

*Electronic Supplementary Information (ESI)*

## **Circularly polarized luminescence of single-handed helical tetraphenylethylene–silica nanotubes**

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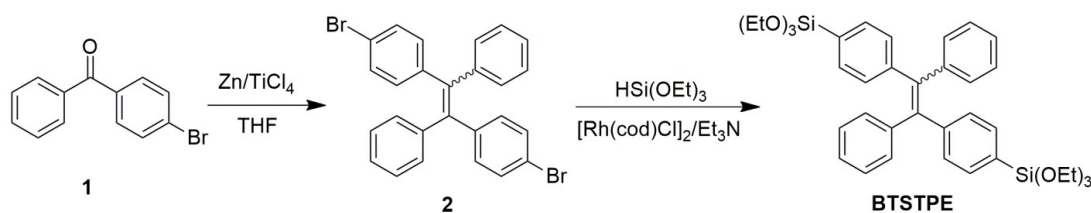
## Experimental Section

### General information

4-Bromobenzophenone was purchased from Alpha Chemical Co., Ltd. (Zhengzhou, China). Triethoxysilane (97%) was obtained from Energy Chemical Co., Ltd. (Shanghai, China). Chloro(1,5-cyclooctadiene)rhodium(I) dimer (98%) was purchased from Meryer (Shanghai) Chemical Technology Co., Ltd. Zinc powder was purchased from Sinopharm Chemical Reagent Co., Ltd (Shanghai, China). *N,N*-Dimethyl form amide (DMF), tetrahydrofuran (THF), trimethylamine (Et<sub>3</sub>N) and hexane were obtained from Shanghai Lingfeng Chemical Reagent Co., Ltd. DMF and Et<sub>3</sub>N were dehydrated by treating with calcium hydride for over 24 h and then distilled under reduced pressure. THF was distilled from sodium benzophenone ketyl before use.

Field-emission scanning electron microscopy (FE-SEM) images were obtained using a Hitachi S-4800 operating (Ibaraki prefecture, Japan) at 5 kV. Transmission electron microscopy (TEM) images were taken on a Tecnai G220 operating at 200 kV. Wide-angle X-ray diffraction (WAXRD) patterns were recorded on an X' Pert-Pro MPD X-ray diffractometer. Circular dichroism (CD) and diffuse reflectance circular dichroism (DRCD) spectra were measured by using a JASCO 815 spectrometer (Tokyo, Japan). Thermo-gravimetric analysis (TGA) measurements were performed on a Perkin-Elmer TGA 7 under dry nitrogen at a heating rate of 10 °C/min. Fluorescence spectra, fluorescence lifetime and quantum yields were measured by Edinburgh Instrument FLS 980. <sup>1</sup>H NMR spectra were recorded on an INOVA-400 spectrometer in DMSO-*d*<sub>6</sub> or CDCl<sub>3</sub> using tetramethylsilane (TMS) as an internal standard. <sup>13</sup>C NMR spectra were recorded using an Agilent DD2-600 spectrometer (Palo Alto, CA, USA). High-resolution mass spectra (HRMS) were measured with an Ultraflex extreme MALDI TOF/TOF spectroscope (Bruker, USA). The fluorescence photos were taken on an Inverted fluorescence microscope Olympus IX71. CPL spectra were measured on JASCO CPL-300.

### Material preparation



Scheme S1. Synthetic route to BTSTPE.

### Synthesis of 1,2-bis (4-bromophenyl)-1,2-diphenylethene (2).

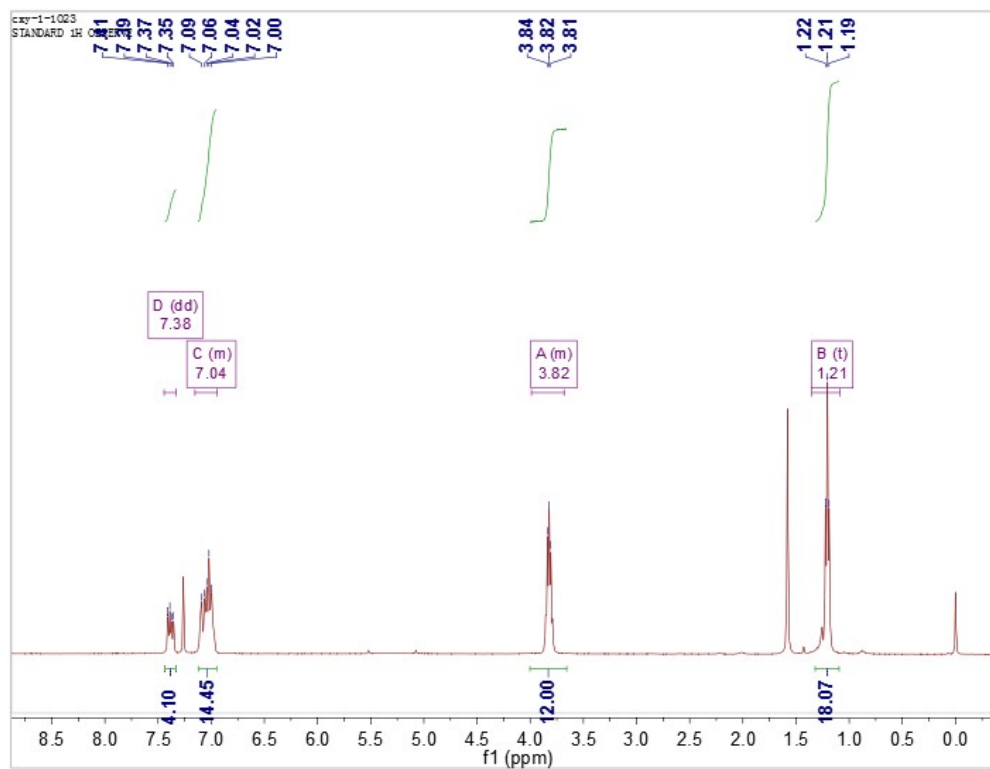
4-Bromobenzophenone (**1**, 13.06 g, 50 mmol) and zinc powder (13.08 g, 200 mmol) were placed in a 500 mL two-necked flask. The flask was evacuated and refilled with dry nitrogen three times. Freshly distilled THF (150 mL) was injected, and then titanium tetrachloride (10.96 mL, 100 mmol) was slowly added dropwise at 0 °C. The reaction mixture returned to room temperature. After refluxing for 8 h, the reaction was quenched by adding 100 mL of 10% potassium carbonate aqueous solution. Then, an appropriate amount of hydrochloric acid was added to remove zinc powder and potassium carbonate. Finally, the product was extracted with dichloromethane and dried over anhydrous magnesium sulfate overnight. After filtration, the filtrate was concentrated and the residue was purified by silica gel chromatography using petroleum ether (PE) to give a white solid in a yield of 87.0%. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>), δ (TMS, ppm): 7.32-7.21 (m, 3H), 7.20-7.10 (m, 7H), 7.09-6.98 (m, 4H), 6.91 (t, *J* = 8.5 Hz, 4H).

### Synthesis of 1,2-diphenyl-1,2-bis(4-(triethoxysilyl)phenyl)ethene (BTSTPE).

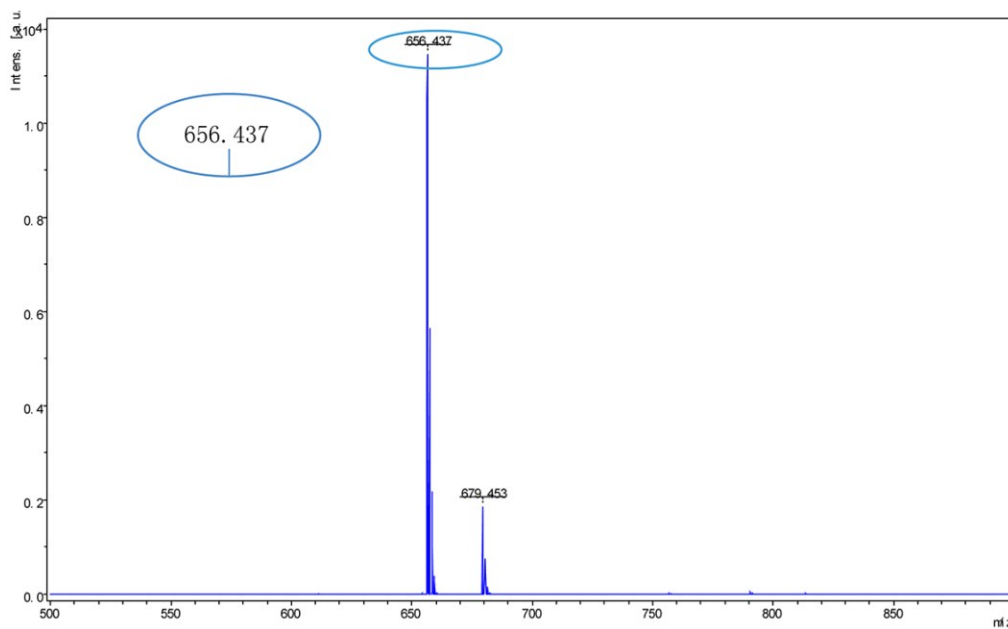
**2** (2.45 g, 5 mmol), chloro(1,5-cyclooctadiene)rhodium(I) dimer (37 mg, 0.075 mmol) were dissolved in 10 mL of DMF in a two-neck flask. Then triethoxysilane (7.4 mL, 40 mmol) and Et<sub>3</sub>N (4.17 mL, 30 mmol) were added. The reaction was carried out at 75 °C under nitrogen for 12 h. The mixture was concentrated *in vacuo*, and then added 100 mL of hexane. The residue was filtered through a pad of Celite to remove the catalyst. The crude product was purified by column chromatography to give a pale yellow viscous liquid in a yield of 45.0%. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>), δ (TMS, ppm): 7.43-7.36 (m, 4H), 7.03-7.00 (m, 14H), 3.99-3.76 (m, 12H, (OCH<sub>2</sub>CH<sub>3</sub>)<sub>3</sub>), 1.21 (t, *J* = 6.8 Hz, 18H, (OCH<sub>2</sub>CH<sub>3</sub>)<sub>3</sub>). <sup>13</sup>C NMR (150 MHz, DMSO-*d*<sub>6</sub>) δ = 145.13, 142.66, 140.92, 133.83, 130.65, 130.14, 128.95, 127.83, 126.73, 58.57, 58.20, 57.72, 56.08, 18.11, 17.93. HRMS (MALDI-TOF), *m/z* 656.437, (M<sup>+</sup>, calcd 656.299).

### Preparation of TPE–Silica.

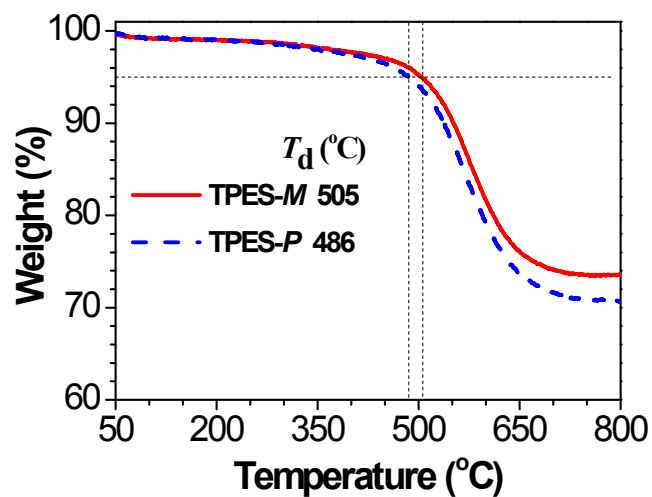
12 mg of L-(or D-)ValPyBr was dissolved in 1.05 mL of *n*-propanol and 0.45 mL 10 wt% NH<sub>3</sub> aq, 20 mg of BTSTPE was added into the solution under vigorous stirring at 0 °C. After turning white, the reaction mixture was kept under static conditions at 0 °C for one day and 80 °C for four days. The templates were finally removed by washing with a mixture of 100 mL of methanol and 5 mL of 36 wt% hydrochloric acid. A white powder of TPE–Silica was obtained.



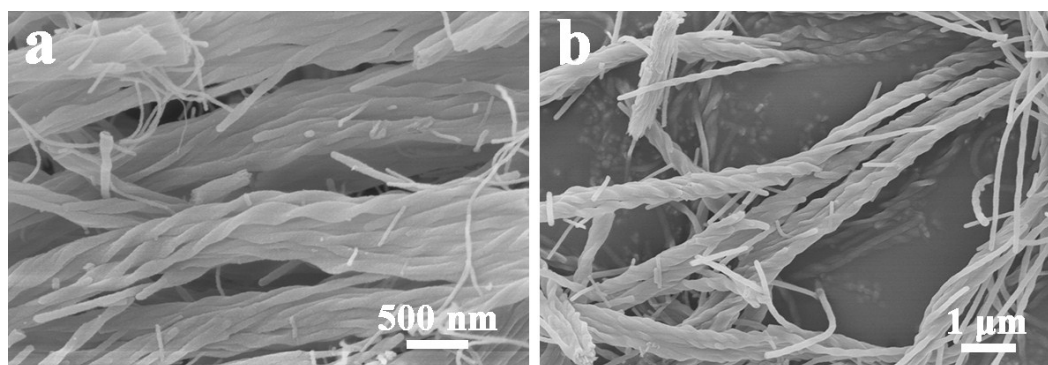
**Fig. S1**  $^1\text{H}$  NMR spectrum of BTSTPE.



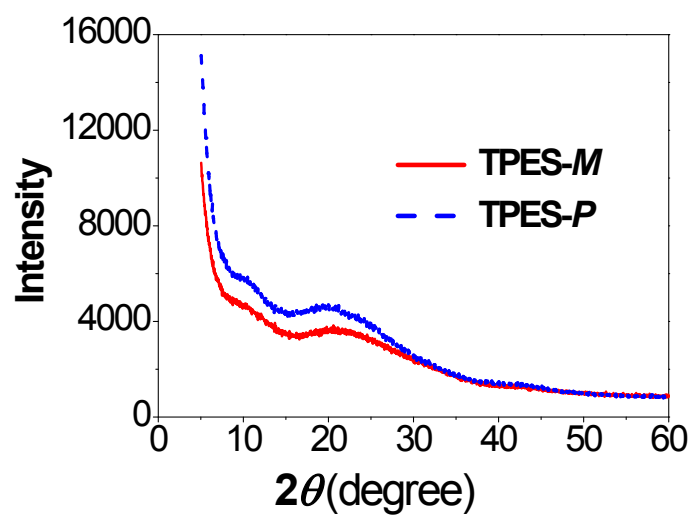
**Fig. S2** HRMS spectrum of BTSTPE.



**Fig. S3** TGA thermograms of TPES-*M* and TPES-*P* recorded under nitrogen at a heating rate of 10 °C min<sup>-1</sup>.



**Fig. S4** FESEM images of TPES-*M* (a) and TPES-*P* (b).



**Fig. S5** WAXRD patterns of TPES-*M* and TPES-*P*.

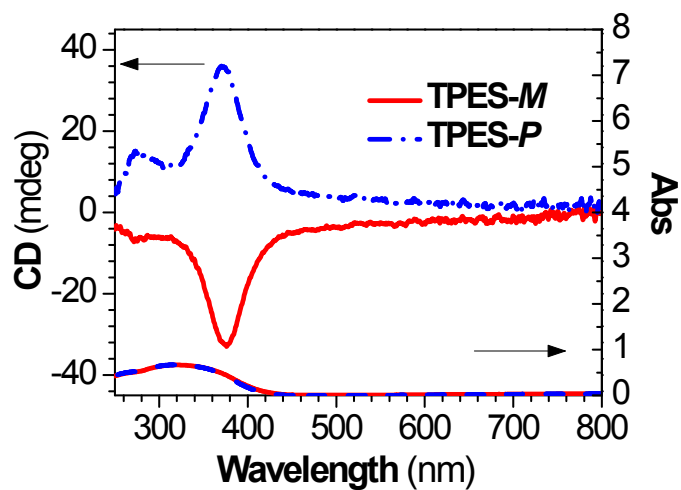


Fig. S6 DRCD and UV-vis spectra of TPES-*M* and TPES-*P*.

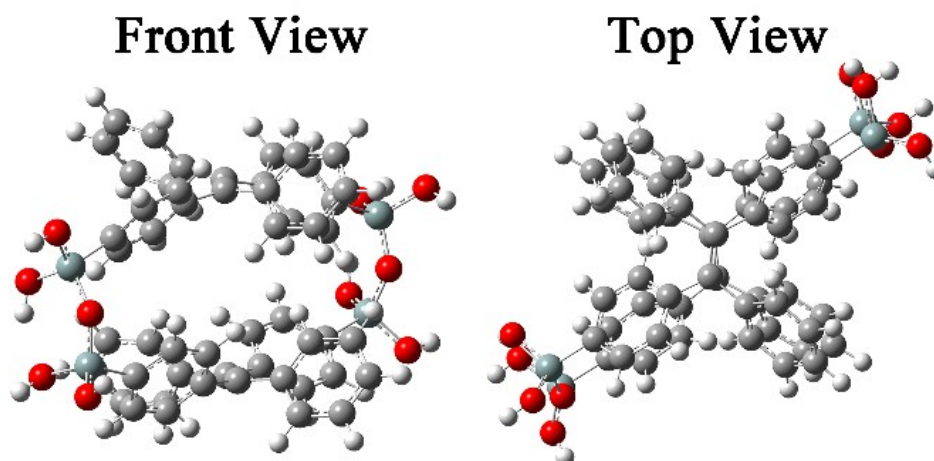


Fig. S7 The optimized structures for BTSTPE dimer (C: grey; H: white; Si: purple; O: red).

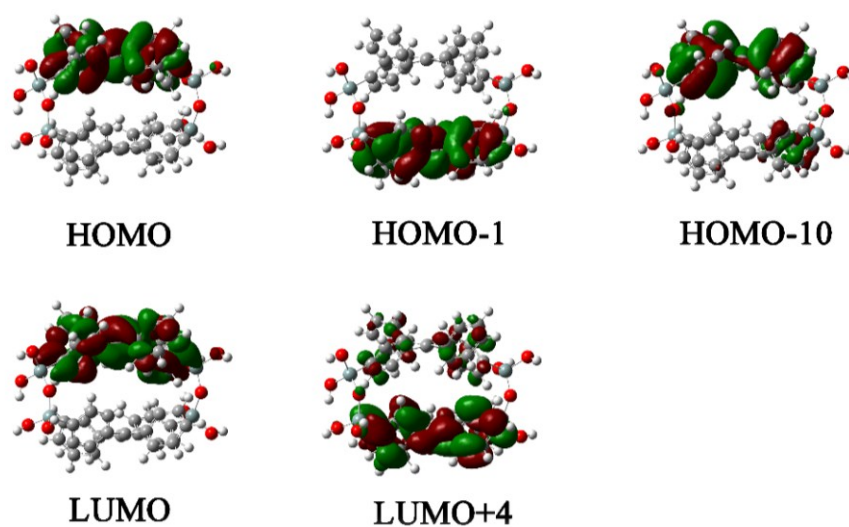
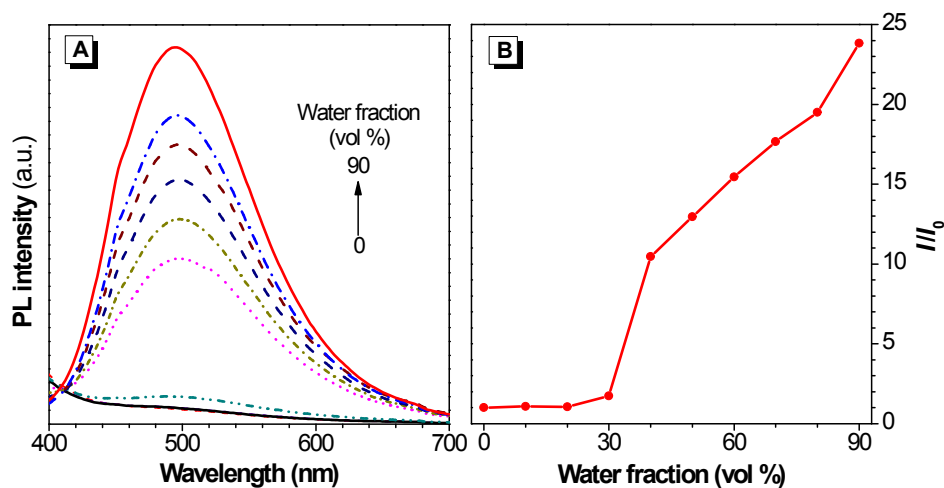


Fig. S8 The HOMOs and LUMOs of a BTSTPE dimer.



**Fig. S9** (A) PL spectra of BTSTPE in DMSO–water mixtures with different water fractions. Concentration: 10  $\mu$ M;  $\lambda_{\text{ex}}$ : 324 nm. (B) Plot of relative emission peak intensity ( $I/I_0$ ) of BTSTPE at 496 nm *versus* water fractions of its DMSO–water mixtures.