Supporting Information for

Tunable circularly polarized luminescence of D-A type chiral conjugated oligomers via achiral donors

Yuxiang Wang,[a]* Yabin Feng,[a] Qian Wang[a] and Qi Meng [a]*

[a]School of Petrochemical Engineering, Changzhou University, Jiangsu Key Laboratory of Advanced Catalytic Materials and Technology, Changzhou, Jiangsu 213164, P. R. China; Email: wangyx@cczu.edu.cn; mengqi@cczu.edu.cn

Table of Contents

1. Measurements and sample Preparation

Nuclear magnetic resonance (NMR) spectra were recorded on 300 or 400 MHz Bruker spectrometer. High-resolution mass spectrometry (HRMS) data were recorded on Agilent 6540 QTOF LC/MS analyzer. Gel permeation chromatography (GPC) data were tested in Waters Breeze GPC analyzer. Ultraviolet-visible (UV-*vis*) spectra were recorded on Shimadzu UV-1700 UV-*vis* spectrophotometer. Emission spectra were performed on Agilent Cary Eclipse spectrophotometer. The transient photoluminescence (PL) decay spectra and absolute PL quantum yield were determined by Edinburgh FS5 Fluorescence Spectrometer. Circular dichroism (CD) spectra were measured from a JASCO J-810 spectropolarimeter. CPL spectra were measured from a JASCO CPL-300 spectrofluoropolarimeter. Thermogravimetric analysis (TGA) was performed by using a SETARAM TG Labsys Evo under N_2 atmosphere. Cyclic voltammetry (CV) was measured on a CHI920C (Shanghai CH Instrument Company, China) electrochemical workstation in CH_2Cl_2 solution at room temperature under N_2 atmosphere, with $TBAPF_6$ (0.1 M) as supporting electrolyte and a Hg/Hg_2Cl_2 electrode as a reference electrode.

Solution Sample Preparation: A suitable quantity of the oligomer was weighed and dissolved in 3 mL of toluene to form a stock solution with a concentration of 1.0×10^{-3} mol/L. Subsequently, 30 μL of the stock solution was taken and diluted to 3 mL with toluene, resulting in a sample solution with a concentration of 1.0×10^{-5} mol/L.

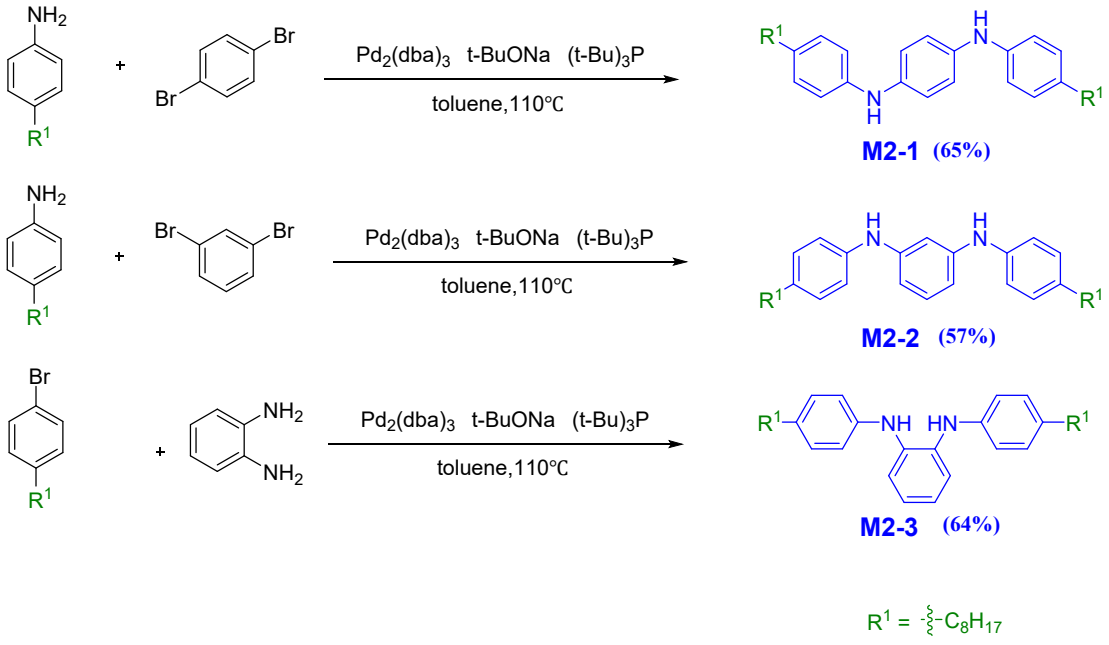
PMMA Doped Film Preparation: 1.98 g of PMMA was weighed and dissolved in 100 mL of toluene, with stirring maintained at 100℃ for 1.5 hours. 1 mg of the oligomer was introduced into a sample vial, followed by the addition of 5 mL of the PMMA toluene solution. The mixture was then filtered using a 0.22 μm microporous membrane to prepare a doped solution with oligomer to PMMA mass ratio of 1:99. 70 μL of the doped solution was drop-casted onto a 1 cm × 4 cm quartz glass plate, and then transferred to a heating pan and heated at 110°C for 5 hours to yield a PMMA doped film with a mass concentration of 1wt%.

***S*-BINOL-CH_2 Doped Film Preparation:** The oligomer solution and *S*-BINOL-CH_2 solution, each with mass concentration of 20 mg/mL in toluene, were prepared. 95 μL

of the oligomer solution and 5 μL of the *S*-BINOL-CH_2 solution were mixed and filtered with a 0.22 μm microporous membrane to yield a doped solution with oligomer to *S*-BINOL-CH_2 mass ratio of 95:5. 50 μL of the doped solution was spin-coated onto a 1 cm × 4 cm quartz glass plate, with rotate speed at 500 rpm for 18 seconds, followed by 1000 rpm for 20 seconds using a spin coater. Then the spin-coated film was transferred to a heating pan and heated at 150°C for 5 hours to obtain an *S*-BINOL-CH_2 doped film with a mass concentration of 5%.

Pure Thin Film Preparation: The oligomer toluene solution with a mass concentration of 20 mg/mL was prepared and filtered using a 0.22 μm microporous membrane. 50 μL of the sample solution was spin-coated onto a 1 cm × 4 cm quartz glass plate, with rotate speed at 500 rpm for 18 seconds, followed by 1000 rpm for 20 seconds using a spin coater. Then the spin-coated film was transferred to a heating pan and heated at 150°C for 5 hours to yield a pure thin film.

2. Synthesis procedures of the M2



Scheme S1. The Synthesis procedures of **M2-1**, **M2-2** and **M2-3**.

Synthesis of M2-1:

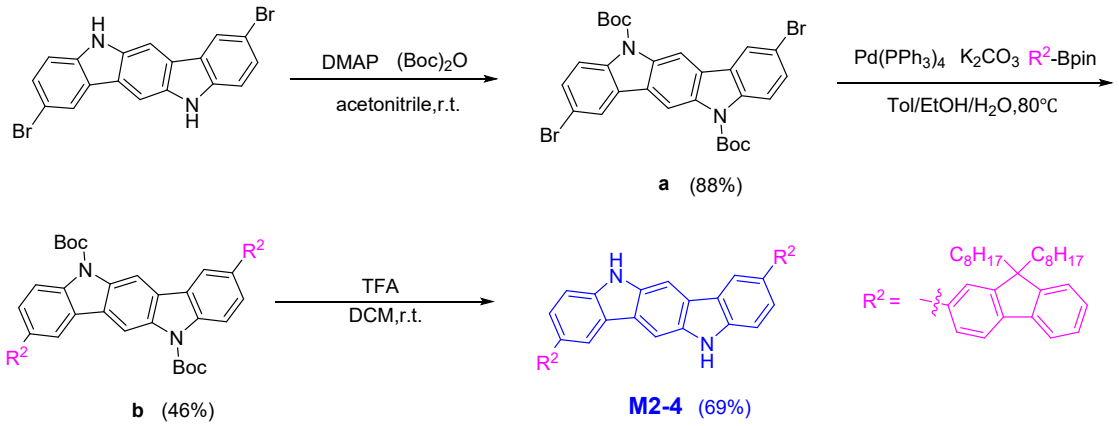
4-n-Octylaniline (600.0 mg, 2.92 mmol), 1,4-Dibromobenzene (328.2 mg, 1.39 mmol), $Pd_2(dba)_3$ (38.2 mg, 41.74 μmol), Tri-tert-butylphosphine tetrafluoroborate (28.2 mg mmol, 139.14 μmol), and NaOtBu (401.2 mg, 4.17 mmol) in dry toluene (10 mL) were heated to 110 ℃ in an oven dried Schlenk flask under N_2 atmosphere for 18 hours. After cooling to room temperature, the reaction mixture was quenched with water and extracted with ethyl acetate. The organic phase was dried with anhydrous Na_2SO_4 and the solvent was evaporated. The reaction mixture was purified by column chromatography (petroleum ether/dichloromethane = 2:1) to afford **M2-1** (443.0 mg, 65%) as white powder. ^{1}H NMR (300 MHz, Benzene-d_6) δ 7.09-7.01 (m, 4H), 6.88 (d, J = 7.2 Hz, 8H), 4.92 (s, 2H), 2.54 (t, J = 7.6 Hz, 4H), 1.61 (p, J = 7.3 Hz, 4H), 1.38-1.18 (m, 21H), 0.91 (t, J = 6.6 Hz, 6H).[1]

Synthesis of M2-2:

Prepared according to same procedure of **M2-1**, 389.0 mg white powder, yield: 57%. ^{1}H NMR (300 MHz, DMSO-d_6) δ 7.90 (s, 2H), 7.00 (q, J = 8.3 Hz, 9H), 6.74 (s, 1H), 6.43 (dd, J = 8.0, 2.1 Hz, 2H), 1.51 (t, J = 7.5 Hz, 4H), 1.40-1.02 (m, 20H), 0.85 (t, J = 6.5 Hz, 6H).[1]

Synthesis of M2-3:

Prepared according to same procedure of **M2-1**, 436.0 mg white powder, yield: 64%. ^{1}H NMR (300 MHz, Benzene-d_6) δ 7.25 (dd, J = 5.9, 3.6 Hz, 2H), 7.03-6.96 (m, 4H), 6.87 (dd, J = 6.0, 3.5 Hz, 2H), 6.82-6.72 (m, 4H), 5.20 (s, 2H), 2.56-2.43 (m, 4H), 1.57 (p, J = 7.5 Hz, 4H), 1.35-1.16 (m, 21H), 0.95-0.87 (m, 6H). ^{13}C NMR (75 MHz, Benzene-d_6) δ 141.93, 135.50, 134.97, 129.21, 122.62, 119.87, 117.75, 35.31, 31.95, 31.83, 29.61, 29.39, 29.33, 22.75, 14.02. HRMS (ESI, m/z): caled for $C_{34}H_{49}N_2$ [M+H$^+$], 485.3890; found, 485.3892.



Scheme S2. The Synthesis procedures of **M2-4**.

Synthesis of a and b:

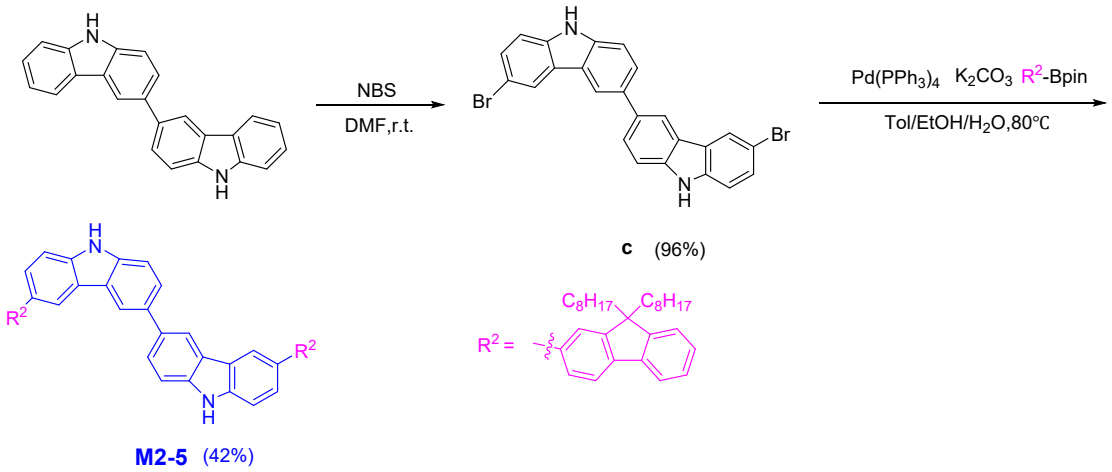
2,8-dibromo-5,11-dihydro indolo[3,2-b]carbazole (500.0 mg, 1.21 mmol), Di-tert-butyl decarbonate (1.32 g, 6.04 mmol), and 4-Dimethylaminopyridine (295.0 mg, 2.41 mmol) in acetonitrile (25 mL) was stirred for 12 h at room temperature. the reaction mixture was quenched with water and extracted with dichloromethane. After evaporating the solvent under reduced pressure, **a** was submitted to the following reaction without further purification.

a (600.0 mg, 976.67 μmol), **R^2-bpin** (1.26 g, 2.44 mmol), $Pd(PPh_3)_4$ (56.4 mg, 48.83 μmol), K_2CO_3 (674.9 mg, 4.88 mmol) were dissolved in toluene (12 mL), ethanol (4 mL) and water (4 mL). The reaction mixture was heated to 80 ℃ in an Schlenk flask under N_2 atmosphere for 12 hours. After cooling to room temperature, the reaction mixture was quenched with water and extracted with ethyl acetate. The organic phase was dried with anhydrous Na_2SO_4 and the solvent was evaporated. The reaction mixture was purified by column chromatography (petroleum ether/ethyl acetate = 200:1) to afford **b** (564.0 mg, 46%) as white powder. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 9.10 (s, 2H), 8.40 (d, *J* = 1.8 Hz, 2H), 8.35 (d, *J* = 8.5 Hz, 2H), 7.89-7.80 (m, 4H), 7.79-7.71 (m, 4H), 7.71 (d, *J* = 1.7 Hz, 2H), 7.45-7.29 (m, 6H), 2.08 (dt, *J* = 11.0, 5.2 Hz, 8H), 1.87 (s, 18H), 1.25-1.01 (m, 42H), 0.80 (t, *J* = 7.0 Hz, 13H).

Synthesis of M2-4:

b (564.0 mg, 457.12 μmol) in dichloromethane (5 mL), TFA (512.2 mg, 4.57 mmol) was add dropwise to the reaction flask stirred for 12 h at room temperature. the

reaction mixture was quenched with water and extracted with ethyl acetate. The organic phase was dried with anhydrous Na_2SO_4 and the solvent was evaporated. The reaction mixture was purified by column chromatography (petroleum ether/ethyl acetate = 200:1) to afford **M2-4** (327.0 mg, 69%) as white powder. ^{1}H NMR (400 MHz, Benzene-d_6) δ 8.69 (d, J = 1.7 Hz, 2H), 8.04 (d, J = 1.6 Hz, 2H), 7.93 (dd, J = 8.3, 1.8 Hz, 2H), 7.88-7.76 (m, 6H), 7.74-7.68 (m, 2H), 7.39-7.33 (m, 2H), 7.32-7.24 (m, 5H), 7.23 (s, 2H), 6.84 (s, 2H), 2.26-2.08 (m, 8H), 1.20-0.98 (m, 48H), 0.82 (t, J = 7.0 Hz, 12H). ^{13}C NMR (75 MHz, Benzene-d_6) δ 151.69, 150.99, 142.09, 141.36, 140.61, 139.94, 135.89, 133.15, 125.92, 124.29, 123.84, 122.85, 121.78, 120.34, 119.91, 119.09, 110.80, 100.95, 55.33, 40.76, 31.83, 30.26, 29.33, 29.28, 24.09, 22.65, 13.99.



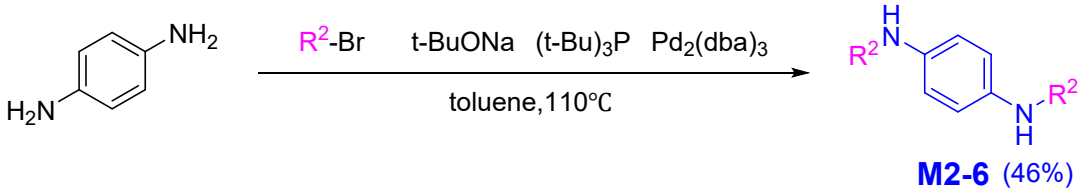
Scheme S3. The Synthesis procedures of **M2-5**.

Synthesis of c:

3,3'-Bicarbazole (400.0 mg, 1.20 mmol) was dissolved in DMF (20 mL). N-Bromosuccinimide (428.4 mg, 2.41 mmol) was slowly added to the reaction flask in an ice bath. After stirred for 12 h at room temperature, the reaction mixture was quenched with water and extracted with ethyl acetate. The organic phase was dried with anhydrous Na_2SO_4 and the solvent was evaporated. The reaction mixture was purified by column chromatography (petroleum ether/ethyl acetate = 10:1) to afford **c** (570.0 mg, 96%) as white powder. ^{1}H NMR (300 MHz, DMSO-d_6) δ 11.48 (s, 2H), 8.62 (s, 2H), 8.47 (d, J = 1.8 Hz, 2H), 7.95-7.77 (m, 2H), 7.68-7.43 (m, 6H).[2]

Synthesis of M2-5:

c (400.0 mg, 816.0 μmol), **R²-bpin** (1.05 g, 2.04 mmol), $Pd(PPh_3)_4$ (47.2 mg, 40.8 μmol), and K_2CO_3 (563.9 mg, 4.08 mmol) were dissolved in toluene (12 mL), ethanol (4 mL) and water (4 mL). The reaction mixture was heated to 80 ℃ in an Schlenk flask under N_2 atmosphere for 12 hours. After cooling to room temperature, the reaction mixture was quenched with water and extracted with ethyl acetate. The organic phase was dried with anhydrous Na_2SO_4 and the solvent was evaporated. The reaction mixture was purified by column chromatography (petroleum ether/ethyl acetate = 20:1) to afford **M2-5** (383.0 mg, 42%) as white powder. ^{1}H NMR (300 MHz, Benzene-d_6) δ 8.57 (d, J = 23.0 Hz, 4H), 7.99 (s, 2H), 7.89 (t, J = 7.9 Hz, 4H), 7.80 (s, 4H), 7.76-7.66 (m, 2H), 7.31 (dd, J = 22.3, 7.9 Hz, 10H), 6.72 (s, 2H), 2.14 (tp, J = 12.9, 6.4, 5.3 Hz, 8H), 1.07 (tt, J = 18.6, 7.5 Hz, 49H), 0.79 (t, J = 6.7 Hz, 12H). ^{13}C NMR (75 MHz, Benzene-d_6) δ 151.60, 150.99, 141.82, 141.35, 139.99, 139.58, 139.20, 134.47, 133.69, 126.99, 126.75, 126.19, 125.79, 124.36, 124.24, 122.81, 121.70, 120.25, 119.88, 119.46, 119.30, 110.92, 110.89, 55.31, 40.70, 31.81, 30.17, 29.27, 29.24, 24.03, 22.62, 13.96.



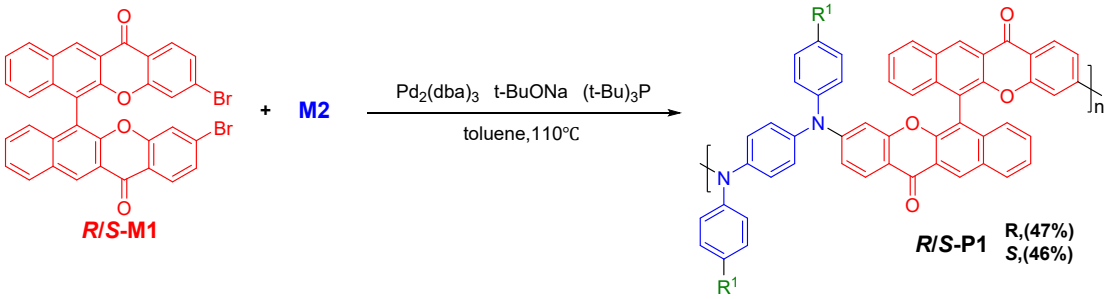
Scheme S4. The Synthesis procedures of **M2-6**.

Synthesis of M2-6:

p-Phenylenediamine (200.0 mg, 1.85 mmol), 2-bromo-9,9-dioctyl-9H-fluorene (2.0 g, 4.25 mmol), $Pd_2(dba)_3$ (67.7 mg, 73.98 μmol), tri-tert-butylphosphine tetrafluoroborate (53.7 mg, 184.94 μmol), and NaOtBu (533.2 mg, 5.55 mmol) in dry toluene (30 mL) were heated to 110 ℃ in an oven dried Schlenk flask under N_2 atmosphere for 18 hours. After cooling to room temperature, the reaction mixture was quenched with water and extracted with ethyl acetate. The organic phase was dried with anhydrous Na_2SO_4 and the solvent was evaporated. The reaction mixture was purified by column chromatography (petroleum) to afford **M2-6** (761.0 mg, 46%) as pink powder. ^{1}H NMR (400 MHz, Benzene-d_6) δ 7.57 (d, J = 7.2 Hz, 2H), 7.52 (d, J =

8.1 Hz, 2H), 7.29 (d, J = 7.4 Hz, 2H), 7.24 (dt, J = 13.1, 7.0 Hz, 5H), 7.00 (d, J = 17.6 Hz, 6H), 6.90 (dd, J = 8.1, 2.1 Hz, 2H), 5.11 (s, 2H), 2.02 (q, J = 6.8, 6.4 Hz, 8H), 1.13 (dd, J = 23.5, 9.1 Hz, 50H), 0.84 (t, J = 7.1 Hz, 12H). ^{13}C NMR (75 MHz, Benzene-d_6) δ 152.48, 150.03, 144.03, 141.74, 137.47, 133.99, 126.94, 125.82, 122.56, 120.67, 120.55, 118.82, 115.53, 111.27, 54.99, 40.85, 31.84, 30.29, 29.34, 24.04, 22.64, 13.99.

3. Synthesis procedures of the chiral conjugated oligomers

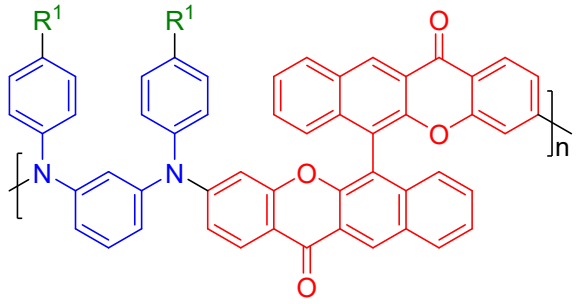


Scheme S5. The Synthesis procedures of ***R***/***S*-P1**.

Synthesis of *R*/*S*-P1:

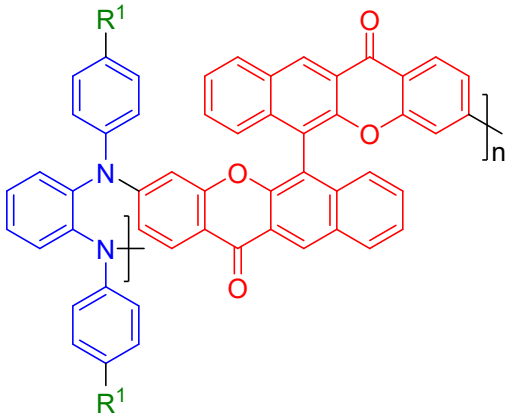
***R*/*S*-M1** (200.0 mg, 308.50 μmol), **M2-1** (149.6 mg, 308.50 μmol), $Pd_2(dba)_3$ (14.1 mg, 15.42 μmol), tri-tert-butylphosphine tetrafluoroborate (17.9 mg, 61.70 μmol), and NaOtBu (118.6 mg, 1.23 mmol) in dry toluene (10 mL) were heated to 110 ℃ in an oven dried Schlenk flask under N_2 atmosphere for 3 days. For end-capping purposes, first diphenylamine (10.4 mg, 61.70 μmol) was added to the reaction flask. After 12 hours, bromobenzene (19.4 mg, 123.40 μmol) was added to the reaction flask for another 12 hours. After cooling to room temperature, the reaction mixture was quenched with water and extracted with dichloromethane. The organic phase was dried with anhydrous Na_2SO_4 and the solvent was evaporated. The residue was dissolved in 2 mL dichloromethane and precipitated in 150 mL methanol. The sediment was successively extracted with acetone and dichloromethane for 24 h in a Soxhlet apparatus. The obtained dichloromethane solution was evaporated to about 5 mL, and subsequently precipitated in 150 mL methanol. Orange solid was obtained by filtration. ***R*-P1**, 146 mg, yield: 47%; ***S*-P1**, 145 mg, yield: 46%. ^{1}H NMR (300 MHz, Chloroform-*d*) δ 9.19 (s, 1H), 9.08 (d, J = 7.5 Hz, 1H), 8.36 (d, J = 8.9 Hz, 1H), 8.27-

7.89 (m, 3H), 7.43 (dt, *J* = 41.8, 7.3 Hz, 4H), 6.95 (ddt, *J* = 85.6, 37.1, 9.8 Hz, 15H), 6.24 (s, 1H), 2.52 (t, *J* = 7.9 Hz, 4H), 1.73-1.40 (m, 4H), 1.28 (dd, *J* = 11.6, 6.3 Hz, 19H), 0.87 (q, *J* = 4.4, 3.1 Hz, 6H).



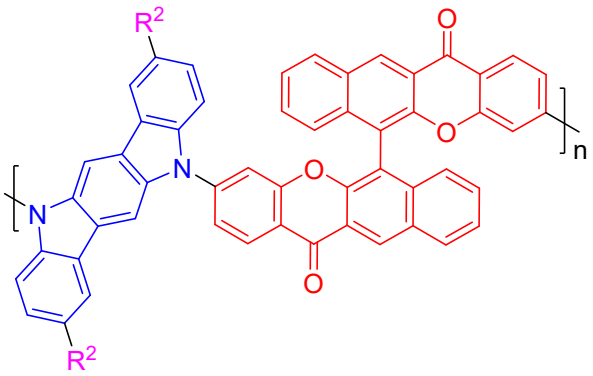
***R*/*S*-P2** ***R*,(58%)** ***S*,(64%)**

***R*/*S*-P2**: ***R*/*S*-M1** (200.0 mg, 308.50 μmol), **M2-2** (149.6 mg, 308.50 μmol), $Pd_2(dba)_3$ (14.1 mg, 15.42 μmol), tri-tert-butylphosphine tetrafluoroborate (17.9 mg, 61.70 μmol), NaOtBu (118.6 mg, 1.23 mmol), diphenylamine (10.4 mg, 61.70 μmol), bromobenzene (19.4 mg, 123.40 μmol). Prepared according to same procedure of ***R*/*S*-P1**, yellow powder, ***R*-P2**, 180 mg, yield: 58%; ***S*-P2**, 198 mg, yield: 64%. ^{1}H NMR (300 MHz, Chloroform-*d*) δ 8.98 (d, *J* = 13.7 Hz, 1H), 7.96 (dt, *J* = 27.3, 9.7 Hz, 3H), 7.51-6.97 (m, 5H), 6.83 (dp, *J* = 16.5, 8.5, 7.7 Hz, 4H), 6.71-6.31 (m, 7H), 6.18 (d, *J* = 15.9 Hz, 2H), 2.37 (t, *J* = 8.3 Hz, 4H), 1.28-0.92 (m, 17H), 0.78 (t, *J* = 6.3 Hz, 6H).



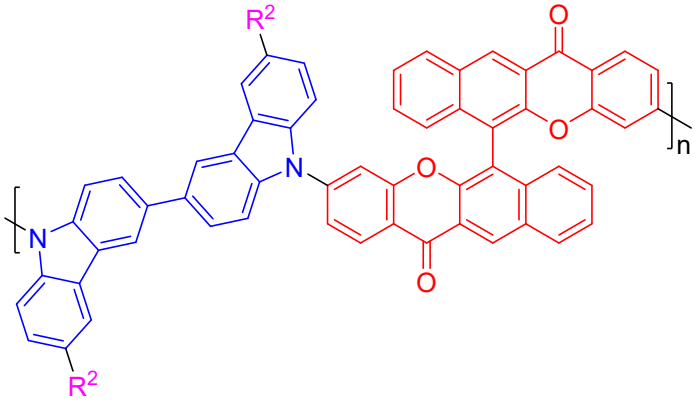
***R*/*S*-P3** ***R*,(64%)** ***S*,(55%)**

***R*/*S*-P3**: ***R*/*S*-M1** (200.0 mg, 308.50 μmol), **M2-3** (149.6 mg, 308.50μmol), $Pd_2(dba)_3$ (14.1 mg, 15.42 μmol), tri-tert-butylphosphine tetrafluoroborate (17.9 mg, 61.70 μmol), NaOtBu (118.5 mg, 1.23 mmol), diphenylamine (10.4 mg, 61.70 μmol), bromobenzene (19.4 mg, 123.40 μmol). Prepared according to same procedure of ***R*/*S*-P1**, yellow powder, ***R*-P3**, 139 mg, yield: 64%; ***S*-P3**, 119 mg, yield: 55%. ^{1}H NMR (300 MHz, Benzene-d_6) δ 7.25 (s, 1H), 7.00 (d, J = 7.9 Hz, 3H), 6.87 (s, 1H), 6.77 (d, J = 7.9 Hz, 3H), 2.50 (t, J = 7.6 Hz, 4H), 1.55 (s, 5H), 1.26 (s, 21H), 0.90 (t, J = 6.4 Hz, 6H).



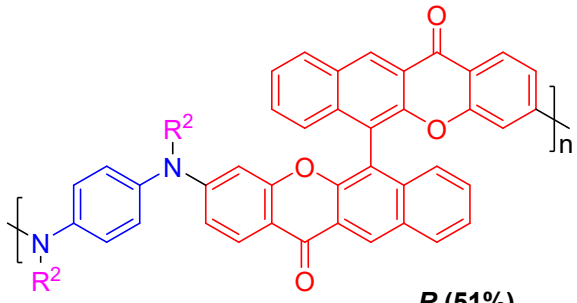
***R*/*S*-P4** ***R*,(75%)** ***S*,(81%)**

***R*/*S*-P4**: ***R*/*S*-M1** (80.0 mg, 123.40 μmol), **M2-4** (127.5 mg, 123.40 μmol), $Pd_2(dba)_3$ (5.7 mg, 6.17 μmol), tri-tert-butylphosphine tetrafluoroborate (7.2 mg, 24.68 μmol), NaOtBu (47.4 mg, 493.60 μmol), diphenylamine (4.2 mg, 24.68 μmol), bromobenzene (7.8 mg, 49.36 μmol). Prepared according to same procedure of ***R*/*S*-P1**, yellow powder, ***R*-P4**, 145 mg, yield: 75%; ***S*-P4**, 155 mg, yield: 81%. ^{1}H NMR (300 MHz, Chloroform-*d*) δ 9.14 (d, J = 4.7 Hz, 1H), 8.60 (t, J = 7.5 Hz, 1H), 8.25-7.86 (m, 3H), 7.76-6.94 (m, 17H), 1.29-0.75 (m, 24H), 0.64 (q, J = 7.2 Hz, 12H).



***R*/*S*-P5** ***R*,(75%)** ***S*,(83%)**

***R*/*S*-P5**: ***R*/*S*-M1** (91.1 mg, 140.58 μmol), **M2-5** (156.0 mg, 140.58 μmol), $Pd_2(dba)_3$ (6.4 mg, 7.03 μmol), tri-tert-butylphosphine tetrafluoroborate (8.2 mg, 28.12 μmol), NaOtBu (54.0 mg, 562.32 μmol), diphenylamine (4.8 mg, 28.12 μmol), bromobenzene (8.8 mg, 56.23 μmol). Prepared according to same procedure of ***R*/*S*-P1**, yellow powder, ***S*-P5**, 190.0 mg, yield: 83%, ***R*-P5**,172.0 mg, yield: 75%. ^{1}H NMR (300 MHz, Chloroform-*d*) δ 9.17 (q, *J* = 19.1, 14.0 Hz, 1H), 8.53 (t, *J* = 11.5 Hz, 1H), 8.43-7.96 (m, 3H), 7.86-6.63 (m, 19H), 0.97 (t, *J* = 16.6 Hz, 24H), 0.63 (q, *J* = 14.7, 11.1 Hz, 12H).



***R*/*S*-P6** ***R*,(51%)** ***S*,(56%)**

***R*/*S*-P6**: ***R*/*S*-M1** (200.0 mg, 308.50 μmol), **M2-6** (274.0 mg, 309.46 μmol), $Pd_2(dba)_3$ (14.1 mg, 15.42 μmol), tri-tert-butylphosphine tetrafluoroborate (17.9 mg, 61.70 μmol), NaOtBu (118.6 mg, 1.23 mmol), diphenylamine (10.4 mg, 61.89 μmol), bromobenzene (19.4 mg, 123.78 μmol). Prepared according to same procedure of ***R*/*S*-P1**, orange powder, ***R*-P6**, 222.0 mg, yield: 51%, ***S*-P6**, 243.0 mg, yield: 56%. ^{1}H NMR (300 MHz, Chloroform-*d*) δ 9.21 (d, *J* = 12.8 Hz, 1H), 8.20 (dt, *J* = 15.4, 7.4

Hz, 2H), 7.91-7.14 (m, 11H), 7.12-6.64 (m, 6H), 6.60-6.19 (m, 1H), 2.40-1.50 (m, 7H), 1.36-0.83 (m, 24H), 0.82-0.30 (m, 12H).

4. TGA curves of the chiral conjugated oligomers

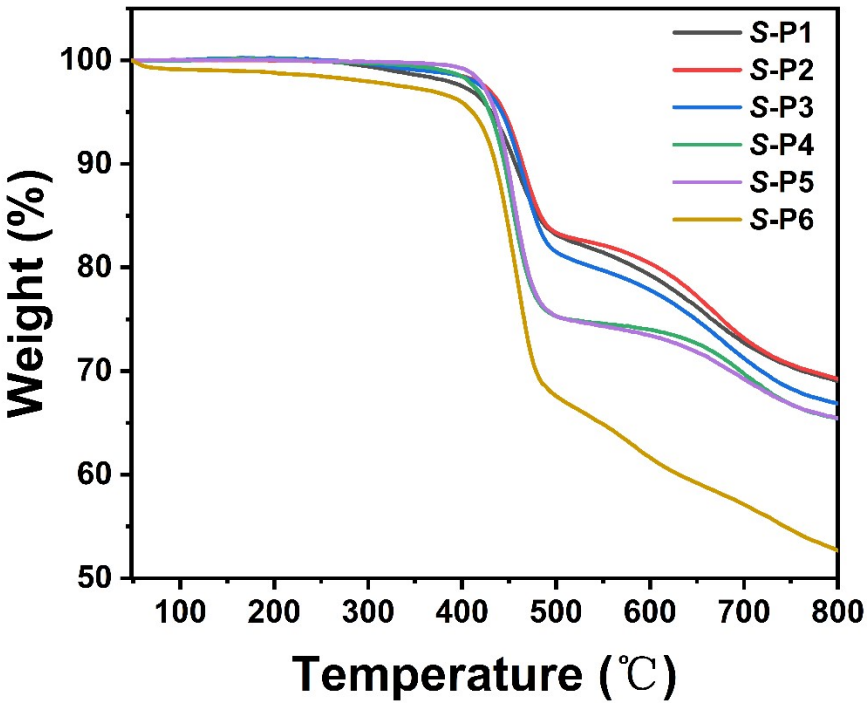


Figure S1. The TGA curves of chiral conjugated oligomers.

5. Photophysical Properties of the chiral conjugated oligomers

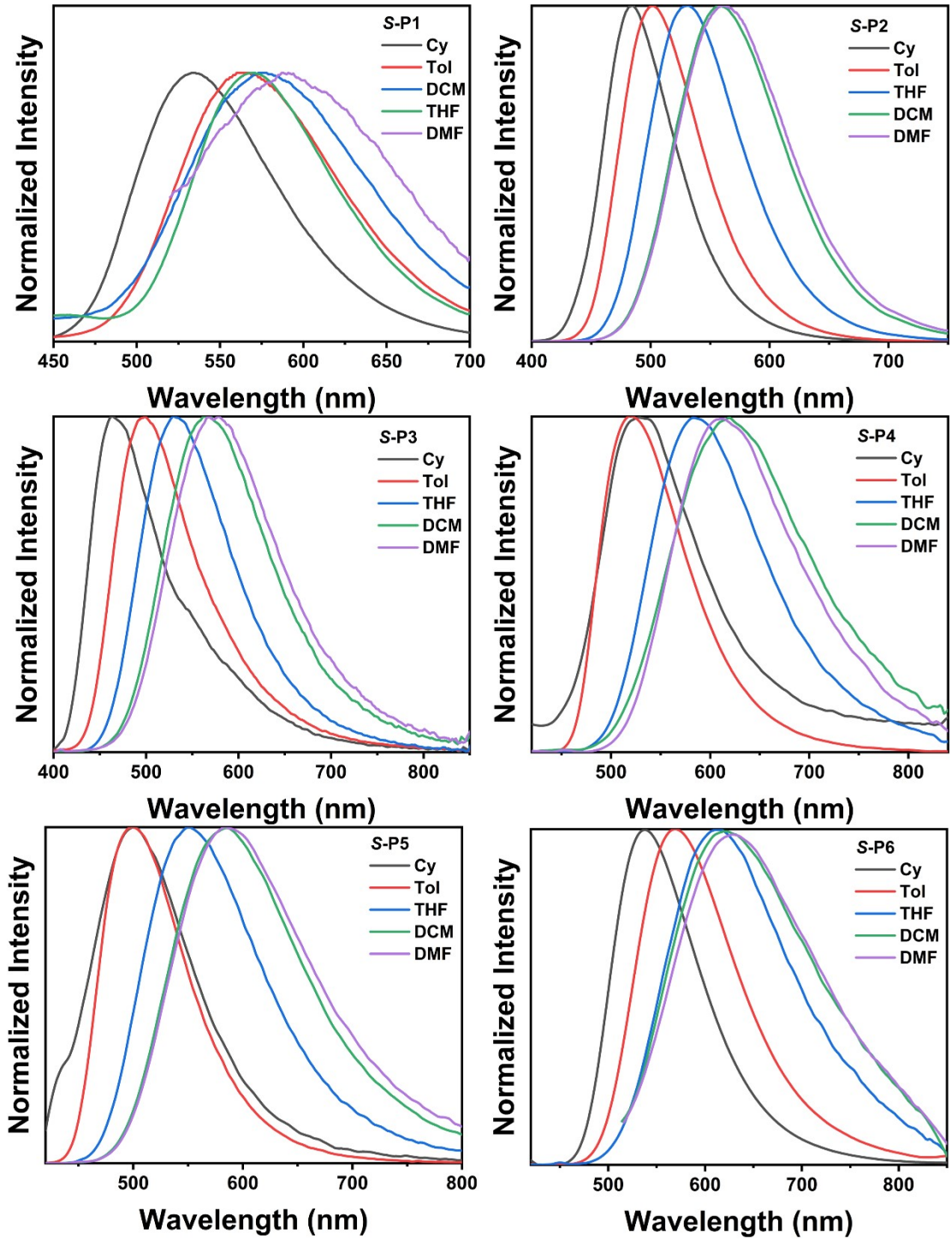


Figure S2. Solvatochromic PL spectra of chiral conjugated oligomers in toluene solutions (1×10^{-5} M).

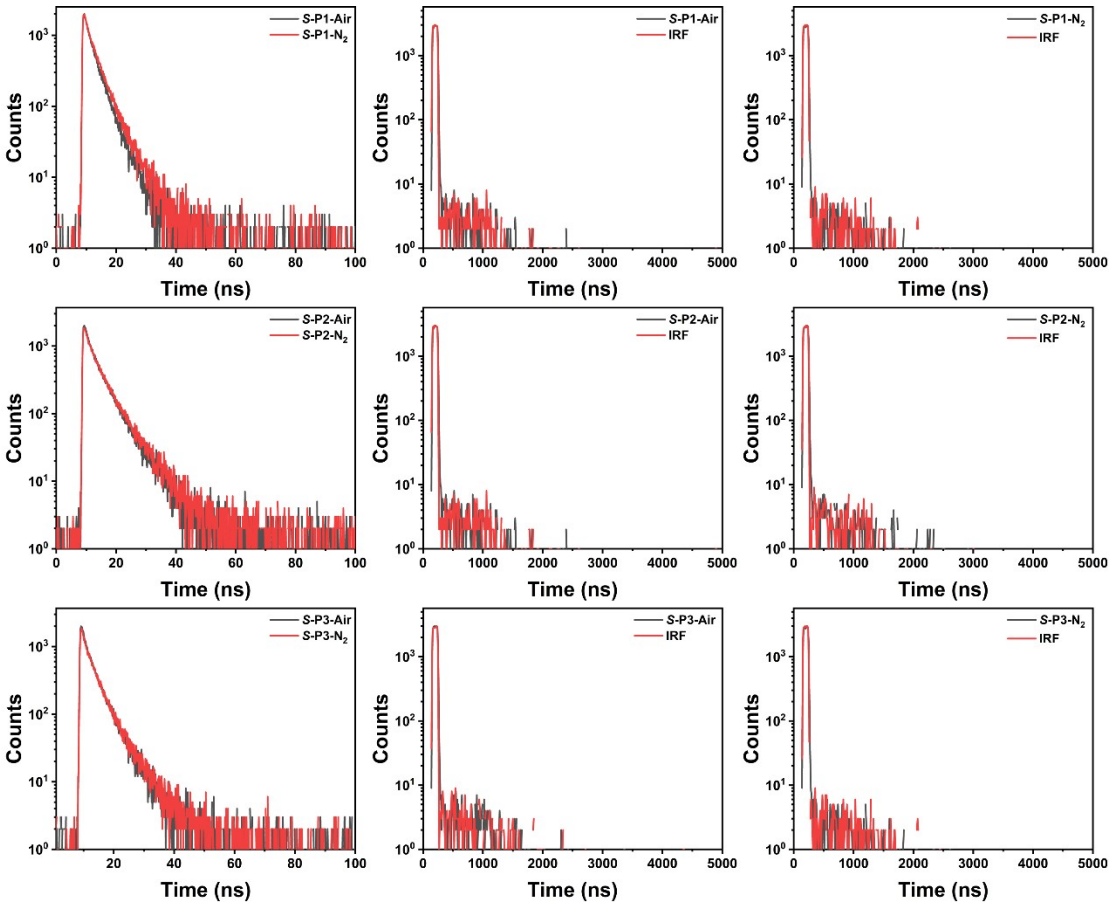


Figure S3. Transient PL spectra of *S*-P1, *S*-P2 and *S*-P3 in toluene under air and N_2 atmosphere (1×10^{-5} mol L^{-1}).

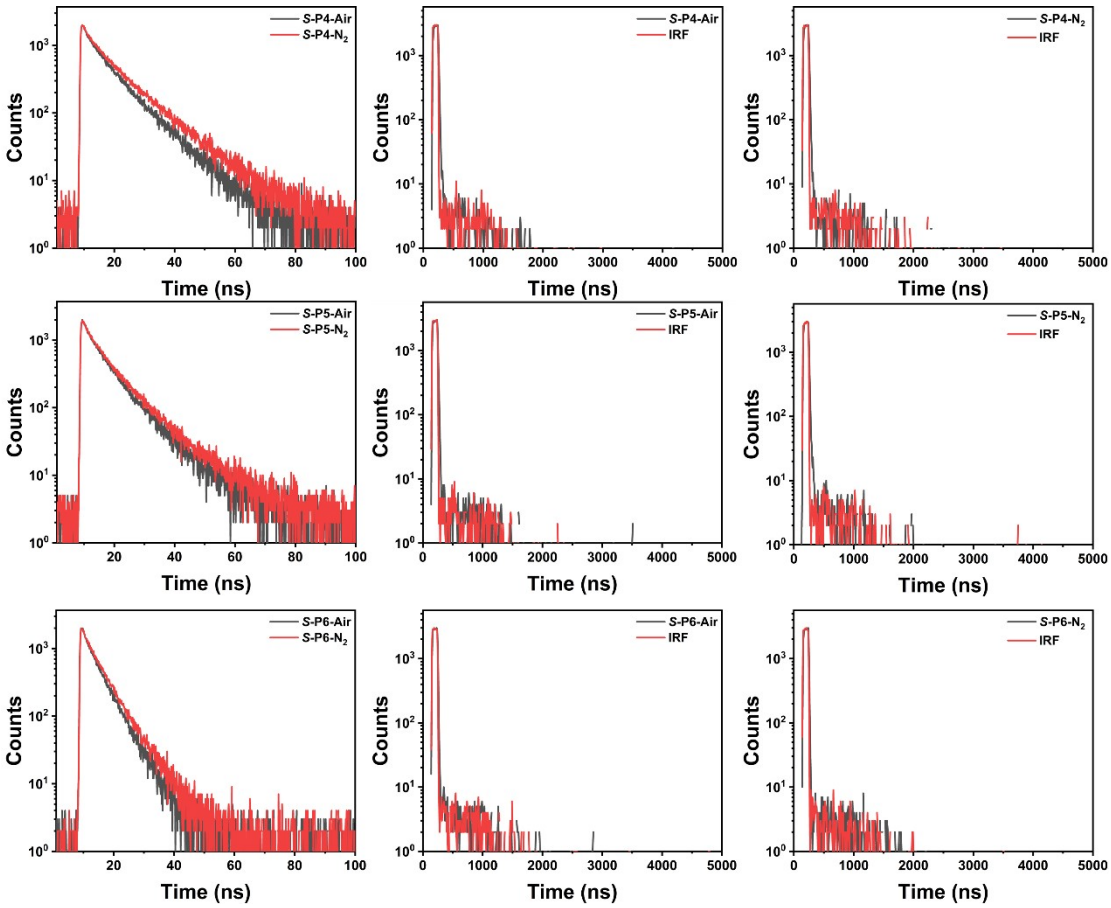


Figure S4. Transient PL spectra of *S*-P4, *S*-P5 and *S*-P6 in toluene under air and N_2 atmosphere (1×10^{-5} mol L^{-1}).

Table S1. The fitting data of the Transient PL curves.[a]

sample	τ_1 (ns)	τ_2 (ns)	A_1	A_2	τ (ns)	χ^2
S-P1 in air	1.6675	3.8628	882.1083	1043.6953	3.2760	1.0413
S-P2 in air	1.9245	5.6427	1072.5784	941.5850	4.6023	0.9636
S-P3 in air	1.8291	4.8901	1333.0754	849.8547	3.7582	0.9503
S-P4 in air	3.1576	9.6504	867.1578	1109.5565	8.3282	0.9450
S-P5 in air	3.5782	9.1947	1151.7531	862.4957	7.2741	1.1128
S-P6 in air	1.6231	5.0924	567.2856	1550.0325	4.7300	0.9295
S-P1 in N_2	1.7632	4.4038	978.0928	1103.4337	3.7121	1.0082
S-P2 in N_2	2.0451	6.0265	989.0323	904.1331	4.9487	1.0426
S-P3 in N_2	2.0415	5.3386	1044.9878	681.5928	4.1200	1.0515
S-P4 in N_2	3.3447	11.3330	812.3218	1157.2357	9.9621	1.0766
S-P5 in N_2	3.8697	10.4361	1040.3115	821.0293	8.3371	1.1162
S-P6 in N_2	2.2577	5.8488	550.9114	1512.4878	5.4061	1.0326

[a]The Transient PL curves were fitted by the function: $I(\tau) = A_1\exp(-\tau/\tau_1) + A_2\exp(-\tau/\tau_2)$. The average fluorescence lifetimes can be calculated by the equation: $\tau = (A_1\tau_1^2 + A_2\tau_2^2)/(A_1\tau_1 + A_2\tau_2)$.

Table S2. Photoluminescence quantum yields (Φ_{PL}) and lifetimes (τ) of the chiral conjugated oligomers in toluene under air and N_2 atmosphere.

oligomer	τ (ns)		Φ_{PL} (%)	
	air	N_2	air	N_2
S-P1	3.28	3.71	16	21
S-P2	4.60	4.94	38	40
S-P3	3.76	4.12	25	29
S-P4	8.32	9.96	49	51
S-P5	7.27	8.34	36	48
S-P6	4.73	5.41	48	54

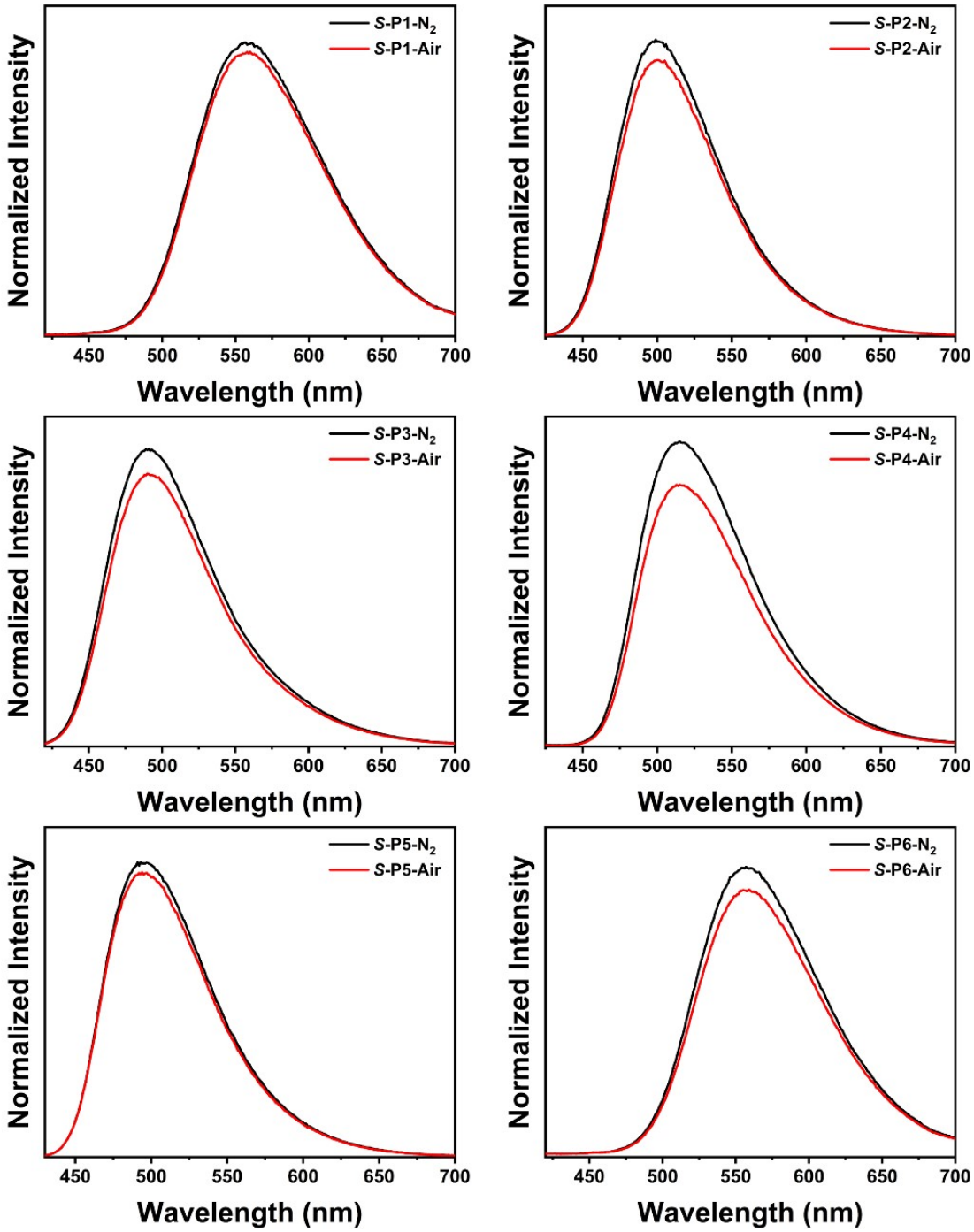


Figure S5. Fluorescence spectra of the chiral conjugated oligomers in toluene under air and N_2 atmosphere (1×10^{-5} mol L^{-1}).

6. Chiroptical properties of the chiral conjugated oligomers

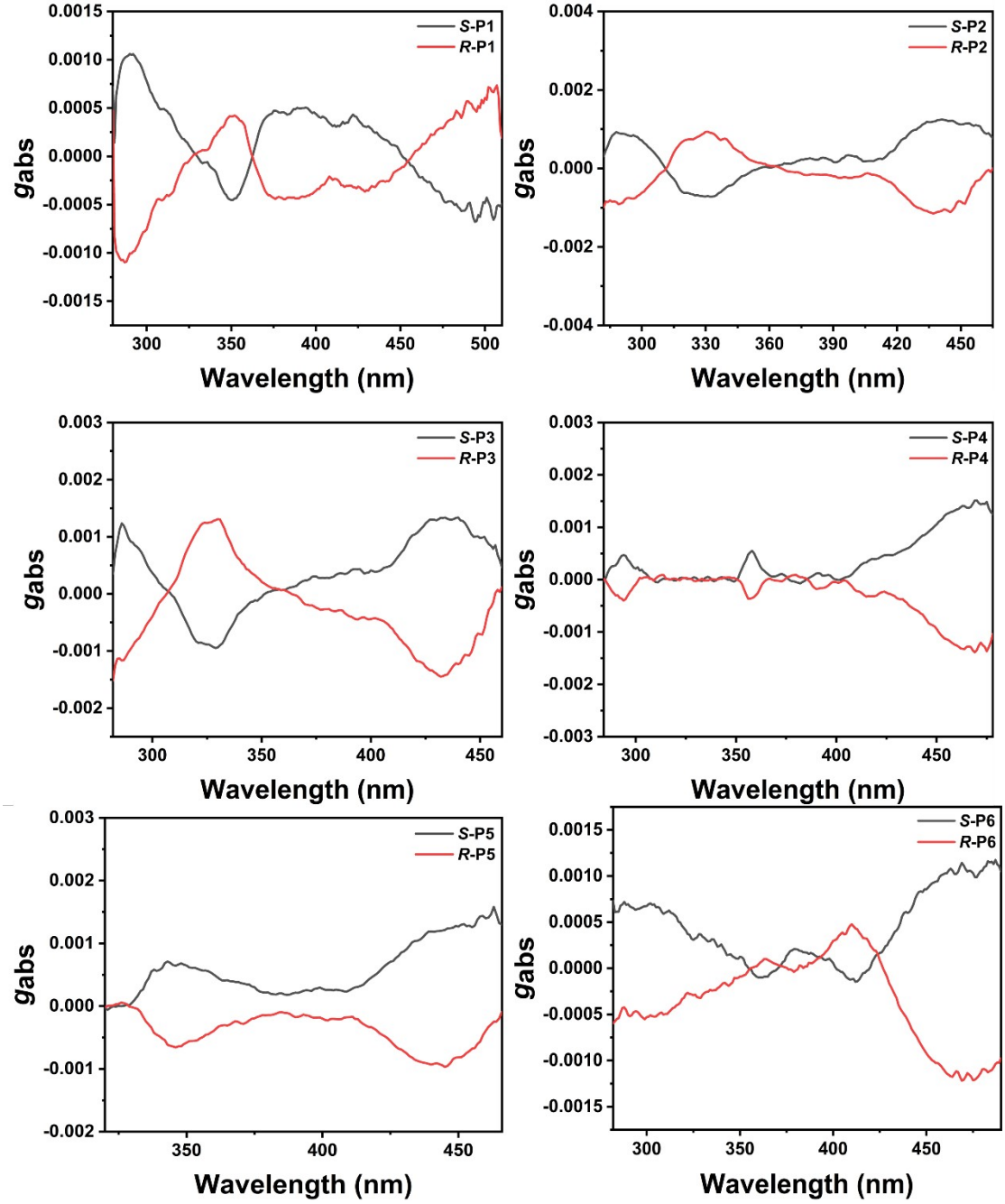


Figure S6. Curves of g_{abs} values versus wavelength for the chiral conjugated oligomers in toluene solutions (1×10^{-4} M).

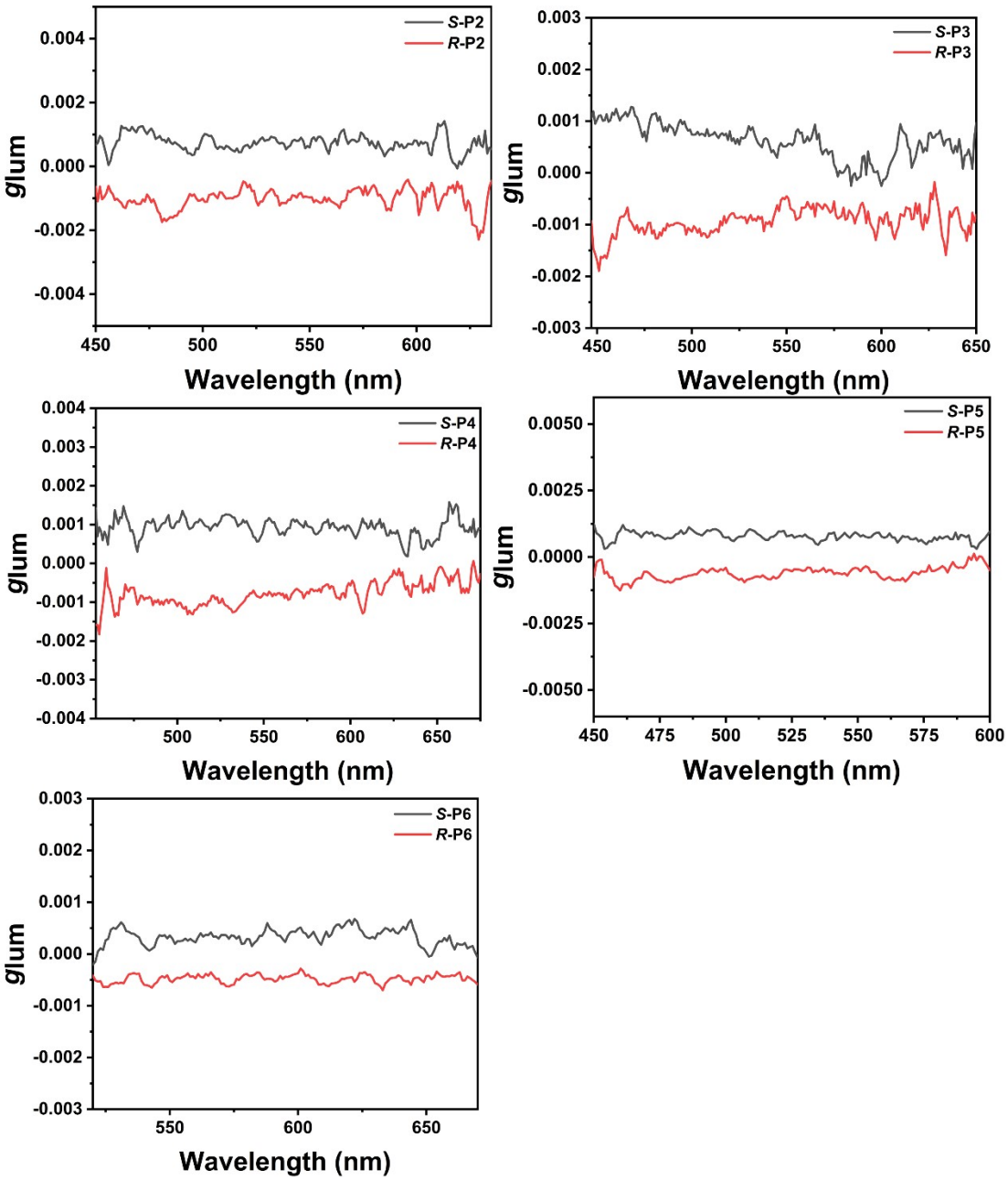


Figure S7. Curves of g_{lum} values versus wavelength for the chiral conjugated oligomers in toluene solutions (1×10^{-4} M).

Table S3. Quantities for the calculation of B_{CPL}.[a]

oligomer	ε (M^{-1} cm^{-1})	Φ_{PL}	g_{lum} (10^{-3})	B_{CPL} (M^{-1} cm^{-1})
S-P1	55360	0.16	-	-
S-P2	44640	0.38	0.93	7.9
S-P3	49060	0.25	0.74	4.5
S-P4	38110	0.49	1.19	11.1
S-P5	62260	0.36	0.76	8.5
S-P6	46340	0.48	0.37	4.1

[a]Brightness of CPL (B_{CPL}) can be calculated by the formula: $B_{CPL} = \varepsilon \times \Phi_{PL} \times g_{lum}/2$.

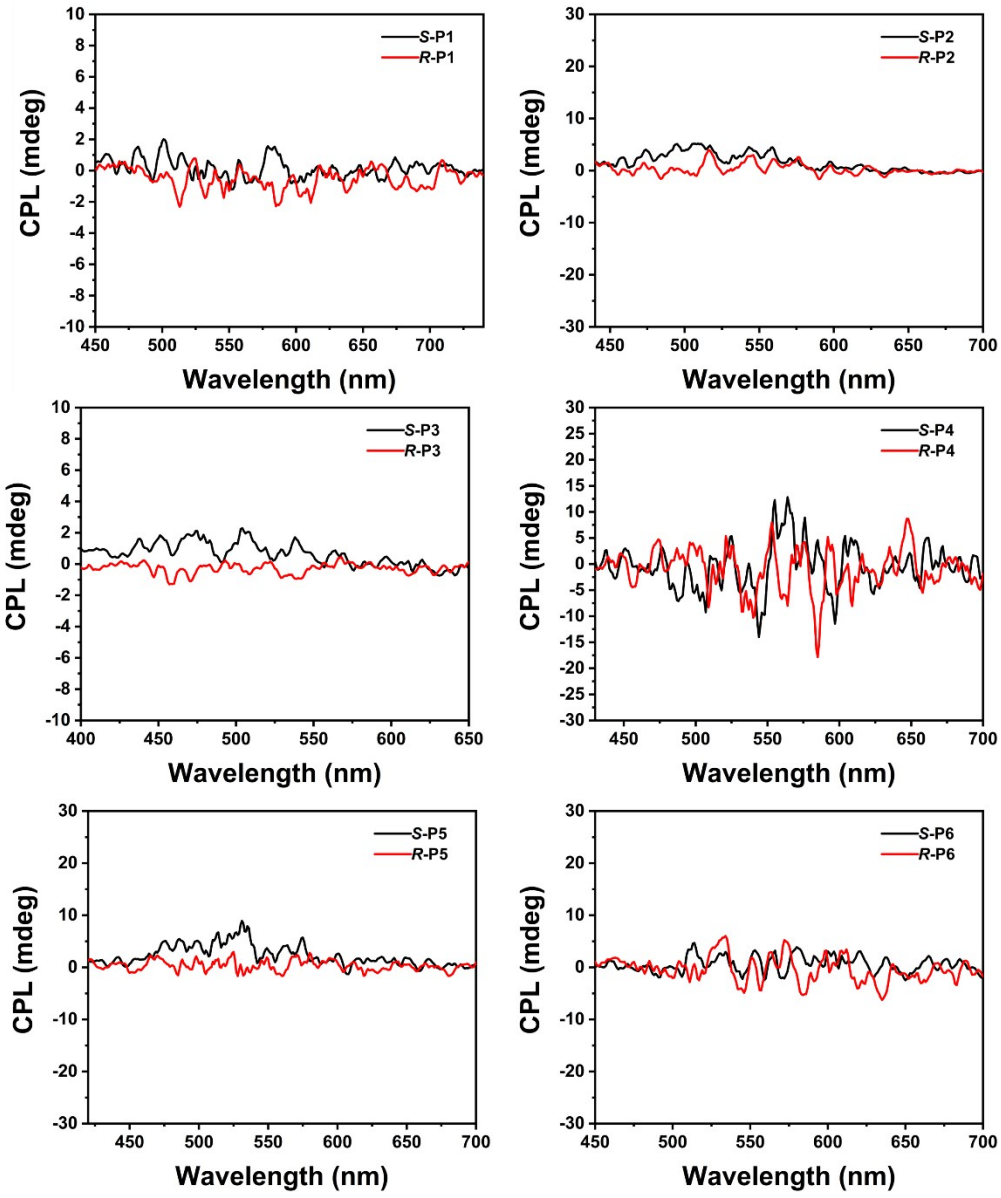


Figure S8. CPL spectra of doped films (1 wt% in PMMA) of the chiral conjugated oligomers.

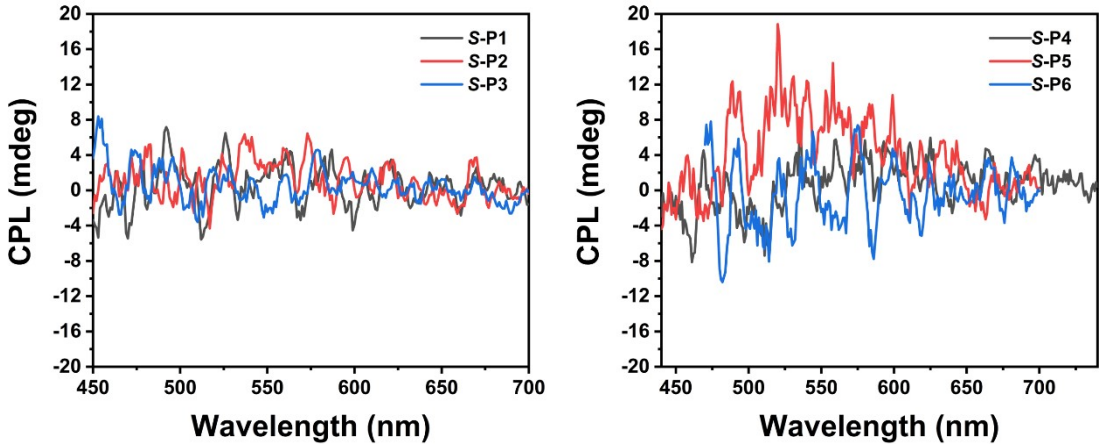


Figure S9. CPL spectra of neat films of the chiral conjugated oligomers.

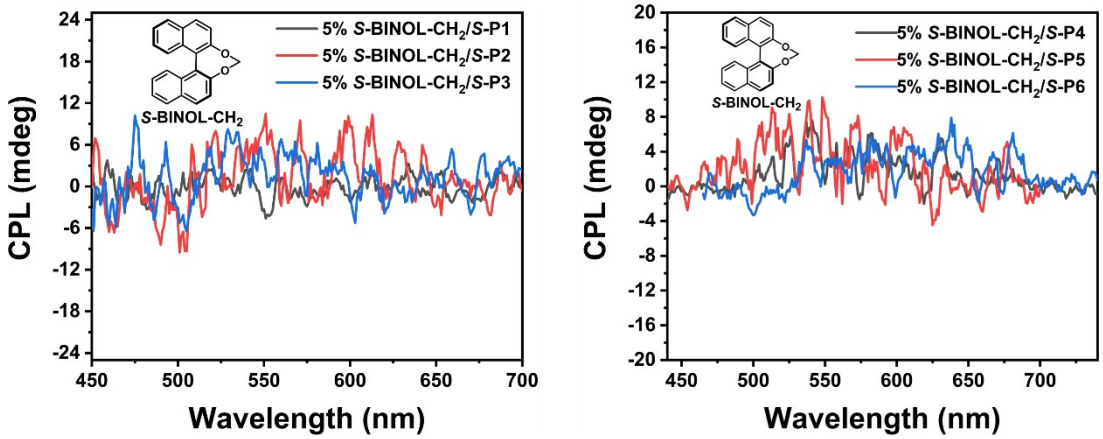


Figure S10. CPL spectra of films of the chiral conjugated oligomers doped with 5wt% *S*-BINOL-CH_2.

7. NMR and HRMS Spectra of all new compounds

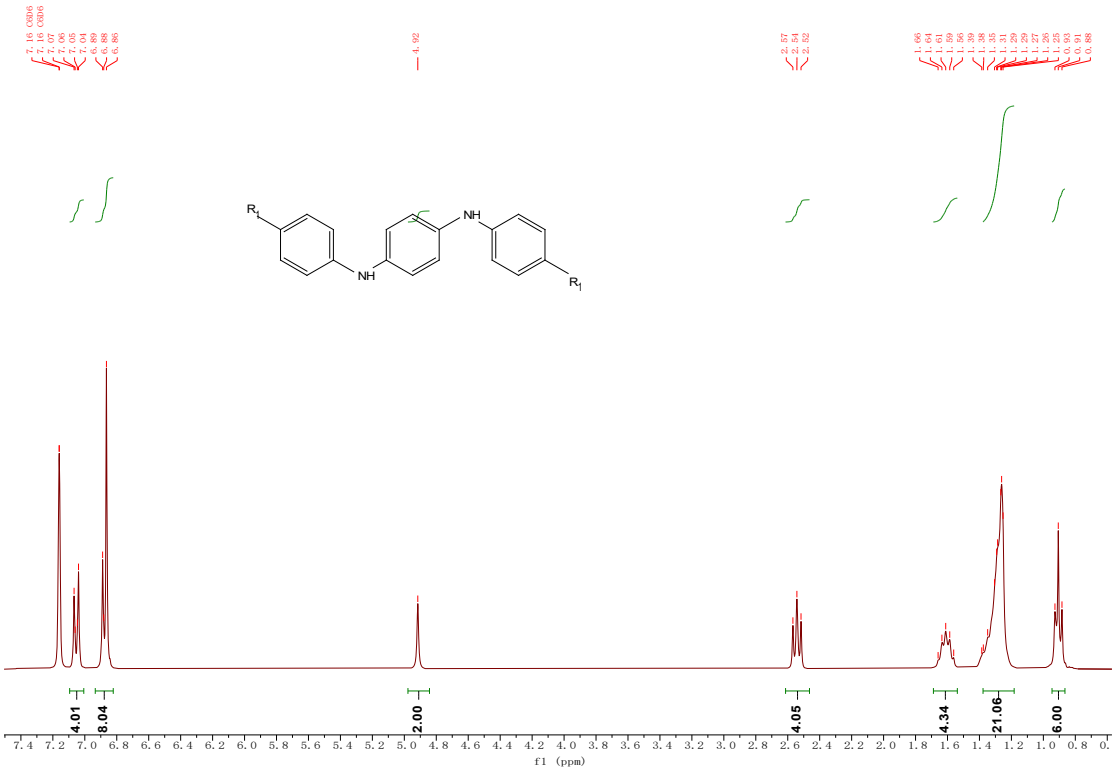


Figure S11. ^{1}H NMR spectrum of **M2-1** (300 MHz, Benzene-d_6).

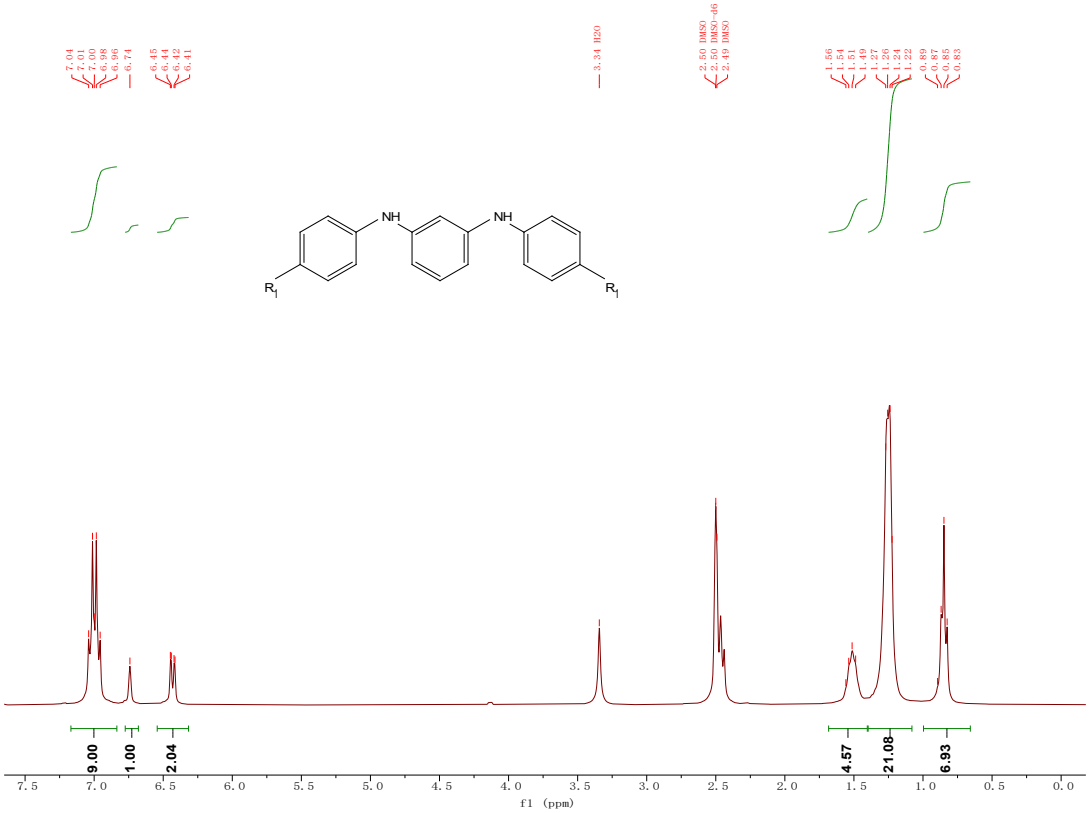


Figure S12. ^{1}H NMR spectrum of **M2-2** (300 MHz, DMSO-d_6).

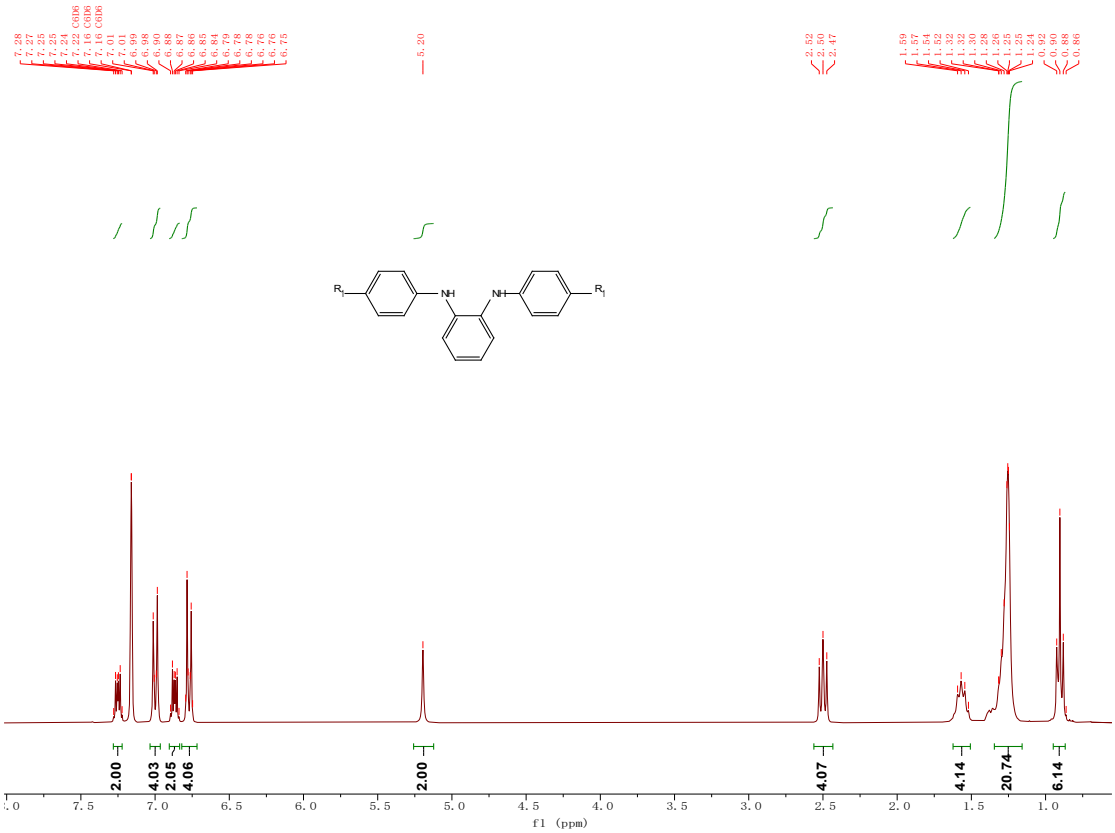


Figure S13. ^{1}H NMR spectrum of **M2-3** (300 MHz, Benzene-d_6).

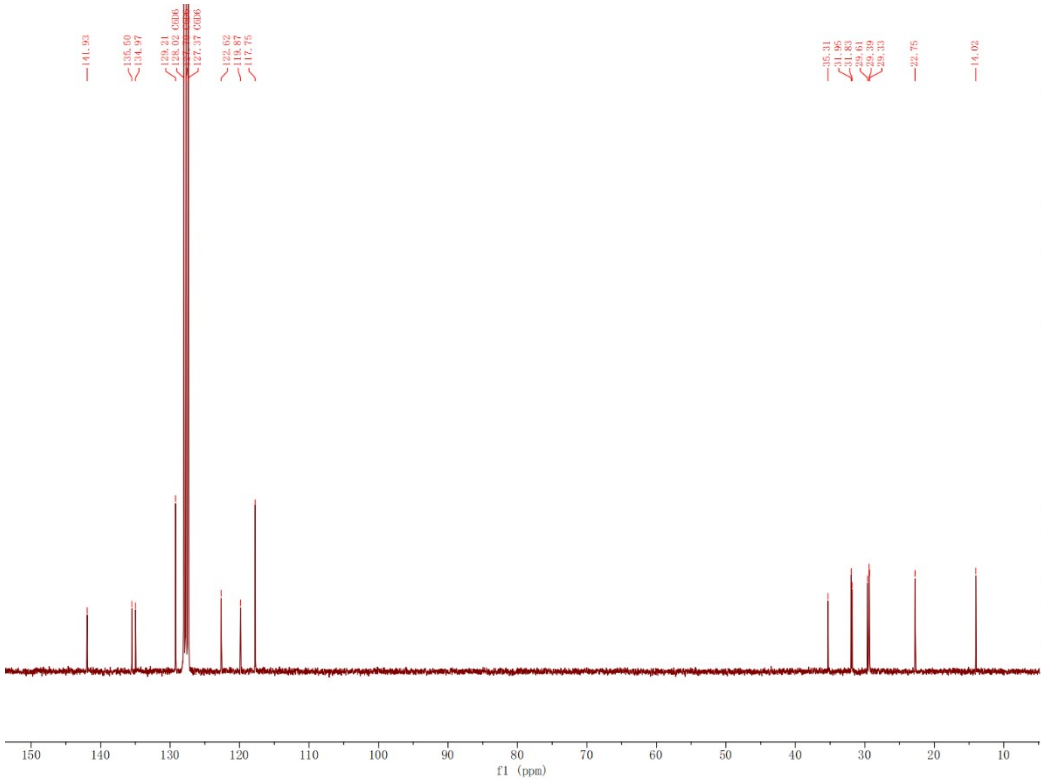


Figure S14. ^{13}C NMR spectrum of **M2-3** (75 MHz, Benzene-d_6).

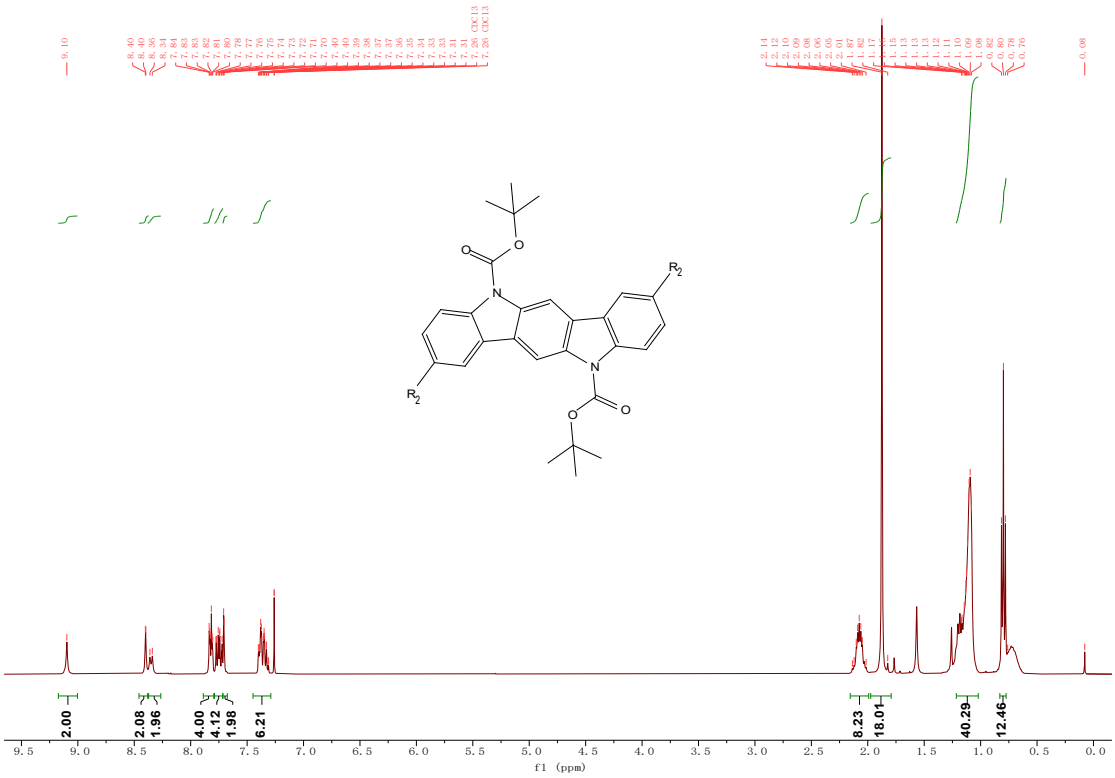


Figure S15. ^{1}H NMR spectrum of **b** (400 MHz, Chloroform-*d*).

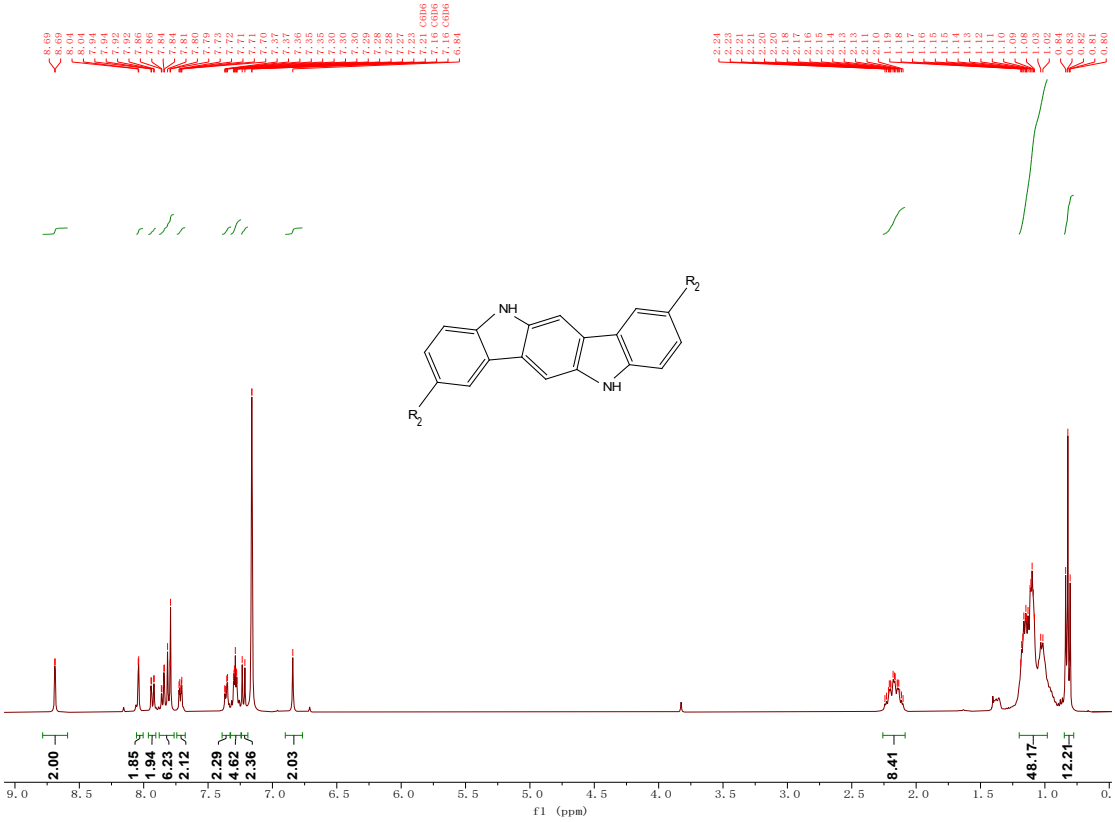


Figure S16. ^{1}H NMR spectrum of **M2-4** (400 MHz, Benzene-d_6).

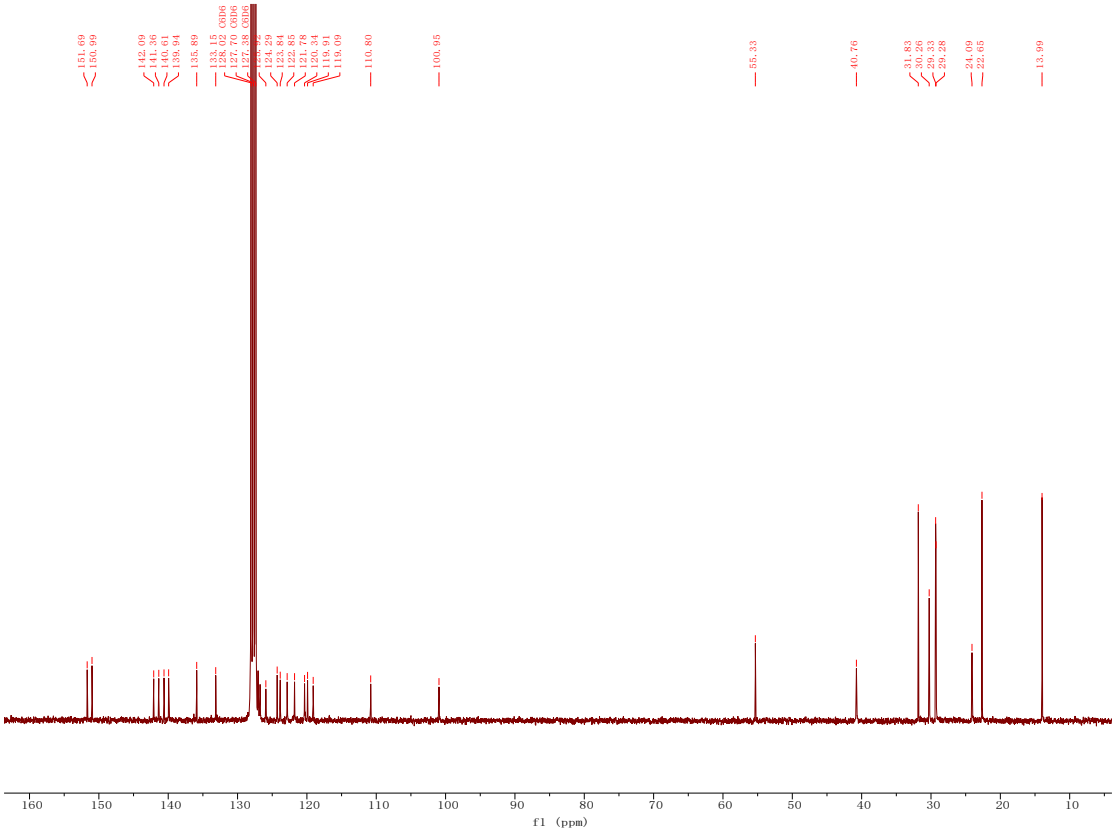


Figure S17. ^{13}C NMR spectrum of **M2-4** (75 MHz, Benzene-d_6).

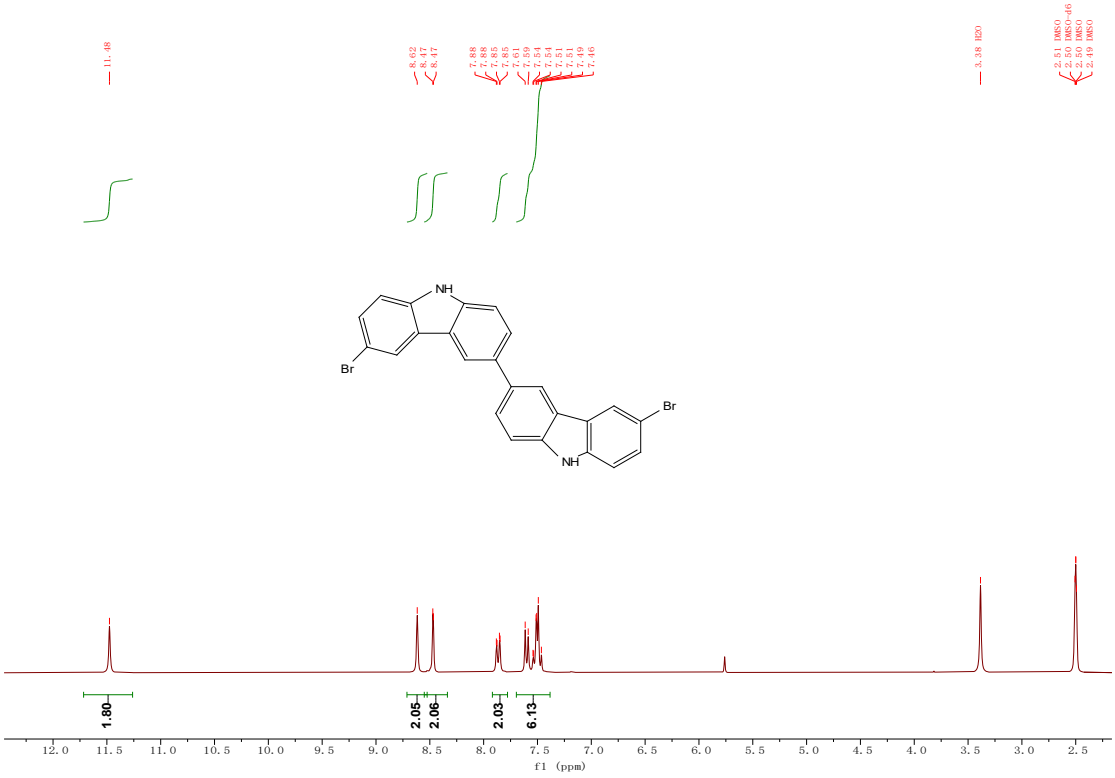


Figure S18. ^{1}H NMR spectrum of **c** (300 MHz, DMSO-d_6).

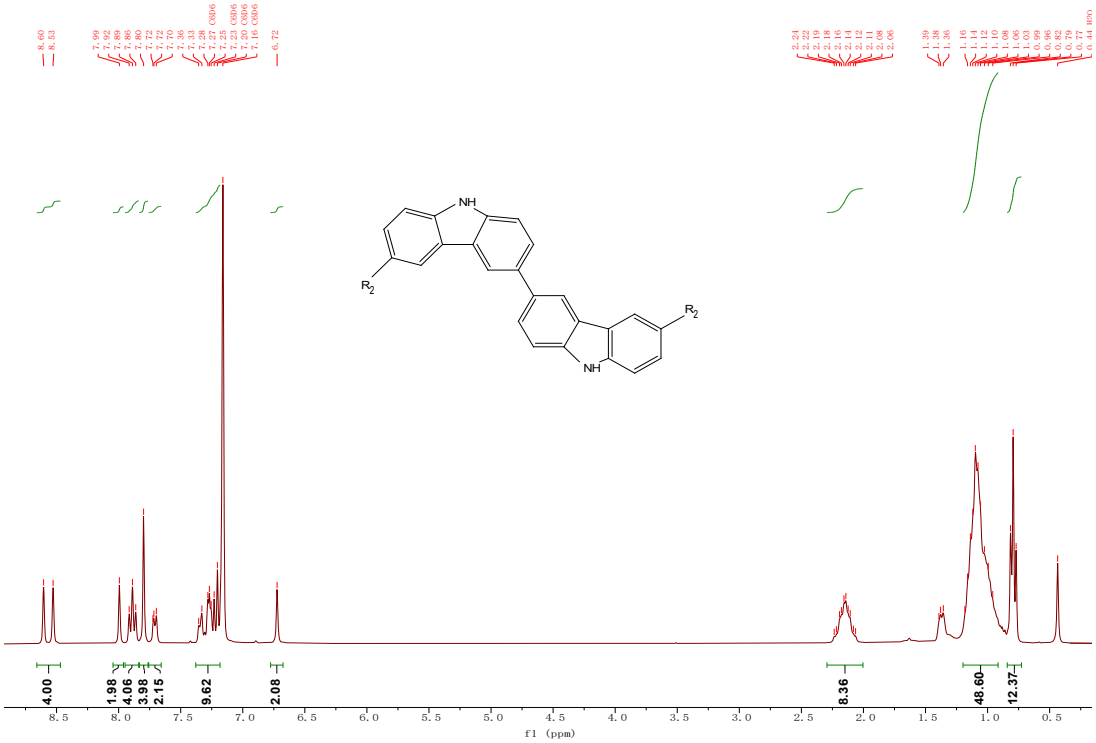


Figure S19. ^{1}H NMR spectrum of **M2-5** (300 MHz, Benzene-d_6).

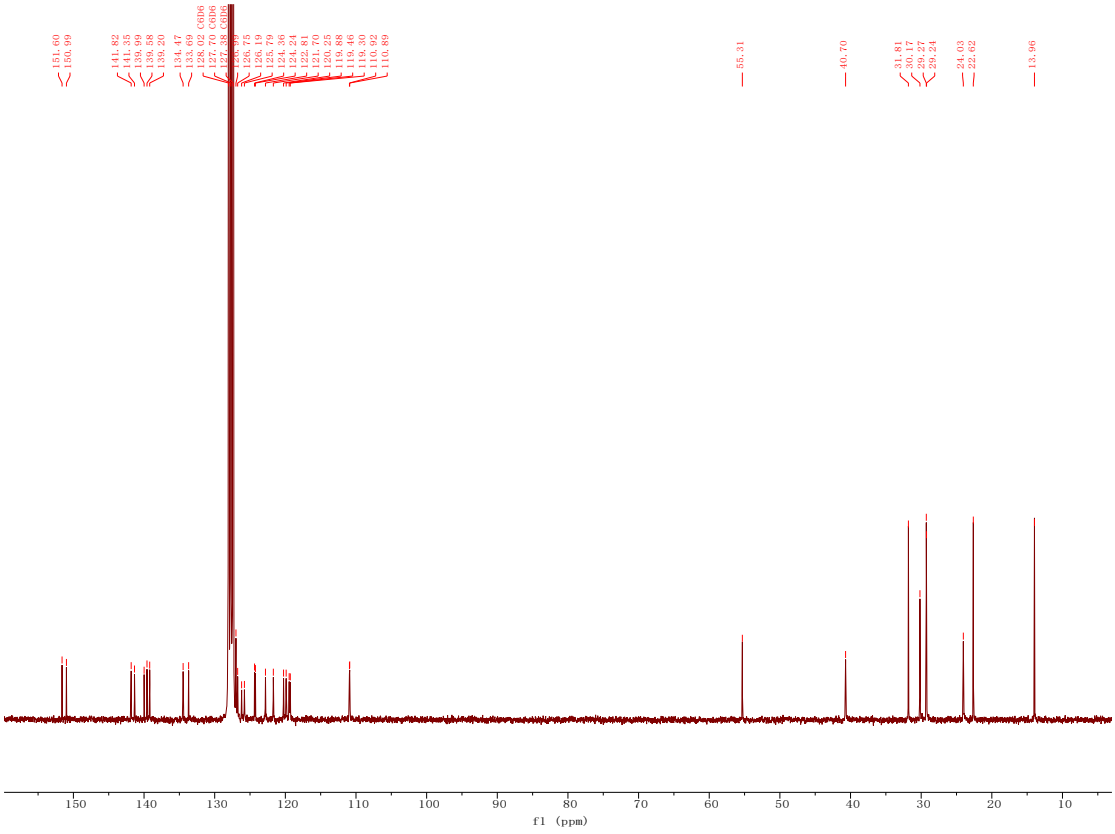


Figure S20. ^{13}C NMR spectrum of **M2-5** (75 MHz, Benzene-d_6).

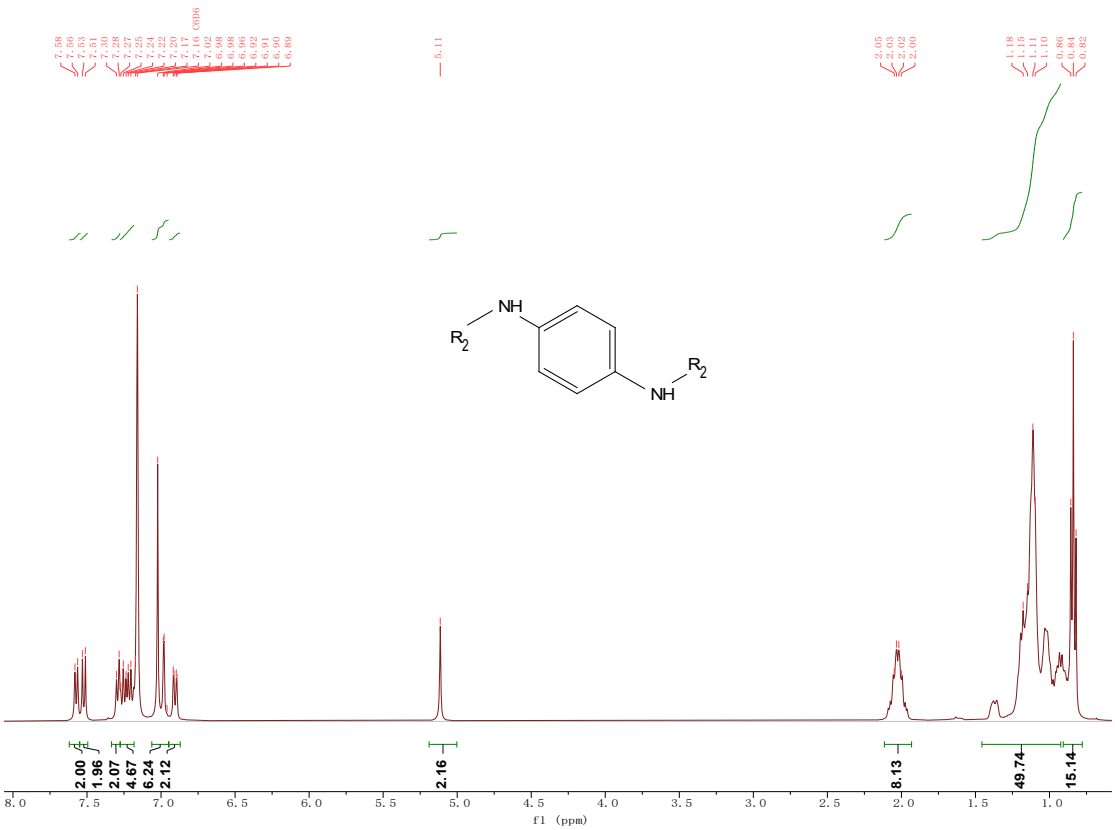


Figure S21. ^{1}H NMR spectrum of **M2-6** (300 MHz, Benzene-d_6).

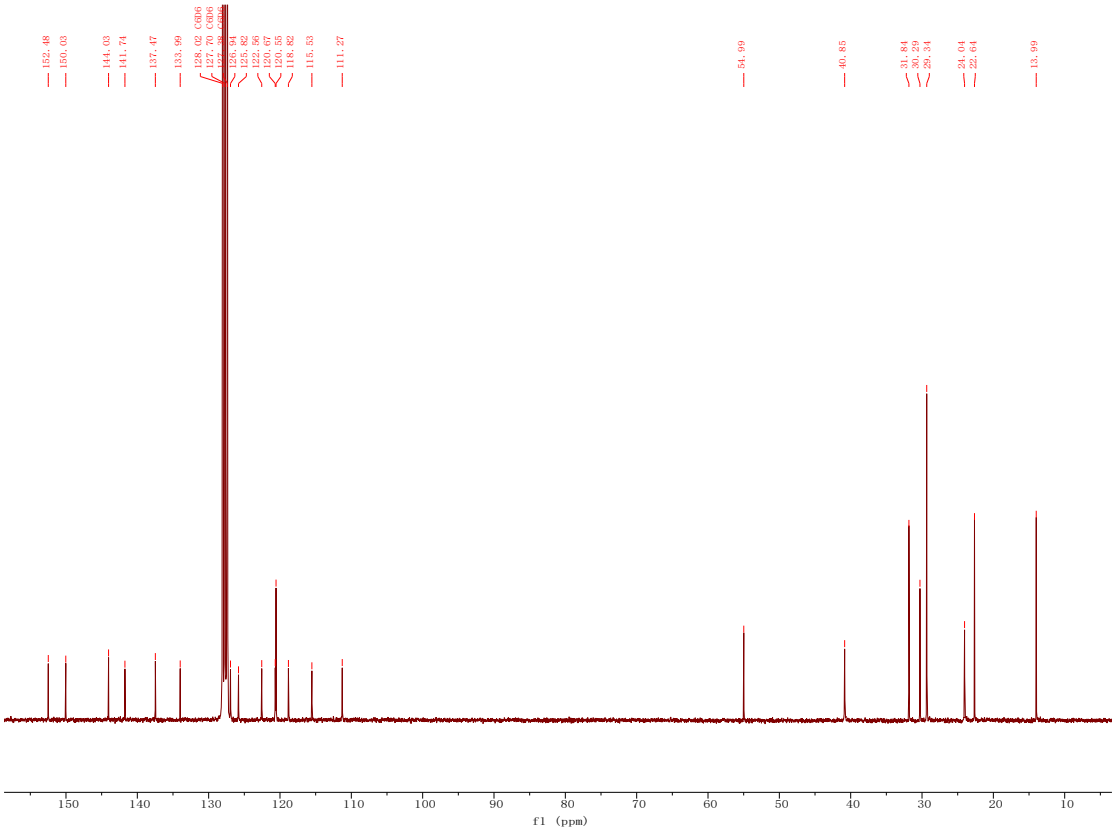


Figure S22. ^{13}C NMR spectrum of **M2-6** (75 MHz, Benzene-d_6).

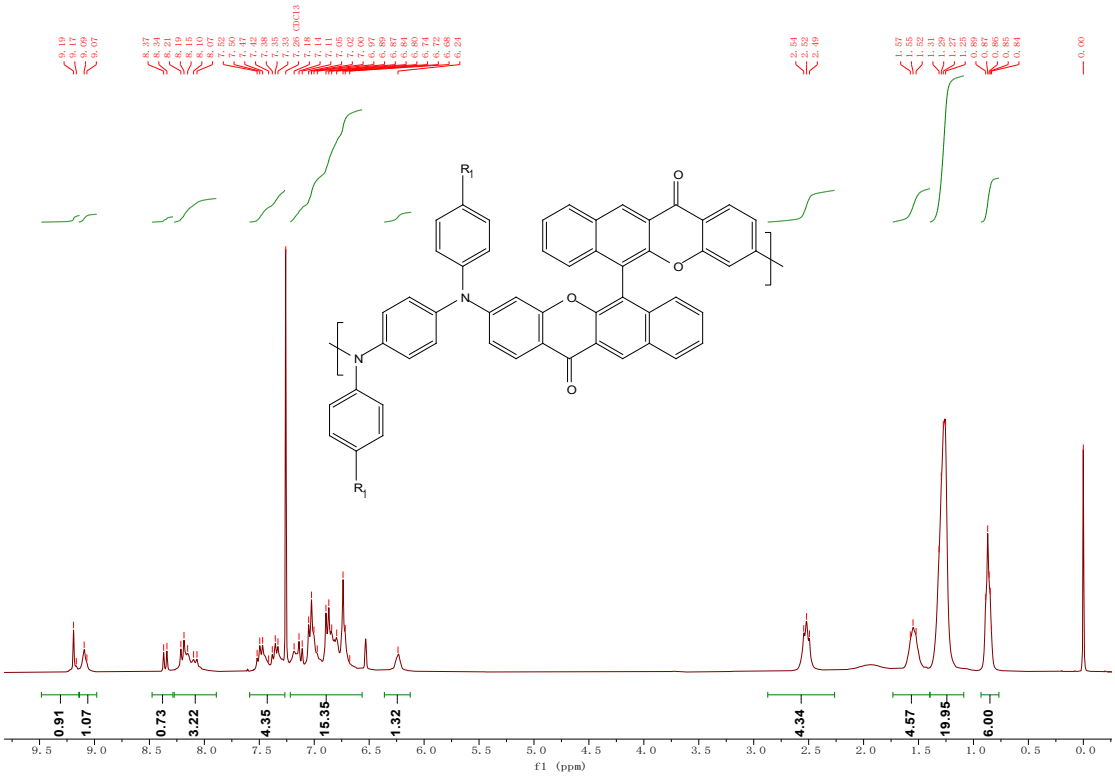


Figure S23. ^{1}H NMR spectrum of **P1** (300 MHz, Chloroform-*d*).

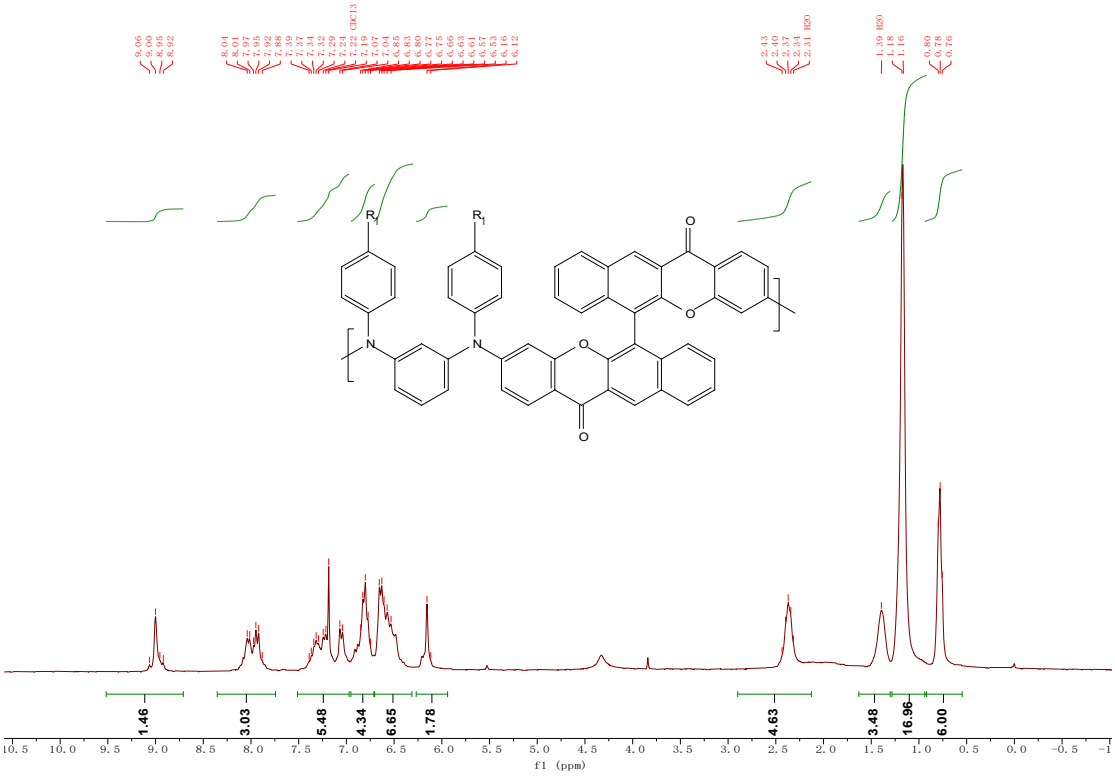


Figure S24. ^{1}H NMR spectrum of **P2**(300 MHz, Chloroform-*d*).

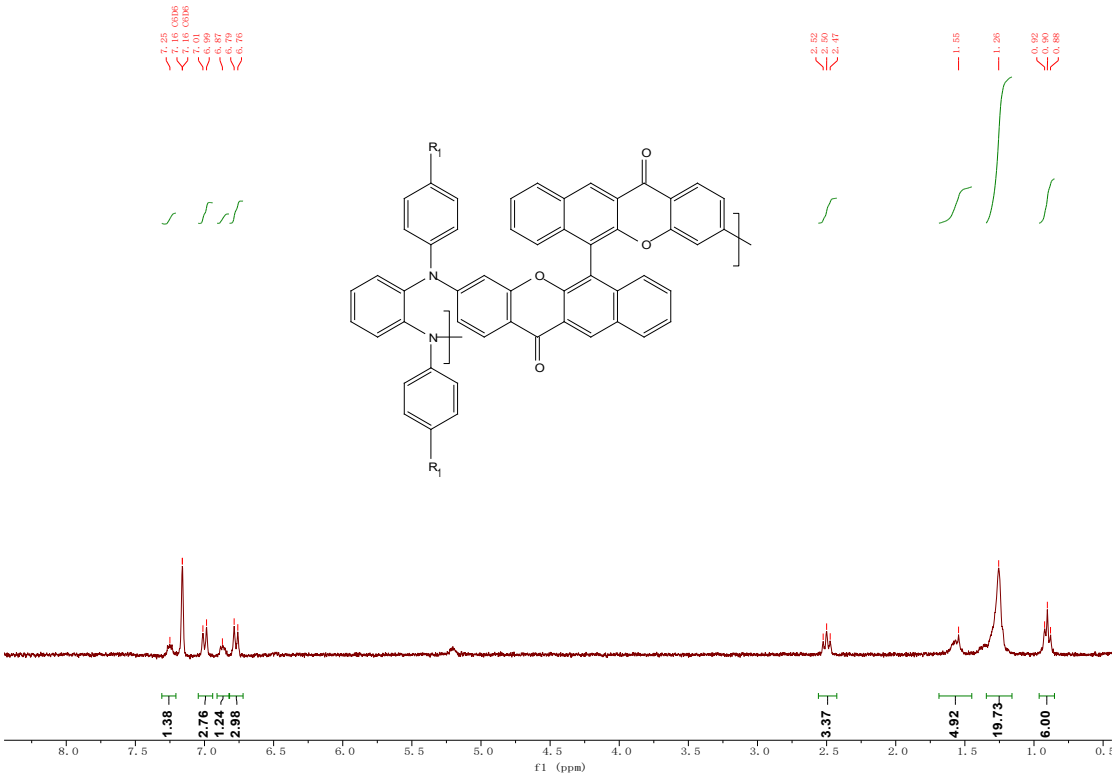


Figure S25. ^{1}H NMR spectrum of **P3** (300 MHz, Chloroform-*d*).

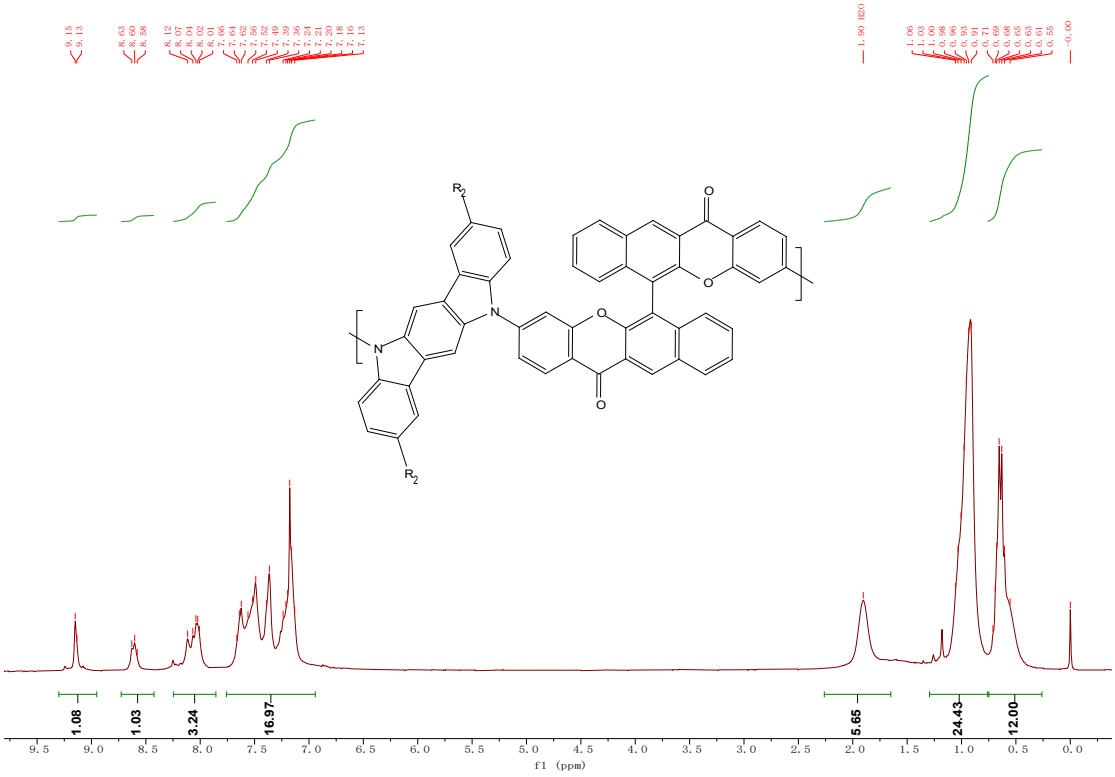


Figure S26. ^{1}H NMR spectrum of **P4** (300 MHz, Chloroform-*d*).

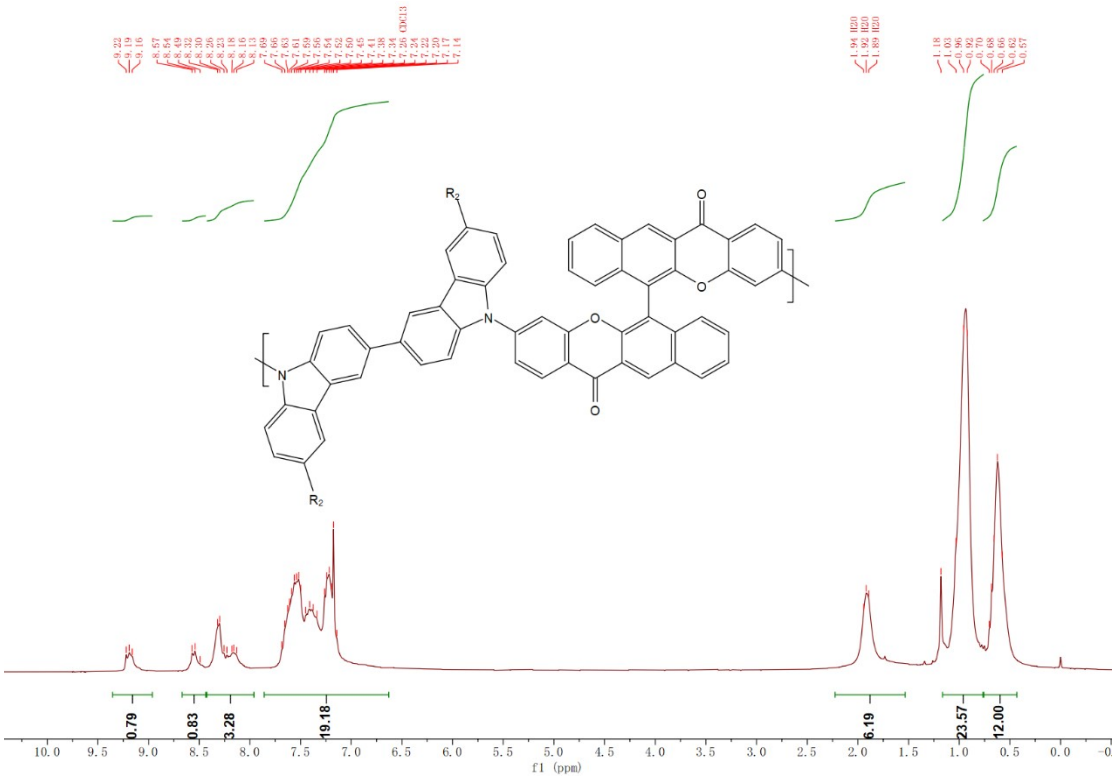


Figure S27. ^{1}H NMR spectrum of **P5** (300 MHz, Chloroform-*d*).

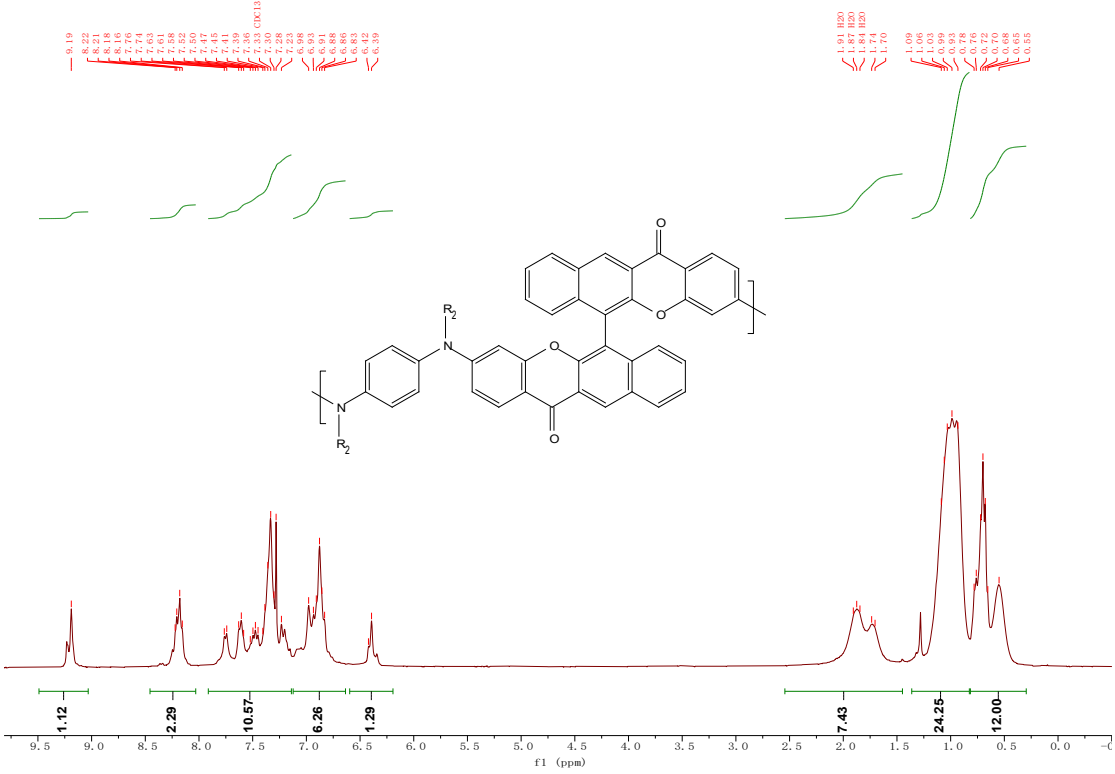


Figure S28. ^{1}H NMR spectrum of **P6** (300 MHz, Chloroform-*d*).

8. References

1. M. Kukino, J. Kuwabara, K. Matsuishi, T. Fukuda and T. Kanbara, *Chem. Lett.*, 2010, **39**, 1248-1250.
2. S. Ameen, J. Lee, H. Han, M. C. Suh and C. Lee, *RSC Adv.*, 2016, **6**, 33212-33220.