Supporting Information

Helical Fibers with Circularly Polarized Luminescence via Ionic Linkage of Binaphthol and Tetraphenylethylene Derivatives

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was dissolved in mixed solution of DMF / water at a concentration of $5 \times 10^{-6}$ M (DMF, 50%, 70%, 80%, 90%, 95%). Excitation wavelength: 320 nm.

**Figure S21.** Aggregation-induced luminescence property of SBNP-TPEHN. SBNP-TPEHN was dissolved in mixed solution of DMF/water at a concentration of $5 \times 10^{-6}$ M (DMF, 50%, 70%, 80%, 90%, 95%). Excitation wavelength: 320 nm.

**Figure S22.** Structural simulation of RBNP-TPEHN molecule DFT calculations B3LYP/6-31G* level in Gaussian 03 program.

**Figure S23.** TEM images of RBNP–TPEHN assemblies. SEM analysis was performed on silicon wafer substrates after naturally evaporation of 0.02 mg/mL drops of RBNP–TPEHN assemblies in chloroform/ethanol mixture (9:1, v/v). Scale bar: a) 500 nm; b) 100 nm; c) 50 nm.

**Figure S24.** TEM images of SBNP–TPEHN assemblies. SEM analysis was performed on silicon wafer substrates after naturally evaporation of 0.02 mg/mL drops of SBNP–TPEHN assemblies in chloroform/ethanol mixture (9:1, v/v). Scale bar: a) 500 nm; b) 100 nm; c) 50 nm.

**Figure S25.** XRD patterns of RBNP–TPEHN (a) and SBNP–TPEHN (b) assemblies as cast films on silicon wafer substrates.
Synthesis

TPEHexN$^+$ and R-/S-BNPSO$_3^-$ were synthesized according to Scheme S1. The chemical structures of all the precursors and ionic compounds were identified via NMR spectra, which were shown in Figure S1-7.

Scheme S1. Synthetic routes for ionic compounds TPEHexN$^+$ and R-/S-BNPSO$_3^-$.

$^a$ Conditions: (i) n-BuLi, THF, \(-5\) °C, 12 h, (ii) p-toluene sulfonic acid, toluene, reflux, overnight, (iii) borontribromide, DCM, \(-78\) °C, 12h, (iv) 1,6-dibromo hexane, K$_2$CO$_3$, DMF, 90 °C, 24 h, (v) trimethylamine, THF, 24 h, (vi) and (vii) 1,3-propanesultone, NaOH, ethyl alcohol, 100 °C, 2h.

Figure S1. $^1$H NMR spectrum of 4-methoxy tetraphenylethylene (compound 1).
Figure S2. $^1$H NMR spectrum of 4-hydroxy tetraphenylethylene (compound 2).

Figure S3. $^{13}$C NMR spectrum of 4-hydroxy tetraphenylethylene (compound 2).
Figure S4. $^1$H NMR spectrum of compound TPEHBr.

Figure S5. $^1$H NMR spectrum of compound TPEHN$^+$. 
Figure S6. $^{13}$C NMR spectrum of compound TPEHN$^\circ$.

Figure S7. $^1$H NMR spectrum of compound (R)-BNPSO$_3^-$. 
Figure S8. $^{13}\text{C}$ NMR spectrum of compound (R)-BNPSO$_3^-$.

Figure S9. $^1\text{H}$ NMR spectrum of compound (S)-BNPSO$_3^-$. 
Figure S10. $^{13}$C NMR spectrum of compound (S)-BNPSO$_3^-$.

Figure S11. $^1$H NMR spectrum of compound RBNP-TPEHN.
Characterization of RBNP-TPEHN and RBNP-TPEH

The $^1$H NMR and FTIR spectra of obtained SBNP-TPEHN and RBNP-TPEH assemblies were presented in Figure S10 and Figure 1, respectively.
Figure S14. a) $^1$H NMR spectrum of SBNP-TPEHN assembly; b) FT-IR spectra of TPEHN$^+$, S-BNPSO$_3^-$ and SBNP-TPEHN assembly in KBr pellets.

Figure S15. The UV−vis absorption, CD, and gabs spectra of SBNP−TPEHN in methanol / water (v/v=1:10) with a concentration of $5 \times 10^{-6}$ M at various temperatures.
Figure S16. CD spectra of RBNP−TPEHN and SBNP−TPEHN in methanol solution with a concentration of $3 \times 10^{-6}$ M.

Figure S17. CD spectra of TPEHN mixed with (R)- or (S)-1,1′-bi-2-naphthol film. The film prepared by dropping 2 mg / ml DCM mixture of TPEHN and (R)- or (S)-1,1′-bi-2-naphthol (mol /mol=2:1) on silicon wafer substrates after solvent evaporation.
Figure S18. CD/CPL and PL spectra of RBNP-TPEHN (a)/(c) and SBNP-TPEHN (b)/(d) at different rotation angles.

Optical properties
The optical properties of RBNP-TPEHN and SBNP-TPEHN as cast films were studied using UV/vis and photoluminescence (PL) spectroscopies. The cast films were prepared by dissolving RBNP-TPEHN and SBNP-TPEHN assemblies in mixture of chloroform/ethanol (v/v=9/1) at a concentration of 0.5 mg/mL, then casting on quartz plates and being dried by natural evaporation.

Figure S19. UV/vis absorption (a) and normalized photoluminescence (b) spectra of RBNP-TPEHN (blue) and
SBNP-TPEHN (red) in solid state. Excitation wavelength: 340 nm. (Inset image: luminescence photos of RBNP-TPEHN (right) and SBNP-TPEHN (left) assemblies cast on silicon quartz when exposed to UV lamp of 365 nm.)

Figure S20. Aggregation-induced luminescence property of RBNP-TPEHN, which was dissolved in mixed solution of DMF / water at a concentration of $5 \times 10^{-6}$ M (DMF, 50%, 70%, 80%, 90%, 95%). Excitation wavelength: 320 nm.

Figure S21. Aggregation-induced luminescence property of SBNP-TPEHN, which was dissolved in mixed solution of DMF/water at a concentration of $5 \times 10^{-6}$ M (DMF, 50%, 70%, 80%, 90%, 95%). Excitation wavelength: 320 nm.

Figure S15a showed the UV/vis absorption spectra of RBNP-TPEHN (blue curve) and SBNP-TPEHN (red curve) as cast films. Two absorption bands, corresponding to $\pi-\pi^*$ transition of binaphthalene moiety and $\pi-\pi^*$ transition of TPE moiety, were clearly observed at 228 nm and 340 nm, respectively. Figure S15b presents the normalized fluorescence spectra of RBNP-TPEHN (blue) and SBNP-TPEHN (red) as cast films. Obvious emission was observed at 465 nm for SBNP-TPEHN, and 457 nm for RBNP-TPEHN cast film. The inset image of Figure S16b shows PL photo of RBNP-TPEHN and SBNP-TPEHN cast films irradiated with 365 nm UV light. Very bright green light were emitted and clearly observed from both films. The quantum
yields of **RBNP-TPEHN** and **SBNP-TPEHN** in solid state were measured by steady-state and time-resolved fluorescence spectrofluorometer and presented high values of 42% and 43%, respectively. To further verify the aggregation-induced luminescence properties, fluorescence emission spectra of **RBNP-TPEHN** and **SBNP-TPEHN** in DMF/water mixtures with different ratio were also studied (see PL spectra shown in Figure S17, S18). When the ratio of water (poor solvent) increased up to 80%, emission at 470 nm was observed in the spectra. When the ratio of water kept increasing, the PL intensities dramatically enhanced, implying **RBNP-TPEHN** and **SBNP-TPEHN** exhibited typical AIE property. These results indicated the **R- or SBNP-TPEHN** still preserves the AIE feature.

![Figure S22](image)

**Figure S22.** Structural simulation of SBNP-TPEHN molecule by DFT calculations B3LYP/6-31G* level in Gaussian 03 program.

![Figure S23](image)

**Figure S23.** TEM images of **RBNP-TPEHN** assemblies. TEM analysis was performed on silicon wafer substrates after naturally evaporation of 0.02 mg/mL drops of **RBNP-TPEHN** assemblies in chloroform/ethanol mixture (9:1, v/v). Scale bar: a) 500 nm; b) 100 nm; c) 50 nm.
Figure S24. TEM images of SBNP–TPEHN assemblies. TEM analysis was performed on silicon wafer substrates after naturally evaporation of 0.02 mg/mL drops of SBNP–TPEHN assemblies in chloroform/ethanol mixture (9:1, v/v). Scale bar: a) 500 nm; b) 100 nm; c) 50 nm.

Figure S25. XRD patterns of RBNP–TPEHN (a) and SBNP–TPEHN (b) assemblies as cast films on silicon wafer substrates.