# Highly sensitive and selective fluorescent chemosensor for $Ni^{2+}$ based on a new poly(arylene ether) with terpyridine substituent groups

## Supplementary Data

### 4-[3,5-di(4'-fuluorophenyl)-4H-1,2,4-trizole-4-yl]-2,2':6',2''-terpyridines (3)

The mixture of 1,4-difluoride-1,4-bis(4'-fluorophenyl)-2,3-diaza-1,3-butadiene (**1**) (2.496g, 8 mmol), 4'-amine-2,2':6',2"-terpyridines (**2**) (2.352 g, 8 mmol), and 40 mL of N,N-dimethylaniline was stirred at 135 °C in a nitrogen atmosphere for 12 h. After reaction was completely promoted, 120 mL o f 2N HCl(aq) was added and the mixture was stirred for another 0.5 h. The solids were filtered, dried, and then purified by crystallization from ethanol to give white solid (**3**). Yield: 48.2%. M.p.: 284-286 °C. GC-MS (EI-m/z)$[M]^+$ : calcd for $C_{35}H_{22}F_2N_6$, 564; Found 565.

FTIR (KBr): 1520 $cm^{-1}$(C=N stretch), 1107 $cm^{-1}$ (C-F stretch).

$^1H$ NMR (400 MHz, $CDCl_3$, δ, ppm): 7.05 (4H), 7.29 (4H), 7.37 (4H), 7.89 (4H), 8.68 (4H).

Elemental analysis: calcd for $C_{35}H_{22}F_2N_6$: C 74.46 %; H 3.93%; N 14.89%; found: C 73.83%; H 3.86%; N 14.67%.

### Preparation of polymer

A 25 mL three-necked round-bottomed flask equipped with an argon inlet, a magnetic stirrer, a Dean-Stark trap, and a condenser was flushed with argon and then charged with biphenol monomer **4** (0.3521 g, 1 mmol), $K_2CO_3$ (0.26 g), DMAc (4 mL), and toluene (8 mL). The reaction mixture was stirred at reflux under argon for 1.5 h to azeotrope off the resulting water with toluene. The toluene was then removed, and the reaction mixture was cooled. After cooling, 0.5642 g (1 mmol) of **3** was added. The mixture was heated to 170 °C and kept at low reflux until a very viscous solution was obtained. After cooling, the mixture was diluted with 2 mL of DMAc and poured into 150 mL of methanol to precipitate out the polymer. The resulting polymer was washed with hot water many times to remove inorganic salts and DMAc. Finally, the result-ing polymer was collected by filtration and dried at 80 °C in avacuum for 12 h. The weight-average molecular weights ($M_w$) and number-average molecular weights ($M_n$) of PAET were recorded in 8018 and 6692, relative to polystyrene standards. Yield: 88.7%. FT-IR: 1519 cm-1 ( C=N stretch), 1227 $cm^{-1}$

(C–O stretch), 3058 $cm^{-1}$(C–H stretch).

Elemental analysis: calcd for $C_{58}H_{37}N_8O_2$: C 79.34 %; H 4.25%; N 12.76%; found: C 79.29%; H 4.20%; N 12.70%.

**Preparation of polymer solutions**

PAET (4.4 mg) was dissolved in 5 mL DMF to afford the stock solution with the concentration of $1.0\times10^{-3}$ mol $L^{-1}$. This stock solution was diluted to $1.0\times10^{-6}$ mol $L^{-1}$.

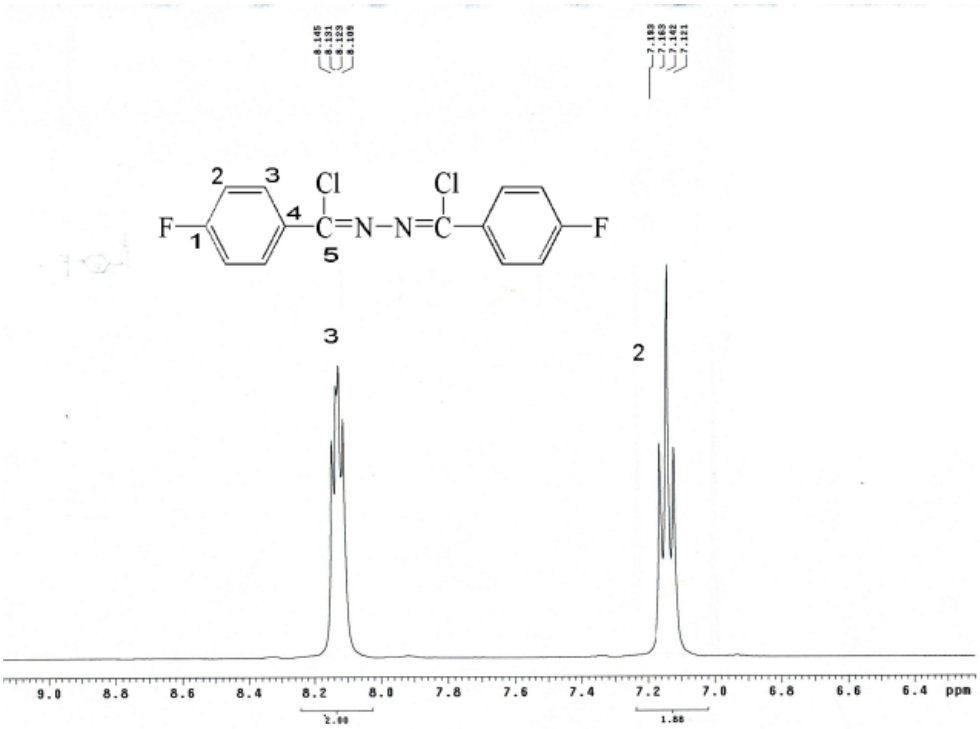


**Fig. S1** $^1$H NMR spectra of compound **1**

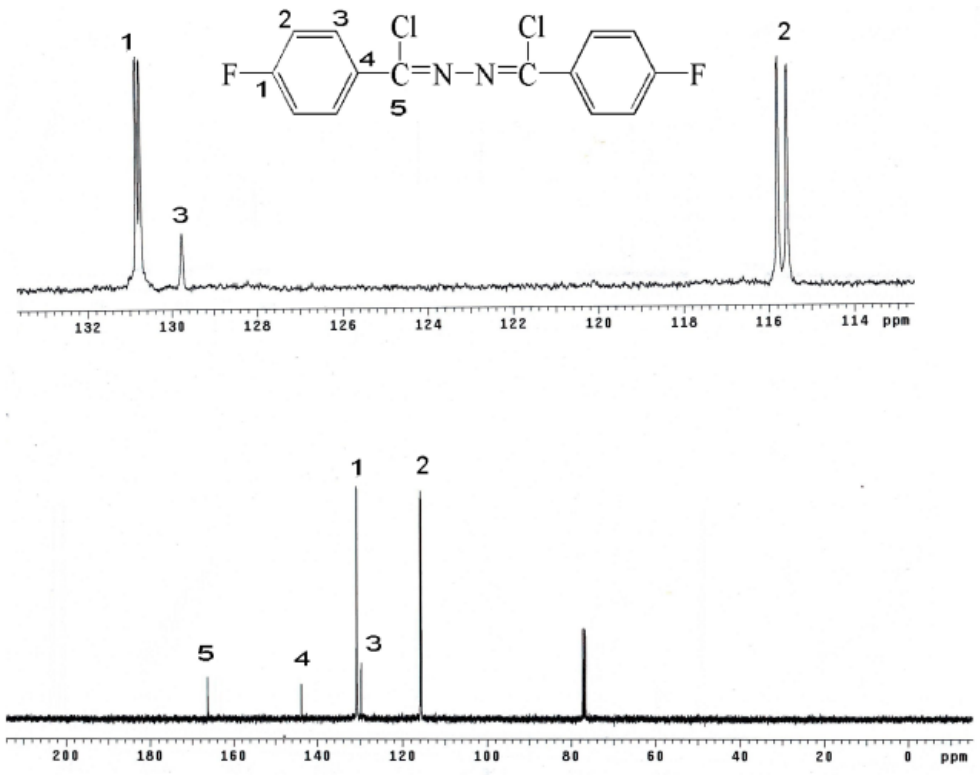


**Fig. S2** $^{13}$C NMR spectra of compound **1**

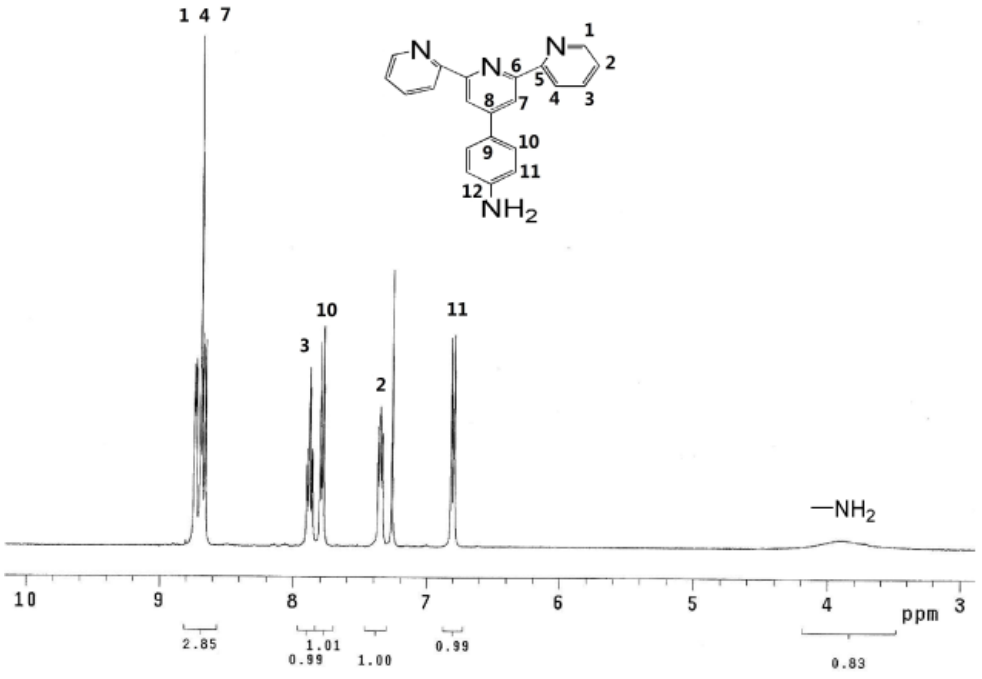


**Fig. S3** $^{1}$H NMR spectra of compound **2**

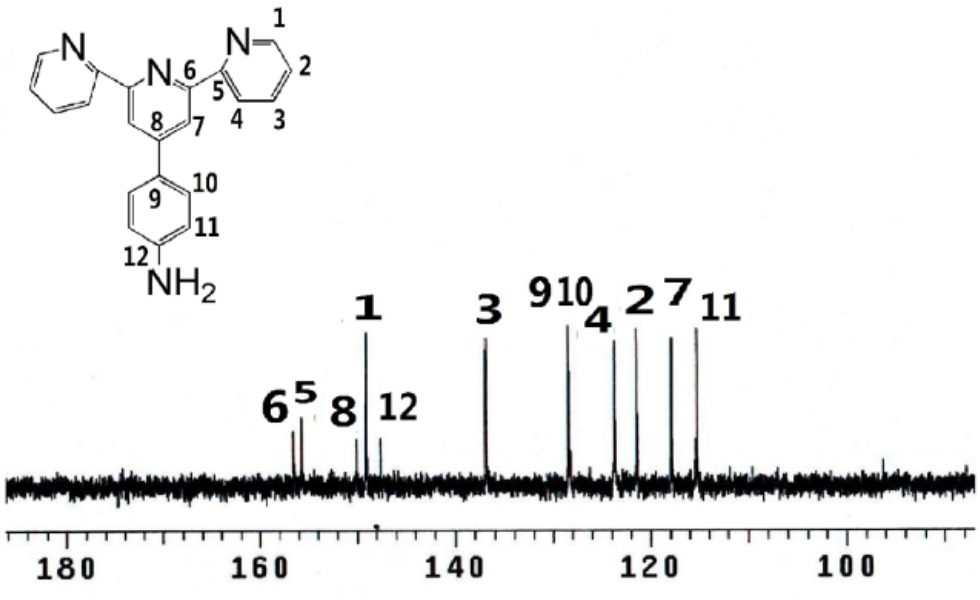


**Fig. S4** $^{1}$H NMR spectra of compound **2**

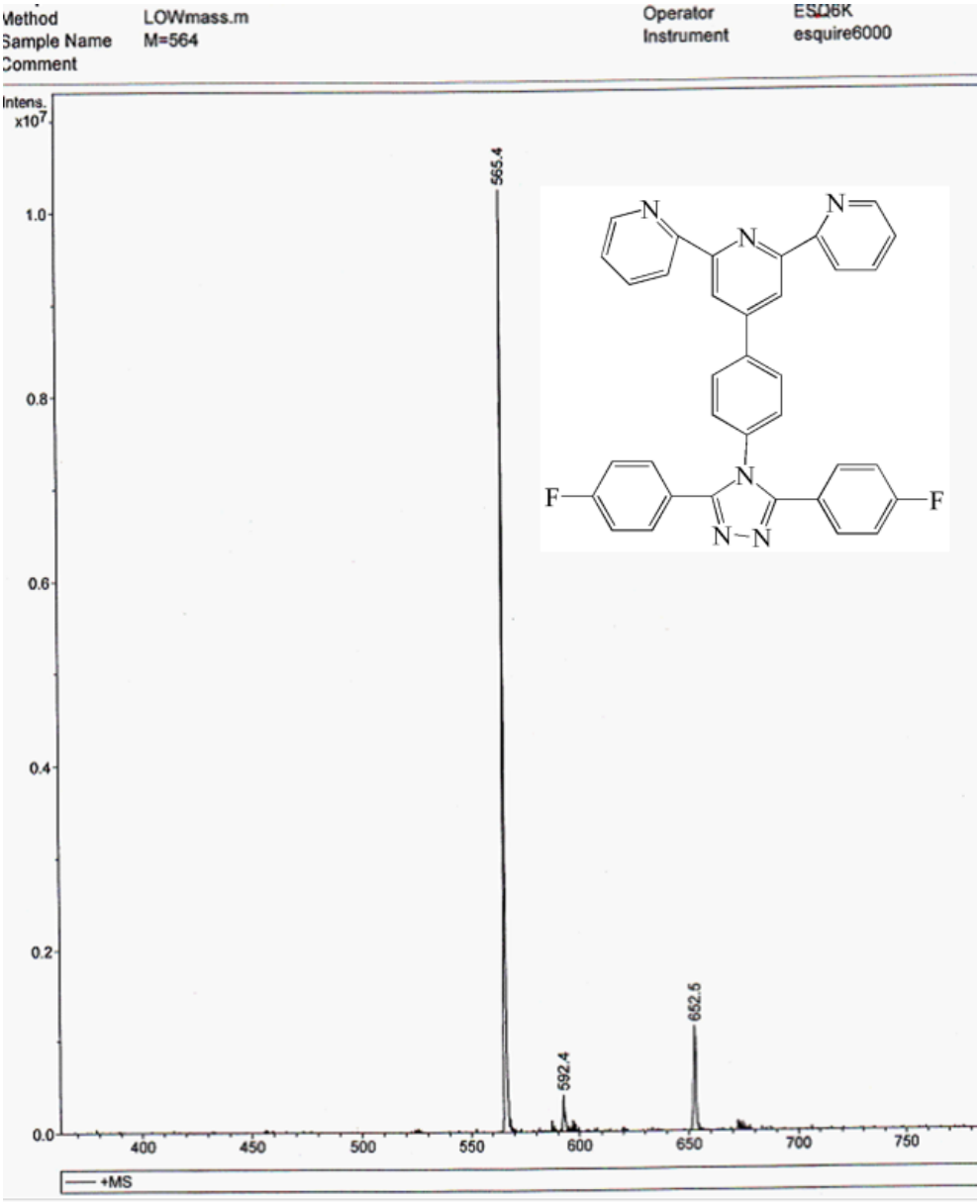


**Fig. S5** GC-MS spectra of compound **3**

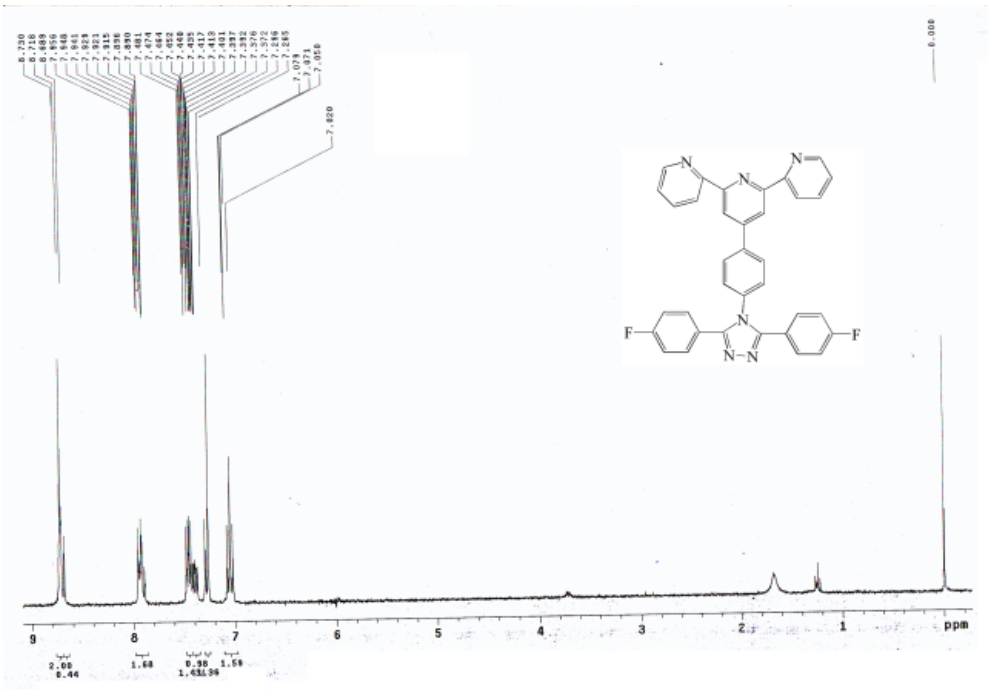


**Fig. S6** $^{1}$H NMR spectra of compound **3**

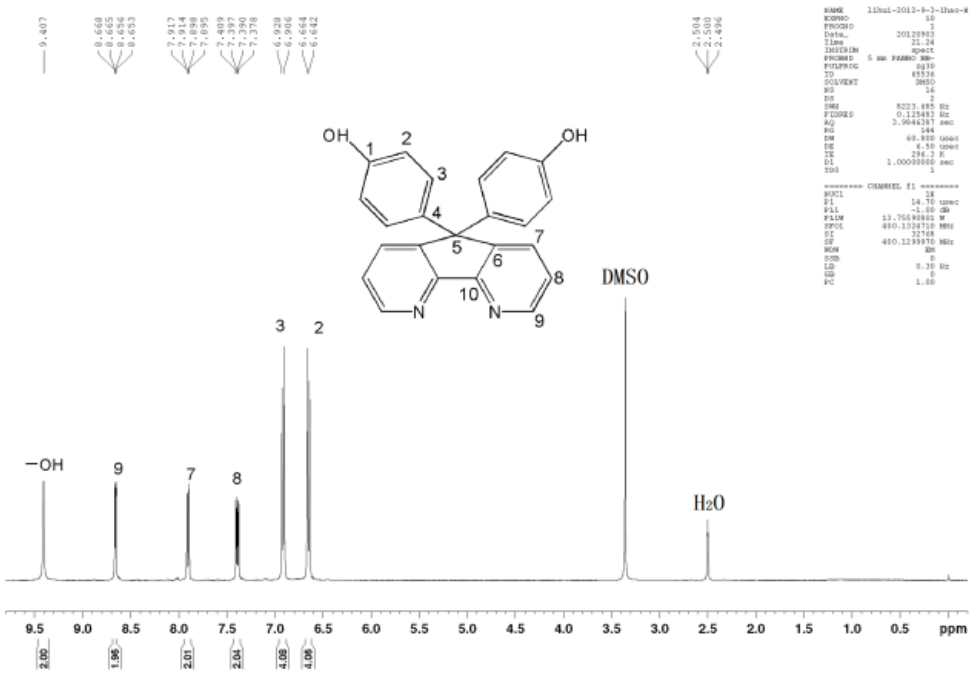


**Fig. S7** $^{1}$H NMR spectra of compound **4**

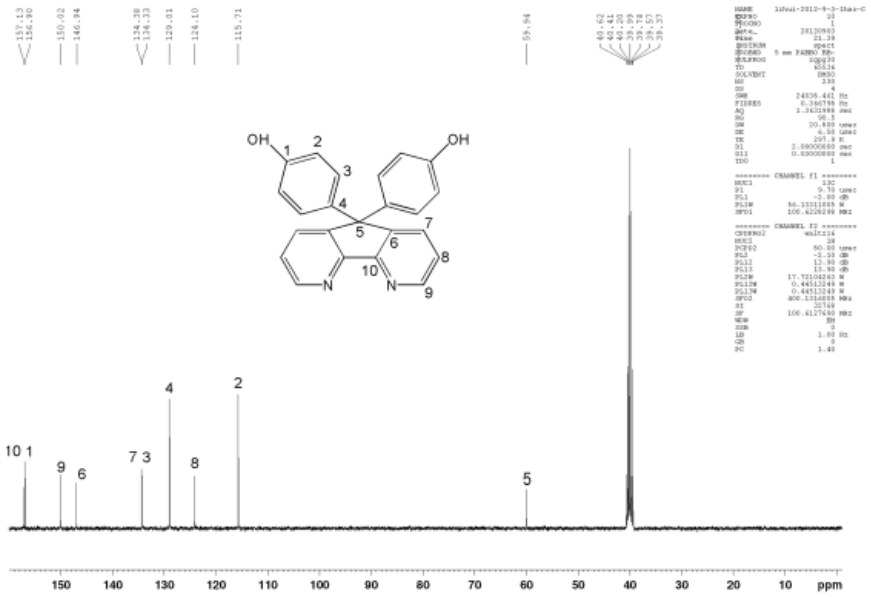


**Fig. S8** $^{13}$C NMR spectra of compound **4**

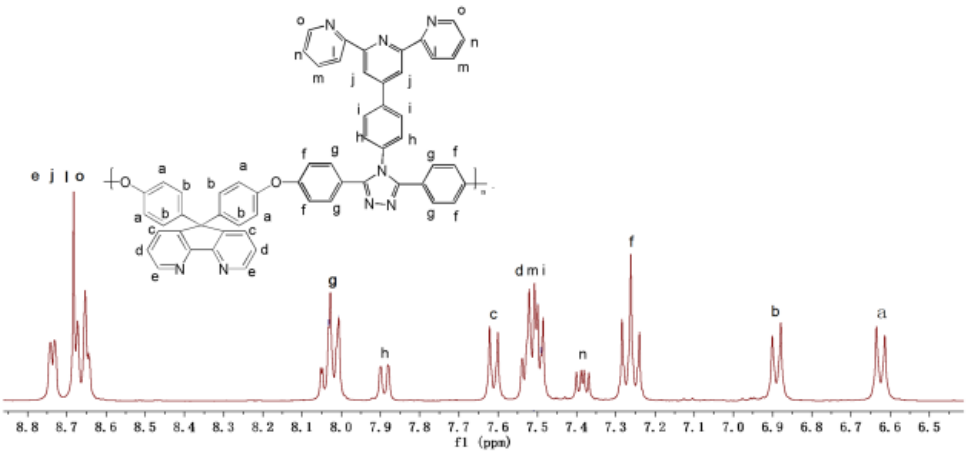


**Fig. S9** $^{1}$H NMR spectra of PAET

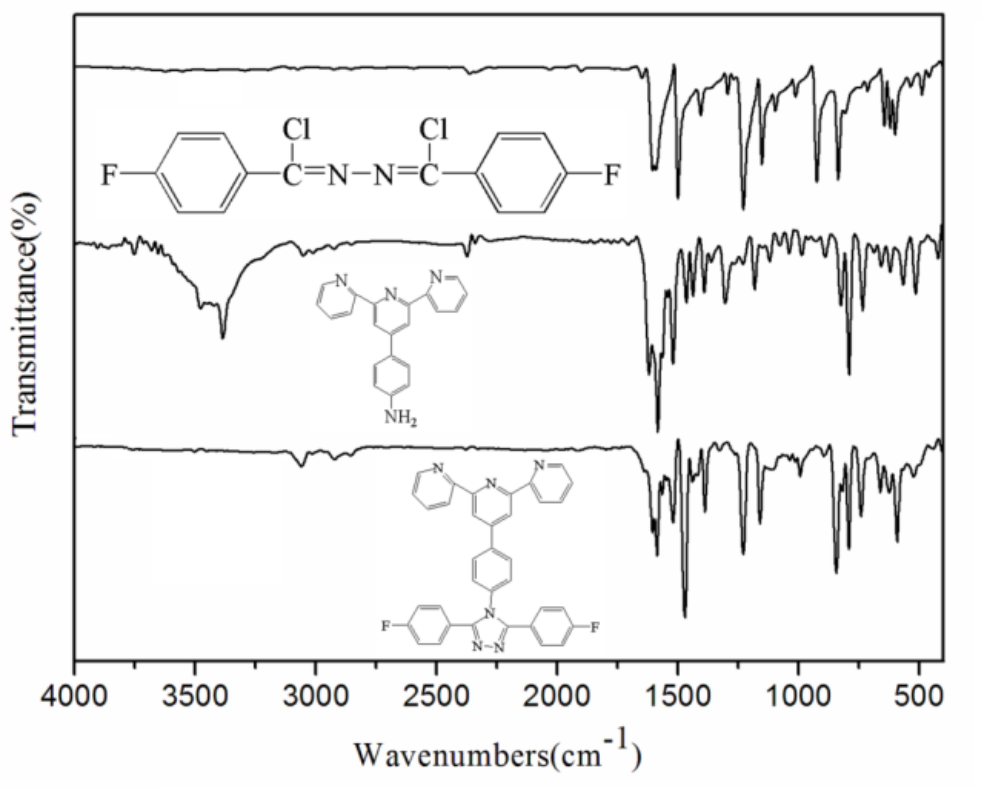


**Fig. S10 FTIR** spectra of compound **1, 2** and **3**.

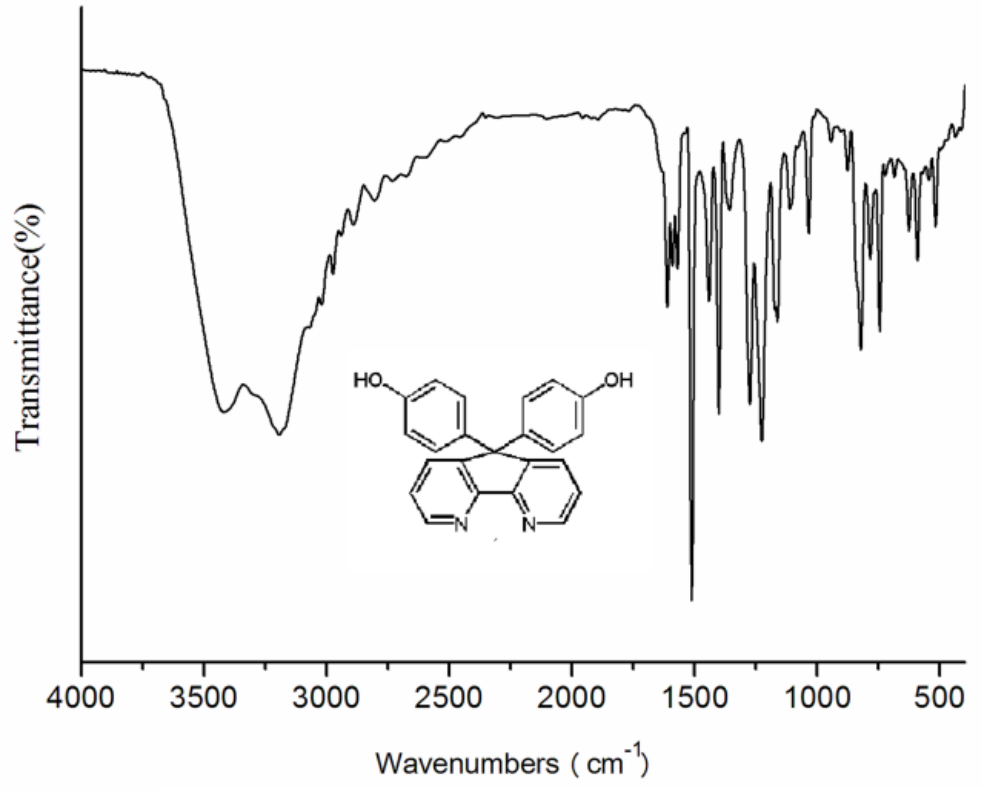


**Fig. S11 FTIR** spectra of compound **4**.

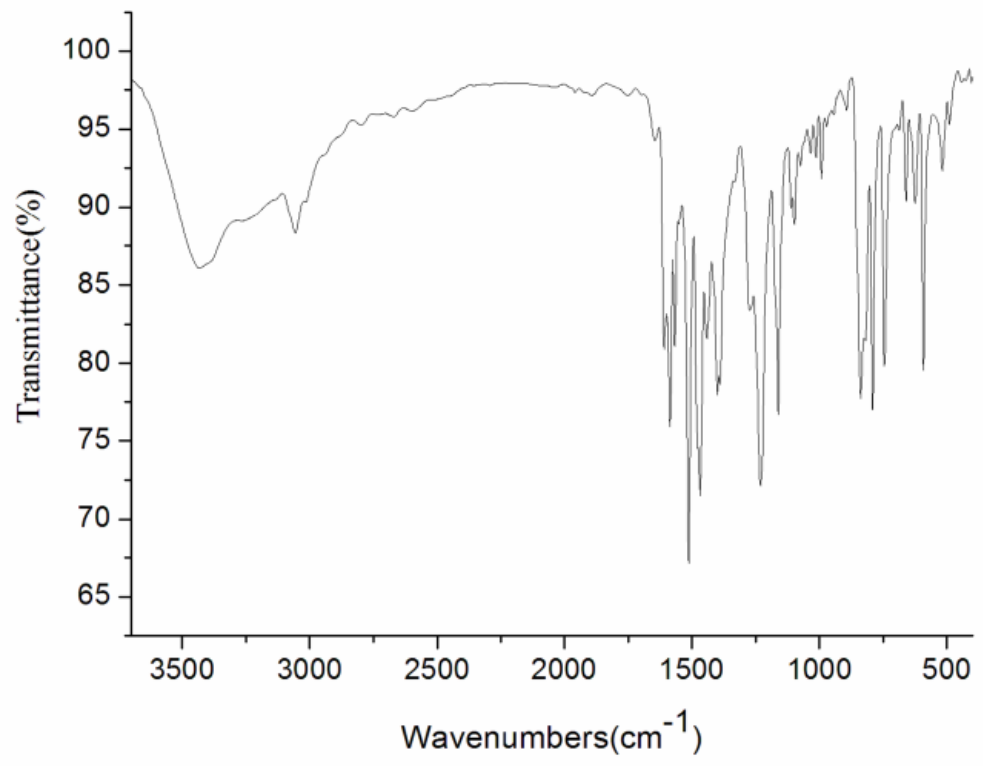


**Fig. S12 FTIR** spectra of PAET

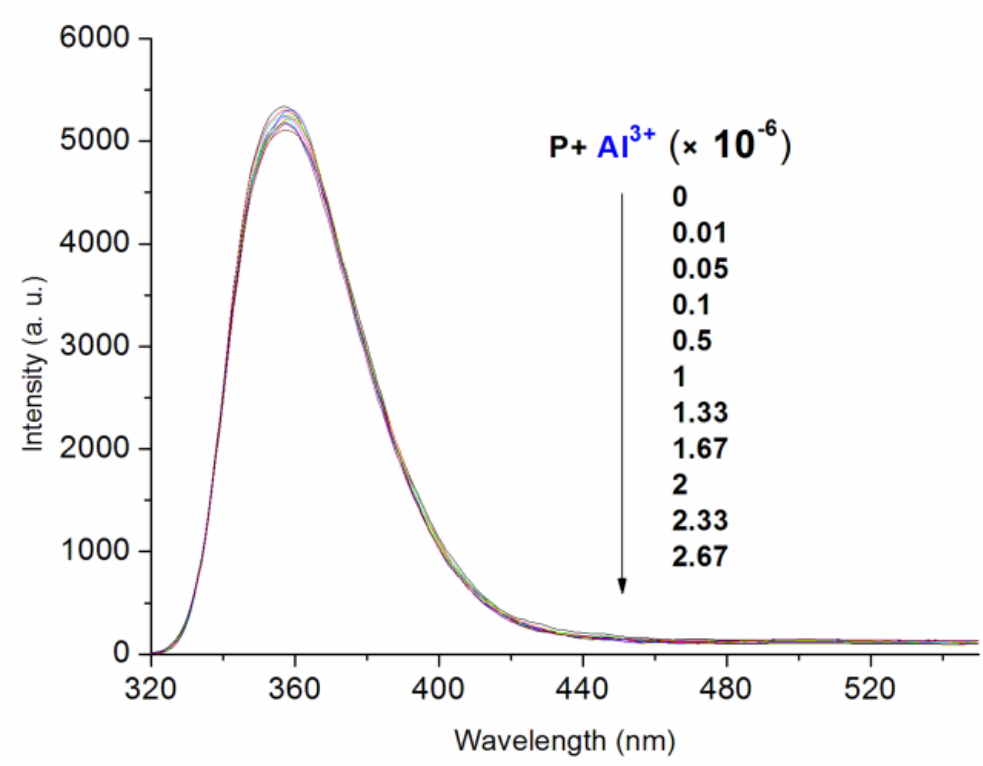


**Fig.S13** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Al^{3+}$. Excitation wavelength (nm): 288.

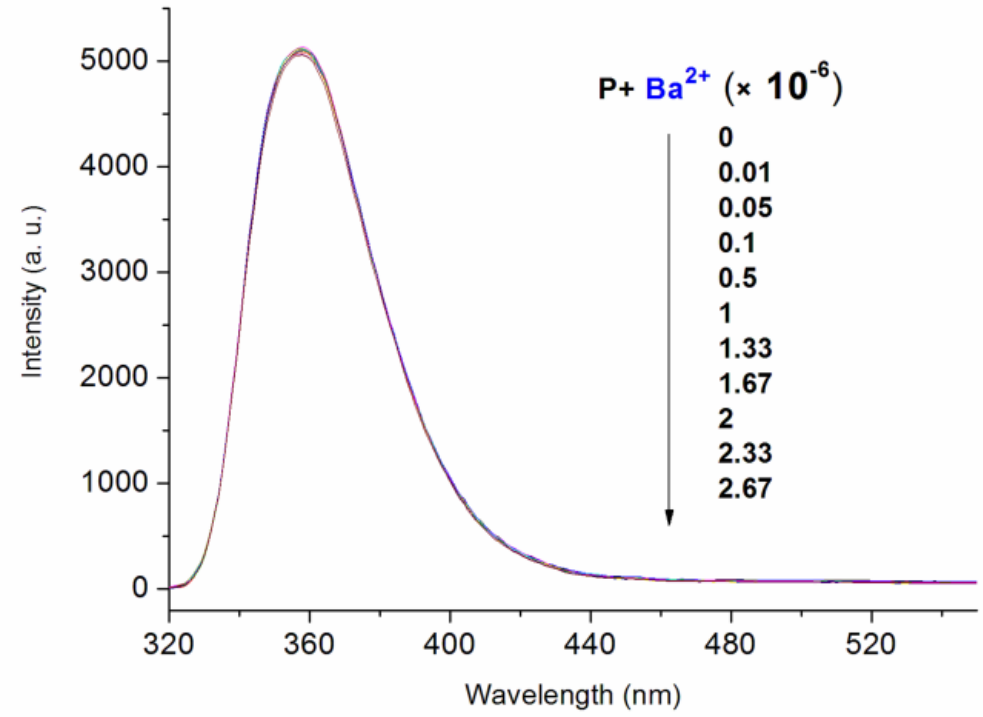


**Fig.S14** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Ba^{2+}$. Excitation wavelength (nm): 288.

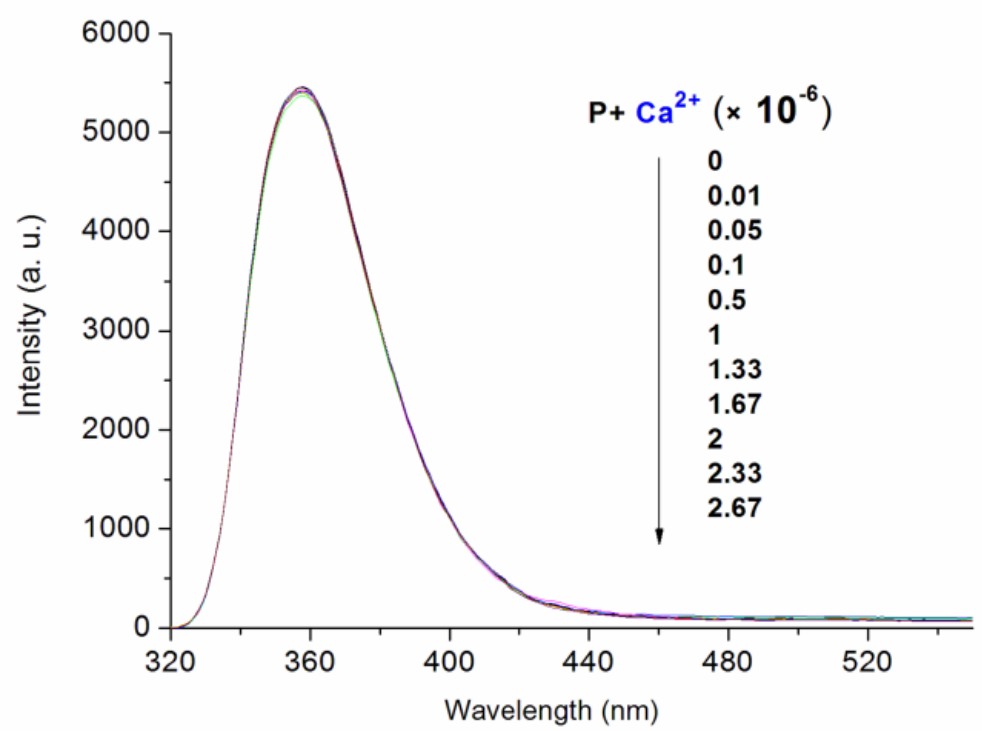


**Fig.S15** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Ca^{2+}$. Excitation wavelength (nm): 288.

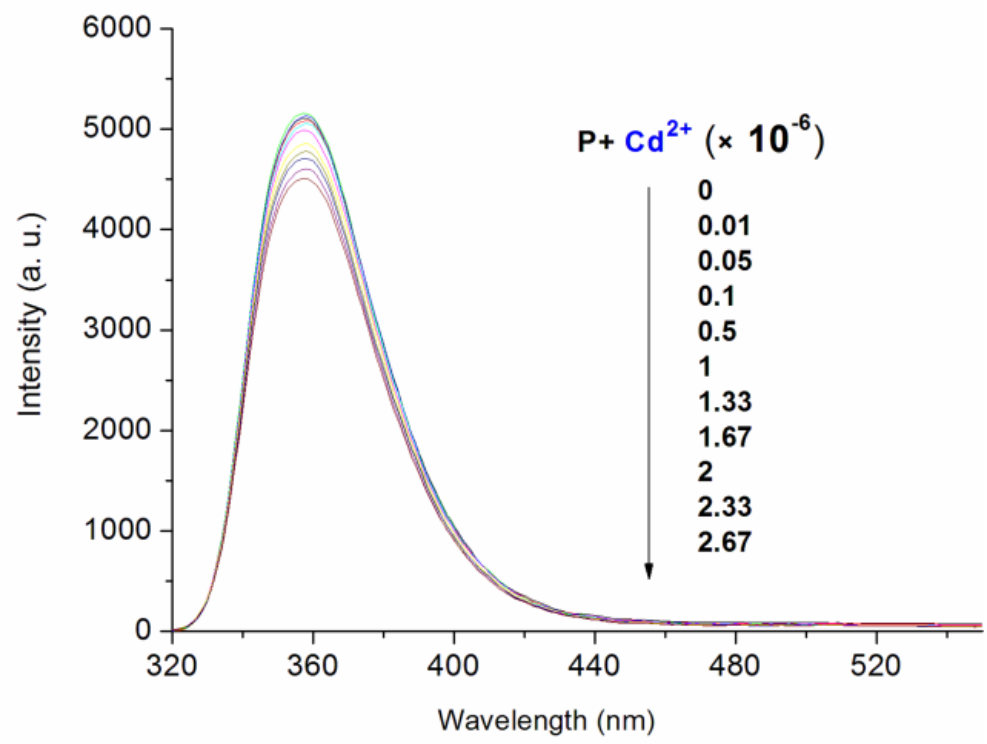


**Fig.S16** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Cd^{2+}$. Excitation wavelength (nm): 288.

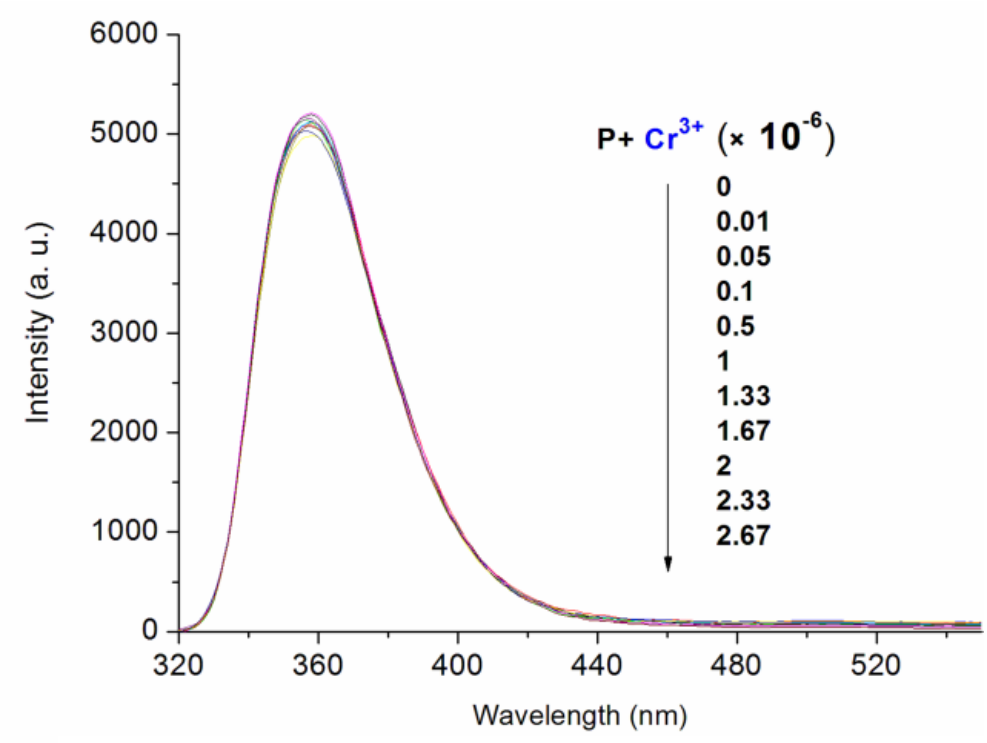


**Fig.S17** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Cr^{3+}$. Excitation wavelength (nm): 288.

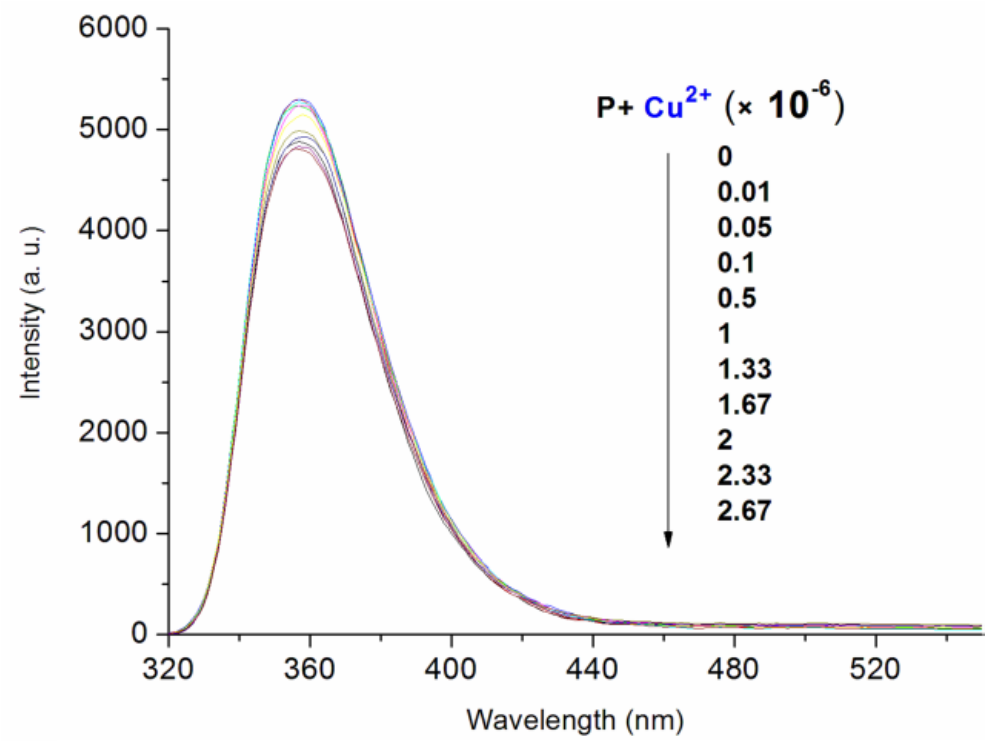


**Fig.S18** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Cu^{2+}$. Excitation wavelength (nm): 288.

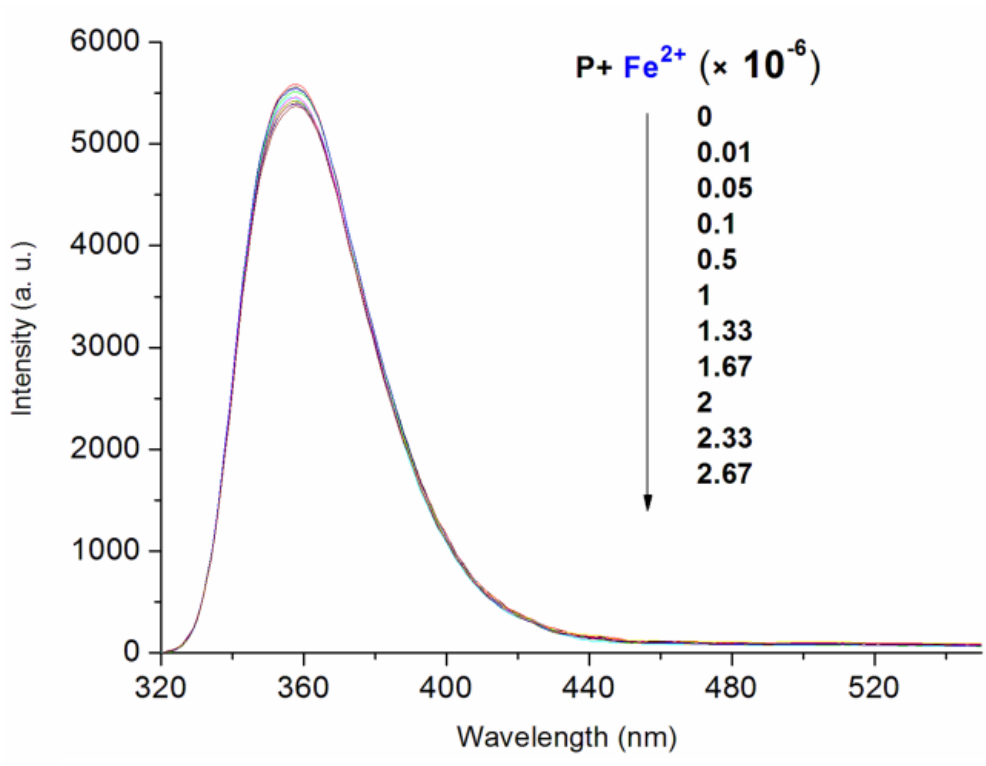


**Fig.S19** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Fe^{2+}$. Excitation wavelength (nm): 288.

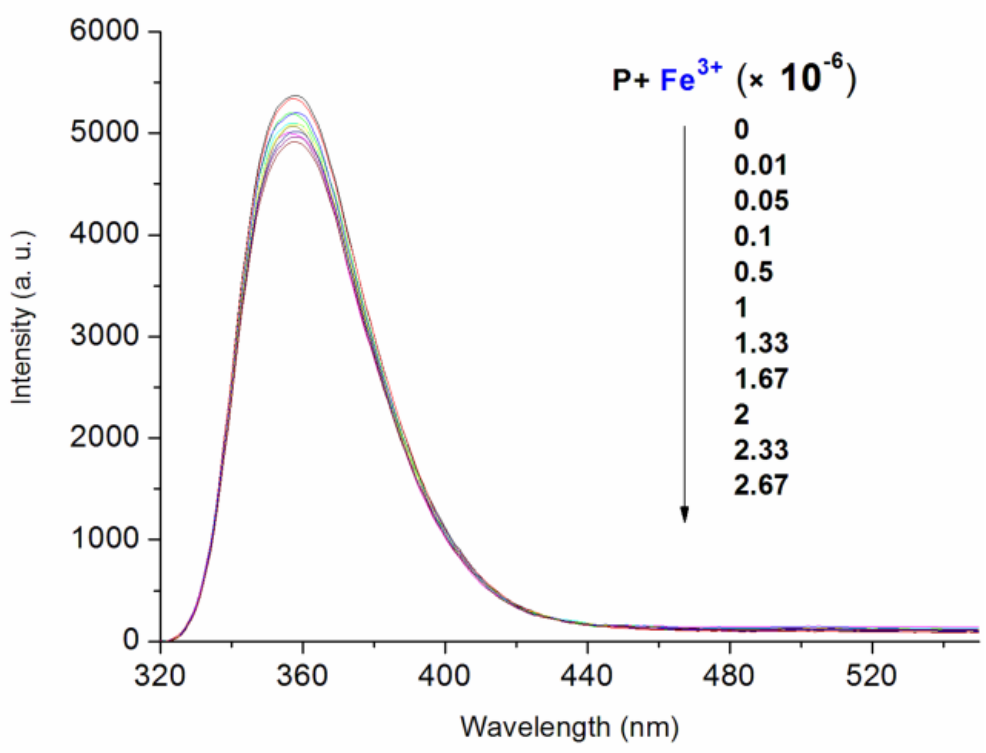


**Fig.S20** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Fe^{3+}$. Excitation wavelength (nm): 288.

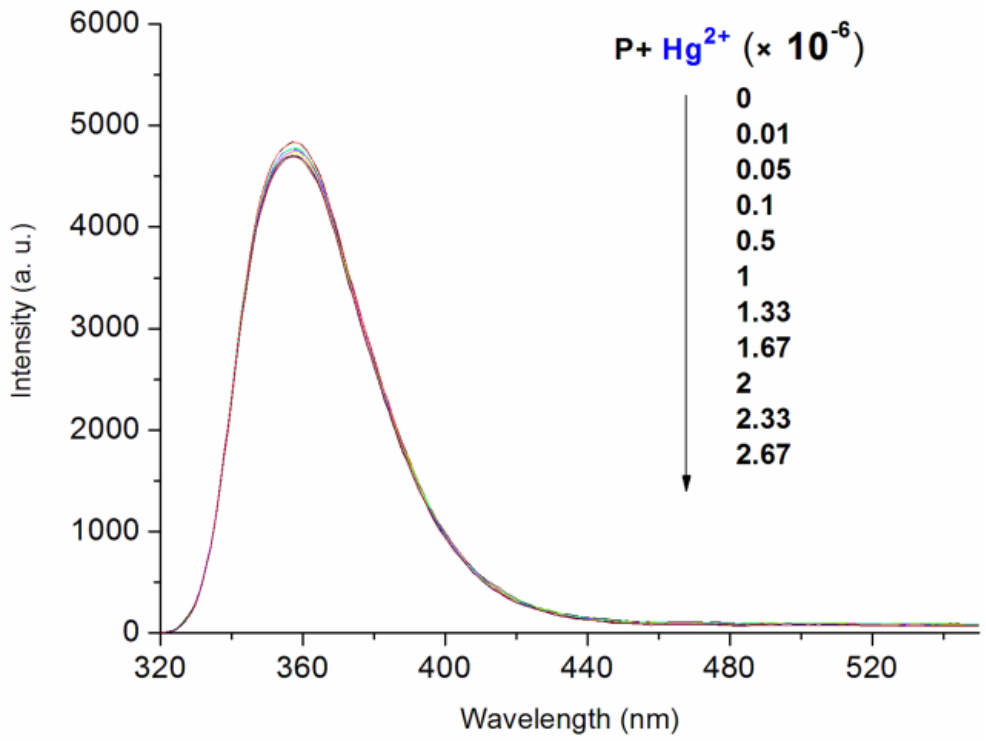


**Fig.S21** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Hg^{2+}$. Excitation wavelength (nm): 288.

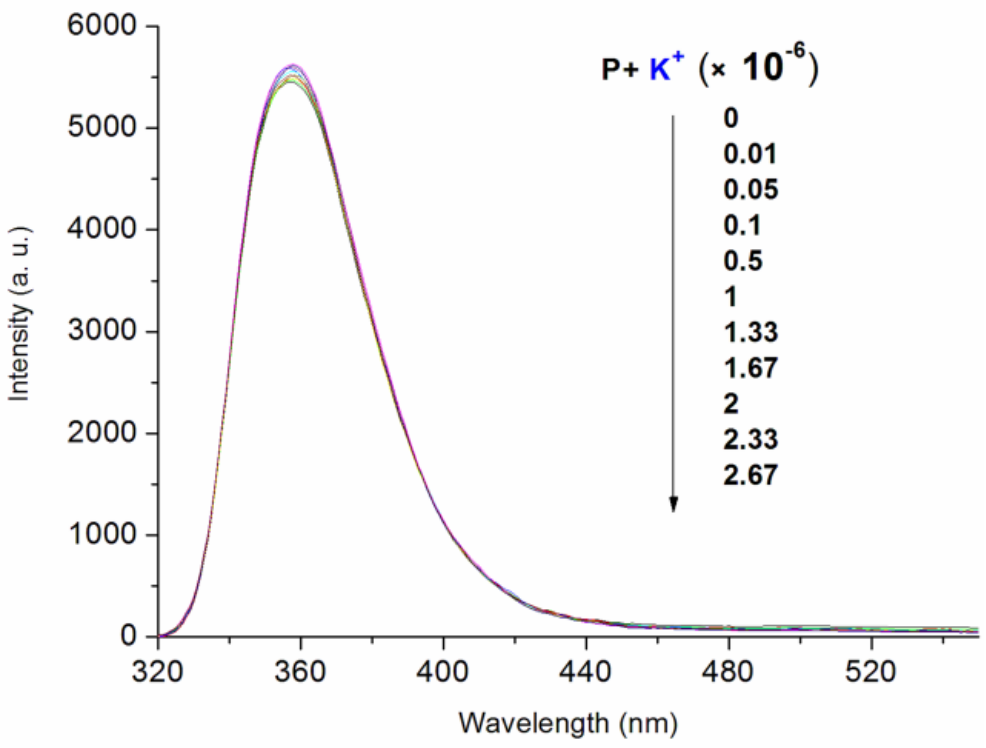


**Fig.S22** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $K^+$. Excitation wavelength (nm): 288.

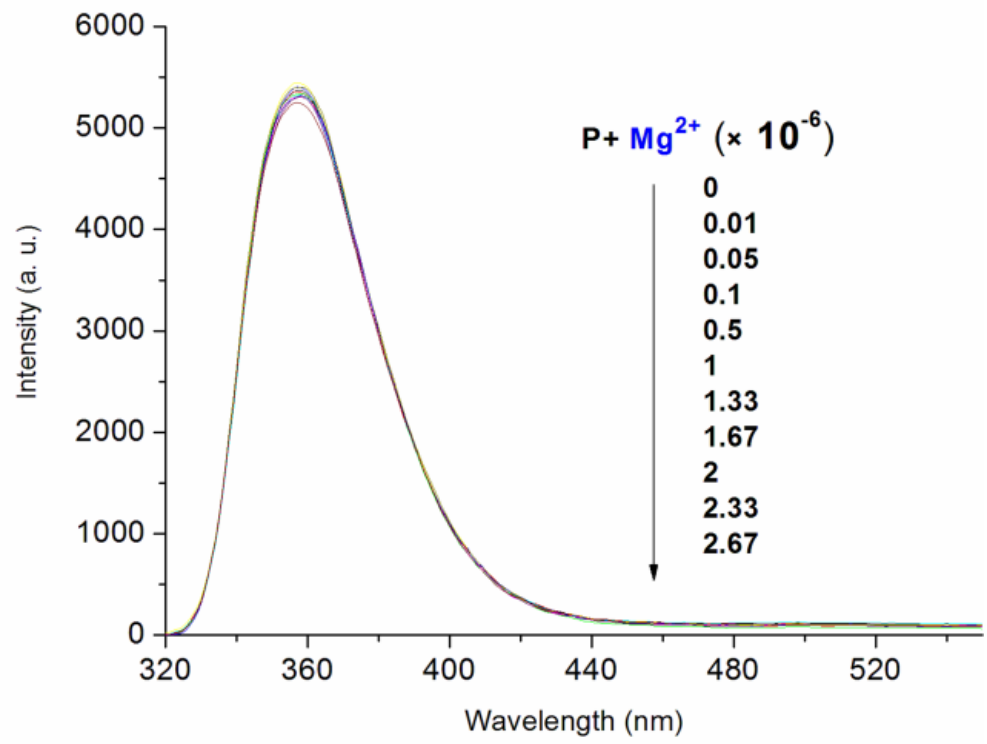


**Fig.S23** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Mg^{2+}$. Excitation wavelength (nm): 288.

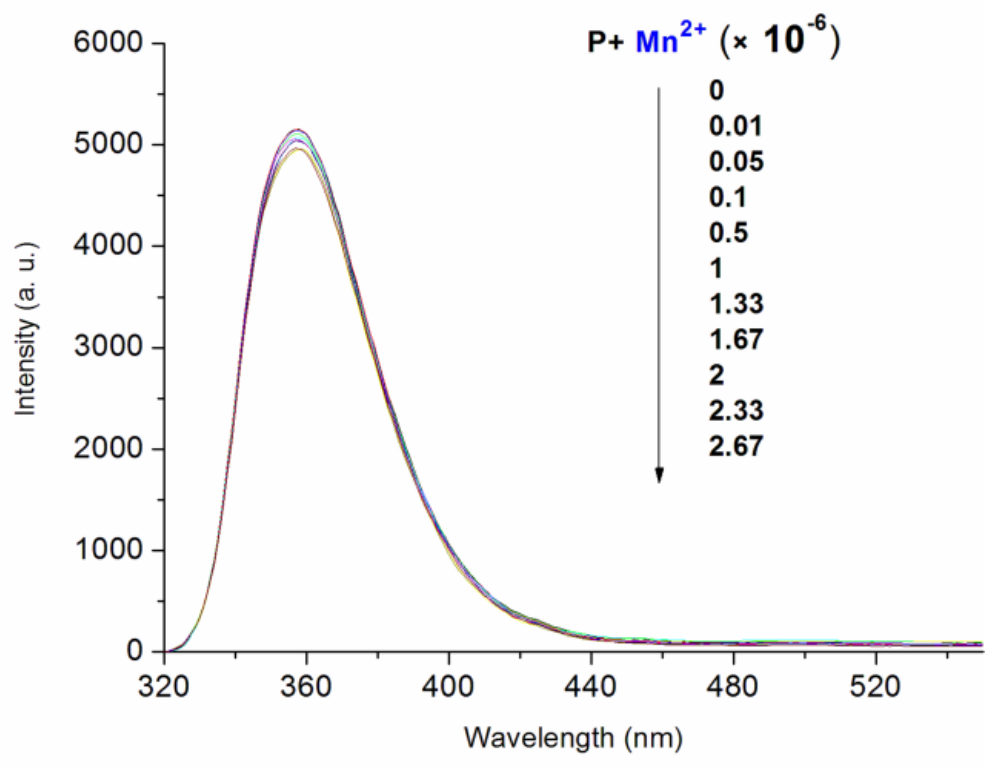


**Fig.S24** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Mn^{2+}$. Excitation wavelength (nm): 288.

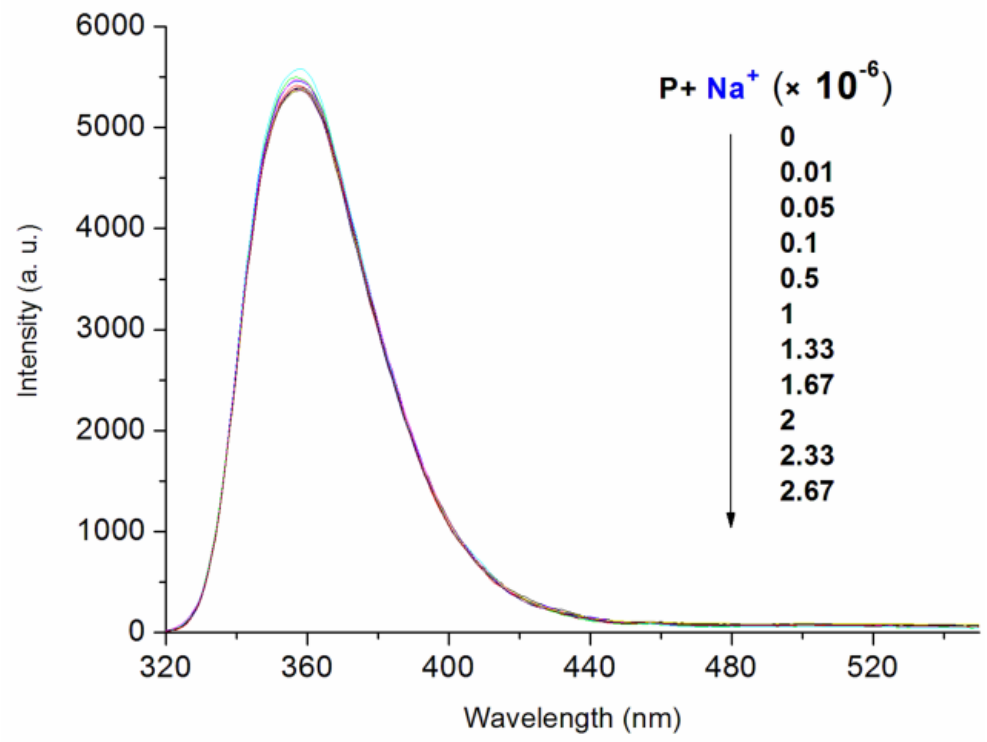


**Fig.S25** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Na^{2+}$. Excitation wavelength (nm): 288.

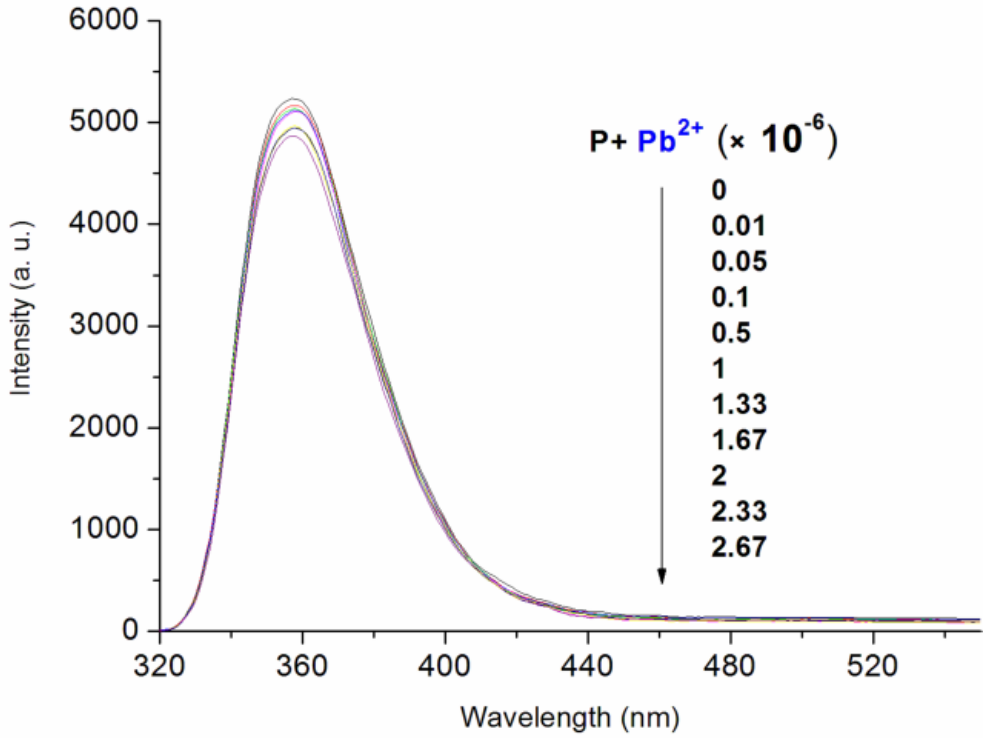


**Fig.S26** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Pb^{2+}$. Excitation wavelength (nm): 288.

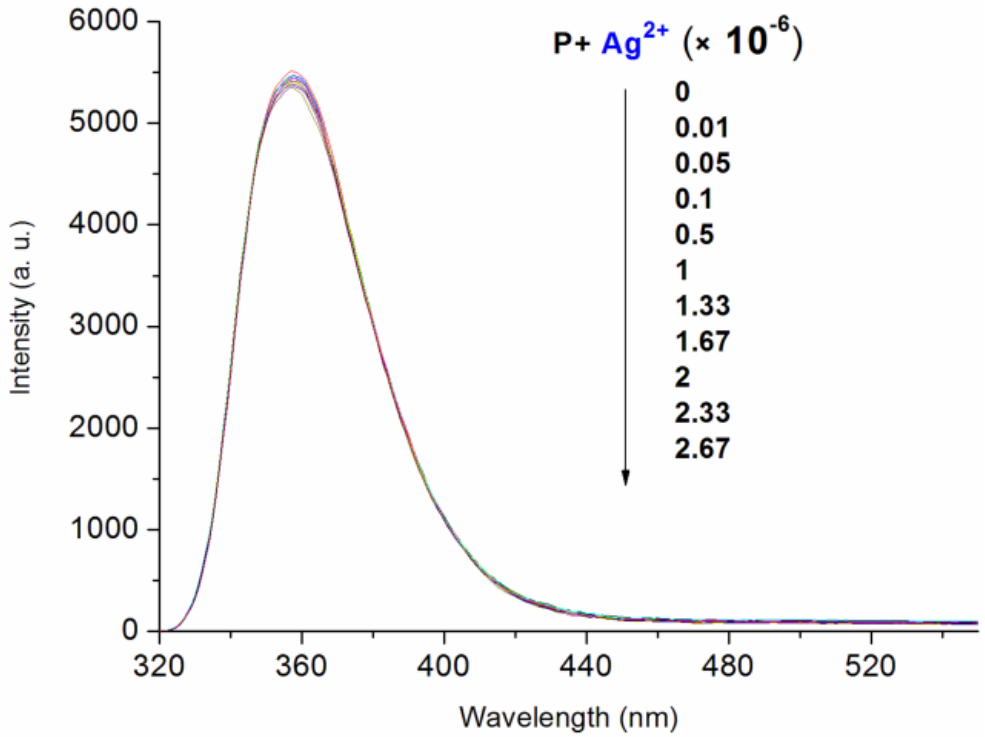


**Fig.S27** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Ag^{2+}$. Excitation wavelength (nm): 288.

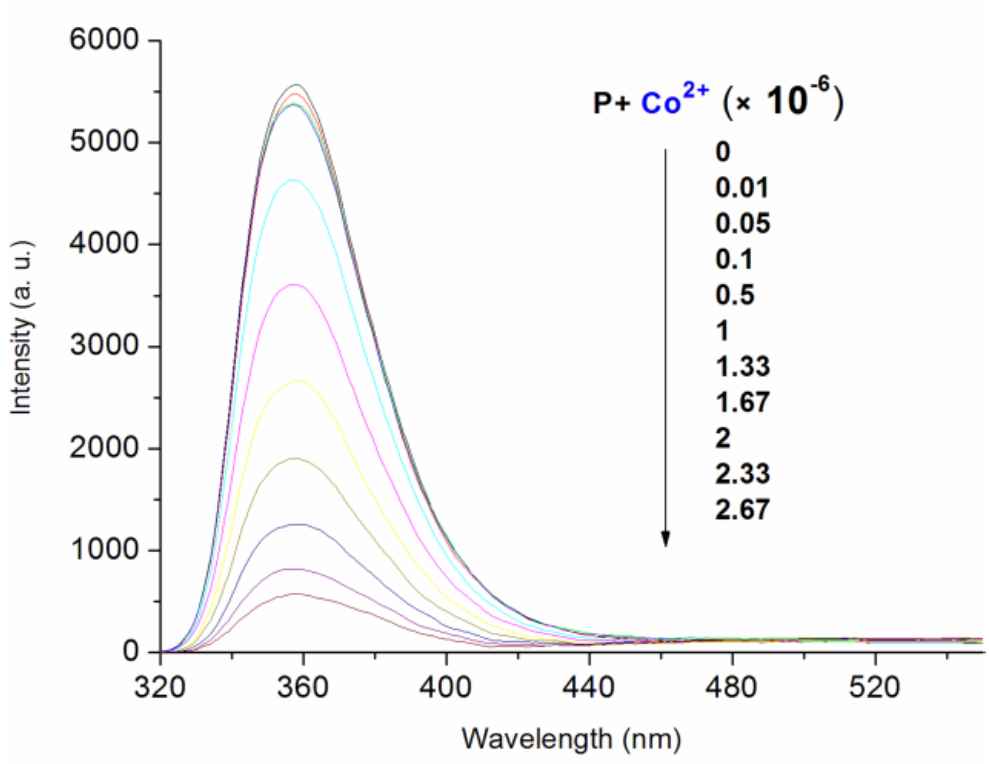


**Fig.S28** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Co^{2+}$. Excitation wavelength (nm): 288.

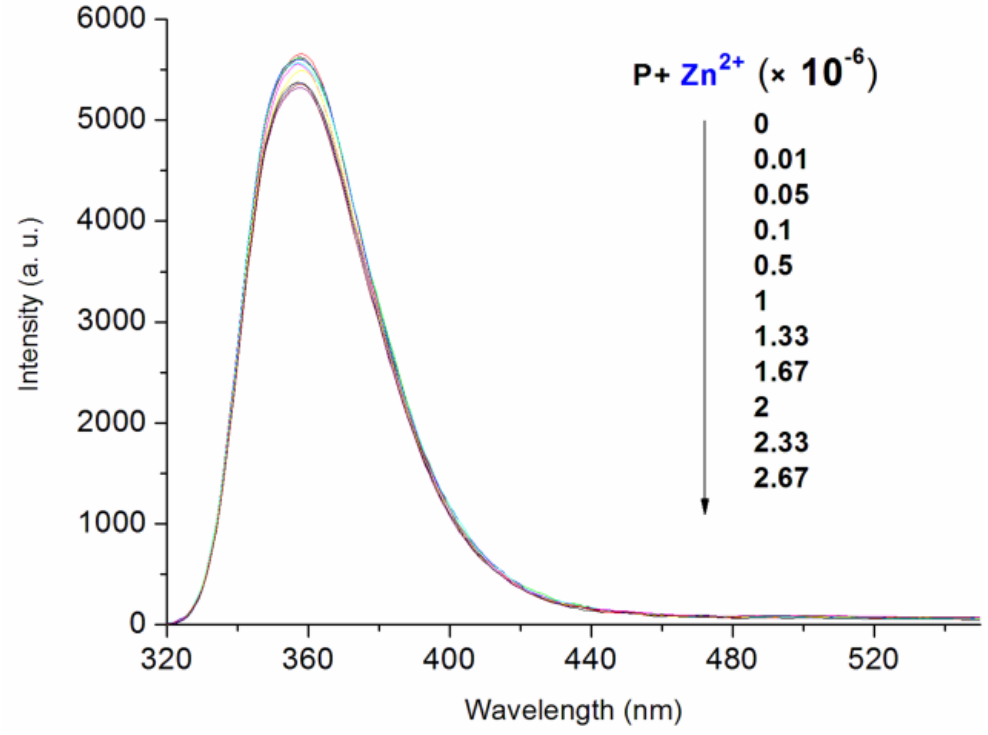


**Fig.S29** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different amounts of $Zn^{2+}$. Excitation wavelength (nm): 288.

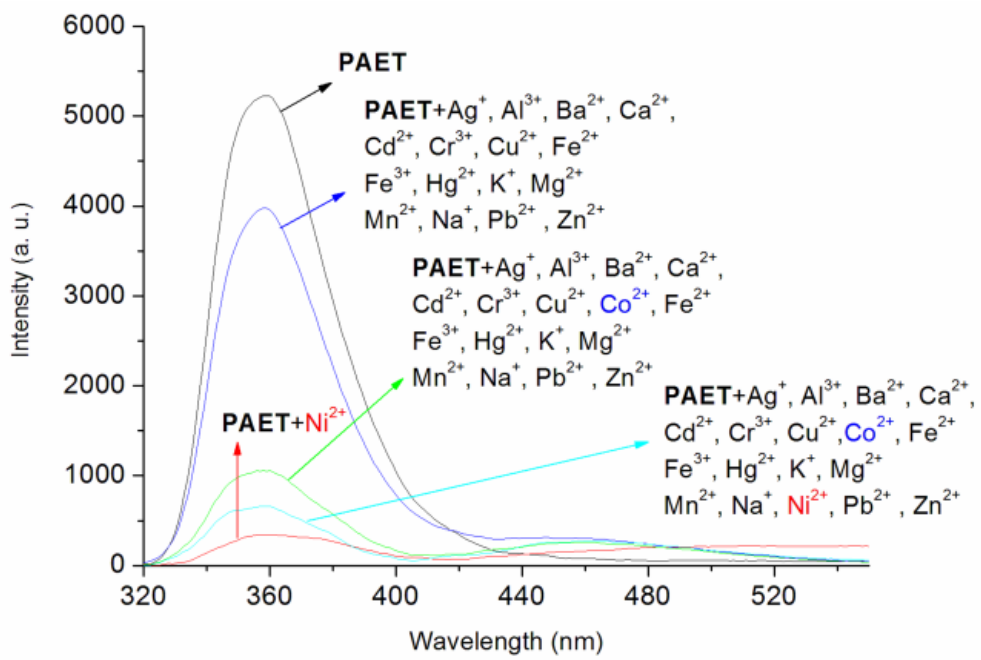


**Fig.S30** Fluorescence emission of **PAET** (1μM) in DMF in the presence of different metal ions ($2\times10^{-6}$ mol $L^{-1}$). Excitation wavelength (nm): 288.