Supporting Information

A stimuli responsive triplet-triplet annihilation upconversion system and its application of ratiometric sensor for Fe^{3+} ions

Shuoran Chen,[a] Fuming Chen,[a] Pengju Han,*[a] Changqing Ye,*[a] Suqin Huang,[a] Lei Xu,[a] Xiaomei Wang,[a] and Yanlin Song [b]

a. Research Centre for Green Printing Nanophotonic Materials, Jiangsu Key Laboratory for Environmental Functional Materials, Institute of Chemistry, Biology and Materials Engineering, Suzhou University of Science and Technology, Suzhou 215009, P. R. China.

b. Key Laboratory of Green Printing, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, P. R. China.

Corresponding Author

E-mail: wxyhpj@163.com; yechangqing@mail.usts.edu.cn

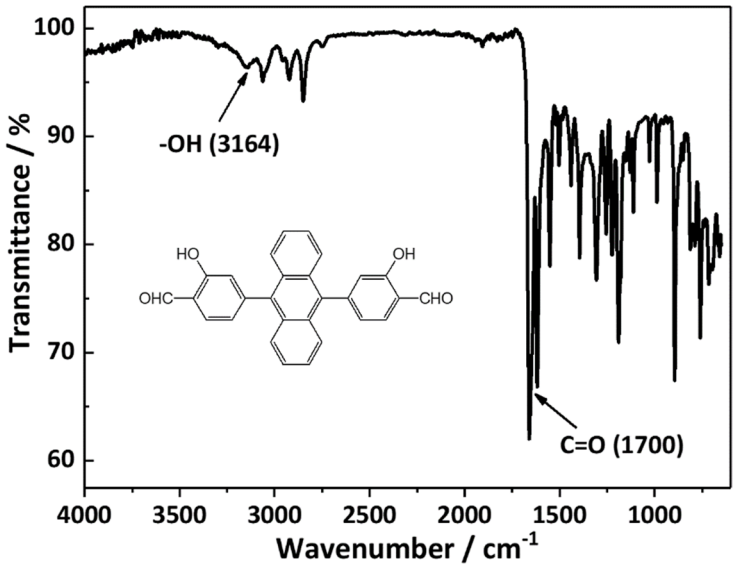

Fig. S1 IR spectrum of intermediate product DHAPA.

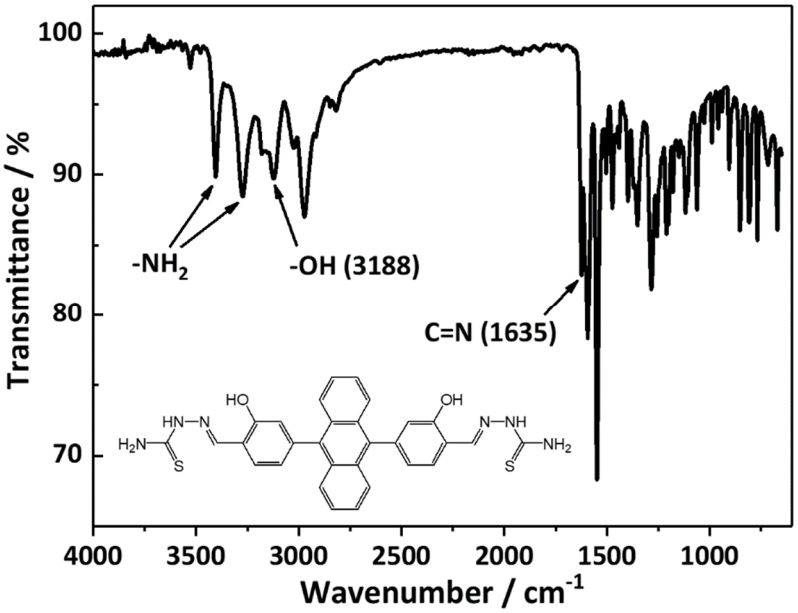

Fig. S2 IR spectrum of the responsive annihilator **DHTPA**.

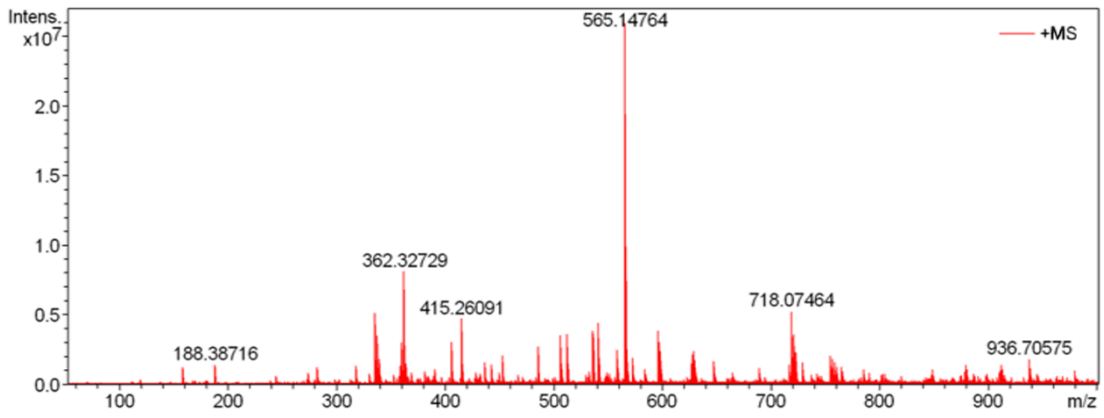

Fig. S3 Mass spectrum of **DHTPA**.

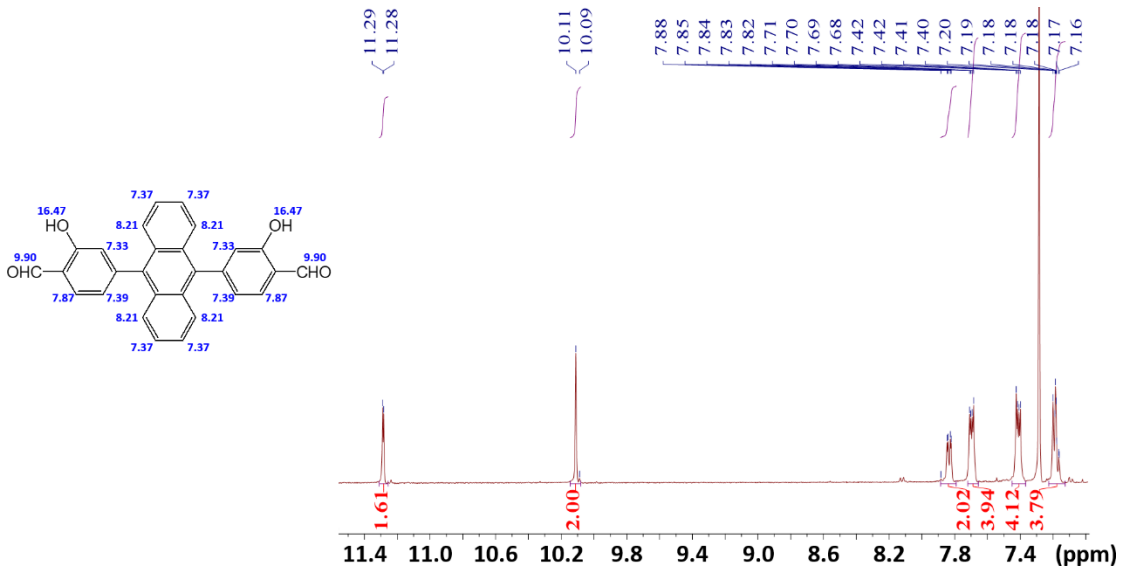

Fig. S4 ^{1}HNMR spectrum of the intermediate product DHAPA.

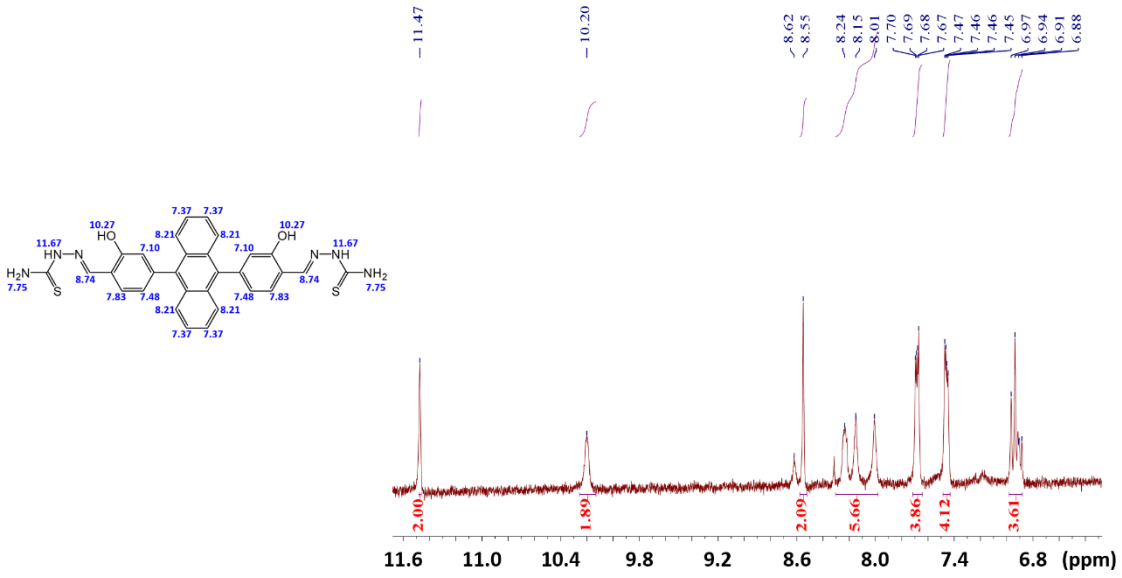

Fig. S5 ^{1}HNMR spectrum of **DHTPA**.

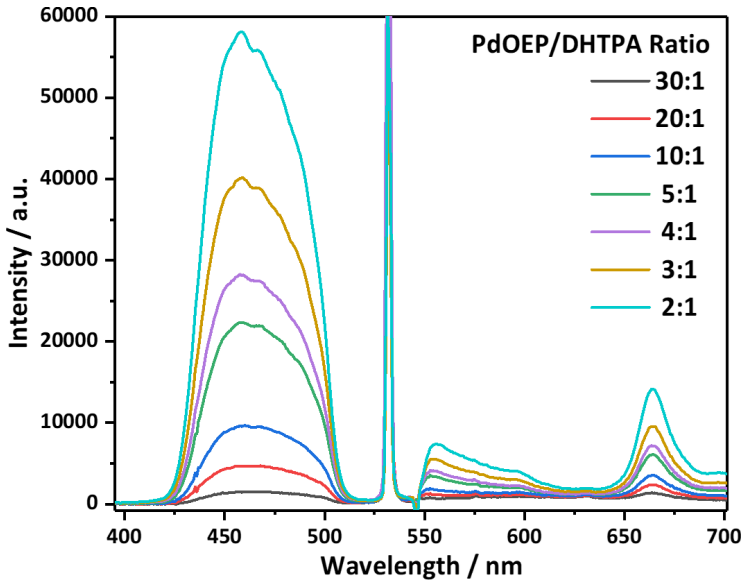

Fig. S6 UC emission spectra of PdOEP/DHTPA with constant DHTPA concentration (60 mM) and increasing PdOEP concentration (2-30 mM).

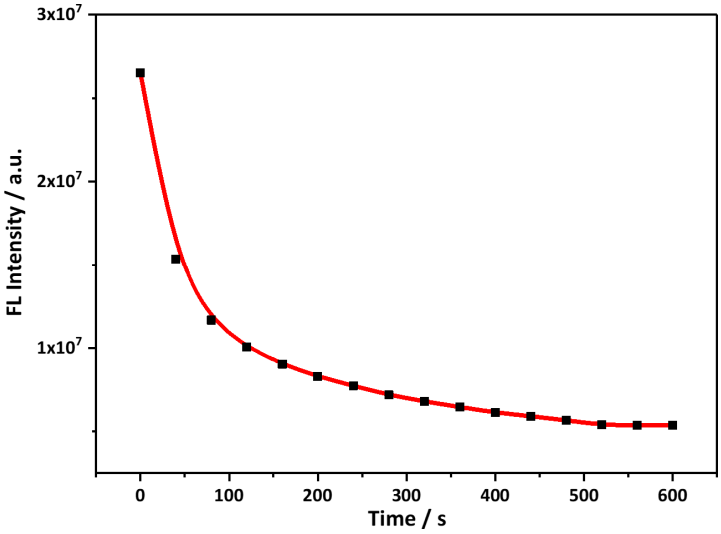

Fig. S7 FL intensity of DHTPA with Fe^{3+} ions (10 μM) dependent on time.

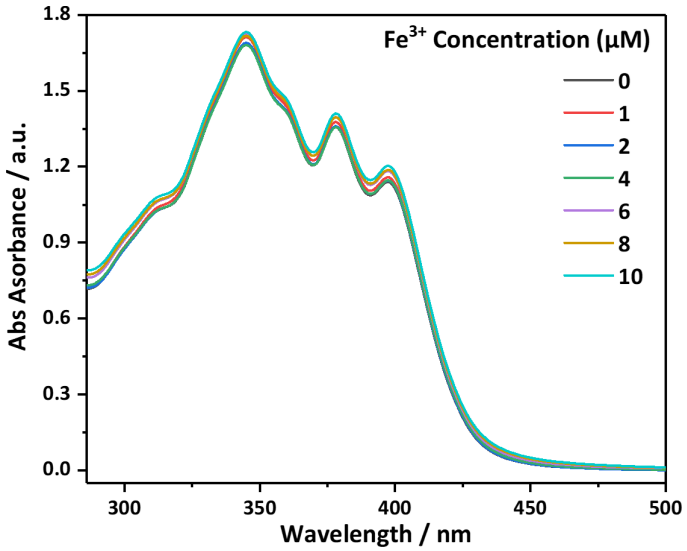

Fig. S8 Absorption spectra of DHTPA with different concentrations of Fe^{3+} ions.

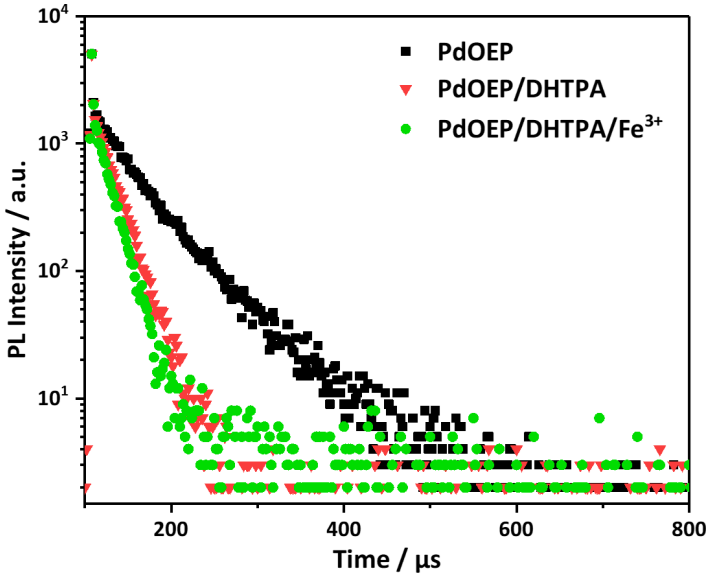

Fig. S9 Phosphorescence lifetimes of PdOEP at 655nm in PdOEP solution (black), PdOEP/DHTPA mixture (red) and PdOEP/DHTPA/Fe^{3+} (green).

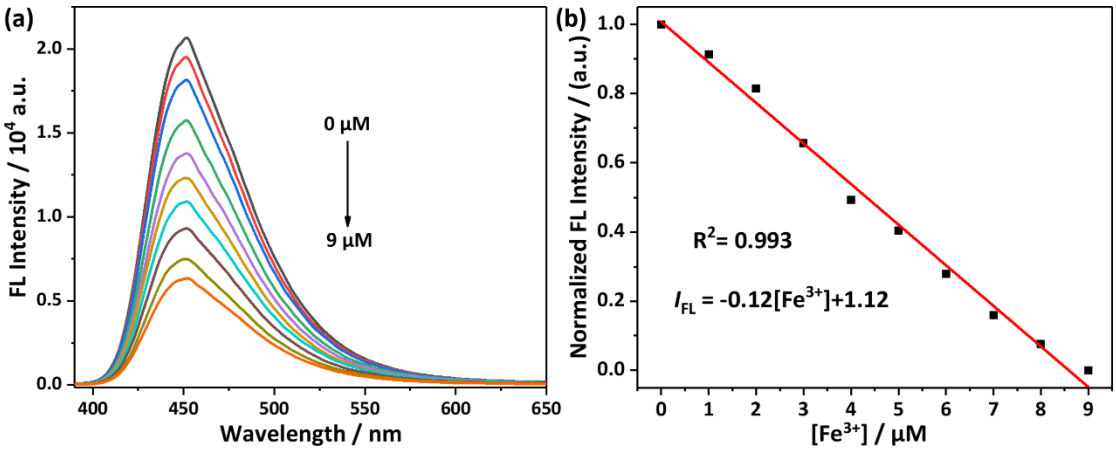

Fig. S10 (a) Fluorescent spectra of DHTPA at environments of different concentrations of Fe^{3+} ions (0-9 μM); (b) Plot of integrated intensities of fluorescence in (a) denpendent on concentration of Fe^{3+} ions.

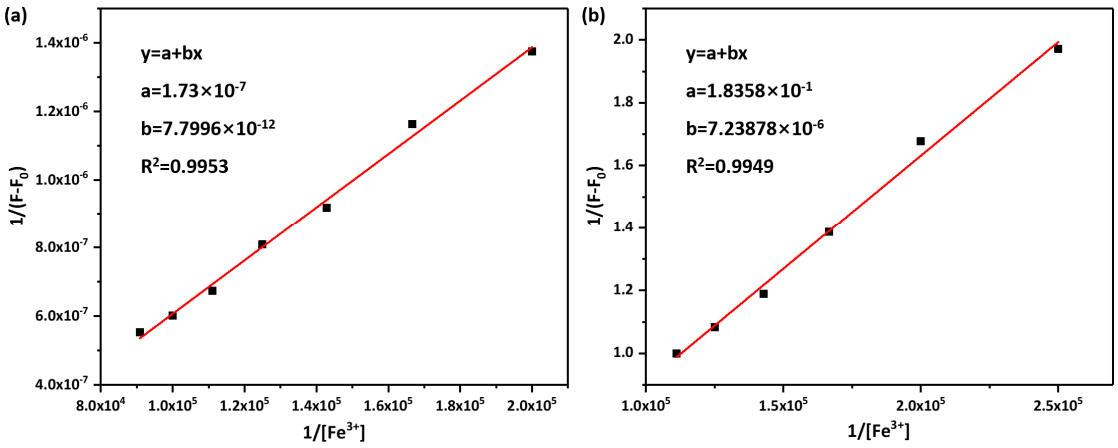

Fig. S11 (a) Benesi-Hildebrand linear fitting data from UC signal in Fig. 4a; (b) Benesi-Hildebrand linear fitting data from FL signal in Fig. S10.

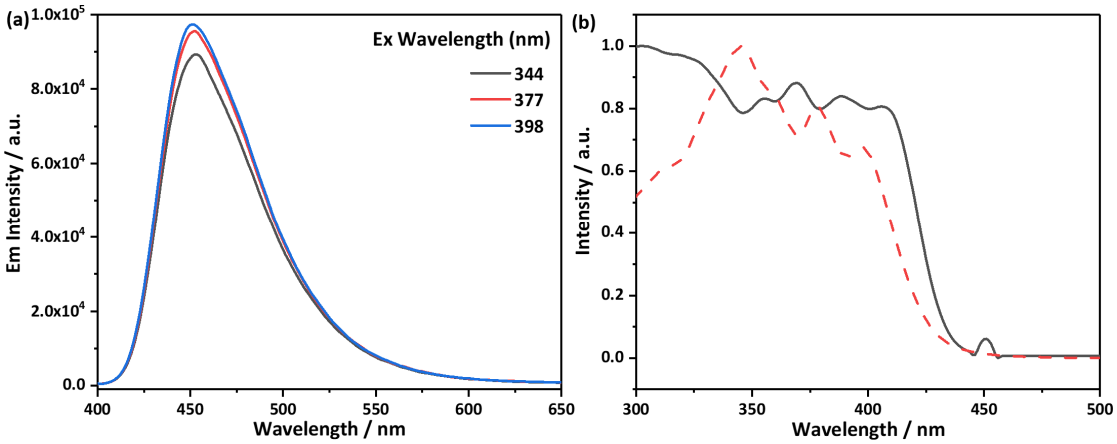

Fig. S12 (a) FL spectra of DHTPA excited at the positions of three absorption peaks; (b) Excitation spectrum of DHTPA (black) of the 455 nm emission; absorption spectrum (red) is regard as control.

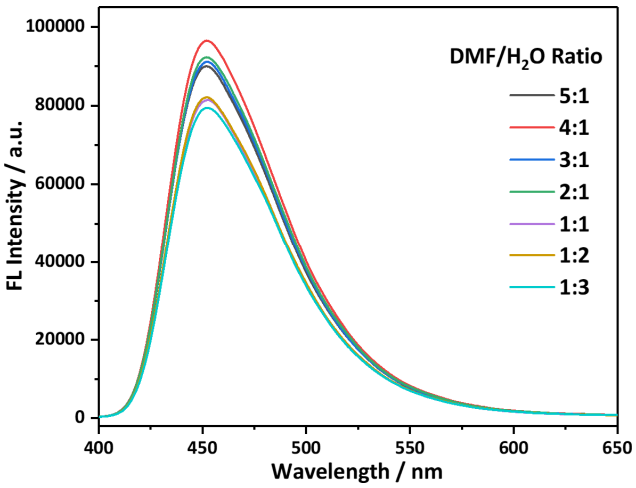

Fig. S13 FL spectra of DHTPA in DMF/H_2O mixed solvent with different volume ratio.

Limit of Detection (LOD) Calculation:

The LOD of the ratiometric sensor in the text is calculated by using Eq. S1.

$$\mathbf{LOD} = \mathbf{3\sigma/S} \qquad \textbf{Eq. S1}$$

where **σ** represents the standard deviation of the ratio intensity of a blank sample without Fe^{3+} ions, and **S** represents the slope of the linear relationship between ratio intensity and the Fe^{3+} concentration, respectively.

Binding Constant (K_a) Calculation

The K_a of the complexing reaction is calculated through Benesi-Hildebrand equation (Eq. S2).

$$F - F_0 = \Delta F = [Fe^{3+}](F_{max} - F_0)/(\frac{1}{K_a} + [Fe^{3+}]) \quad \textbf{Eq. S2}$$

where F represents the FL intensity, F_0 represents the FL intensity before adding Fe^{3+}, $[Fe^{3+}]$ represents the concentration of Fe^{3+} ions and F_{max} represents the FL intensity maximum, respectively.