

**Artificial Light-harvesting Systems (LHSs) Based on Boron-difluoride (BF<sub>2</sub>) Hydrazone Complexes (BODIHYs)**

Vishwa Deepak Singh, Bhupendra Kumar Dwivedi, Yogesh Kumar and Daya Shankar Pandey\*

Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi – 221 005 (U. P.) India

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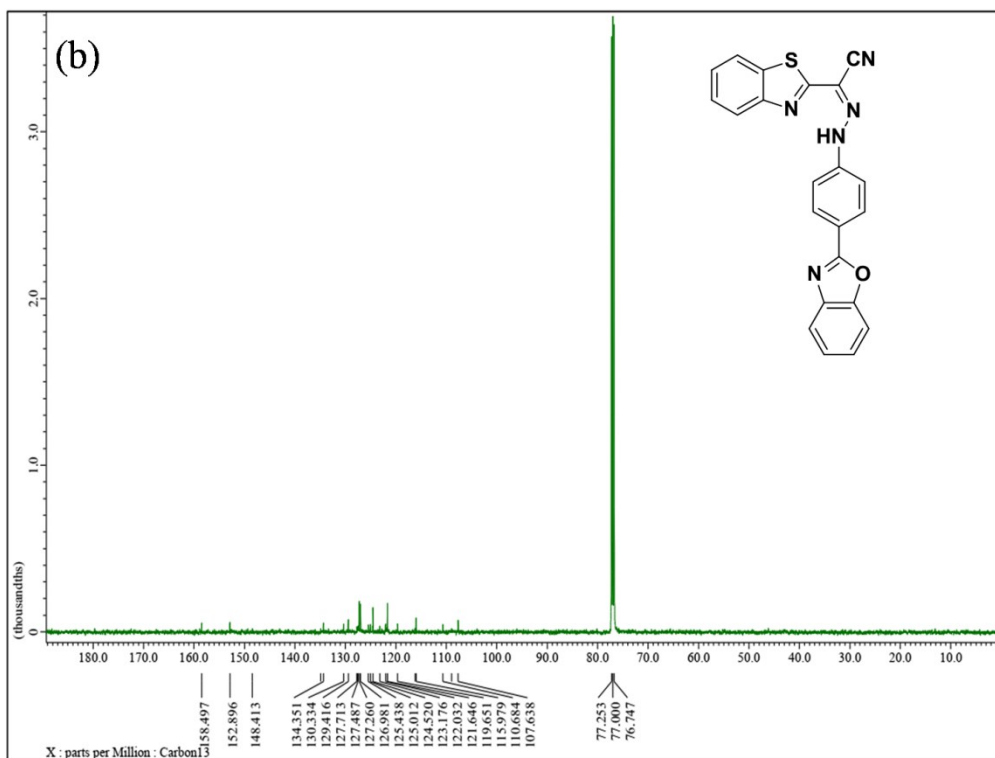
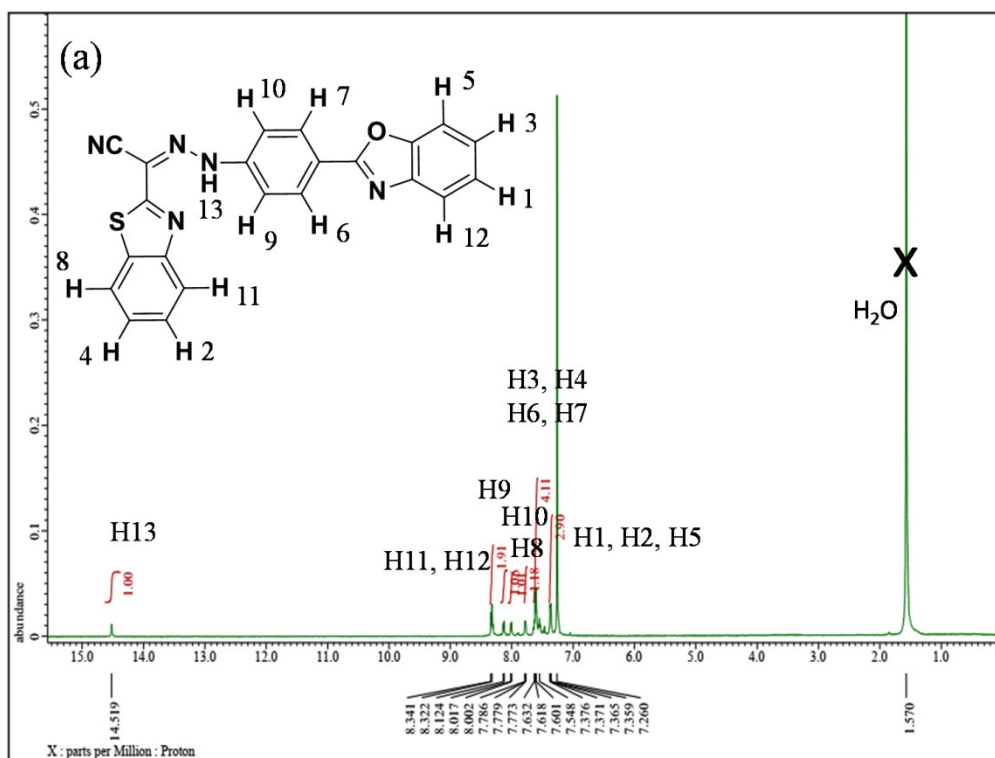


Fig. S1.  $^1\text{H}$  (a) and  $^{13}\text{C}$  (b) NMR spectra of L1.

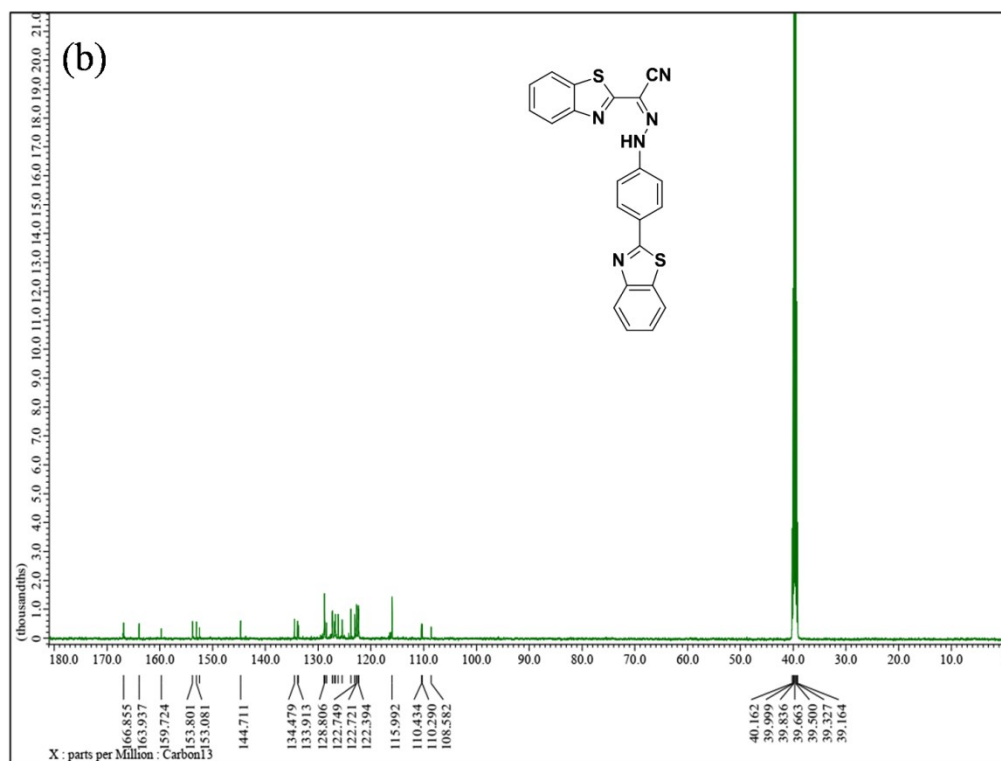
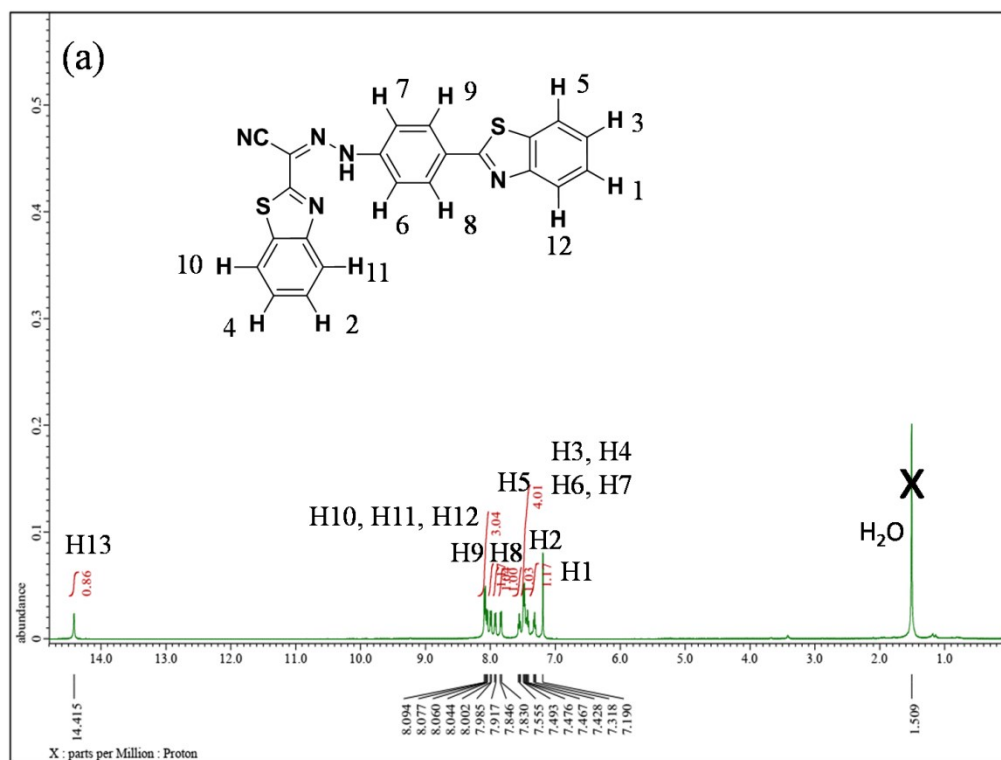


Fig. S2.  $^1\text{H}$  (a) and  $^{13}\text{C}$  (b) NMR spectra of L2.

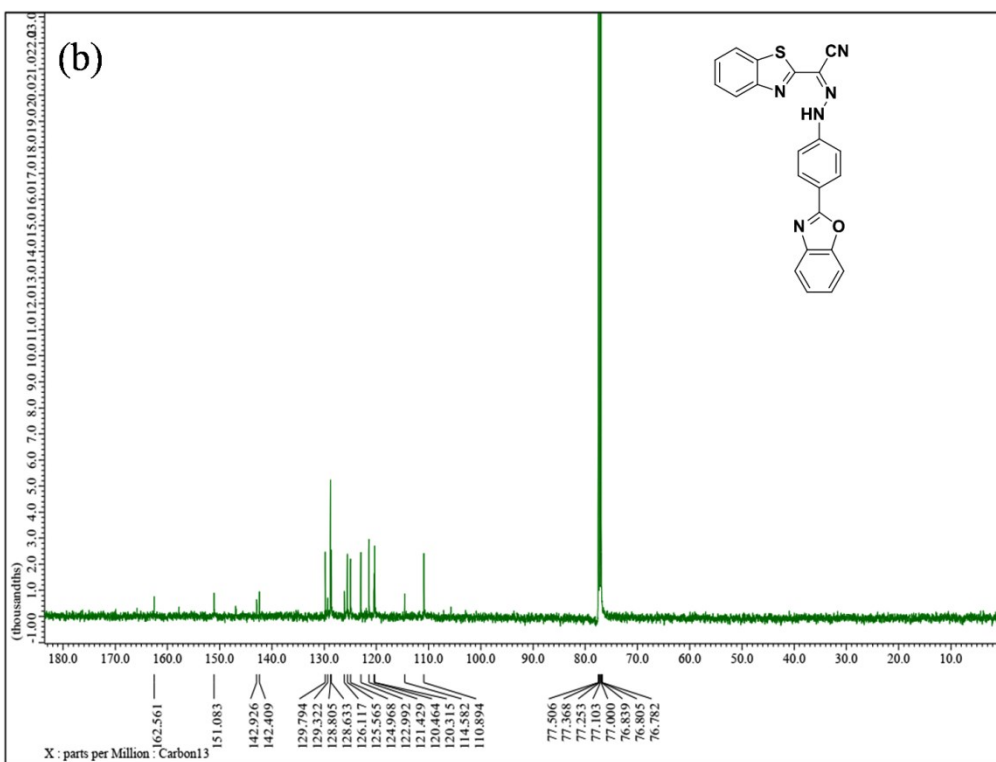
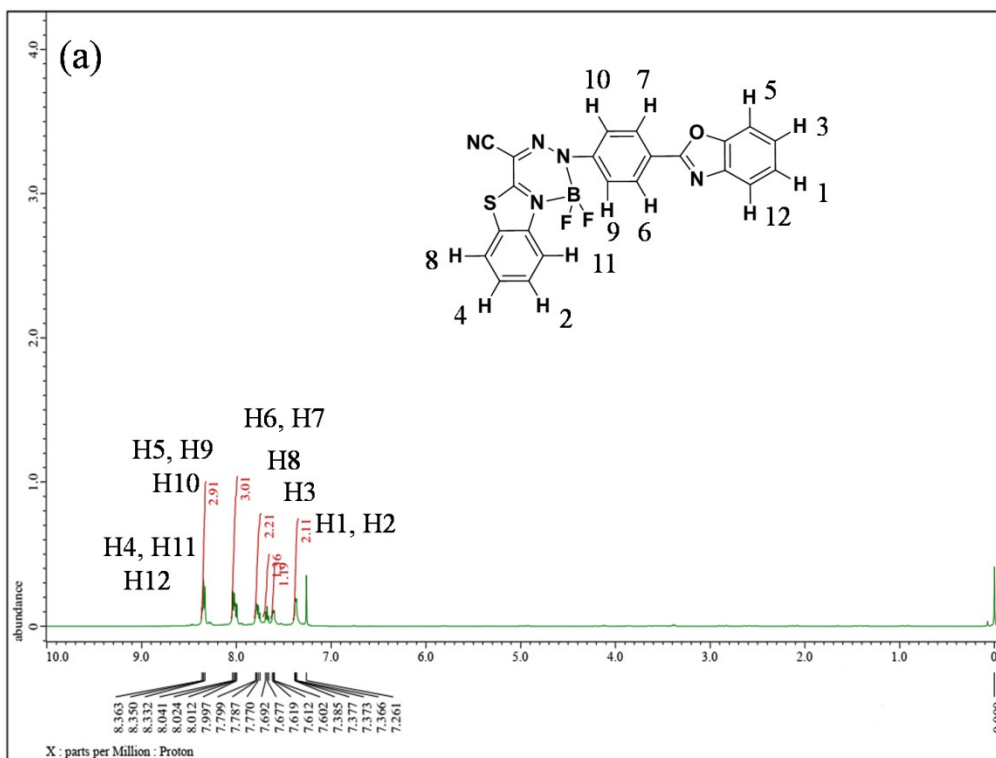
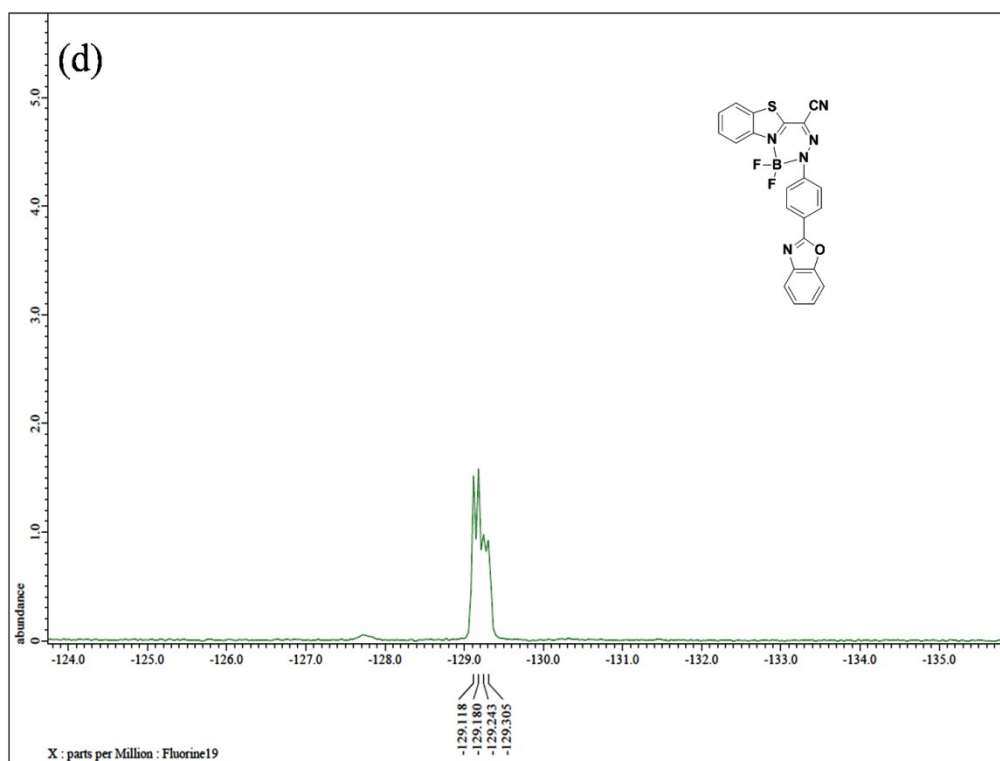
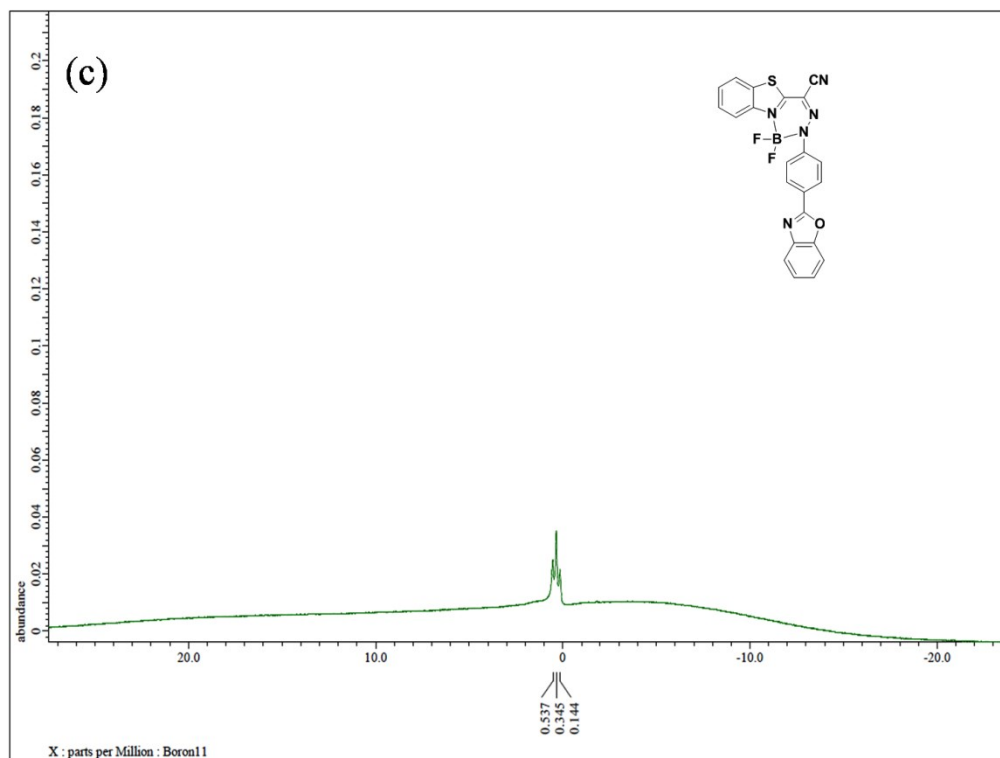


Fig. S3.  $^1\text{H}$  (a) and  $^{13}\text{C}$  (b) NMR spectra of B1.



**Fig. S4.**  $^{11}\text{B}$  (c) and  $^{19}\text{F}$  (d) NMR spectra of **B1**.

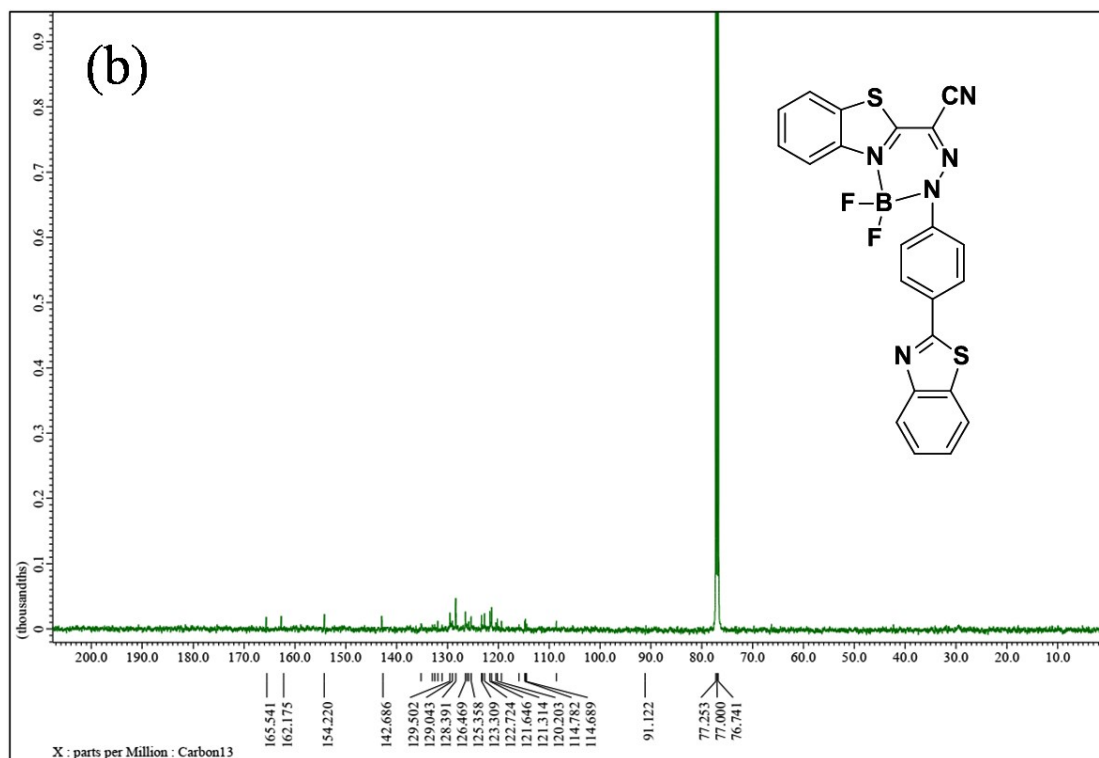
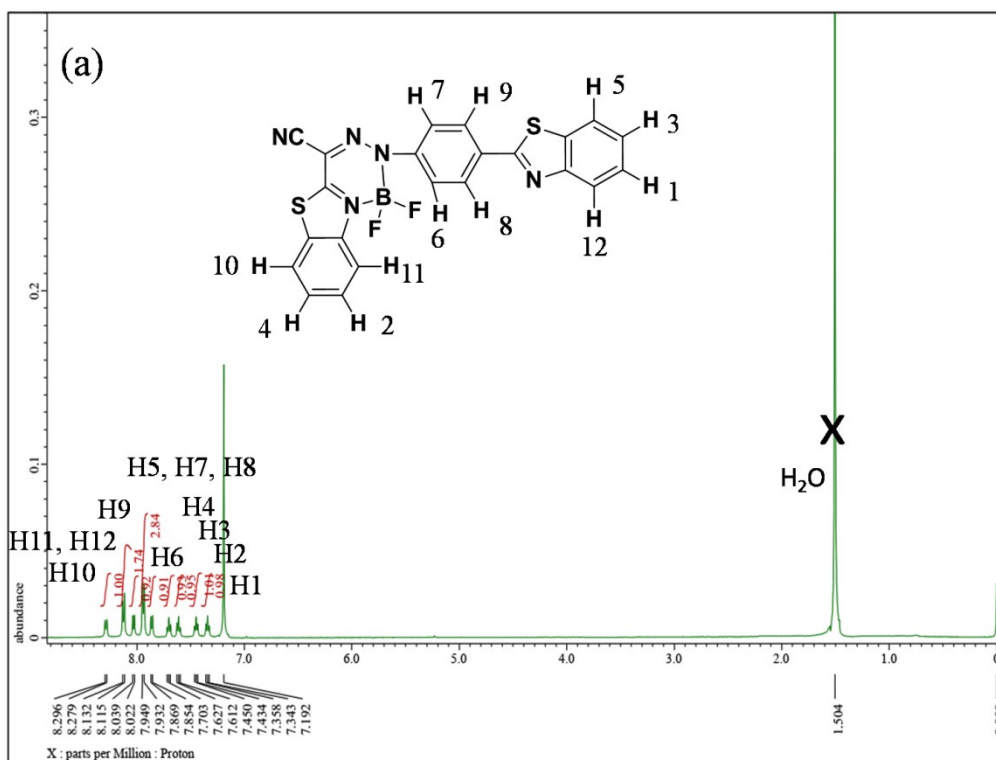
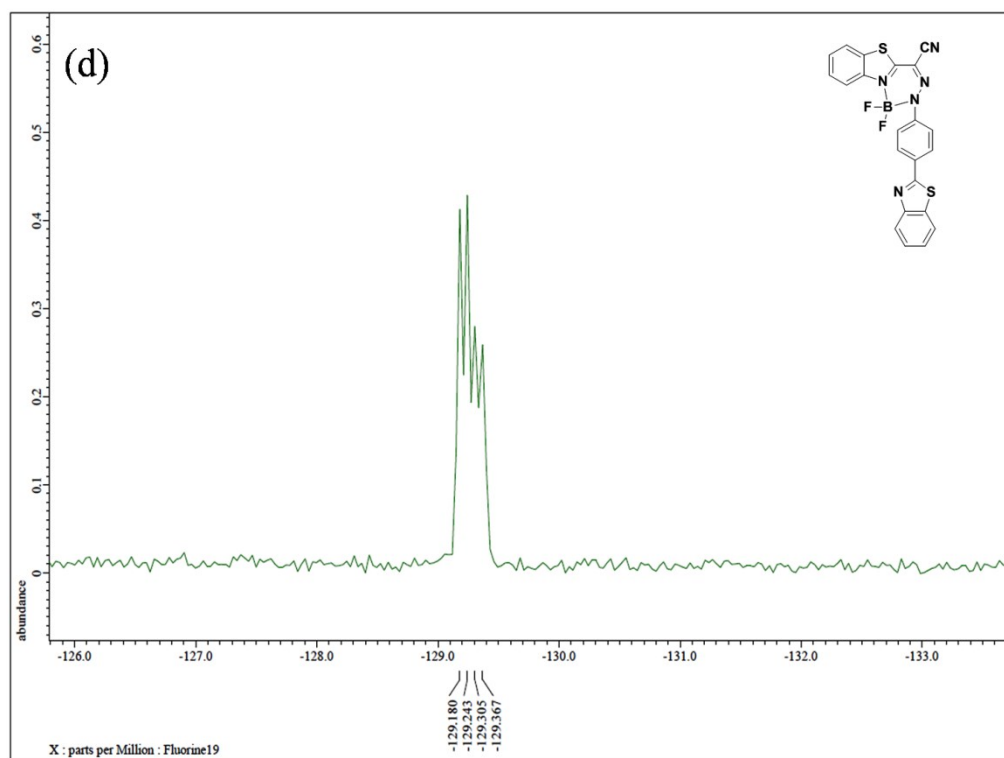
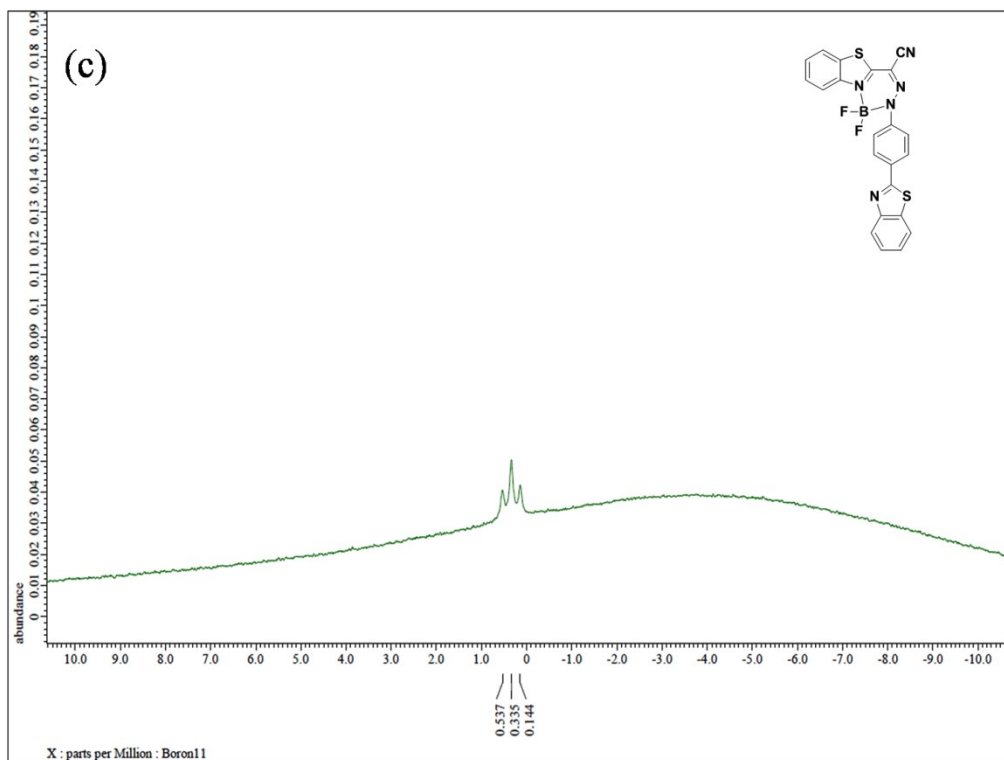
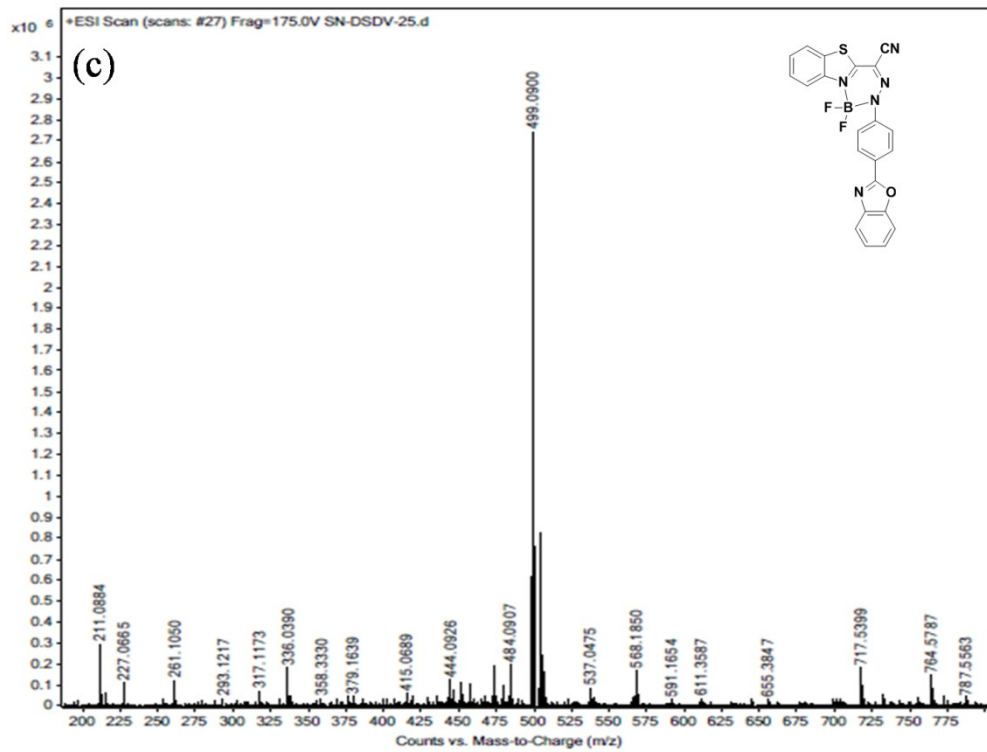
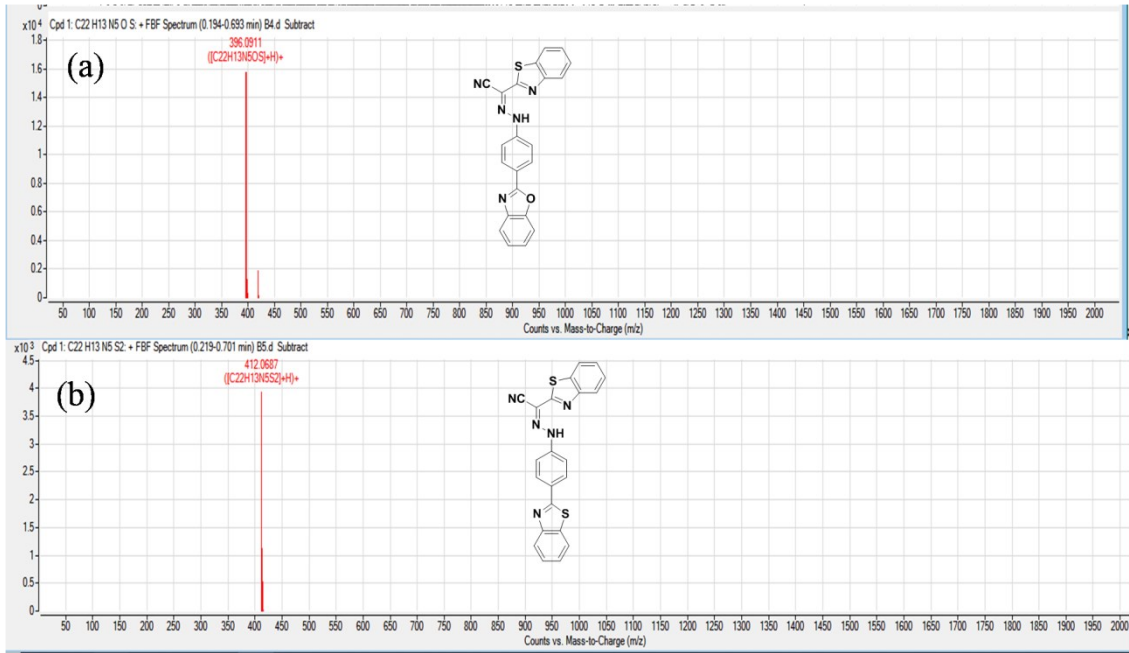


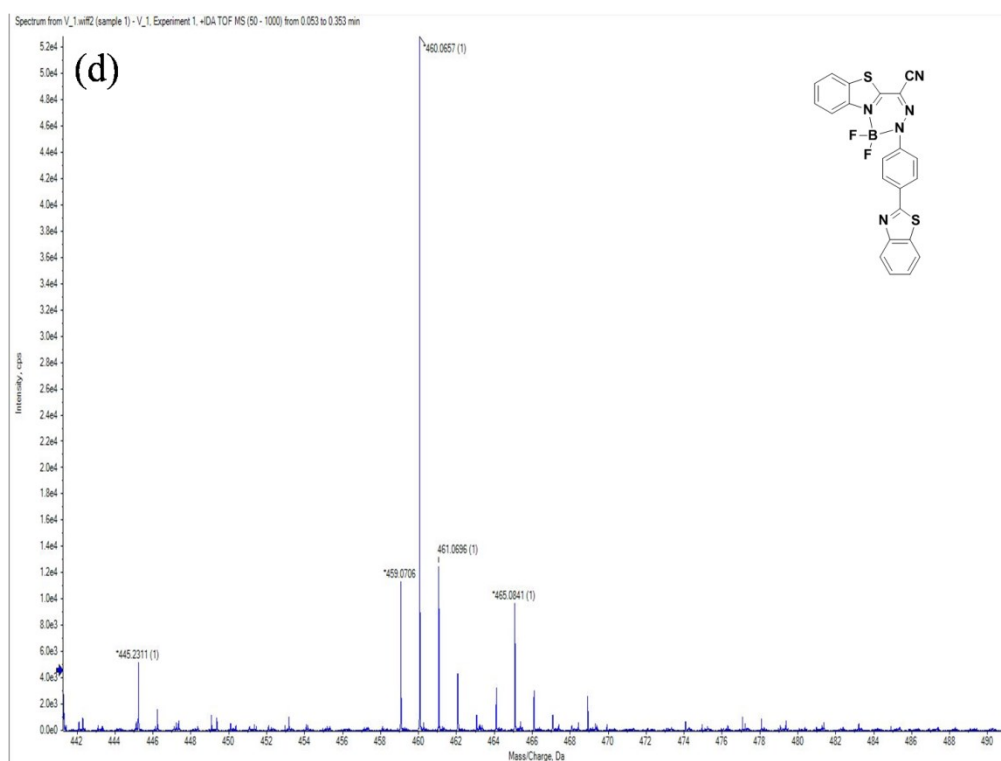
Fig. S5.  $^1\text{H}$  (a) and  $^{13}\text{C}$  (b) NMR spectra of **B2**.



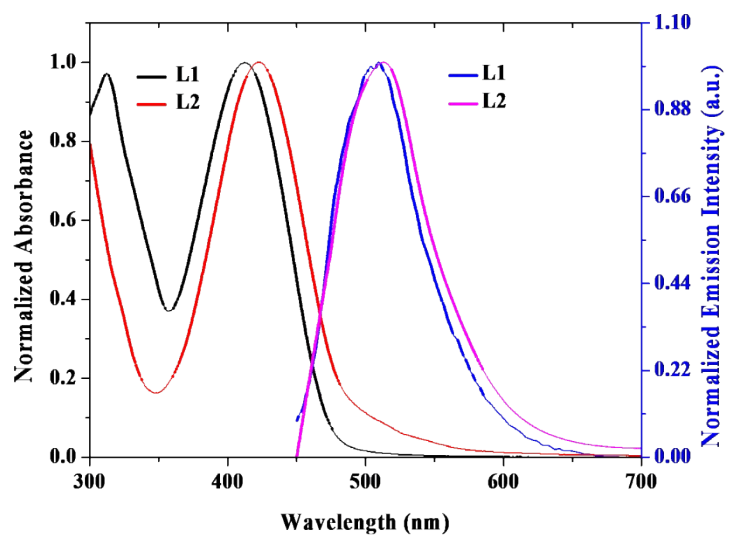
**Fig. S6.**  $^{11}\text{B}$  (c) and  $^{19}\text{F}$  (d) NMR spectra of **B2**.







**Fig. S7.** Mass spectra of L1 (a), L2 (b), B1 (c) and B2 (d).



**Fig. S8.** Normalized UV-Visible (a) and normalized emission (b) spectra of L1 and L2 (c, 50  $\mu$ M).

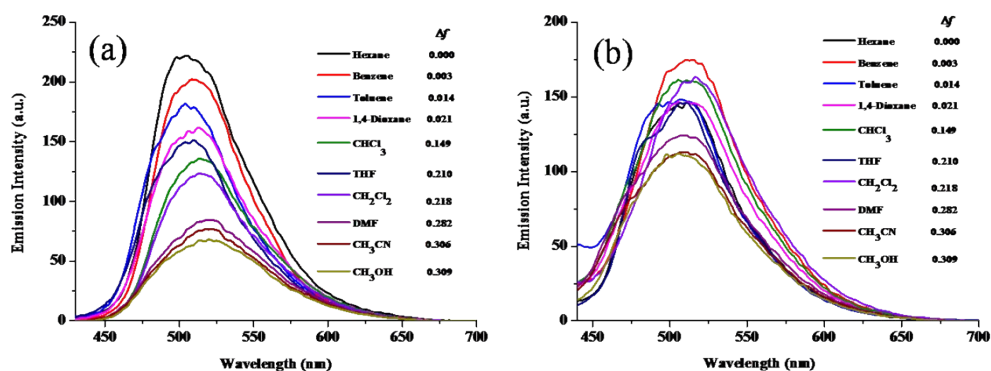


Fig. S9. Emission spectra of L1 (a) and L2 (b) in various solvent polarities (c, 50  $\mu$ M).

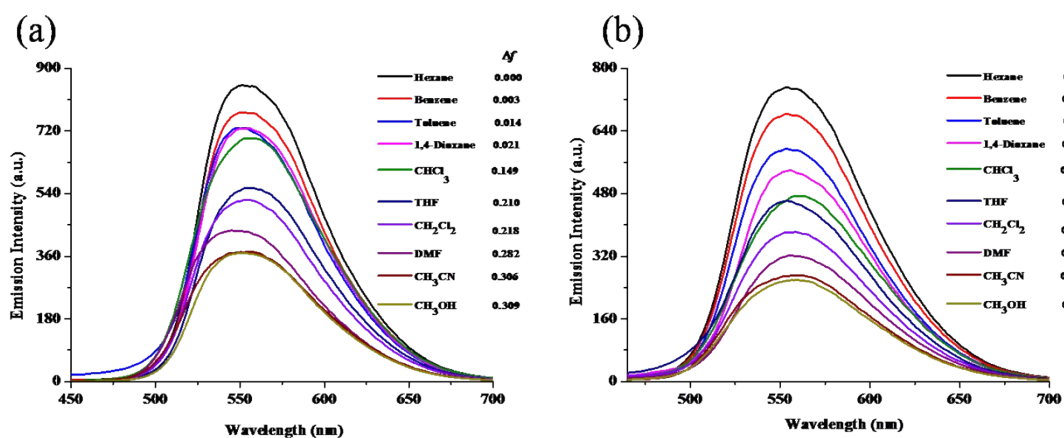


Fig. S10. Emission spectra of B1 (a) and B2 (b) in various solvent polarities (c, 50  $\mu$ M).

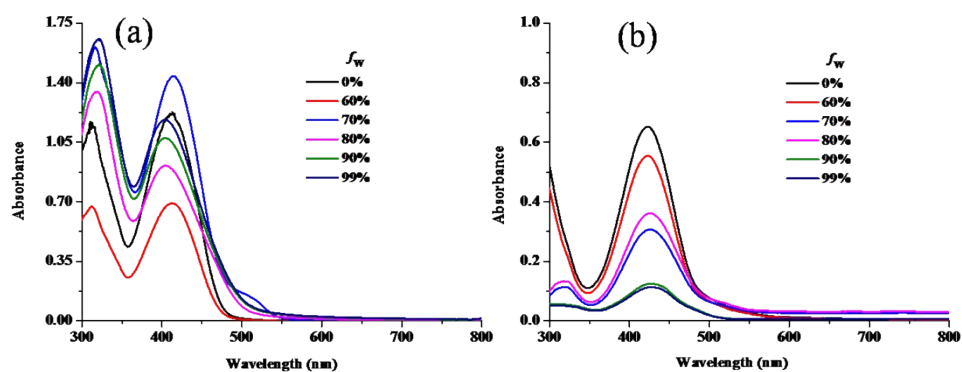
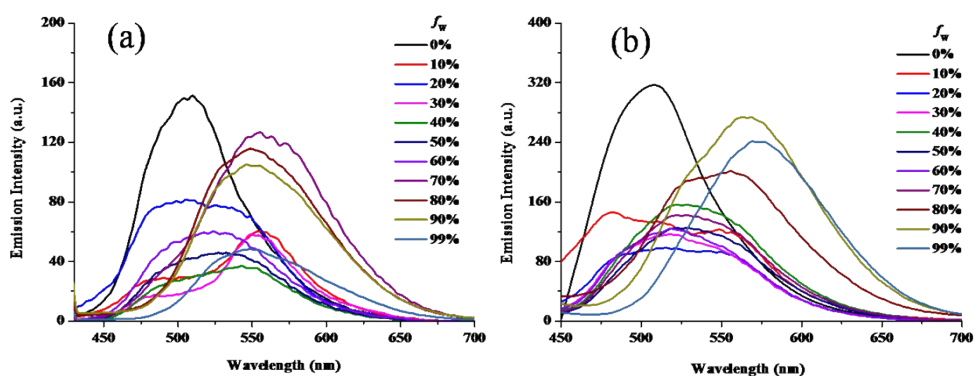
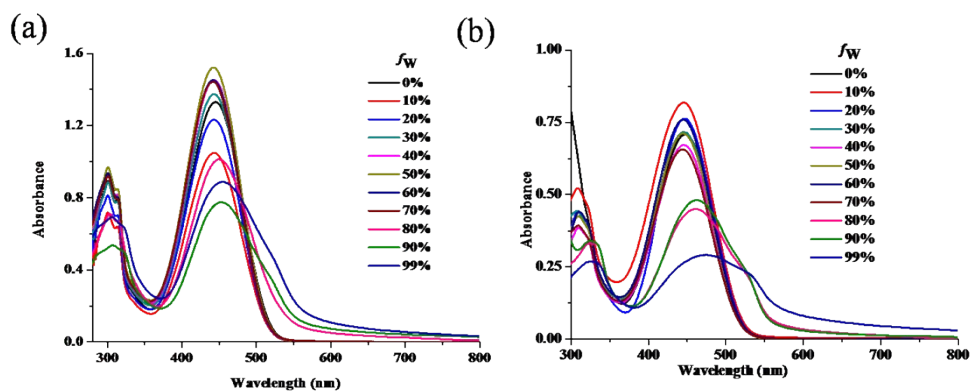


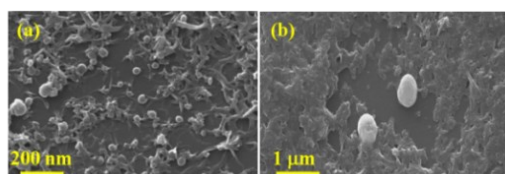
Fig. S11. Absorption spectra of L1 (a) and L2 (b) in THF/water fraction (c, 50  $\mu$ M).



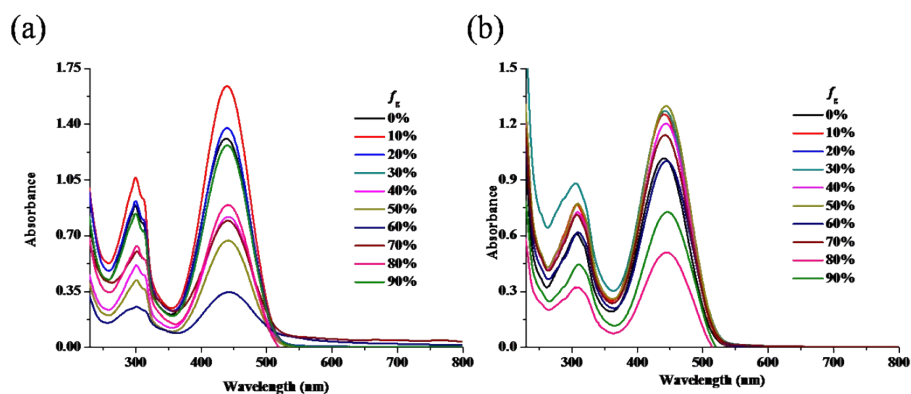
**Fig. S12.** Emission spectra of **L1** (a) and **L2** (b) in THF/water fraction (c, 50  $\mu$ M).



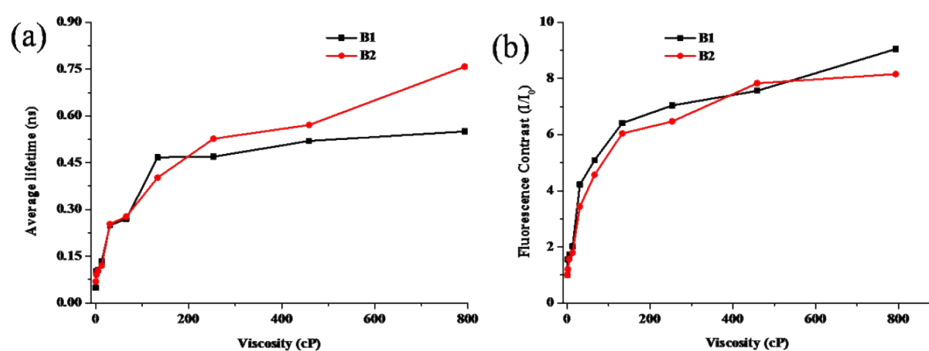
**Fig. S13.** Absorption spectra of **B1** (a) and **B2** (b) in THF/water fraction (c, 50  $\mu$ M).



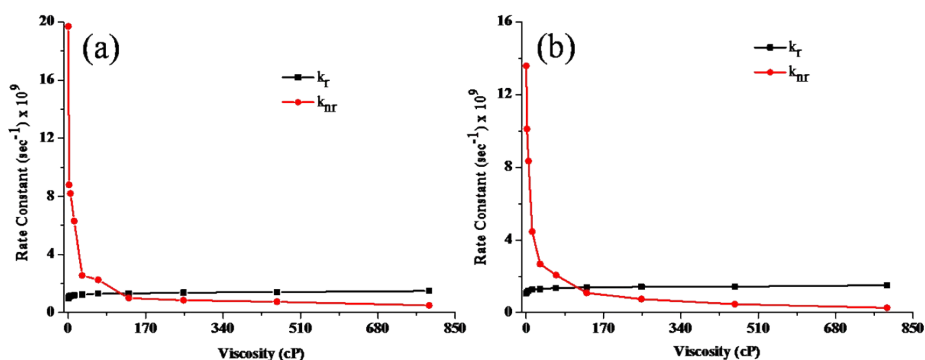
**Fig. S14.** SEM images of aggregates of **B1** (a) and **B2** (b) formed in mixture of THF/water (c, 50  $\mu$ M).



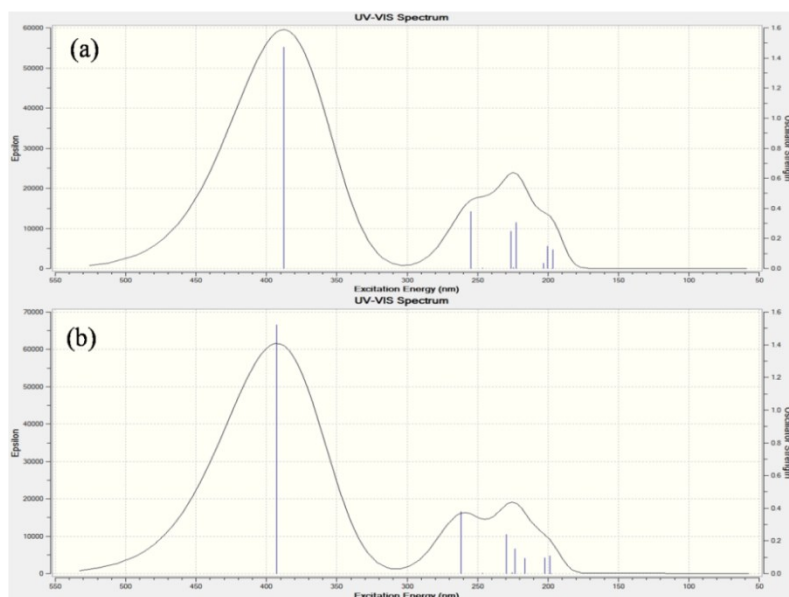
**Fig. S15.** Absorption spectra of **B1** (a) and **B2** (b) in CH<sub>3</sub>OH/glycerol fraction (c, 50 μM).



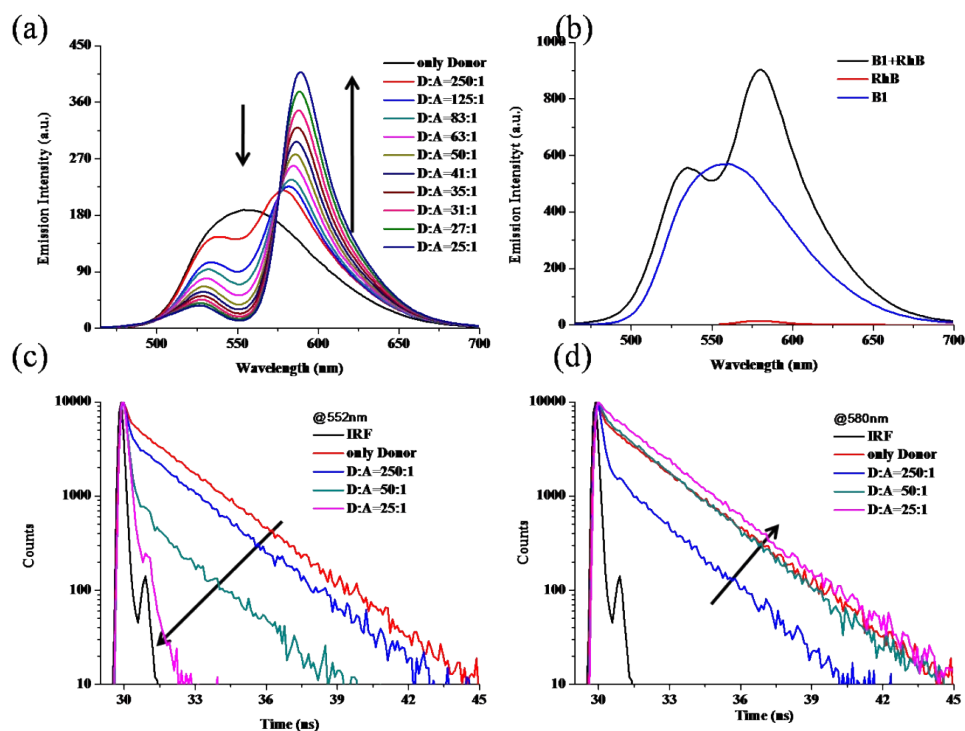
**Fig. S16.** (a) Average fluorescence lifetimes of **B1** and **B2** as function of viscosity; (b) Fluorescence contrast ( $I/I_0$ ) of **B1** and **B2** as function of viscosity.



**Fig. S17.** Plot between radiative ( $k_r$ ) and non-radiative ( $k_{nr}$ ) rate constants vs. viscosity for **B1** (a) and **B2** (b).



**Fig. S18.** UV-Vis spectra of **B1** (a) and **B2** (b) obtained from TD-DFT calculations.



**Fig. S19.** (a) Fluorescence spectra of **B1** with gradual addition of RhB ( $\lambda_{\text{ex}} = 540 \text{ nm}$ ) in THF/water ( $f_w$  70%) ( $[\text{B1}] = 50 \mu\text{M}$  and  $[\text{RhB}] = 0.0, 0.2 \times 10^{-6}, 0.4 \times 10^{-6}, 0.6 \times 10^{-6}, 0.8 \times 10^{-6}, 1.0 \times 10^{-6}, 1.2 \times 10^{-6}, 1.4 \times 10^{-6}, 1.6 \times 10^{-6}, 1.8 \times 10^{-6}, 2.0 \times 10^{-6} \text{ M}$ ); (b) emission spectra of **B1** ( $50 \mu\text{M}$ ), RhB+**B1** ( $[\text{B1}] = 50 \mu\text{M}$ ,  $[\text{RhB}] = 1 \mu\text{M}$ ) and RhB ( $0.25 \mu\text{M}$ ); (c) and (d) Change in the fluorescence decay profiles of **B1** in the presence of RhB in THF/water (70%; v/v).

**Table S1. Experimental/theoretical absorption wavelength, energy, oscillation strength (*f*) and assignments**

	<b>Experimental Wavelength (nm)</b>	<b>Calculated Wavelength (nm)</b>	<b>Oscillator Strength (<i>f</i>)</b>	<b>Energy (eV)</b>	<b>% Contribution</b>	<b>Assignments</b>
<b>B1</b>	436	387	1.455	3.20	16 72	HOMO-1 → LUMO HOMO → LUMO
		255	0.381	4.86	36 32	HOMO-1 → LUMO HOMO → LUMO+1
<b>B2</b>	440	393	1.520	3.15	75 7	HOMO → LUMO HOMO-1 → LUMO
		262	0.380	4.73	42 18	HOMO → LUMO+1 HOMO-2 → LUMO