Electronic Supplementary Material (ESI) for Soft Matter.
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Supporting Information

The influence of alkyl length on circularly polarized luminescence for non-liquid crystalline binaphthol-based cyanostilbene

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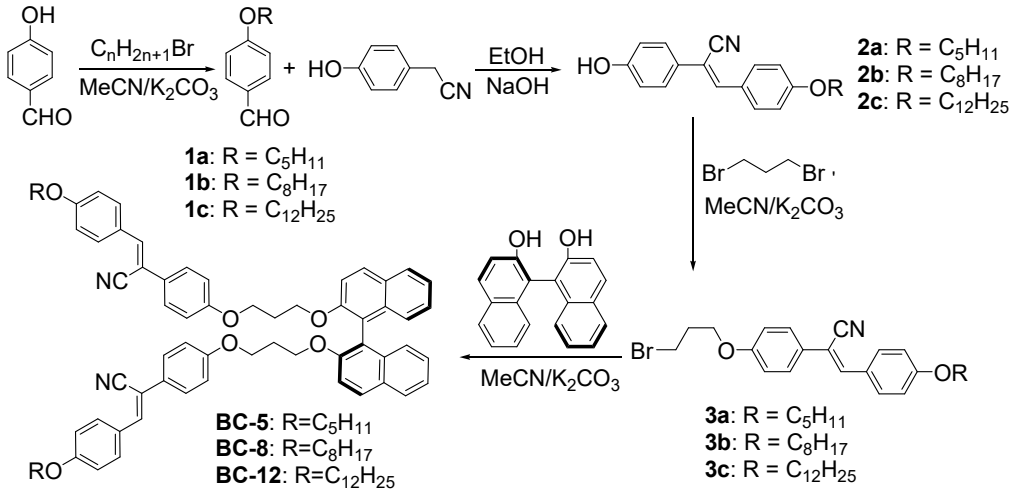
1. General

The organic and inorganic reagents used here were purchased from Aladdin Aladdin reagent company. TLC analysis was carried out on pre-coated glass plates for monitoring reaction process. Silica gel (200-300 mesh) was used for separating products on column chromatography. NMR experiments were done on a Bruker-ARX 400 instrument with TMS as internal standard. Bruker mass spectrometer was empoyed for investigating MS spectra. The phase transition process was studied under Leica DMRX with a hot stage of Linkam THMSE 600. Thermal analysis was performed on Thermal Analysis Q100 under N_2 atmosphere. UV-Vis experiments were explored on Varian spectrometer. Fluorescence spectra were examined by the analysis on a Hitachi F-4500 spectrometer. The fluorescence absolute yields (Φ_F) were obtained on an Edinburgh Instruments FLS920 Fluorescence Spectrometer containing a 6-inch integrating sphere. CD spectra were recorded on a Jasco J-815 CD spectrometer (Jasco, Japan). CPL was measured on a Jasco CPL-200 spectrometer (Jasco, Japan). Compounds **3a**, **3b** and **3c** were prepared by the reported procedures (Soft Matter, 2020, 16, 10368).



Scheme S1 The synthetic routes for **BC-5**, **BC-8** and **BC-12**

2. **The synthetic processes for BC-5, BC-8** and **BC-12**

The mixture of compound **3a** (or **3b**, **3c**) (2.0 mmol), R-binaphthol (0.29g, 1 mmol) and anhydrous K_2CO_3 (0.69g, 5 mmol) was stirred and refluxed in 50 mL of ddried MeCN for 24 h. The reaction process was monitored by TLC analysis. After cooling, 30 mL of HCl solution (1M) and 50 mL of $CHCl_3$ were added in the reaction system. The organic layer was partitioned and concentrated under reduced pressure. The residue was separated by the rapid column chromatography, using CH_2Cl_2/hexane (1:1, *V*/*V*) as eluents. Compounds **BC-5**, **BC-8** and **BC-12** were collected as pale yellow solid in yields of 60%, 64 and 69%, respectively.

Compound **BC-5**: ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.81-7.96 (m, 6H, ArH), 7.13-7.48 (m, 16H, ArH), 6.94-6.98 (m, 2H, ArH), 6.75 (d, *J* = 8.0 Hz, 2H, ArH), 6.52(m, 2H, ArH), 6.43(d, *J* = 8.0 Hz, 2H, ArH), 4.00-4.14 (m, 6H, OCH_2), 3.93(t, *J* = 8.0 Hz, 2H, OCH_2), 3.33-3.41(m, 4H, OCH_2), 0.89-1.89 (m, 22H, CH_2 and CH_3).^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.67, 160.36, 159.23, 153.93, 142.73, 139.82, 134.04, 131.52, 130.80, 129.99, 129.56, 127.86, 126.97, 126.86, 126.32, 126.11, 125.28, 120.88, 120.58, 118.82, 115.60, 114.85, 114.46, 111.14, 108.18, 68.07, 65.96, 64.08, 31.84, 31.81, 29.38, 29.26, 29.11, 28.19, 26.04, 22.66, 22.48, 14.14. MALDI-TOF-MS ($C_{66}H_{64}N_2O_6$) Calcd. For *m*/*z* = 980.476, found: 980.476. Anal. Calcd for $C_{66}H_{64}N_2O_6$: C, 80.79; H, 6.57; N, 2.85. Found: C, 80.74; H, 6.61; N, 2.81.

Compound **BC-8**: ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.80-7.96 (m, 6H, ArH), 7.10-7.48 (m, 16H, ArH), 6.95-6.98 (m, 2H, ArH), 6.75 (d, *J* = 8.0 Hz, 2H, ArH), 6.52(m, 2H, ArH), 6.43(d, *J* = 8.0 Hz, 2H, ArH), 3.98-4.14 (m, 6H, OCH_2), 3.92(t, *J* = 8.0 Hz, 2H, OCH_2), 3.33-3.43(m, 4H, OCH_2), 0.85-1.91 (m, 34H, CH_2 and CH_3).^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.81, 160.36, 159.17, 153.92, 142.72, 139.80, 133.96, 131.52, 130.89, 130.07, 129.41, 127.89, 127.06, 126.79, 126.43, 125.27, 124.92, 123.83, 120.98, 120.48, 118.76, 115.45, 114.77, 114.52, 111.36, 107.99, 68.13, 65.86, 64.21, 31.84, 29..37, 29.32, 29.26, 29.22, 29.13, 26.01, 22.68, 14.13. MALDI-TOF-MS ($C_{72}H_{76}N_2O_6$) Calcd. For *m*/*z* = 1064.570, found: 1065.383(MH^+). Anal. Calcd for $C_{72}H_{76}N_2O_6$: C, 81.17; H, 7.19; N, 2.63. Found: C, 81.12; H, 7.16; N, 2.66.

Compound **BC-12**: ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.79-7.97 (m, 6H, ArH), 7.10-7.45 (m, 16H, ArH), 6.95-6.97 (m, 2H, ArH), 6.75 (d, *J* = 8.0 Hz, 2H, ArH), 6.53(m, 2H, ArH), 6.43(d, *J* = 8.0 Hz, 2H, ArH), 3.99-4.14 (m, 6H, OCH_2), 3.93(t, *J* = 8.0 Hz, 2H, OCH_2), 3.33-3.46(m, 4H, OCH_2), 0.86-1.92 (m, 50H, CH_2 and CH_3).^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.75, 160.37, 159.23, 153.93, 142.71, 139.81, 134.03, 131.53, 130.78, 129.88, 129.42, 127.71, 127.17, 126.70, 126.63, 126.36, 125.28, 123.84, 120.98, 120.61, 118.82, 115.52, 114.85, 114.47, 111.30, 108.10, 68.24, 65.87, 64.22, 31.95, 29.61, 29.38, 29.19, 26.04, 22.72, 14.15. MALDI-TOF-MS ($C_{80}H_{92}N_2O_6$) Calcd. For *m*/*z* = 1176.696, found: 1177.561(MH^+). Anal. Calcd for $C_{80}H_{92}N_2O_6$: C, 81.59; H, 7.87; N, 2.38. Found: C, 81.55; H, 7.84; N, 2.33.

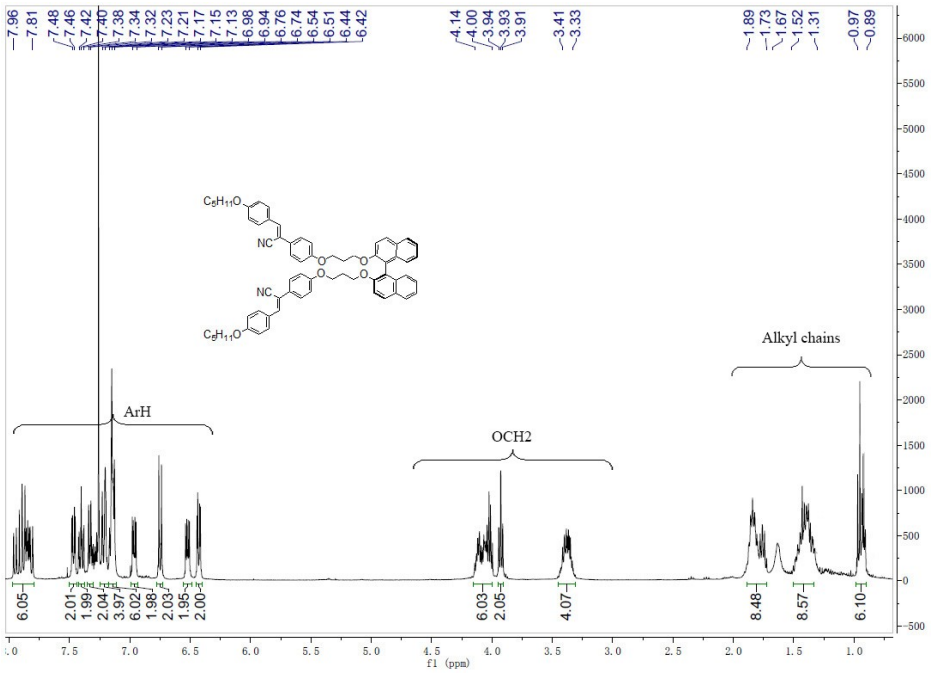


Figure S1 The ^{1}H NMR spectrum of compound **BC-5**

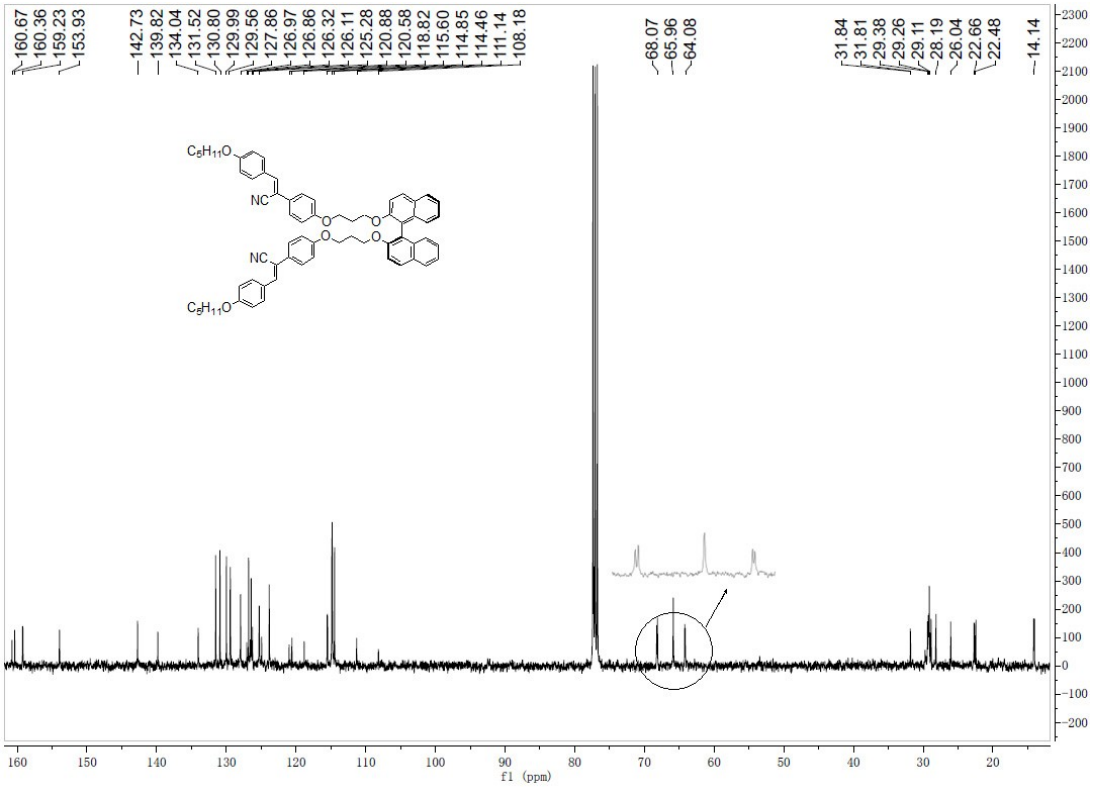


Figure S2 The ^{13}C NMR spectrum of compound **BC-5**

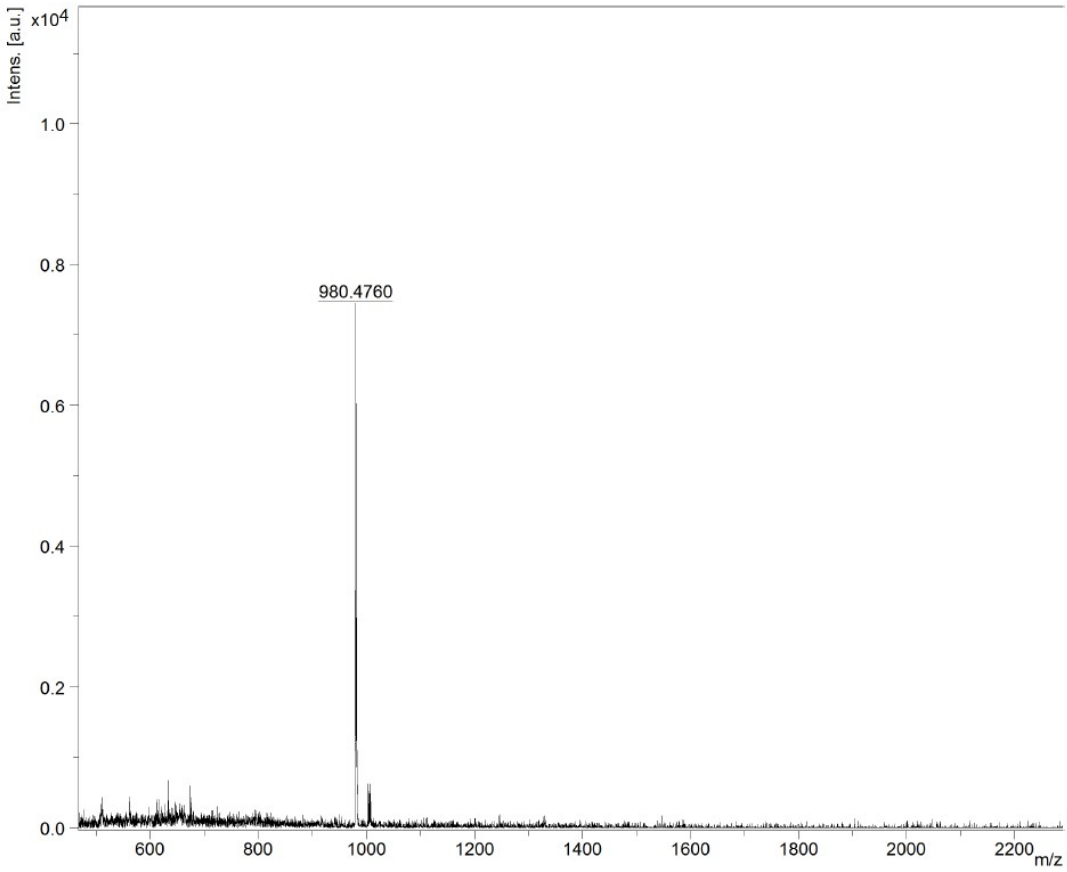


Figure S3 The MALDI-TOF-MS spectrum of compound **BC-5**

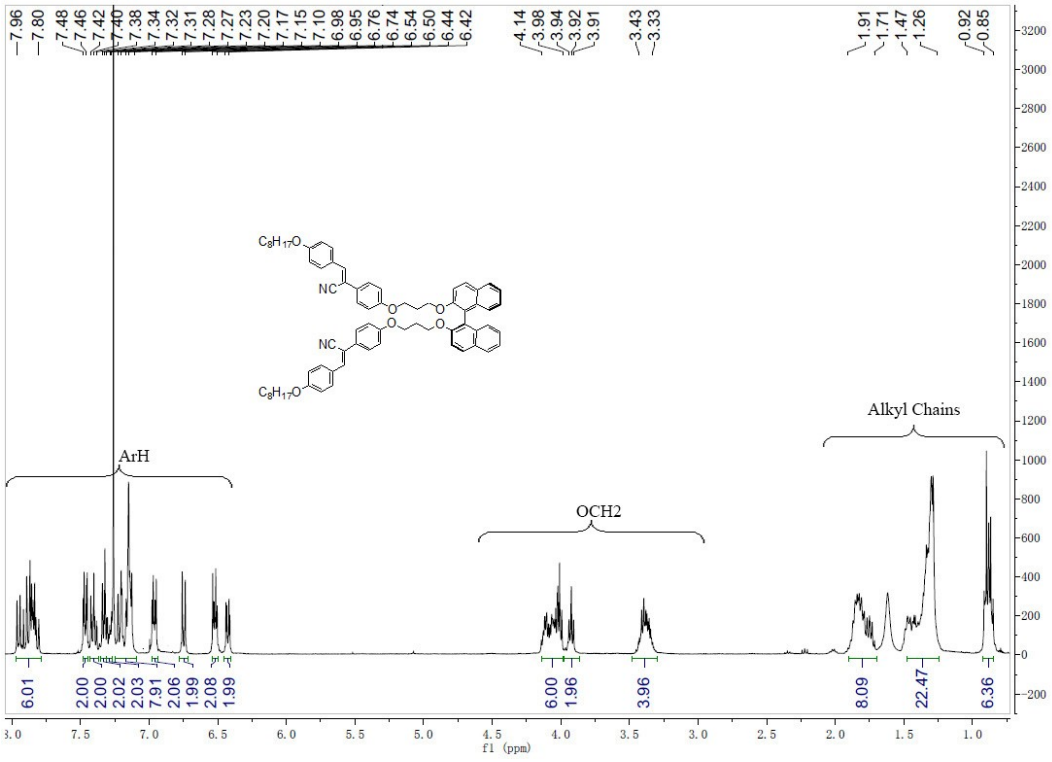


Figure S4 The ^{1}H NMR spectrum of compound **BC-8**

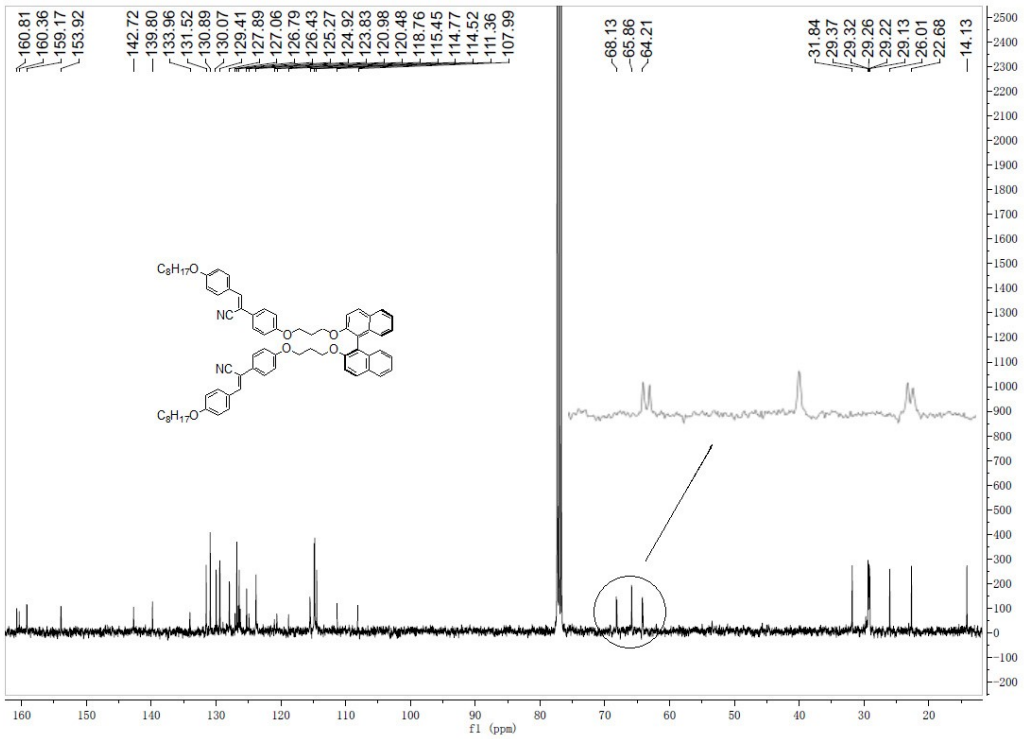


Figure S5 The ^{13}C NMR spectrum of compound **BC-8**

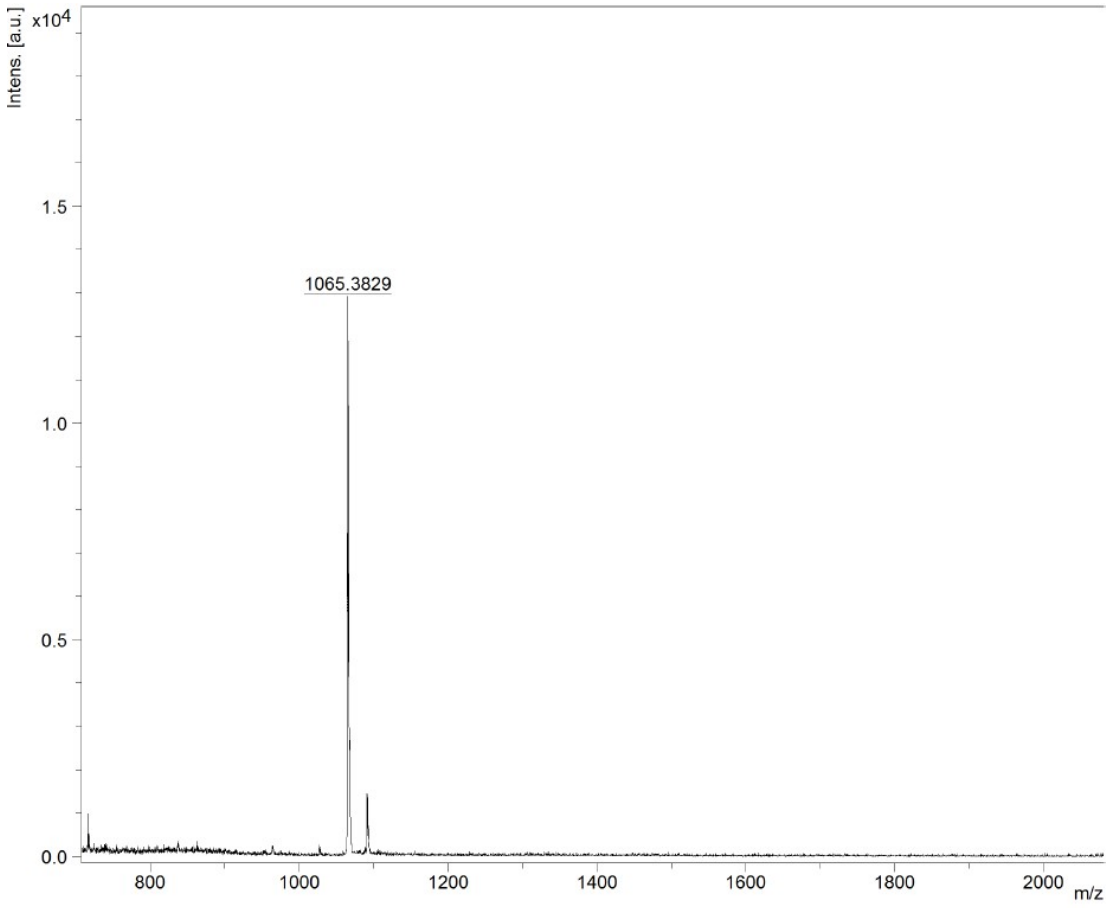


Figure S6 The MALDI-TOF-MS spectrum of compound **BC-8**

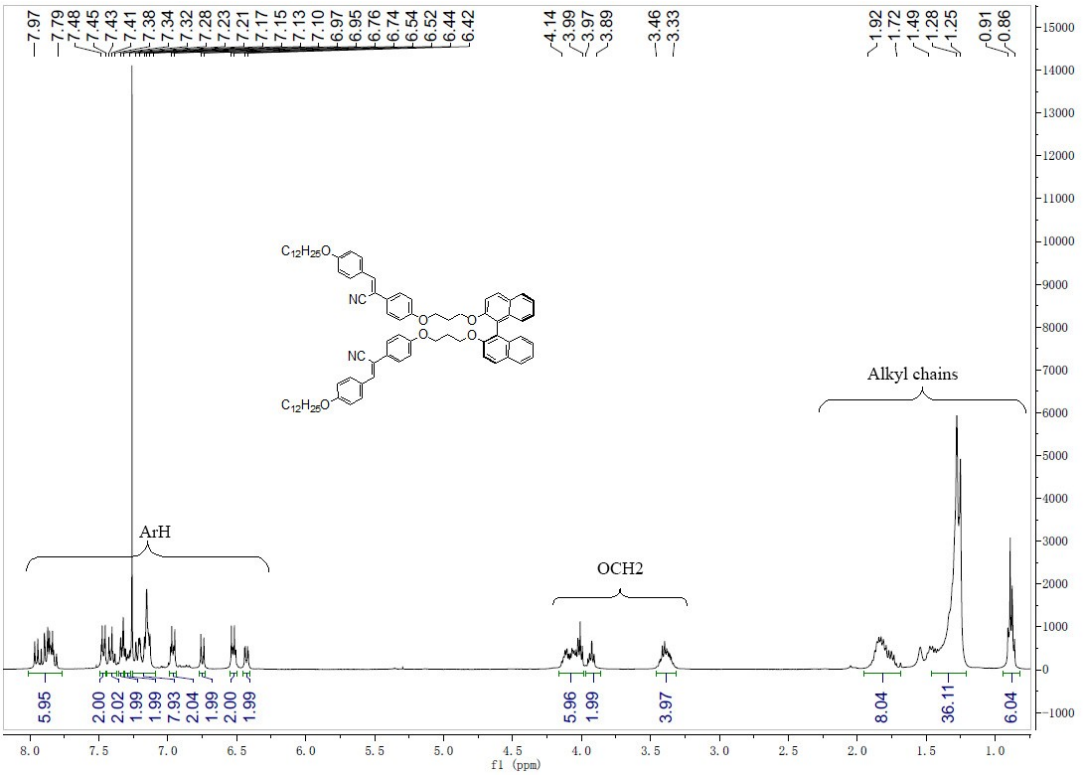


Figure S7 The ^{1}H NMR spectrum of compound **BC-12**

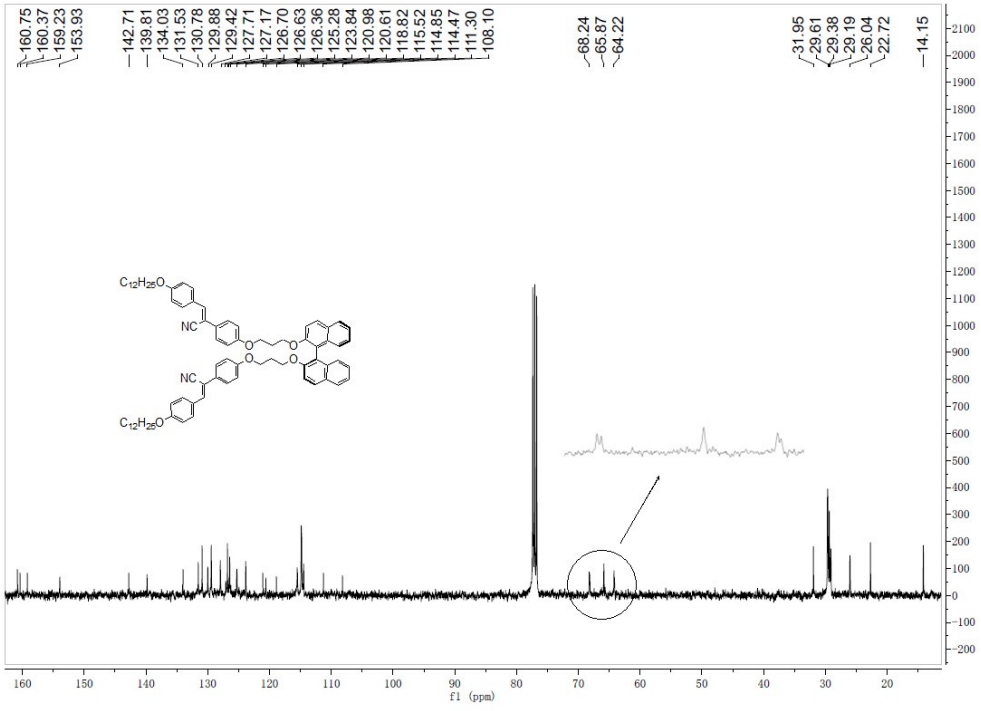


Figure S8 The ^{13}C NMR spectrum of compound **BC-12**

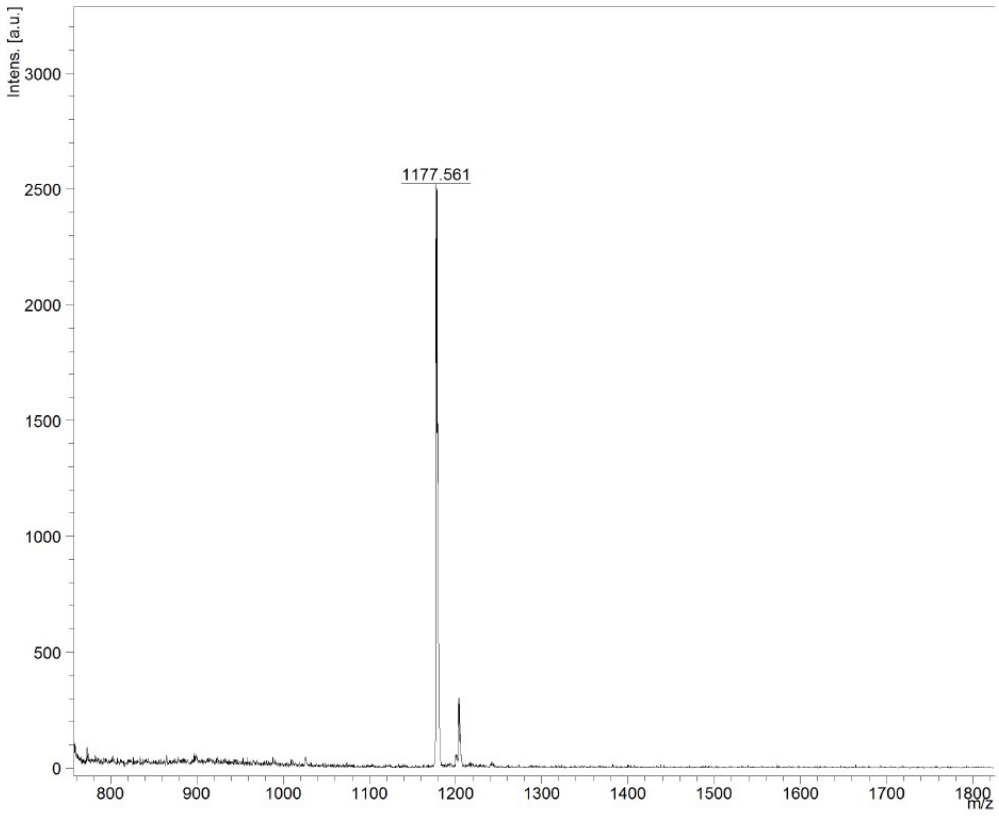


Figure S9 The MALDI-TOF-MS spectrum of compound **BC-12**

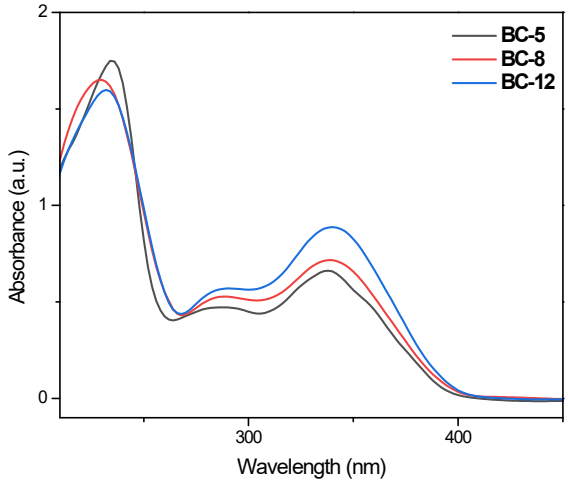


Figure S10 The UV-vis absorption spectra of **BC-5**, **BC-8** and **BC-12** (1.0×10^{-5} M in THF solution, each)

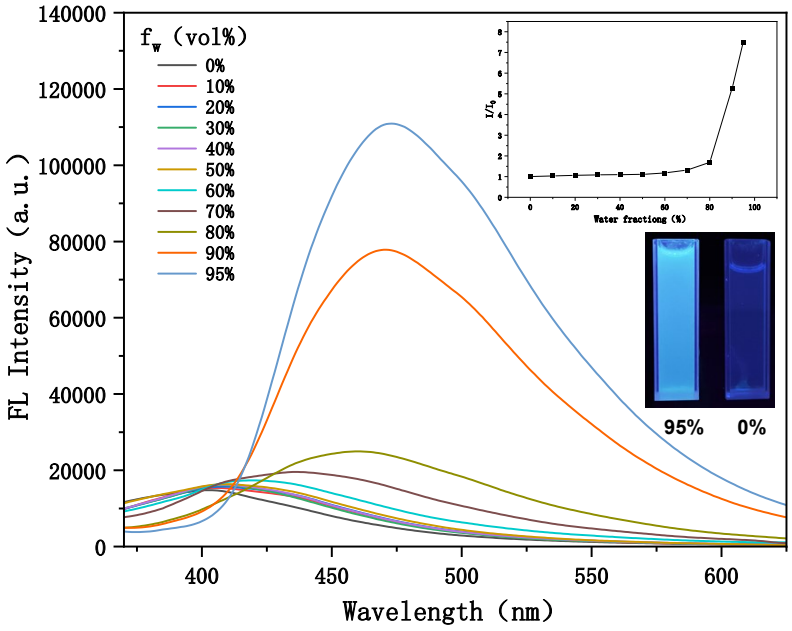


Figure S11 Fluorescence emission spectra of **BC-8** in THF-H_2O solution(1×10^{-5} M, λ_{ex} = 340 nm). Inserted: Fluorescence photos of **BC-8** at 95% and 0% H_2O fractions.

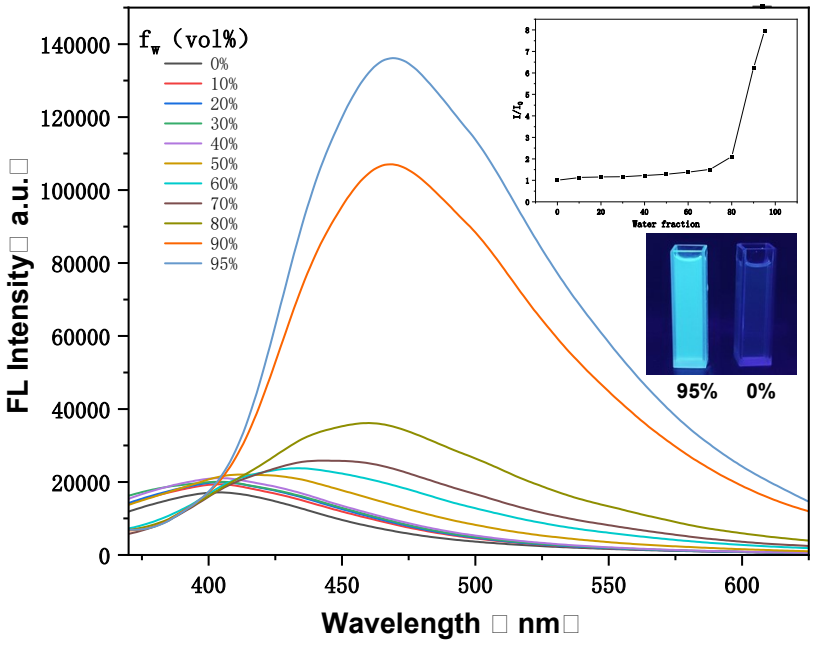


Figure S12 Fluorescence emission spectra of **BC-12** in THF-H_2O solution (1×10^{-5} M, λ_{ex} =340 nm). Inserted: Fluorescence photos of **BC-12** at 95% and 0% H_2O fractions.

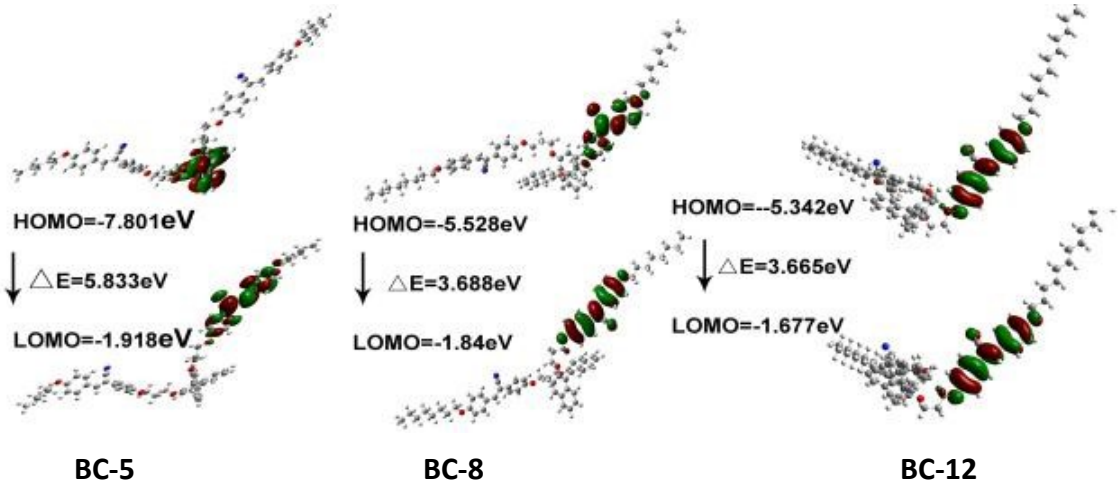


Figure S13 Molecular theoretical orbital amplitude plots of HOMO and LUMO energy levels of **BC-5**, **BC-8** and **BC-12**.

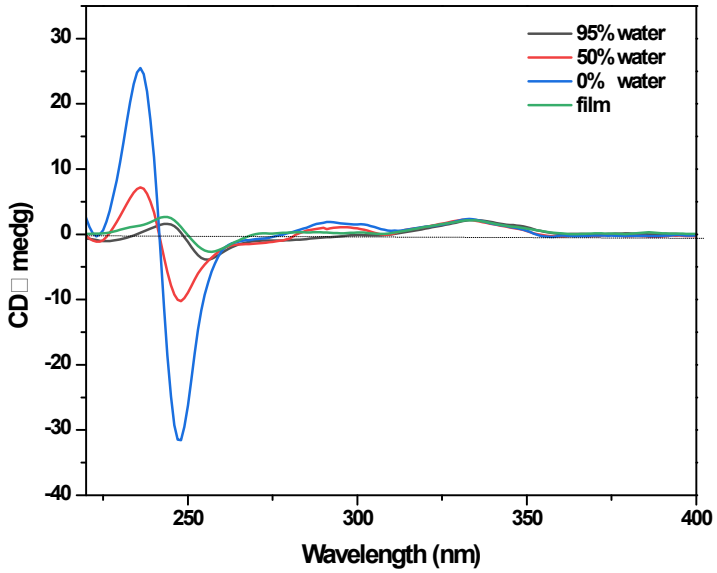


Figure S14 CD spectra of **BC-8** in various states (1.0×10^{-5} M for THF-H_2O solution)

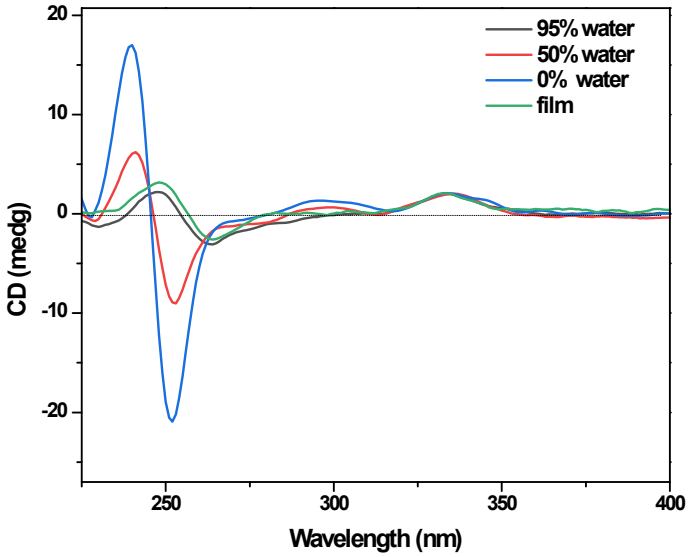


Figure S15 CD spectra of **BC-12** in various states (1.0×10^{-5} M for THF-H_2O solution)

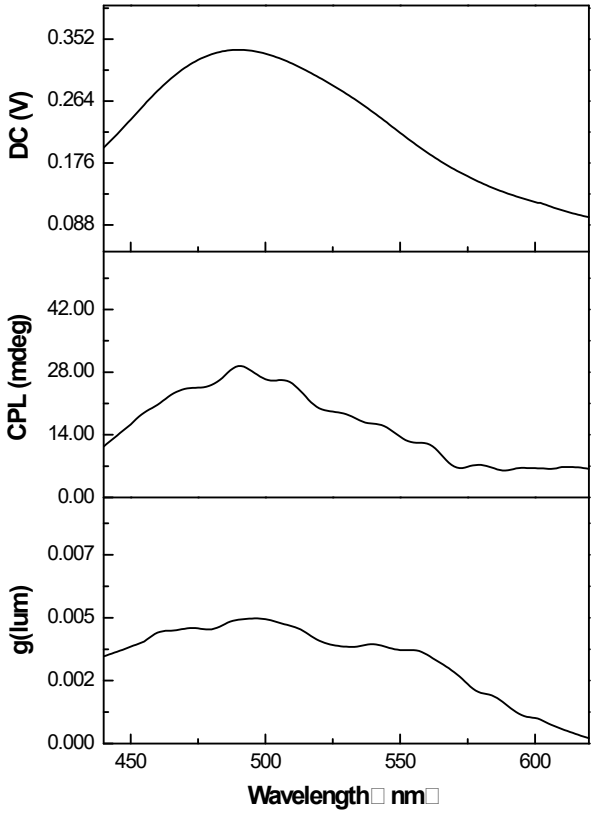


Figure S16 Circularly polarized luminescence spectra and luminescence dissymmetry factors (g_{lum}) of **BC-5** in THF-H_2O (5:95) solution.

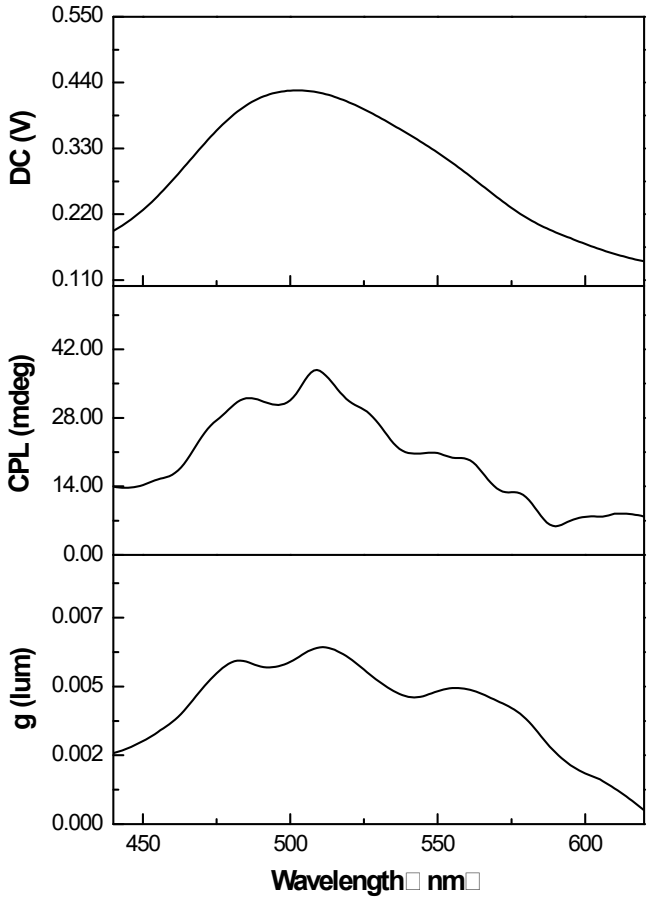


Figure S17 Circularly polarized luminescence spectra and luminescence dissymmetry factors (g_{lum}) of **BC-5** in solid film.

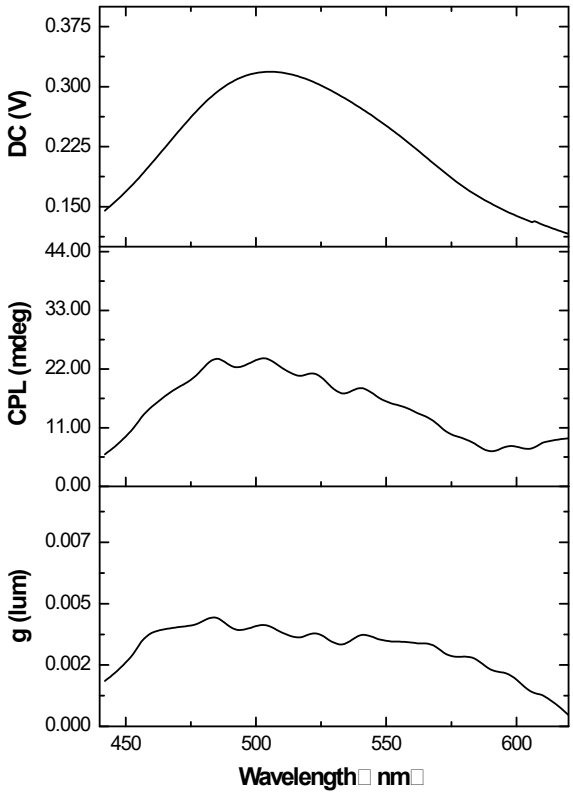


Figure S18 Circularly polarized luminescence spectra and luminescence dissymmetry factors (g_{lum}) of **BC-8** in THF-H_2O (5:95) solution.

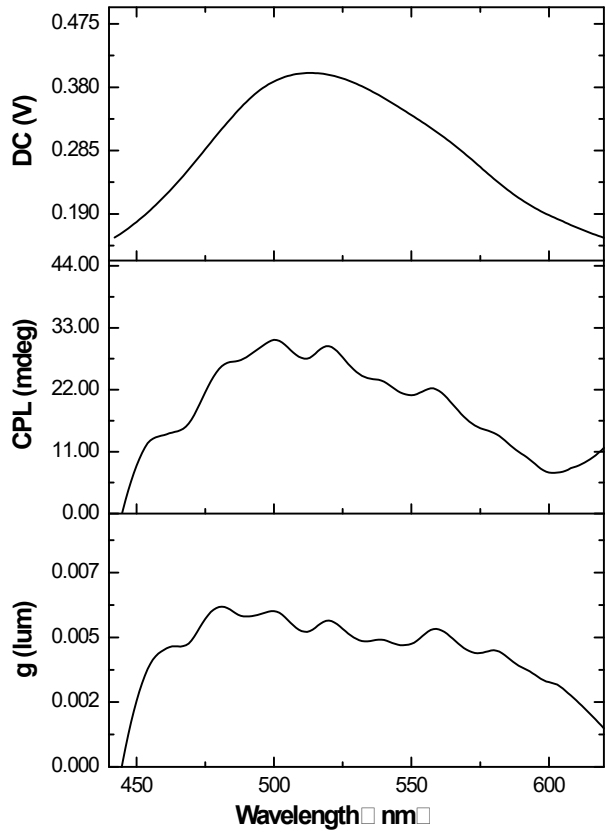


Figure S19 Circularly polarized luminescence spectra and luminescence dissymmetry factors (g_{lum}) of **BC-8** in solid film

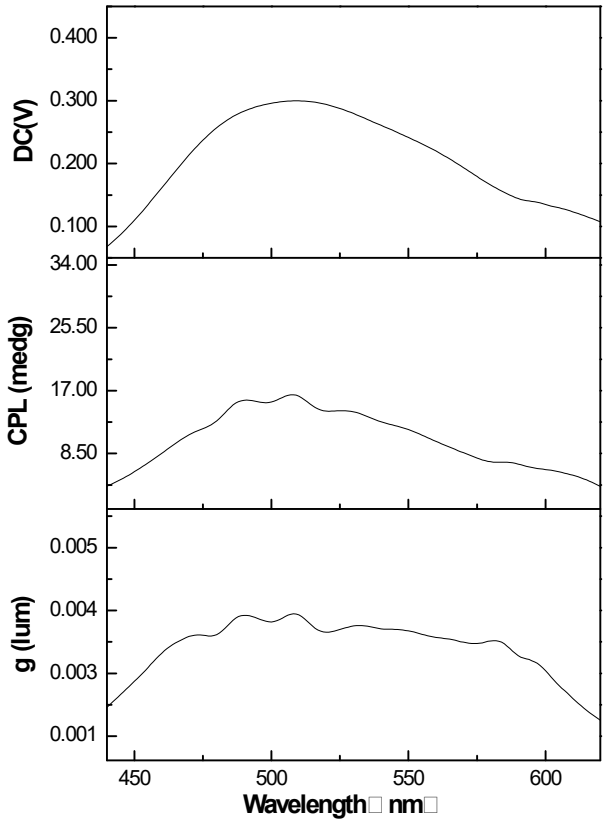


Figure S20 Circularly polarized luminescence spectra and luminescence dissymmetry factors (g_{lum}) of **BC-12** in THF-H_2O (5:95) solution.

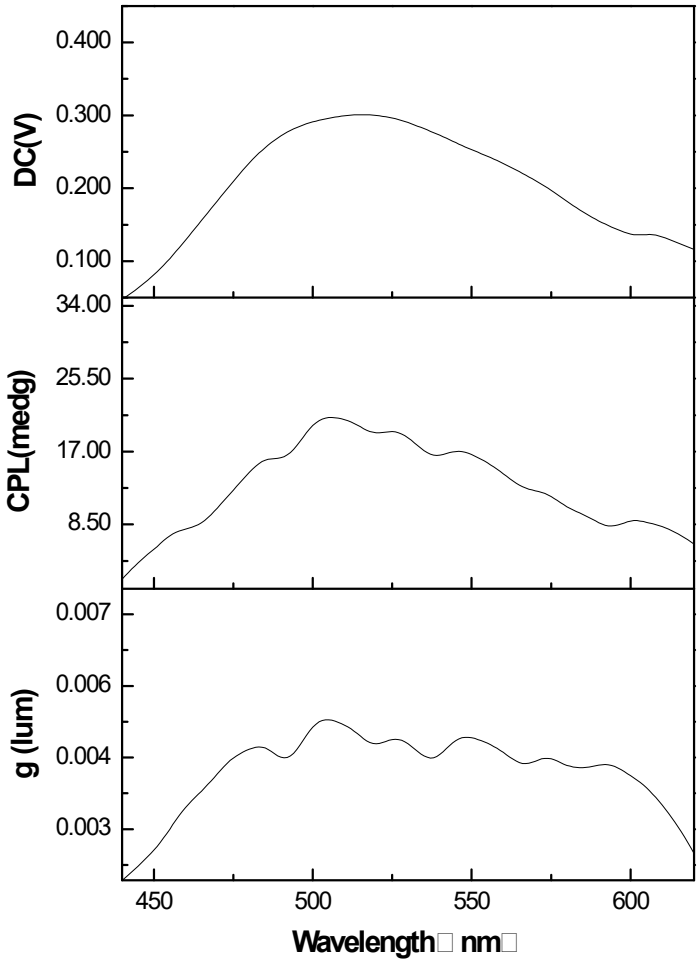


Figure S21 Circularly polarized luminescence spectra and luminescence dissymmetry factors (g_{lum}) of **BC-12** in solid film.