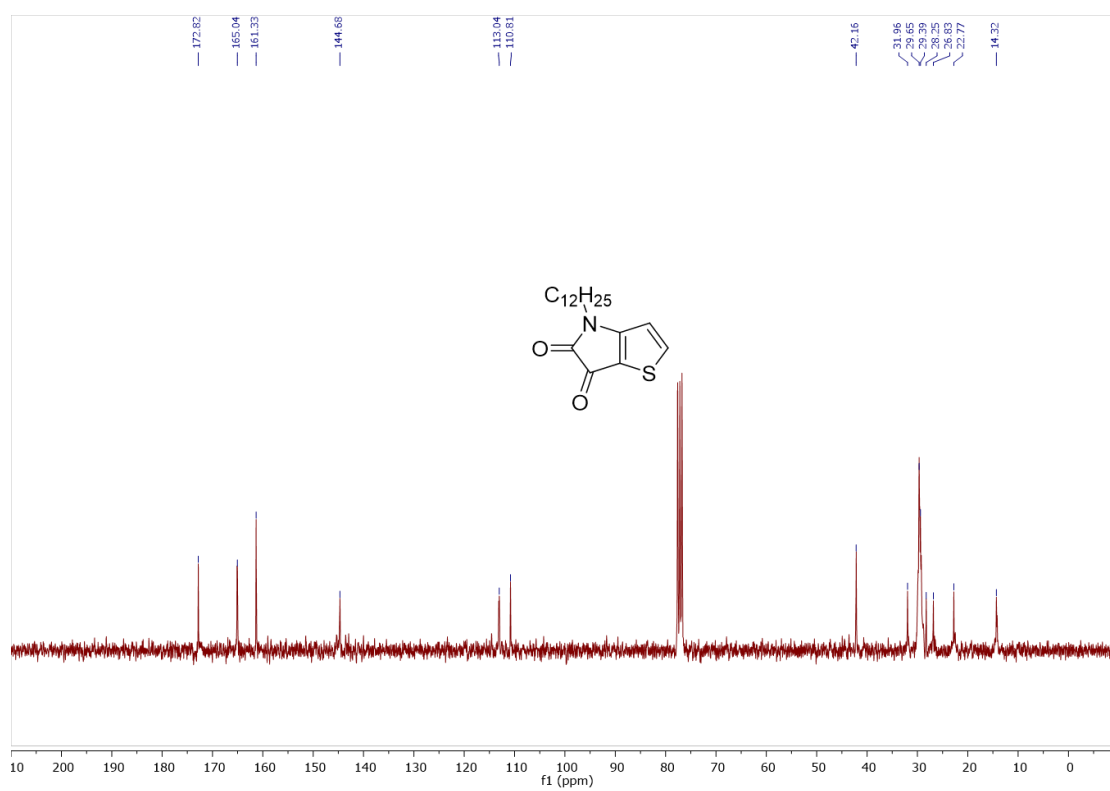
IV. OFET Device Fabrication and Transistor Properties

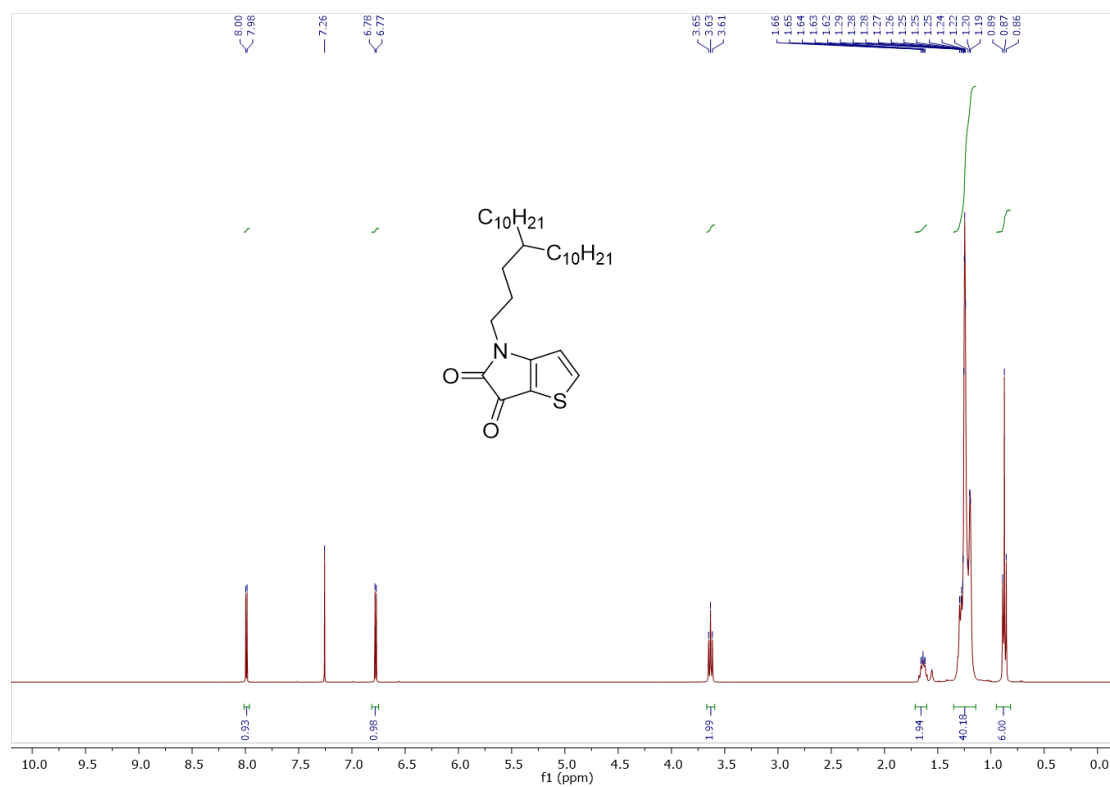
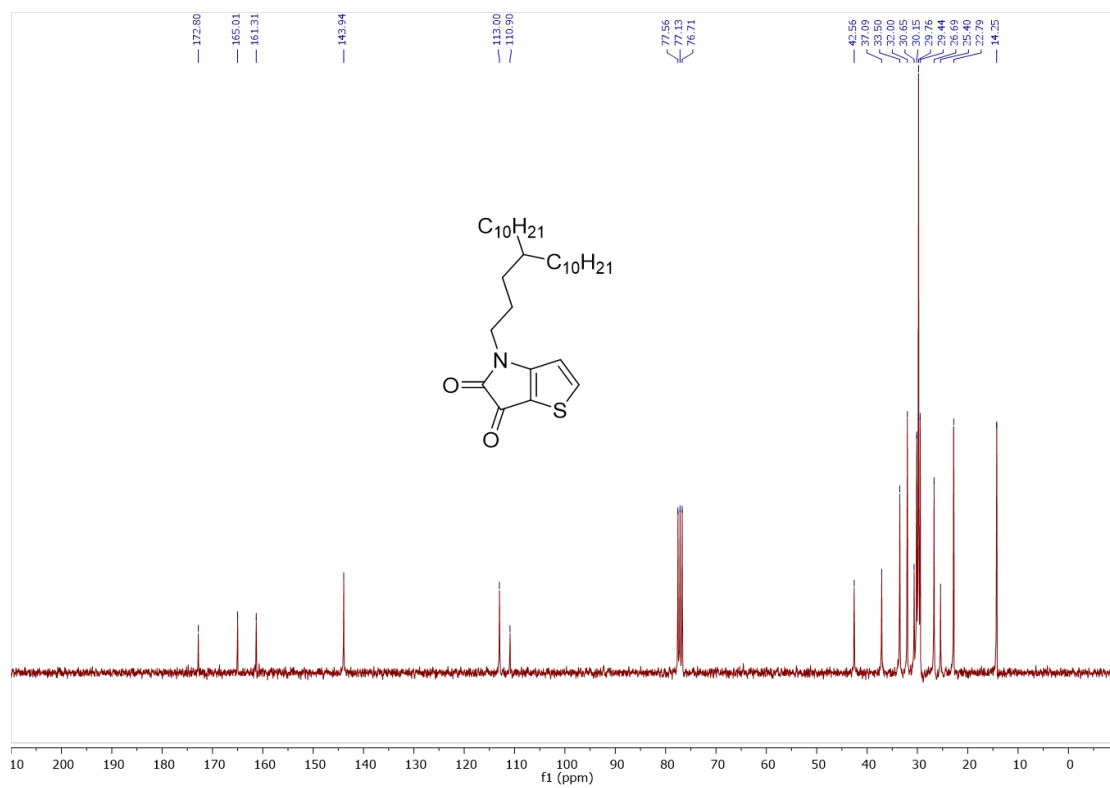
A heavily n-doped Si wafer with a 300-nm SiO₂ surface layer (capacitance of 11 nF/cm²) was employed as the substrate with Si wafer serving as the gate electrode and SiO₂ as the dielectric. The gold S/D electrodes were sputtered and patterned by photolithography technique. For the octadecyltrichlorosilane (OTS) modification, the silicon wafer (with Au bottom contact) was first cleaned with hot piranha solution (98%H₂SO₄:30%H₂O₂=2:1). It was then further subjected to sonication sequentially in water, ethanol, acetone for 6 min each. After drying at an oven, the silicon wafer was then put in a petri dish with a small drop of OTS. The dish was then covered and heated in a vacuum oven at 120 °C for 3 hours resulting in the formation of an OTS self-assembled monolayer on the surface. The OTS modified substrates were rinsed successively with hexane, ethanol, and chloroform, and dried by nitrogen before used. All polymers were dissolved in *o*-DCB at 5mg/mL at 50 °C for 1h. The polymers were then spin coated in ambient air on the substrate at 1500 rpm for 60 s, followed by 4000 rpm for 60s to wipe out residual solvent on the surface. All polymer films were annealed at 120 °C for 15 min inside the glovebox. The device channel length was 30 μm, and the channel width was 1000 μm. FET device characterization was carried out using Keithley 4200 in ambient air.

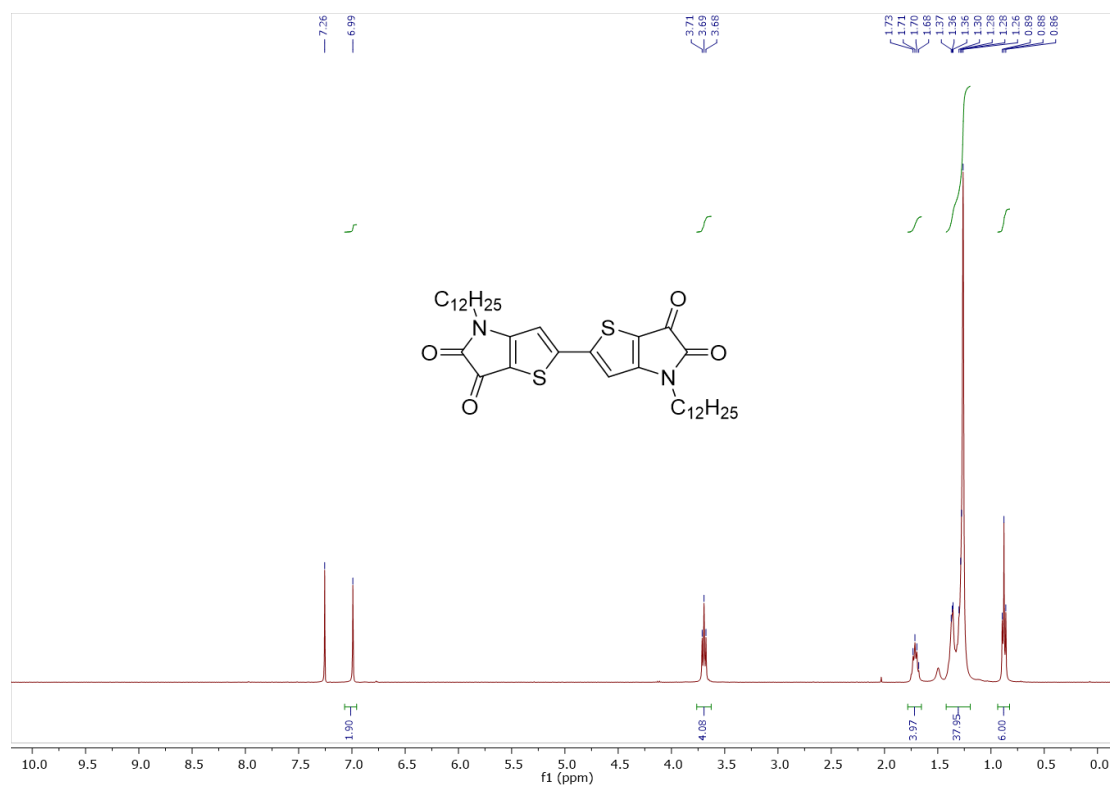
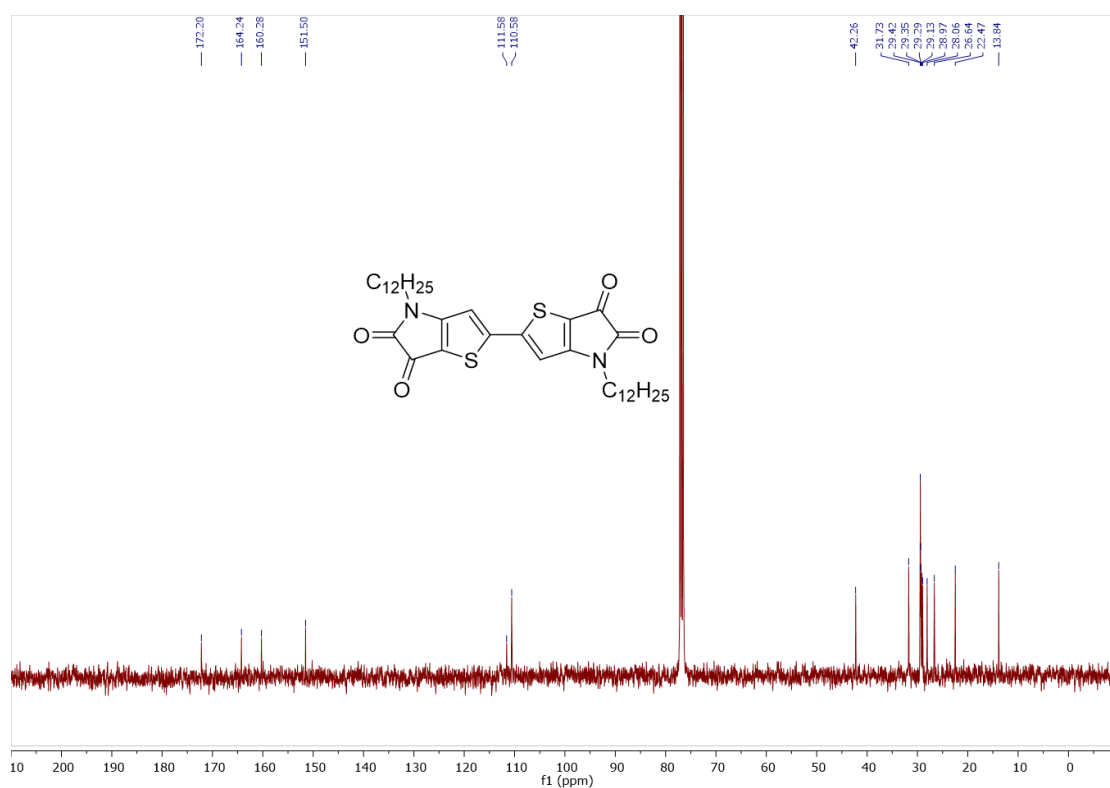
V. ^1H - and ^{13}C -NMR spectra

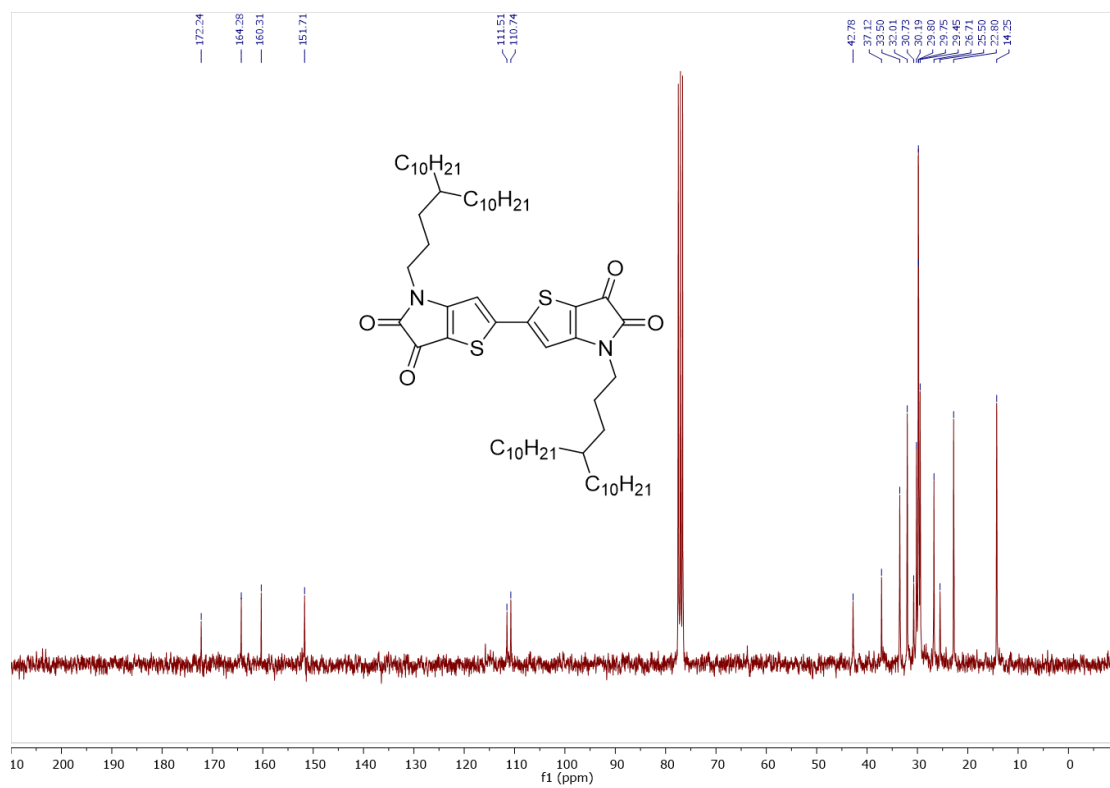


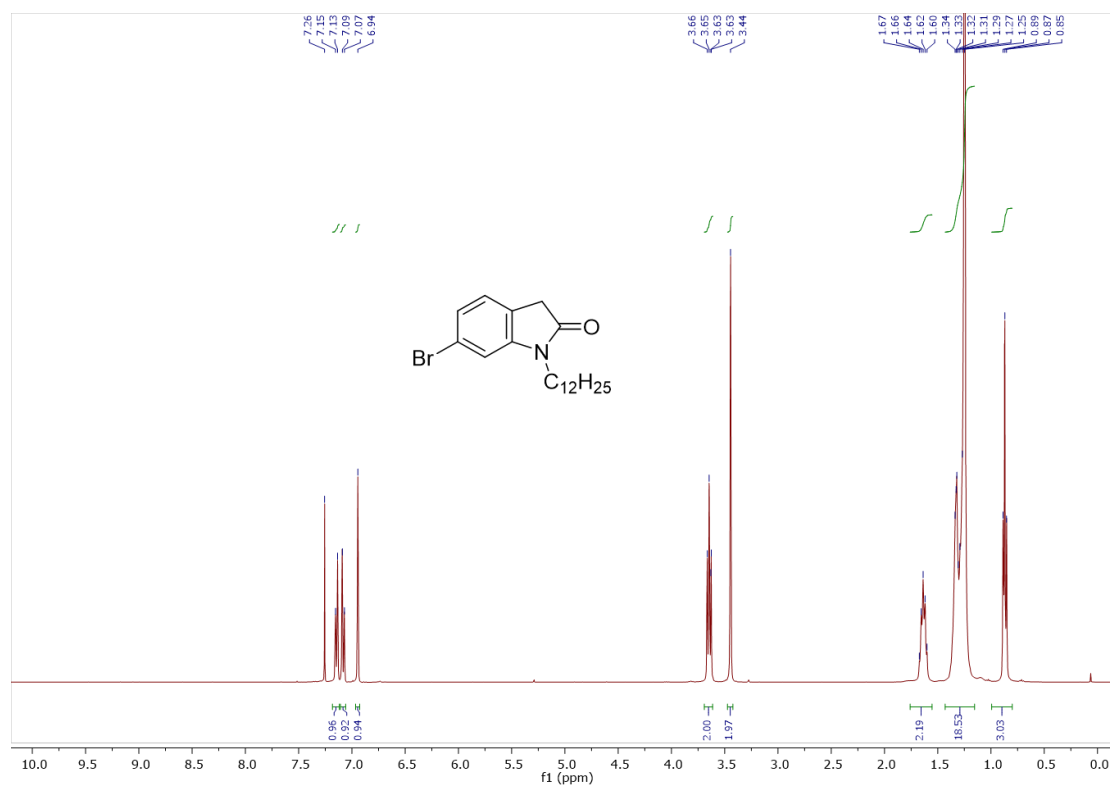
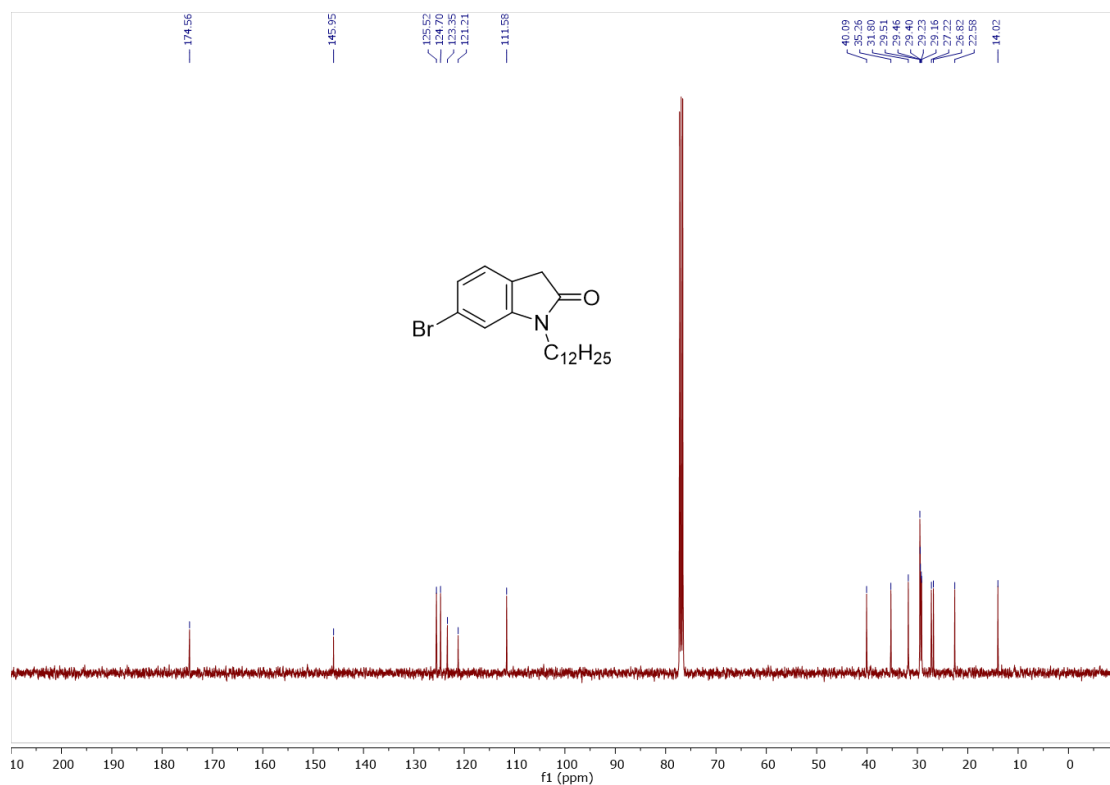


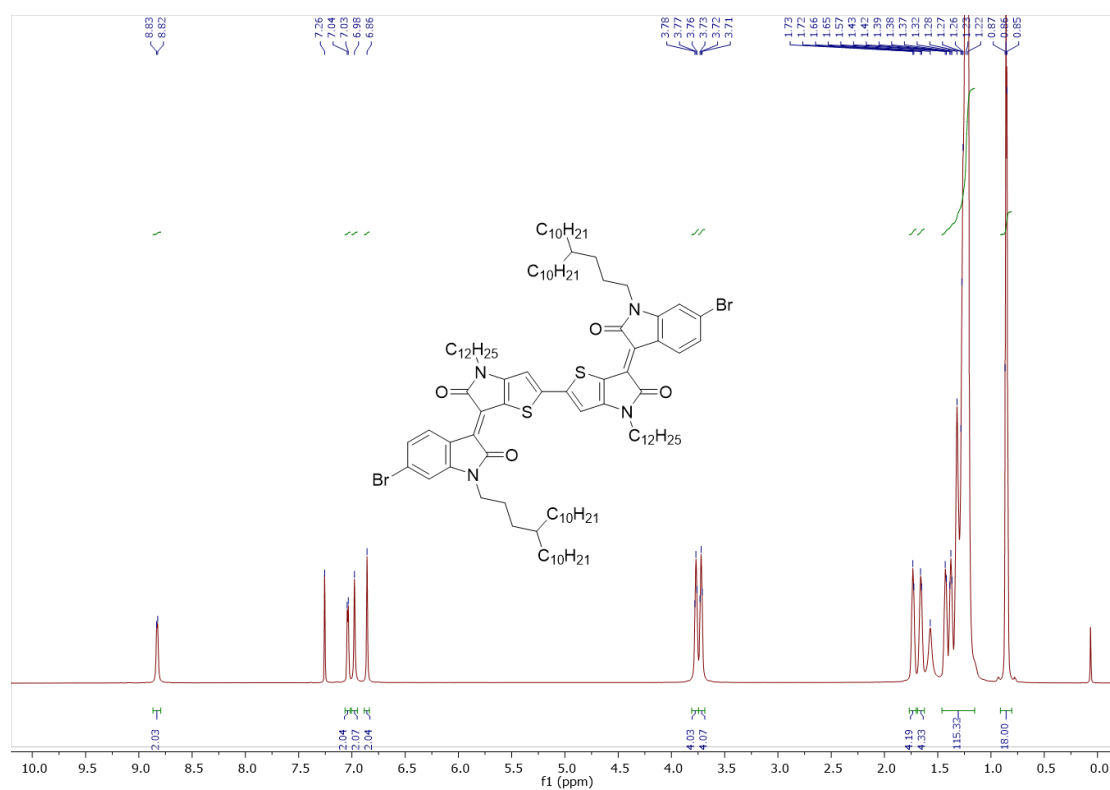
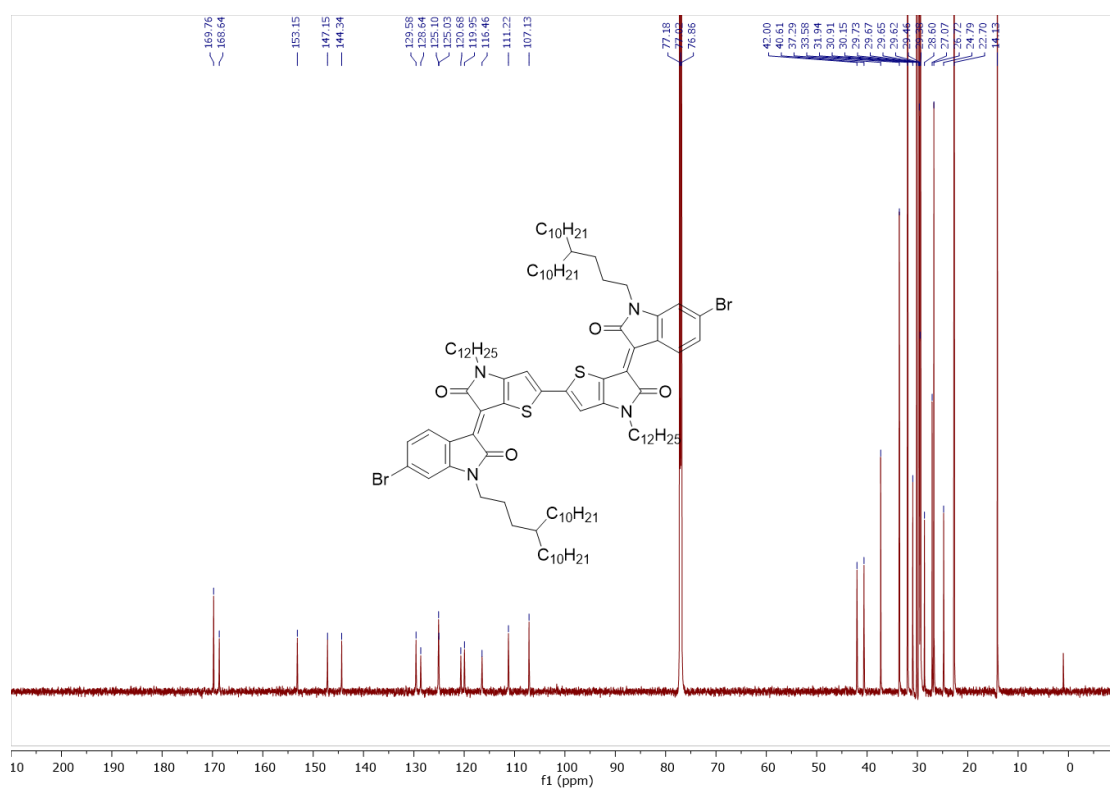


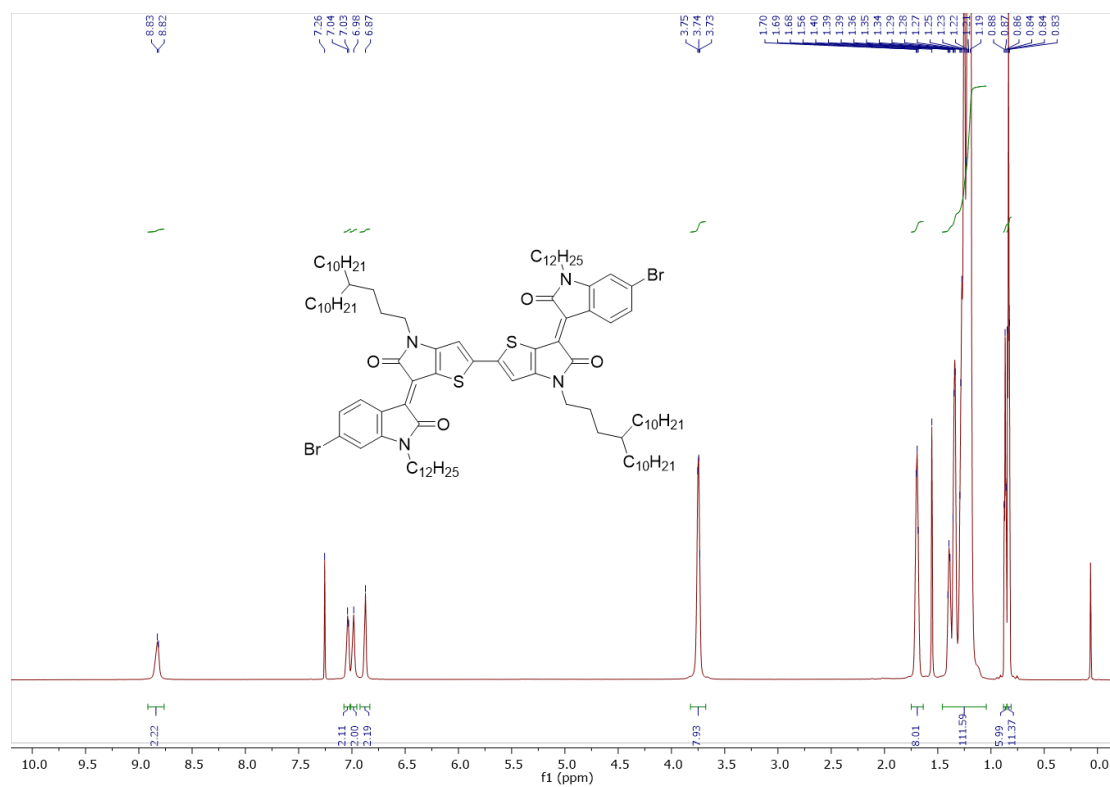
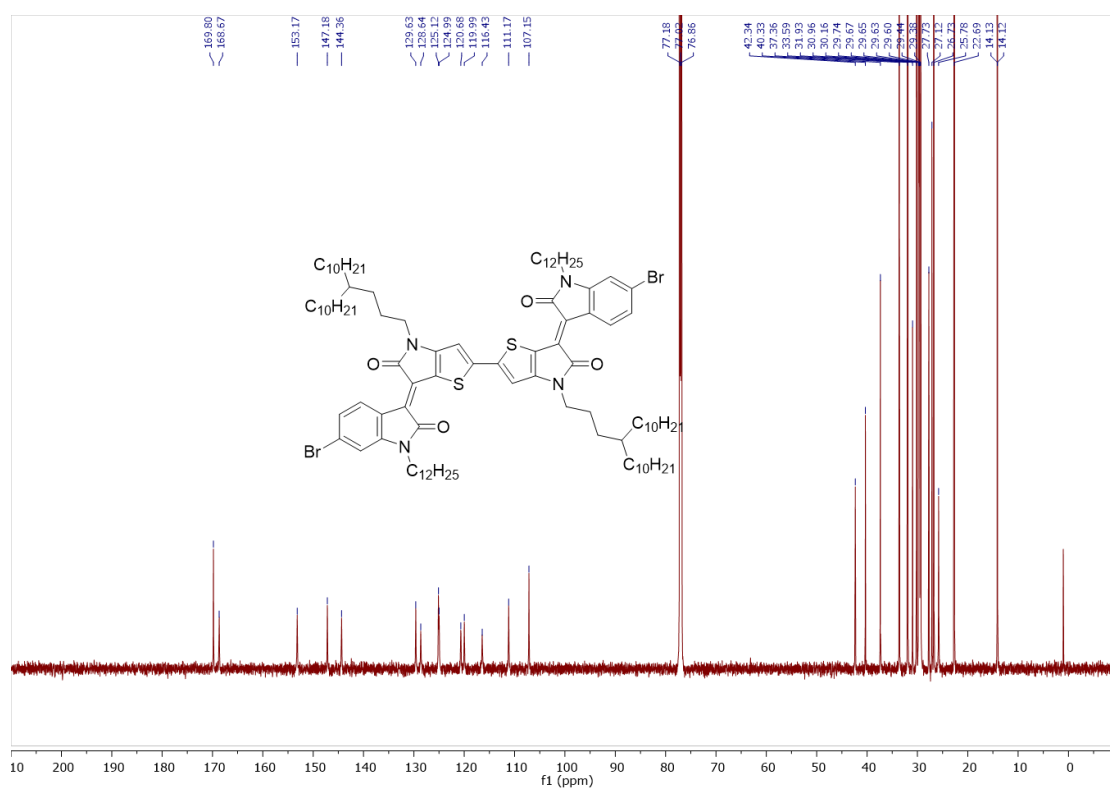












Reference:

- (1) Black, H. T.; Pelse, I.; Wolfe, R. M. W.; Reynolds, J. R. *Chem. Commun.* **2016**, 52 (87), 12877–12880.
- (2) Yang, J.; Zhao, Z.; Geng, H.; Cheng, C.; Chen, J.; Sun, Y.; Shi, L.; Yi, Y.; Shuai, Z.; Guo, Y.; Wang, S.; Liu, Y. *Adv. Mater.* **2017**, 29 (36), 1702115.
- (3) Cao, Y.; Yuan, J.-S.; Zhou, X.; Wang, X.-Y.; Zhuang, F.-D.; Wang, J.-Y.; Pei, J. *Chem. Commun.* **2015**, 51 (52), 10514–10516.
- (4) Luo, X.; Tran, D. T.; Sun, H.; Mi, T.; Kadlubowski, N. M.; Zhao, Y.; Zhao, K.; Mei, J. *Asian J. Org. Chem.* **2018**, DOI: 10.1002/ajoc.201800360.