SUPPORTING INFORMATION

Doping-Free Circularly Polarized Electroluminescence of AIE-Active

Chiral Binaphthyl-Based Polymers

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1. Instrumentation and Materials.

NMR spectra were taken on 400 MHz Bruker spectrometer with 400 MHz for ¹H NMR and 100 MHz for ¹³C NMR and reported as parts per million (ppm) from the internal standard TMS. Ultraviolet-visible (UV-vis) spectra were obtained by using a Perkin-Elmer Lambda 35 spectrophotometer. Fluorescence spectra were obtained from HORIBA Scientific FluoroMax-4 Spectrofluorometer. Circular dichroism (CD) spectra were recorded on a JASCO J-810 spectropolarimeter. Circularly polarized luminescence/electroluminescence (CPL/CP-EL) spectra were recorded with a JASCO CPL-300 spectrofluoropolarimeter. Molecular weight was determined by GPC with Waters-244 HPLC pump and THF was used as solvent and relative to polystyrene standards. Thermogravimetric analyses (TGA) and differential scanning calorimetry (DSC) were performed by using a PerkinElmer Pyris-1 instrument under N2 atmosphere at a heating rate of 20 °C/min. Cyclic voltammetry (CV) was carried out on CHI660D (Shanghai CH Instrument Company, China) with a conventional three-electrode system consisting of a glassy carbon working electrode, a platinum wire auxiliary electrode, and an Ag/AgCl reference electrode in CH₂Cl₂ solution containing 0.1 M TBAPF₆ as supporting electrolyte and ferrocene as internal standard with scan rate of 100 mV/s at room temperature. All solvents and reagents were commercially available A.R. grade.

2. Synthesis Procedures of Monomers, Model Monomer Molecules and Polymers.



Scheme S1 Synthesis procedures of the monomers



Scheme S2 Synthesis procedures of the model monomer molecules of S-/R-M

Synthesis of S-/R-M1

S-/R-1 (1.50 g, 2.79 mmol), 1-bromooctane (1.18 g, 6.13 mmol) and K₂CO₃ (1.93 g, 13.94 mmol) were dissolved in 50 mL of CH₃CN, and the reaction mixture was refluxed overnight. After the reaction mixture was cooled to room temperature, the solution was filtered. The solvent was removed under reduced pressure, and the residue was purified by silica gel column chromatography (eluent: petroleum ether/ethyl acetate, v/v, 100:1) to give *S-/R-M1* as yellow oil (1.90 g, 89.2 %). ¹H NMR (400 MHz, Chloroform-*d*) δ 8.50 (s, 2H), 7.77 (d, *J* = 8.2 Hz, 2H), 7.44 – 7.36 (m, 2H), 7.28 – 7.23 (m, 2H), 7.11 (d, *J* = 8.5 Hz, 2H), 3.86 – 3.78 (m, 2H), 3.34 – 3.27 (m, 2H), 1.37 – 1.16 (m, 8H), 1.06 (m, 8H), 0.93 – 0.70 (m, 12H), 0.64 – 0.49 (m, 2H).¹³C NMR (100 MHz, CDCl₃) δ 154.10, 139.57, 133.95, 132.06, 126.89, 126.87, 125.92, 125.71, 125.42, 93.04, 73.64, 31.76, 29.69, 29.20, 28.99, 25.42, 22.71, 14.20.

Synthesis of M2

Cu(OAc)₂ (61.1 mg, 0.34 mmol), tricyclohexylphosphine (25 wt% solution in toluene, 1.18 mmol) were added to 15 mL MeOH under N₂ atmosphere. After the mixture was stirred at 80 °C for 1 h, the solvent was removed under reduced pressure. To the residue were added an alkyne (3 g, 16.83 mmol), bis(pinacolato)diboron (5.56 g, 21.88 mmol) and 20 mL toluene, and the reaction mixture was stirred at 80 °C under N₂ atmosphere for 12 h. After cooling to room temperature, the reaction mixture was diluted with ethyl acetate and filtered through a Celite plug. The organic solution was washed three times with brine, dried over MgSO₄ and concentrated under reduced pressure. Repetitive recrystallization from hexane afforded **M2** as a white solid (3.71 g, 51%). ¹H NMR (400

MHz, Chloroform-*d*) δ 7.11 – 6.99 (m, 6H), 6.99 – 6.88 (m, 4H), 1.32 (s, 24H). ¹³C NMR (100 MHz, CDCl₃) δ 141.26, 129.31, 127.42, 125.78, 84.06, 24.90.

Synthesis of S-/R-M

*S-/R-*M3 (473.0 mg, 0.90 mmol), M2 (150.0 mg, 0.35 mmol), Pd(PPh₃)₄ (40.1 mg, 0.03 mmol) and K₂CO₃ (960.0 mg, 6.94 mmol) were added into the mixed solvents of 13 mL dioxane and 3 mL water. The mixture was stirred at 100 °C under N₂ atmosphere. After reaction for 24 h, the solvent was removed under reduced pressure, and the residue was purified by silica gel column chromatography (eluent: petroleum ether/ethyl acetate, v/v, 40:1) to afford *S-/R-*M as a pale yellow solid (90.0 mg, 32.1%). ¹H NMR (400 MHz, Chloroform-*d*) δ 7.96 (s, 2H), 7.89 (d, *J* = 9.0 Hz, 2H), 7.78 (t, *J* = 8.2 Hz, 4H), 7.31 (q, *J* = 6.1, 4.8 Hz, 5H), 7.22 – 7.17 (m, 5H), 7.11 – 7.00 (m, 12H), 6.86 (d, *J* = 8.5 Hz, 2H), 3.90 (td, *J* = 6.3, 3.6 Hz, 4H), 3.36 (q, *J* = 6.9 Hz, 2H), 2.78 – 2.69 (m, 2H), 1.39 – 1.31 (m, 4H), 0.98 (q, *J* = 7.4 Hz, 4H), 0.80 – 0.53 (m, 14H), 0.40 (t, *J* = 7.2 Hz, 6H). ¹³C NMR (100 MHz, CDCl₃) δ 154.40, 154.26, 142.61, 139.73, 138.67, 134.07, 133.88, 131.07, 130.91, 130.23, 129.27, 129.02, 127.99, 127.43, 127.30, 126.55, 126.22, 125.62, 125.35, 125.23, 124.27, 123.89, 123.36, 120.51, 114.20, 71.69, 68.40, 31.74, 31.31, 18.82, 18.49, 13.58, 13.53.

Synthesis of S-/R-P

*S-/R-*M1 (150.0 mg, 0.20 mmol), M2 (85.0 mg, 0.20 mmol), Pd(PPh₃)₄ (22.7 mg, 0.02 mmol) and K₂CO₃ (0.82 g, 5.90 mmol) were added to a mixture solvent of 10 mL dioxane and 3 mL water. The mixture was stirred at 100 °C under N₂ atmosphere. After reaction for 48 h, bromobenzene (3.1 mg, 0.02 mmol) was added for a period of 2 h and then phenylboronic acid (4.8 mg, 0.04 mmol) was added for another 2 h. After the reaction was finished, the mixture was poured into water and extracted with CH₂Cl₂. The organic layer was filtrated through a short silica gel column, then evaporated under reduced pressure. And then the residues were dissolved in 2 mL of CH₂Cl₂ and precipitated in 80 mL of methanol. The obtained solids was filtered and further washed by using 2 × 10 mL of methanol. Then the solids were dried in vacuum to afford *S-/R-P* as pale yellow solid (80.0 mg, 57.9 %). ¹H NMR (400 MHz, Chloroform-*d*) δ 8.14 – 7.47 (m, 4H), 7.45 – 7.28 (m, 2H), 7.24 – 6.44 (m, 14H), 3.95 – 2.77 (m, 4H), 1.30 – 0.26 (m, 30H). GPC: M_n = 3631, M_w = 4174, PDI = 1.15.

3. Device Fabrication.

Indium tin oxide (ITO) coated glass substrates with a sheet resistance of 15 Ω /square were patterned by a conventional wet-etching process using a mixture of HCl (6 N) and HNO₃ (0.6 N) as the etchant. After patterning, the substrates were rinsed and cleaned with deionized water, followed by ultrasonicating in acetone and ethanol sequentially. Before the fabrication of OLEDs, the ITO substrates were treated in a UV-ozone oven for 20 min. Then a thin film of poly(3,4ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS) (4083) was spin-coated on the ITO substrates and dried at 80 °C for 30 min. The emitting layer of the devices was deposited by spincoating, with chlorobenzene as the solvent. The electron-transporting layer was deposited by thermal evaporation at a vacuum below 1×10^{-4} Pa, and the deposition rate was $1 \sim 2$ Å/s. Finally, calcium (Ca) and silver (Ag) were deposited as the electron injection layer and cathode sequentially under 10^{-5} Pa, respectively. The thickness of the resulting thin films was measured by a Dektak surface profilometer. The brightness and current-voltage characteristics of the devices were tested in a glove box with a nitrogen atmosphere using a Keithley 2636A system SourceMeter. The electroluminescence (EL) spectra were recorded by a Photo Research PR-655 SpectraScan at ambient conditions without nitrogen protection.



4. TGA and DSC Curves of S-P.

Fig. S1 TGA curve and DSC curve (the second heating cycle) of S-P at a scan rate of 20 °C/min.

5. Photophysical Properties of S-/R-P.



Fig. S2 (a) Normalized absorption spectra and emission spectra of *R*-P ($\lambda_{ex} = 340$ nm) in spin-coated film and THF. (b) Fluorescence emission spectra of *R*-P ($\lambda_{ex} = 340$ nm) in THF/H₂O mixtures at a fixed concentration (1.0 × 10⁻⁵ mol/L).





Fig. S3 UV-*vis* spectra of (a) *S*-P and (b) *R*-P in THF/H₂O mixtures at a fixed concentration $(1.0 \times 10^{-5} \text{ mol/L})$.





Fig. S4 CD spectra of S-/R-P in THF/H₂O mixtures at a fixed concentration (1.0×10^{-5} mol/L).





Fig. S5 CD spectra of S-/R-P and S-/R-M (a) in THF $(1.0 \times 10^{-5} \text{ mol/L})$ and (b) in spin-coated film.

7. Electrochemical Measurements.



Fig. S6 Cyclic voltammograms of S-P in CH₂Cl₂ solution.

Table S1 Electrochemical properties of S-P

	λ_{onset}	E_{g}^{a}	$E_{\rm ox,onset}$	HOMO ^b	HUMO ^c
	(nm)	(eV)	(V)	(eV)	(eV)
S-P	376	3.30	0.85	-5.18	-1.88

 ${}^{a}E_{g} = 1240/\lambda_{onset}$. ${}^{b}E_{HOMO} = -(E_{ox} - E_{(Fc/Fc^{+})} + 4.8) \text{ eV}$, $E_{(Fc/Fc^{+})} = 0.47 \text{ V vs Ag/AgC1}$. ${}^{c}E_{LUMO} = E_{HOMO} + E_{g}$.



8. Devices Performance of Model Monomer Molecules and S-/R-P.

Fig. S7 Electroluminescence spectra and CIE coordinates of devices based on (a) S-P and (b) R-P.



Fig. S8 Current efficiency-brightness characteristics of the OLEDs based on S-P and R-P.



Fig. S9 (a) Current density-voltage- brightness characteristics and (b) Current efficiency-brightness characteristics of the OLEDs based on *S*-M and *R*-M.



Fig. S10 CP-EL spectra of S-/R-M in spin-coated film.

EML(45nm)	$V_{on}(V)$	CE_{max} (cd A ⁻¹)	PE _{max} (lm W ⁻¹)	L_{max} (cd m ⁻²)
S-P	6.0	0.926	0.390	1669
<i>R</i> -P	5.7	0.833	0.422	1270
S-M	3.8	0.016	0.009	47
<i>R</i> -M	4.0	0.011	0.007	34

Table S2 Summary of device performance

9. NMR Spectra of Monomers, Model Monomer Molecules and Polymer.























Fig. S17 ¹H NMR spectrum of *S*-/*R*-P (400 MHz, CDCl₃).