

Electronic Supplementary Information

Dynamic quenching mechanism based optical detection of carcinogenic Cr(VI) in water and on economical paper test strips via a conjugated polymer

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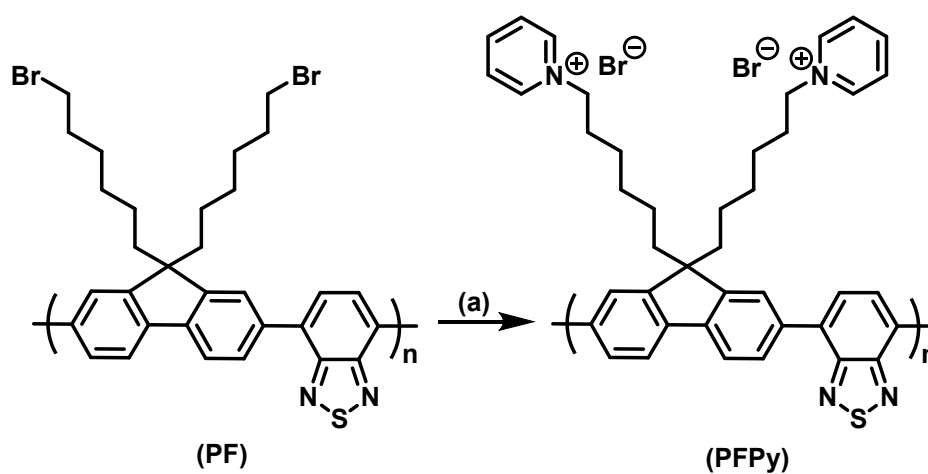
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Table S1: Fluorescence lifetime decay of each component and their fractions in water.

Sample	τ_1 (ns)	%	τ_2 (ns)	%	χ^2	τ_{avg} (ns)
PFPy	1.281	24.534	4.836	75.466	1.030	3.96
PFPy + Cr(VI) (6.66 μM)	0.993	42.583	4.118	57.417	1.064	2.78
PFPy + Cr(VI) (13.3 μM)	0.709	48.564	3.274	51.436	1.060	2.16
PFPy + Cr(VI) (20.0 μM)	0.581	55.356	2.716	44.644	1.041	1.53



Scheme S1. Synthesis of PFPy (a) pyridine, DMF, 70°C, 24 h.

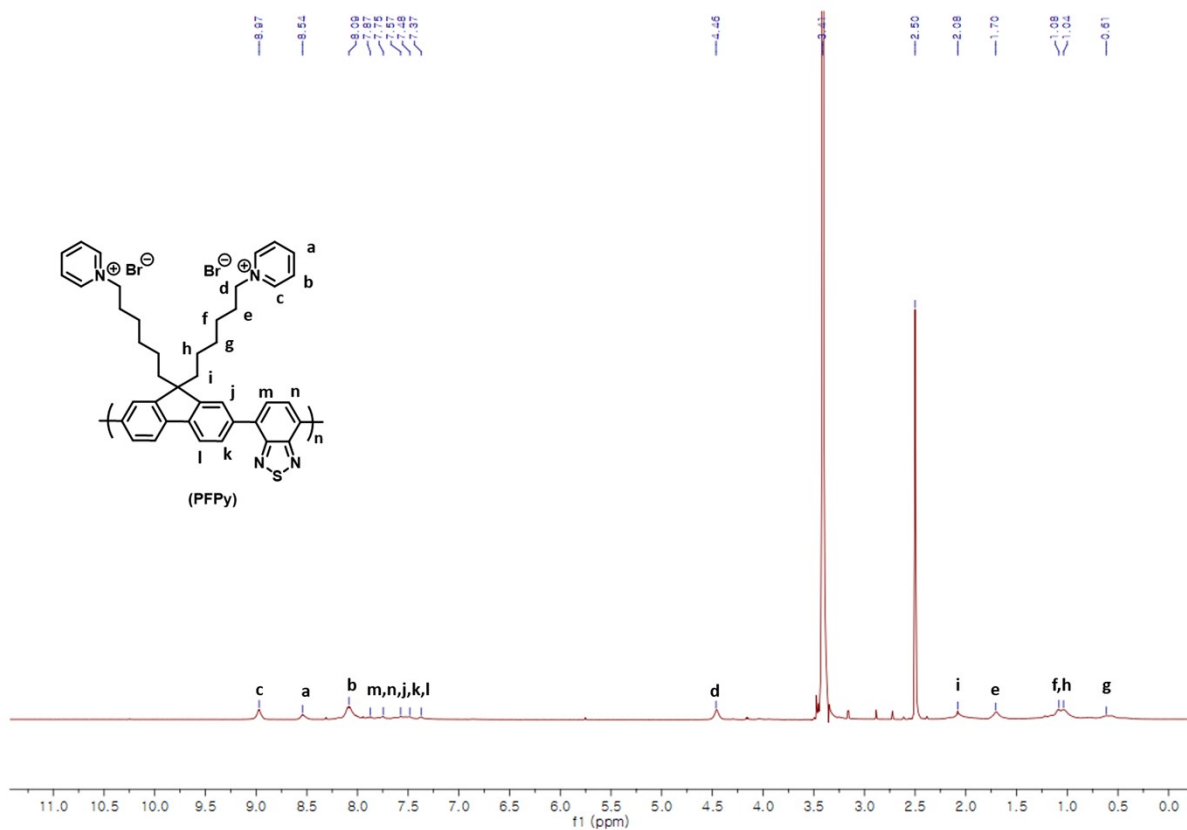


Fig. S1 ¹H NMR spectra of PFPy.

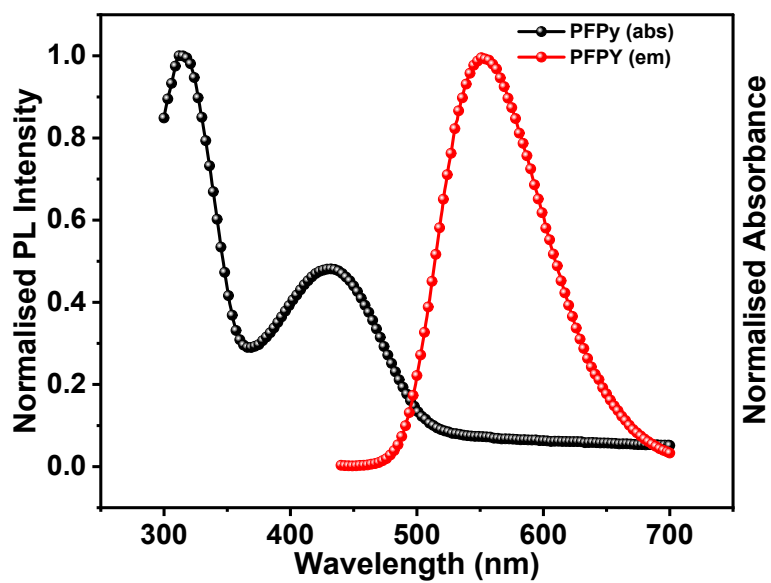


Fig. S2 UV-Vis spectrum and PL spectrum of PFPy.

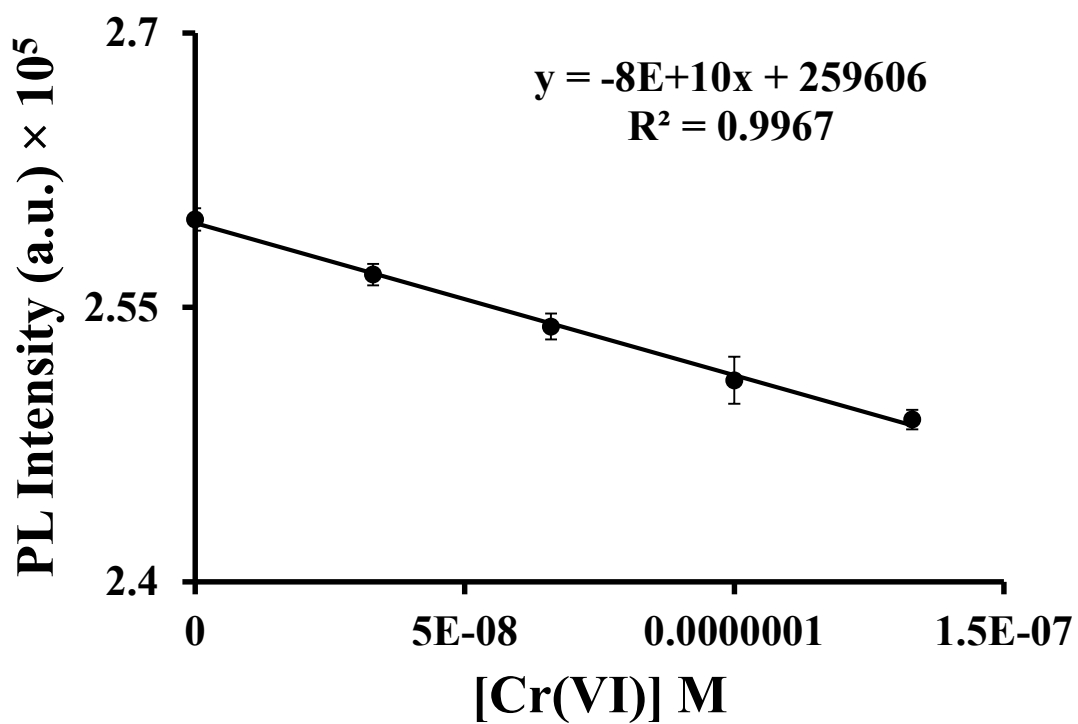


Fig. S3 Fluorescence intensity of PFPy vs Cr(VI) concentration.

$$\text{LOD} = 3 \times \text{S.D.}/k$$

$$\text{LOD} = 3 \times 616.16 / (8 \times 10^{10})$$

$$\text{LOD} = 23.1 \text{ nM}$$

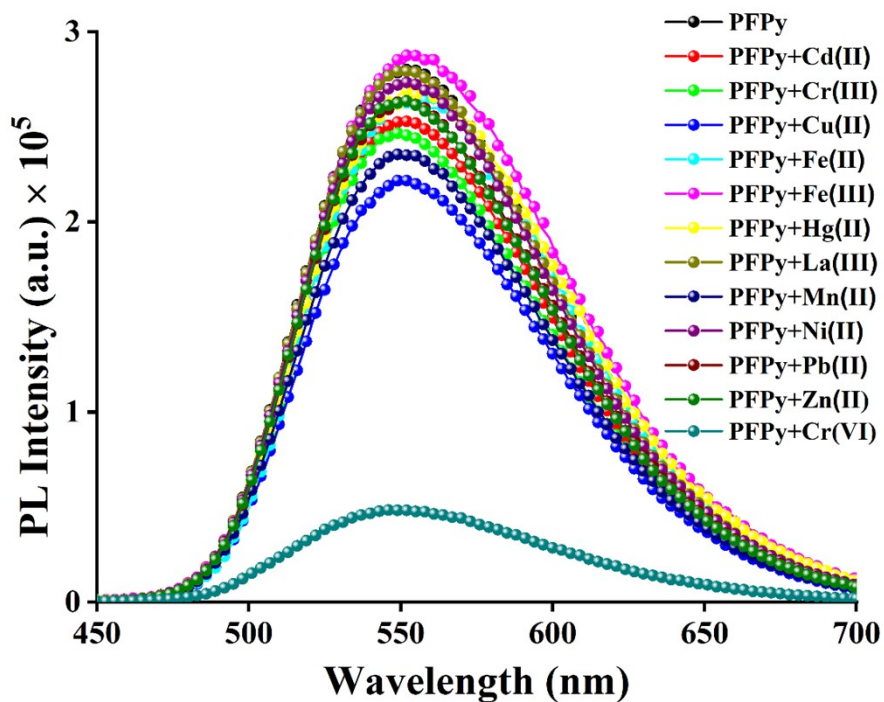


Fig. S4 PL spectra of PFPy in presence of various metal ions in water.

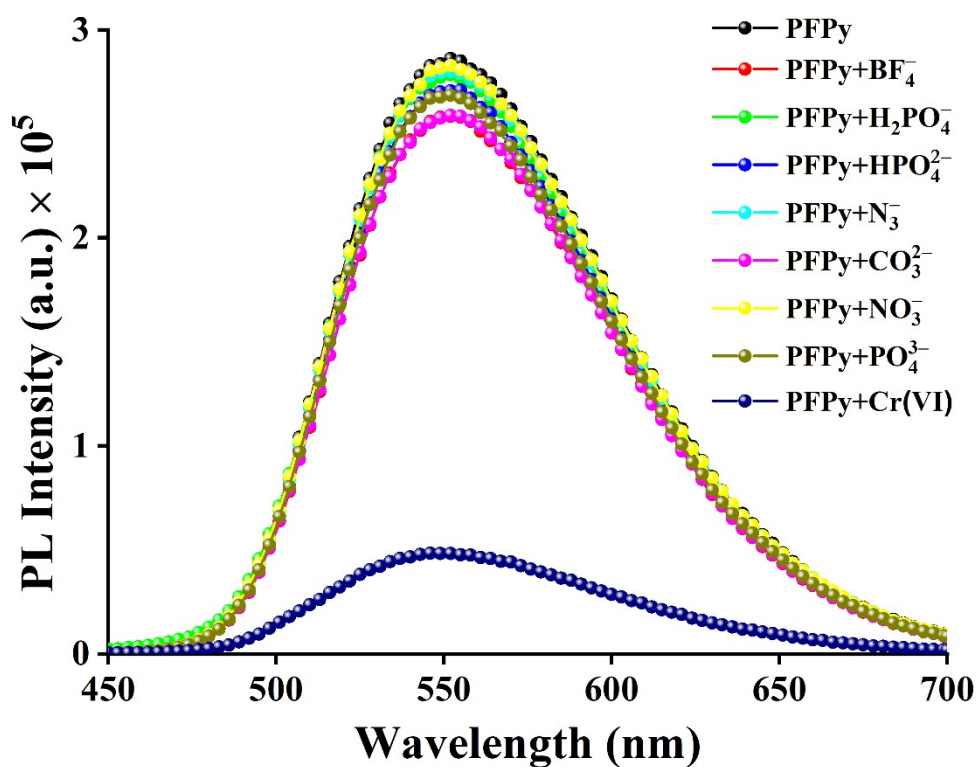


Fig. S5 PL spectra of PFPy in presence of various anions in water.

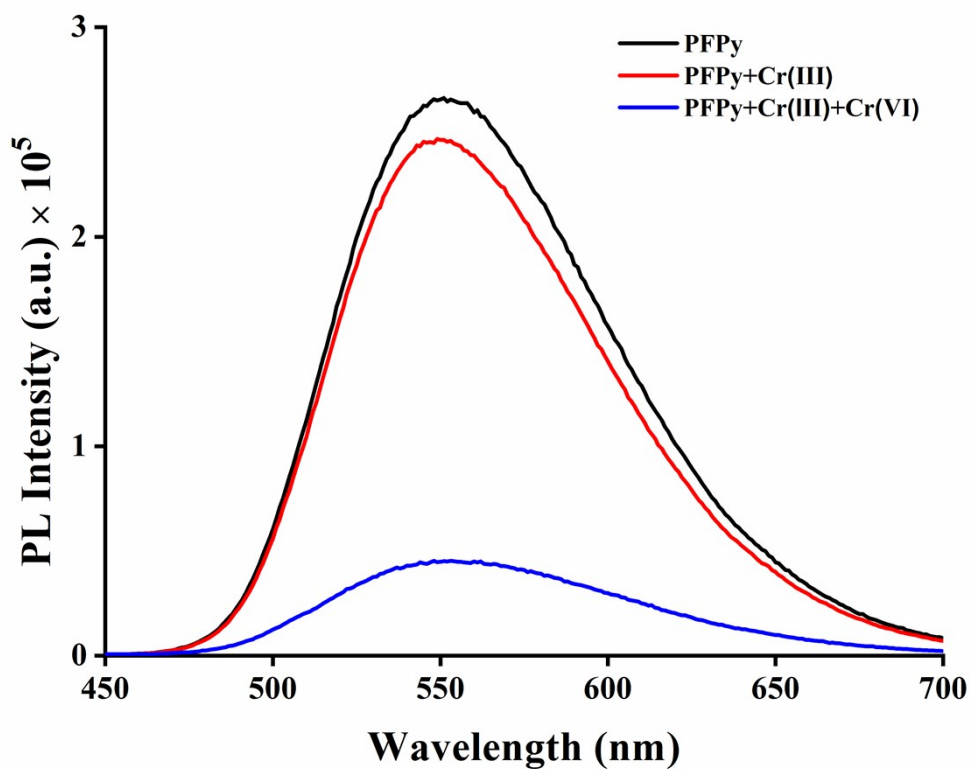


Fig. S6 PL spectra of PFPy (black), PFPy in presence of Cr(III) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

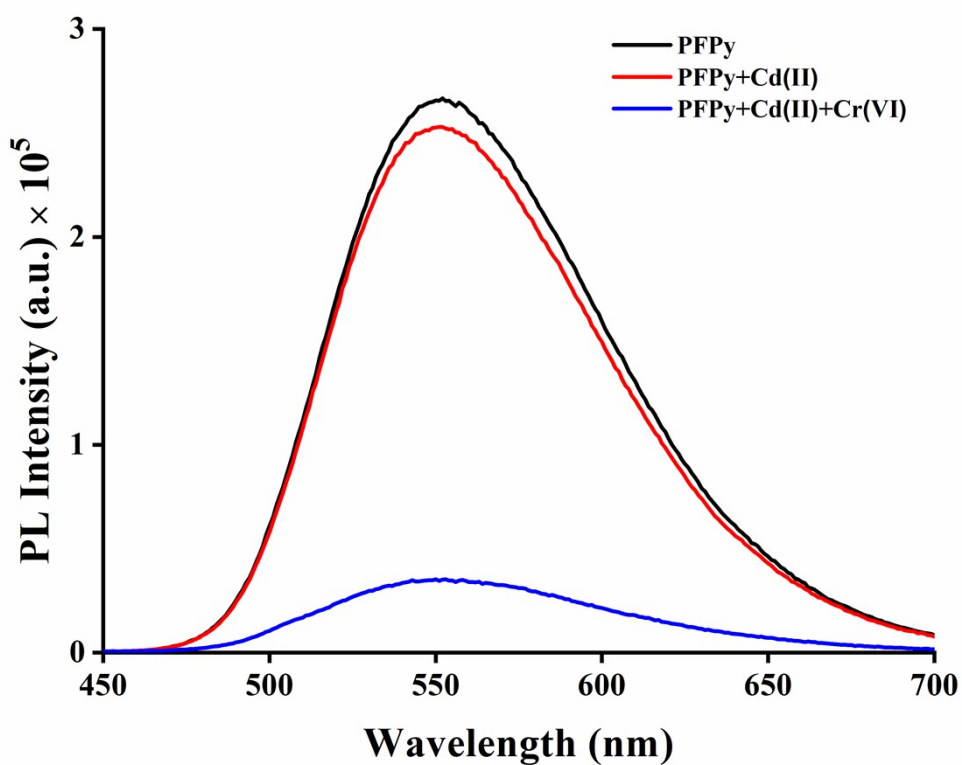


Fig. S7 PL spectra of PFPy (black), PFPy in presence of Cd(II) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

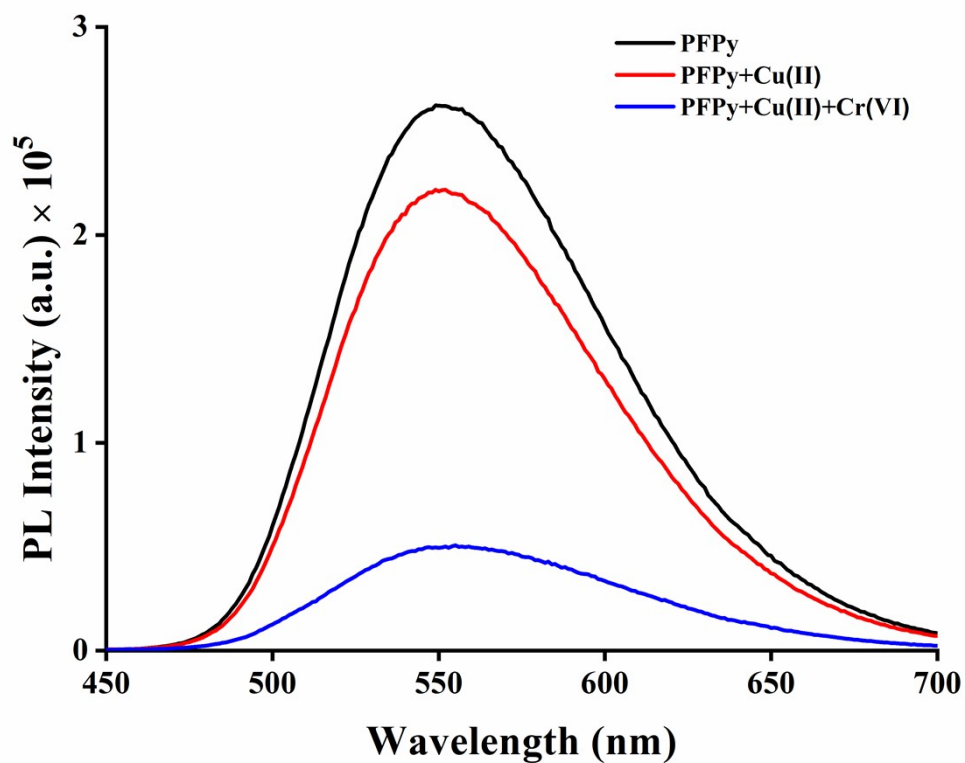


Fig. S8 PL spectra of PFPy (black), PFPy in presence of Cu(II) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

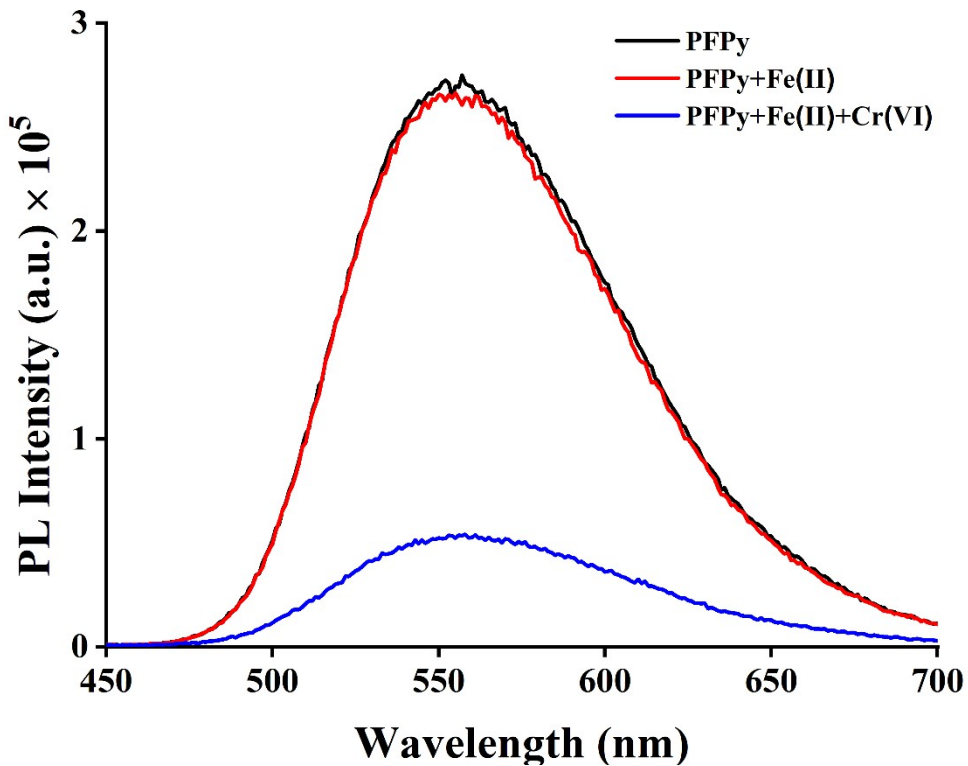


Fig. S9 PL spectra of PFPy (black), PFPy in presence of Fe(II) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

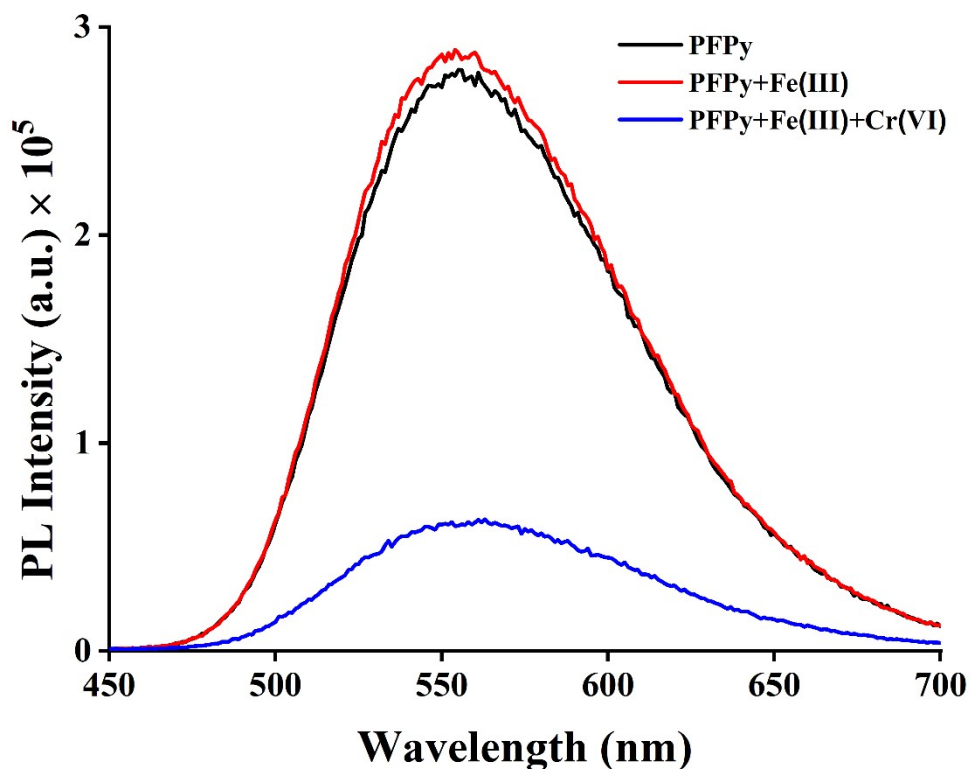


Fig. S10 PL spectra of PFPy (black), PFPy in presence of Fe(III) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

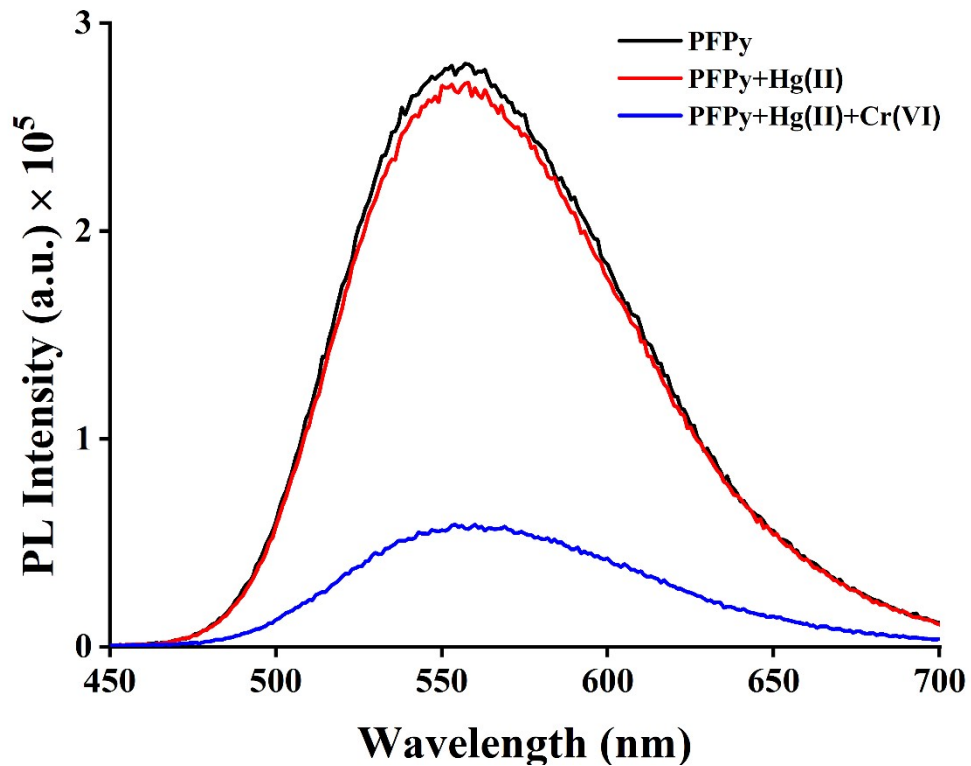


Fig. S11 PL spectra of PFPy (black), PFPy in presence of Hg(II) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

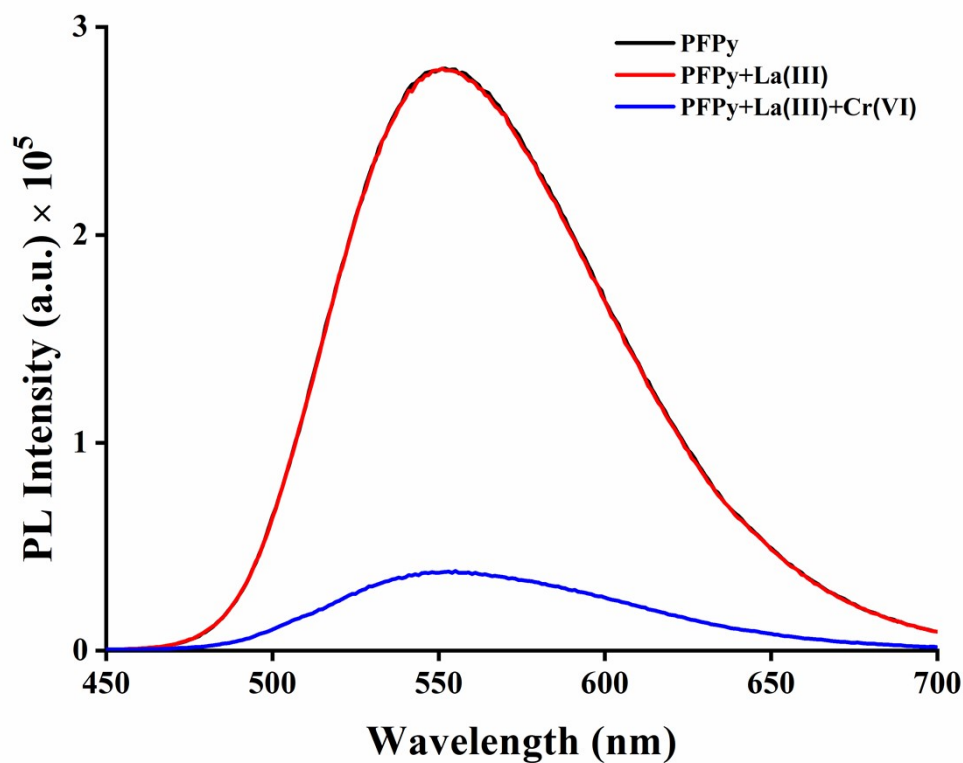


Fig. S12 PL spectra of PFPy (black), PFPy in presence of La(III) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

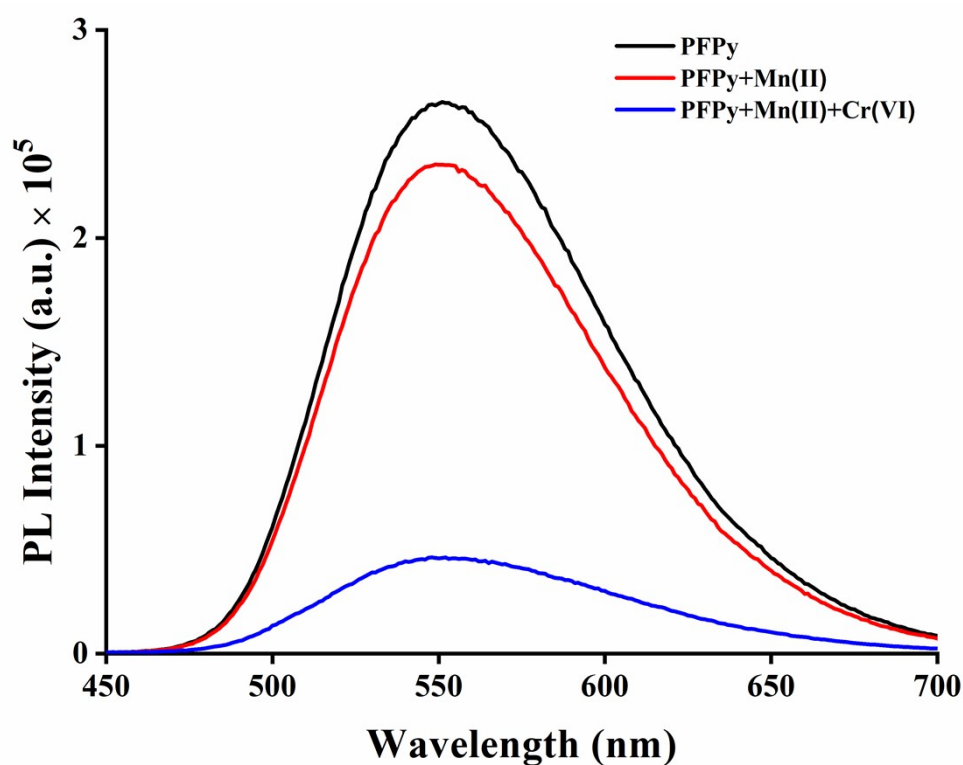


Fig. S13 PL spectra of PFPy (black), PFPy in presence of Mn(II) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

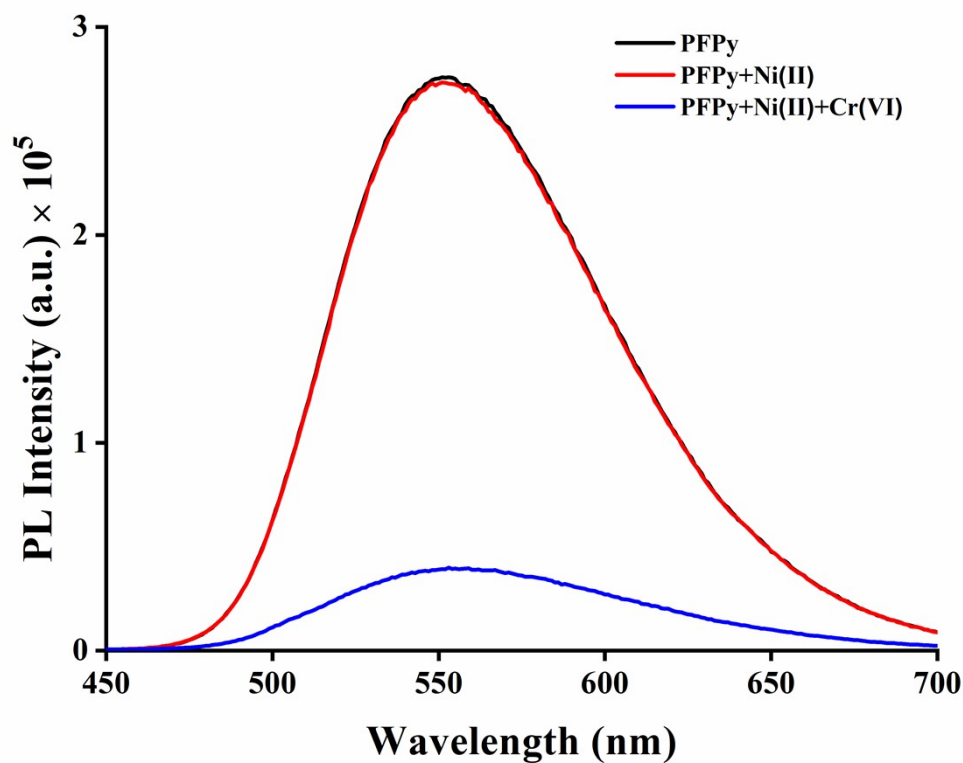


Fig. S14 PL spectra of PFPy (black), PFPy in presence of Ni(II) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

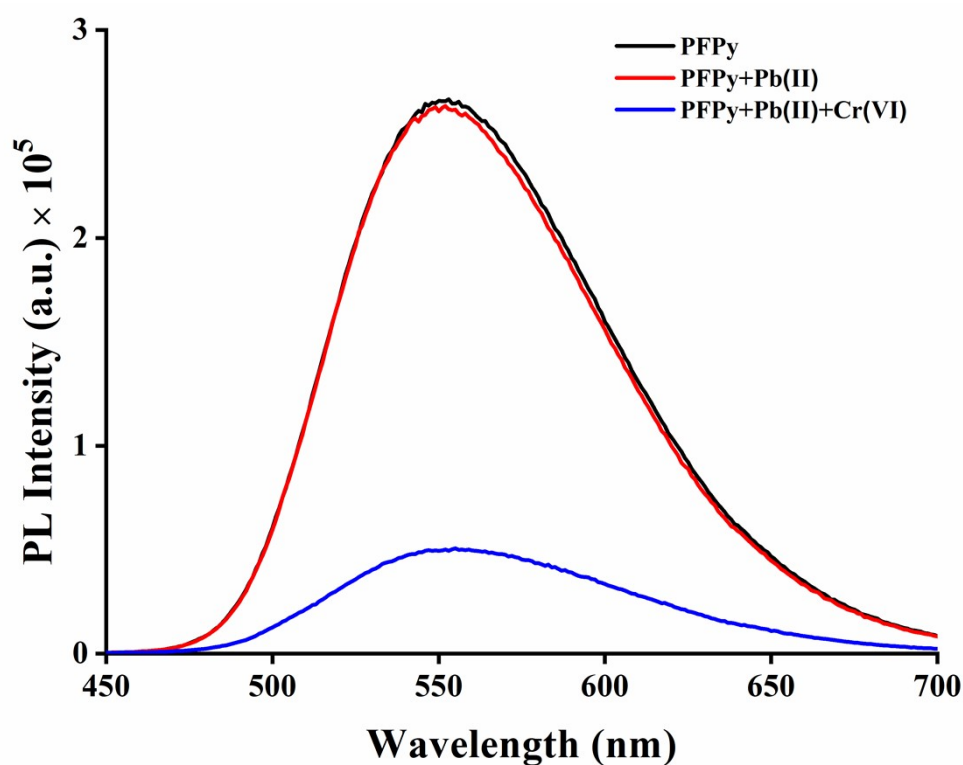


Fig. S15 PL spectra of PFPy (black), PFPy in presence of Pb(II) (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

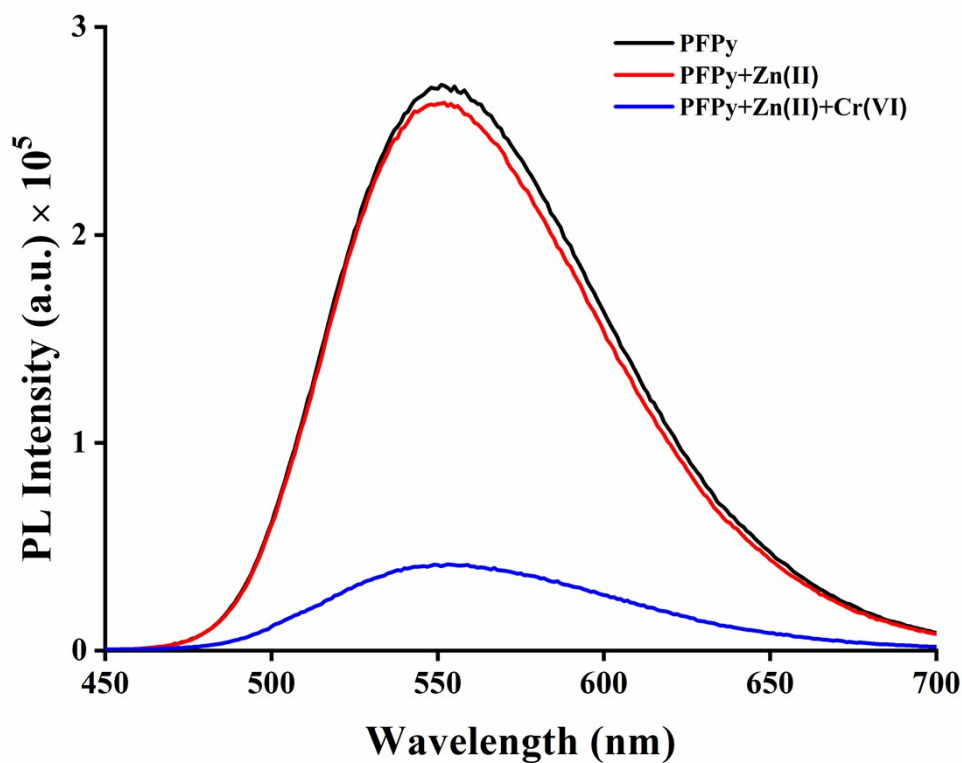


Fig. S16 PL spectra of PFPy (black), PFPy in presence of Zn(II) (20 μM) (Red), followed by addition of Cr(VI) (20 μM).

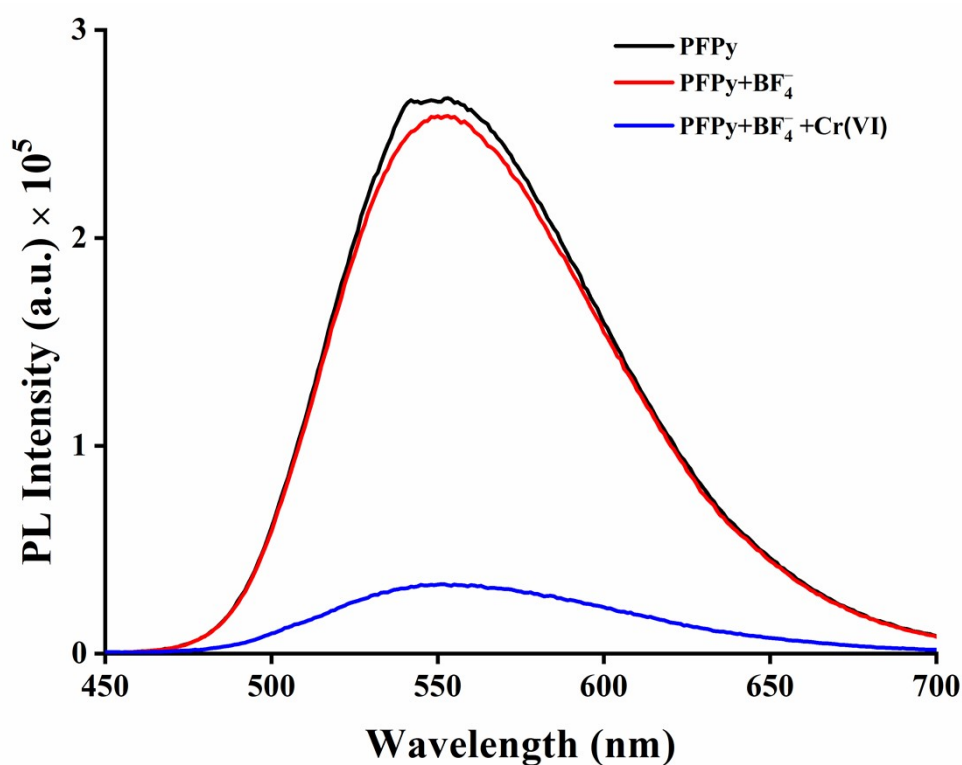


Fig. S17 PL spectra of PFPy (black), PFPy in presence of BF₄⁻ (20 μM) (Red), followed by addition of Cr(VI) (20 μM).

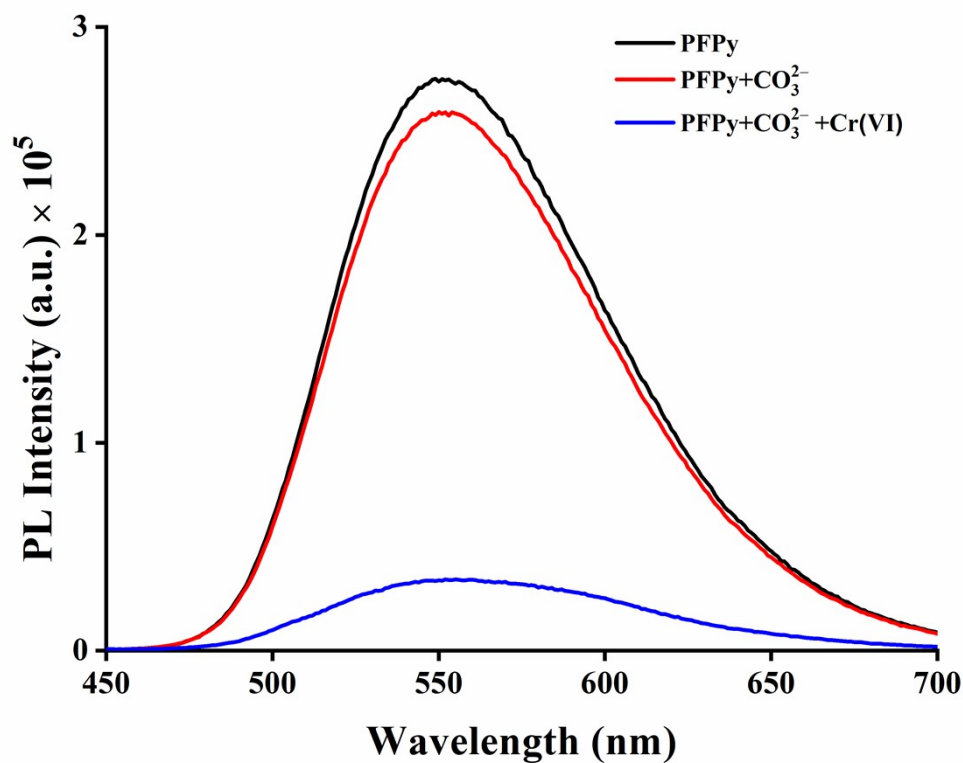


Fig. S18 PL spectra of PFPy (black), PFPy in presence of CO₃²⁻ (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

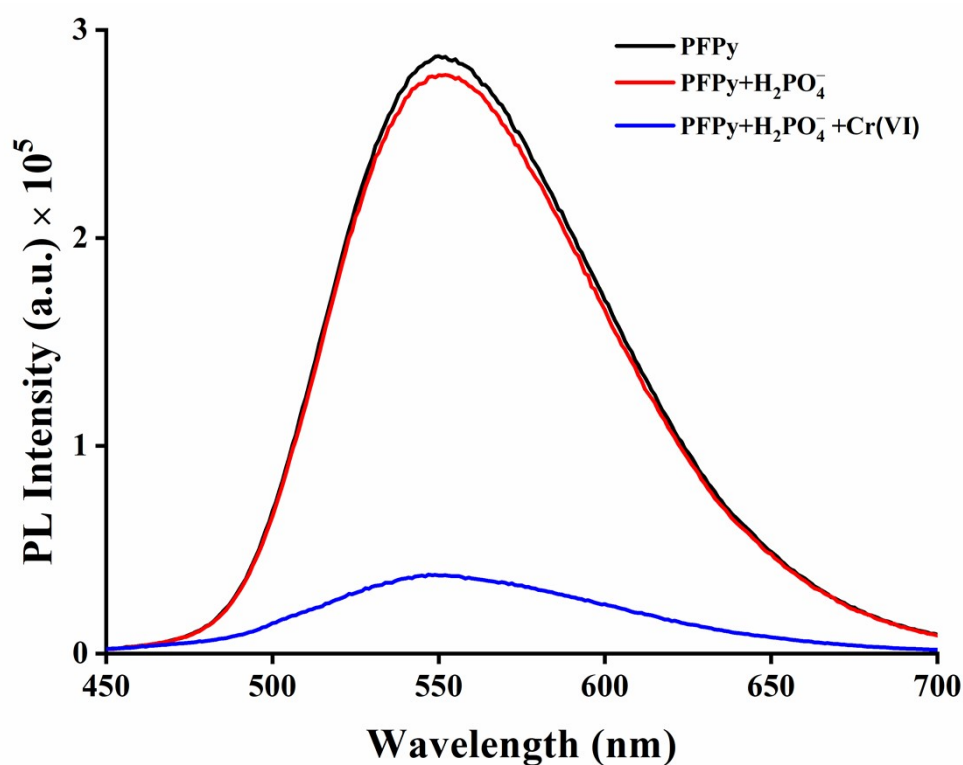


Fig. S19 PL spectra of PFPy (black), PFPy in presence of H₂PO₄⁻ (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

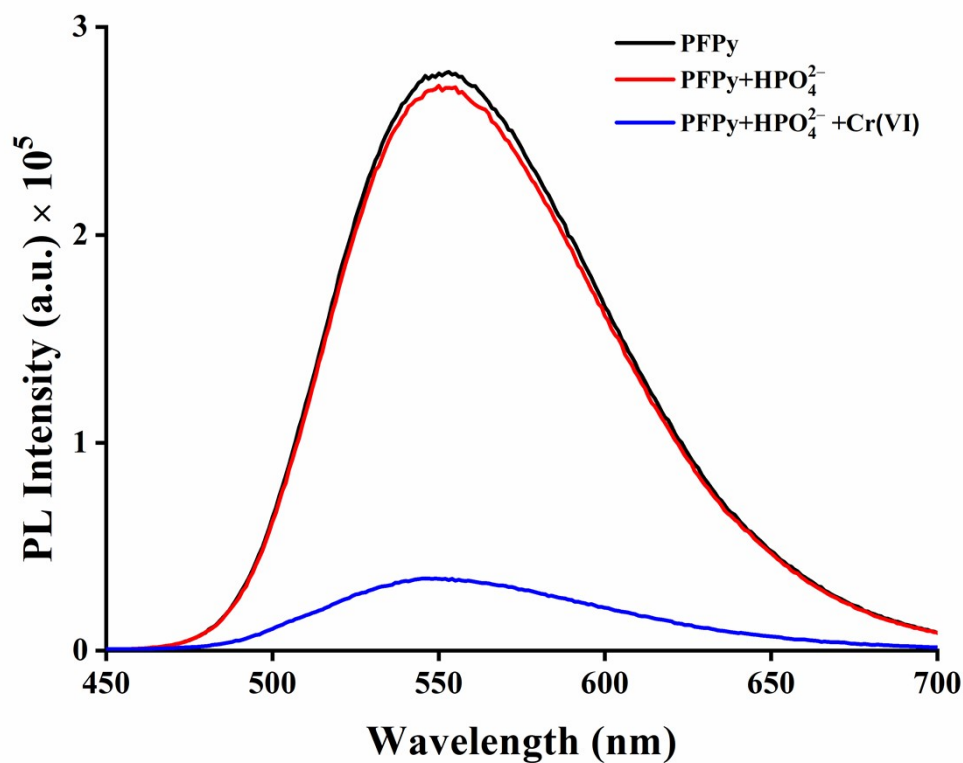


Fig. S20 PL spectra of PFPy (black), PFPy in presence of HPO₄²⁻ (20 μM) (Red), followed by addition of Cr(VI) (20 μM).

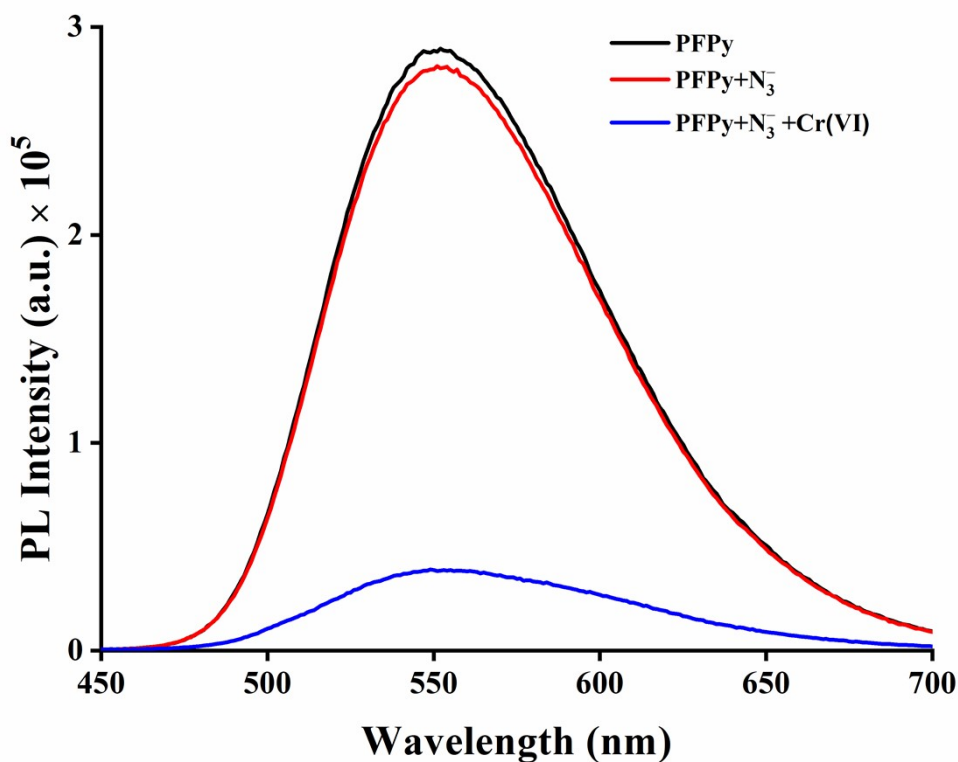


Fig. S21 PL spectra of PFPy (black), PFPy in presence of N₃⁻ (20 μM) (Red), followed by addition of Cr(VI) (20 μM).

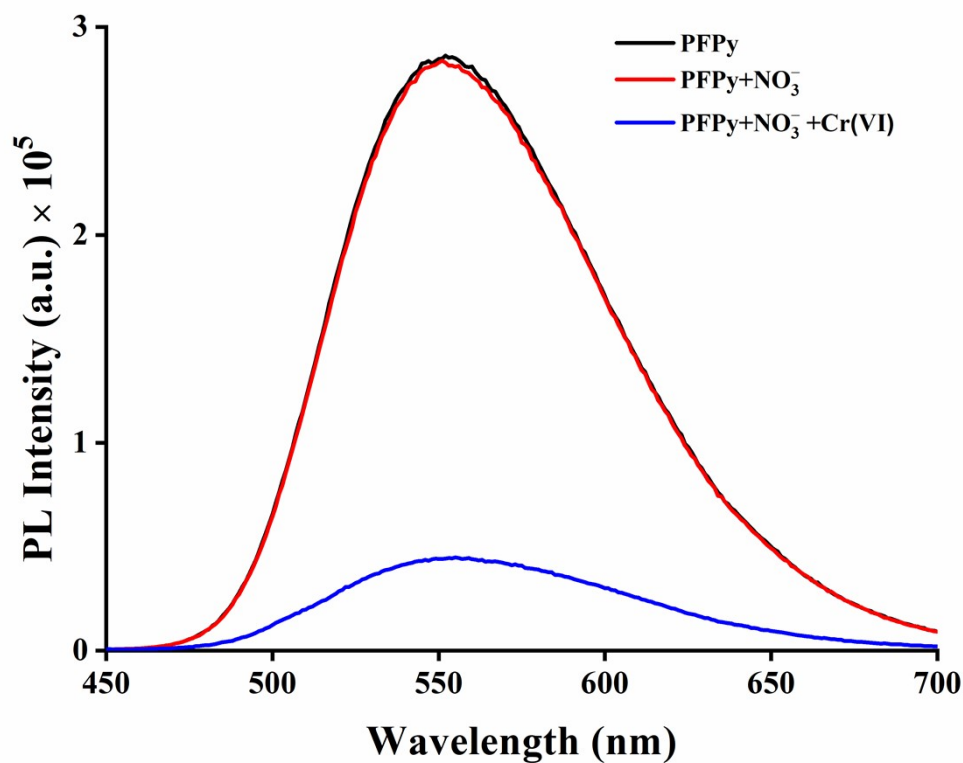


Fig. S22 PL spectra of PFPy (black), PFPy in presence of NO₃⁻ (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

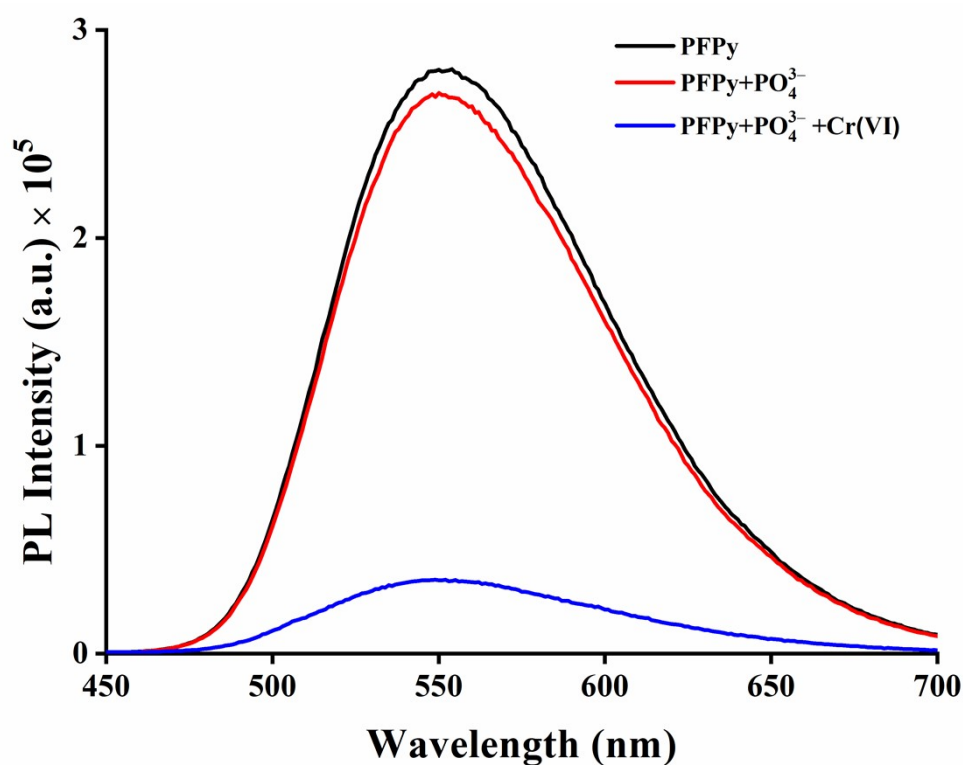


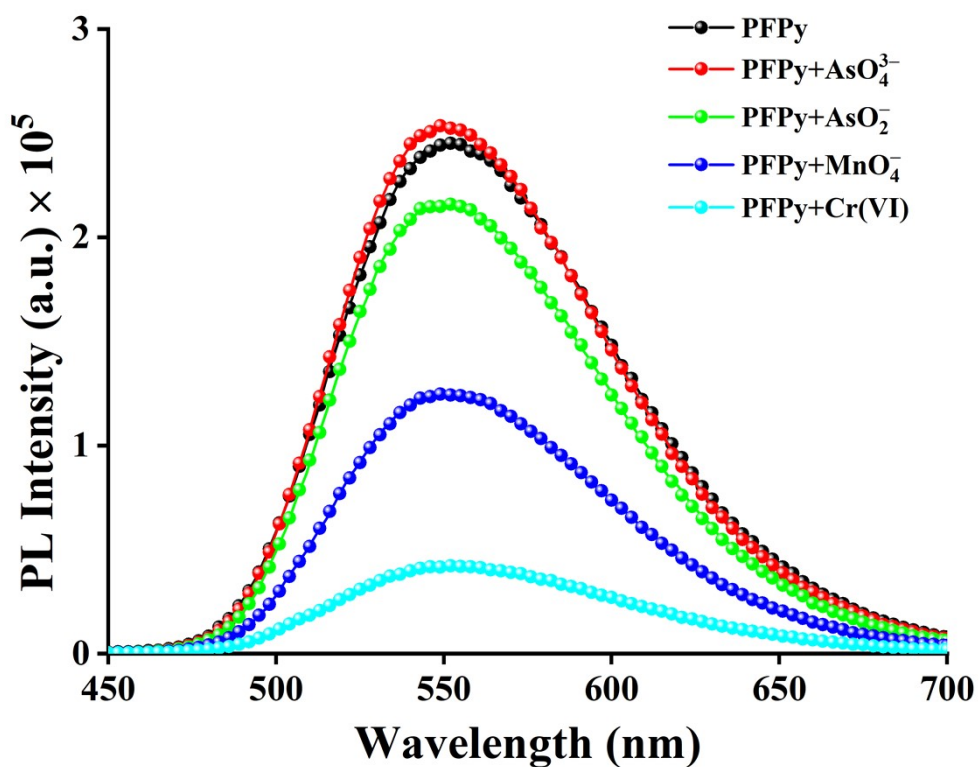
Fig. S23 PL spectra of PFPy (black), PFPy in presence of PO₄³⁻ (20 μ M) (Red), followed by addition of Cr(VI) (20 μ M).

Table S2. Förster distance, Overlap integral $J(\lambda)$ values and RET efficiency calculated for Cr(VI).

Solvent	Förster distance R_0 (Å)	$J(\lambda)$ values ($M^{-1}cm^{-1}nm^4$)	RET efficiency (%)
water	11.32	1.92×10^{11}	61.63

Table S3. IFE corrections for quenching of PFPy by Cr(VI).

Cr(VI) [μ M]	I_{obs}	I_{corr}	I_{corr}/I_{obs} Correction factor (CF)	$I_{corr}/I_{corr,o}$	E_{obs} (%)	E_{corr} (%)
0	263622.4958	268827.0506	1.0197	1	0	0
0.333	148114.007	150652.9469	1.0171	0.5604	43.816	43.959
0.666	108507.3325	110463.9547	1.018	0.4109	58.84	58.909
1	82279.20539	83891.62152	1.0196	0.3121	68.789	68.793
1.333	70238.41289	71800.37123	1.0222	0.2671	73.356	73.291
1.666	56550.82416	57928.25398	1.0244	0.2155	78.549	78.451
2	48193.63477	49516.86969	1.0275	0.1842	81.719	81.58

**Fig. S24** PL spectra of PFPy in the presence of various oxoanions.

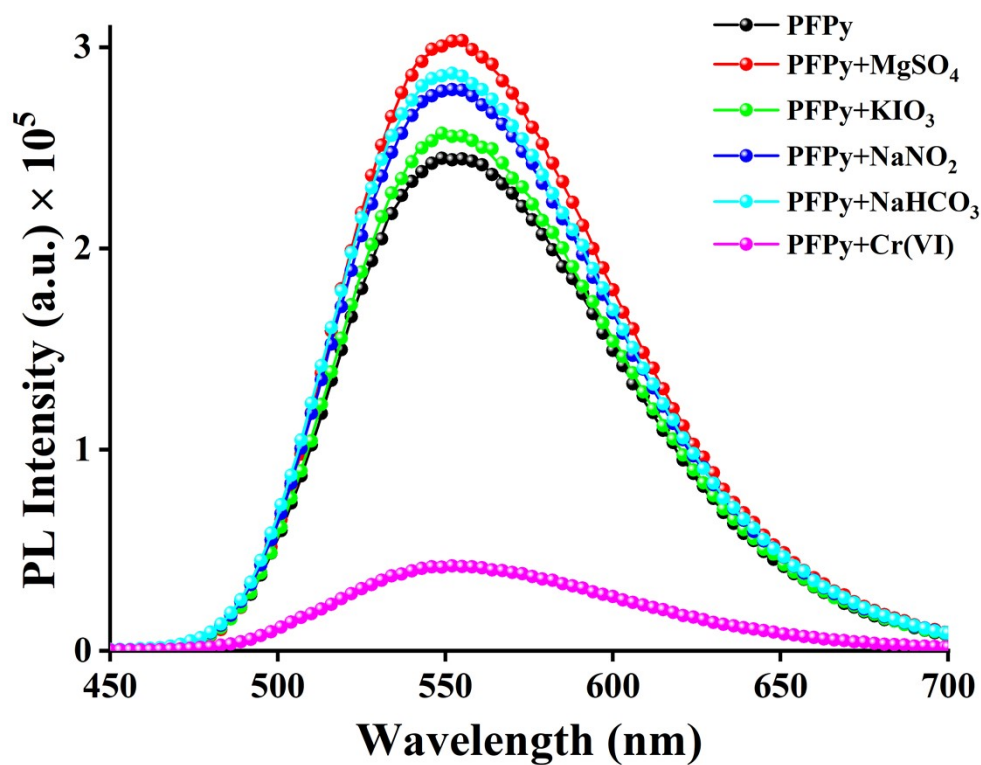


Fig. S25 PL spectra of PFPy in the presence of various electrolytes.

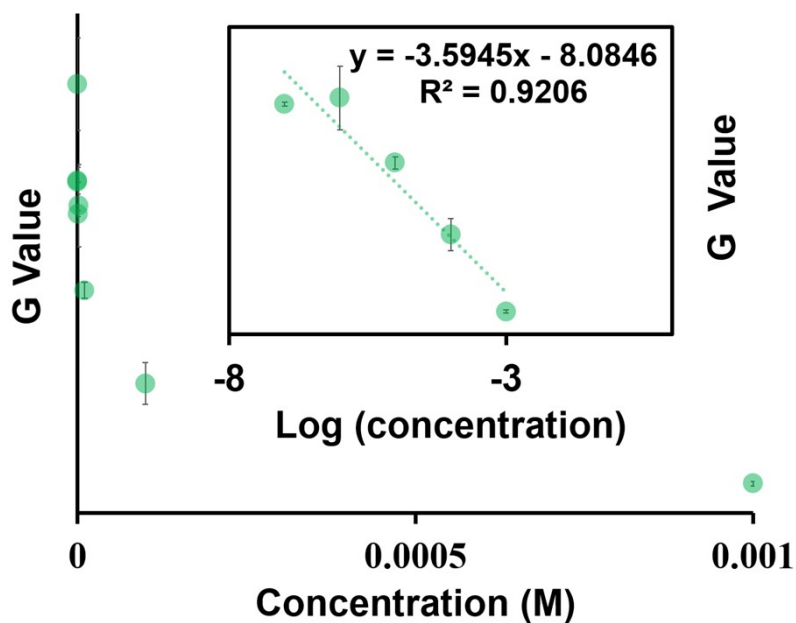


Fig. S26 G values obtained for various paper test strips after exposure to various concentrations of Cr(VI) solutions. (inset: a linear plot of G value vs Log (concentration of Cr(VI))).

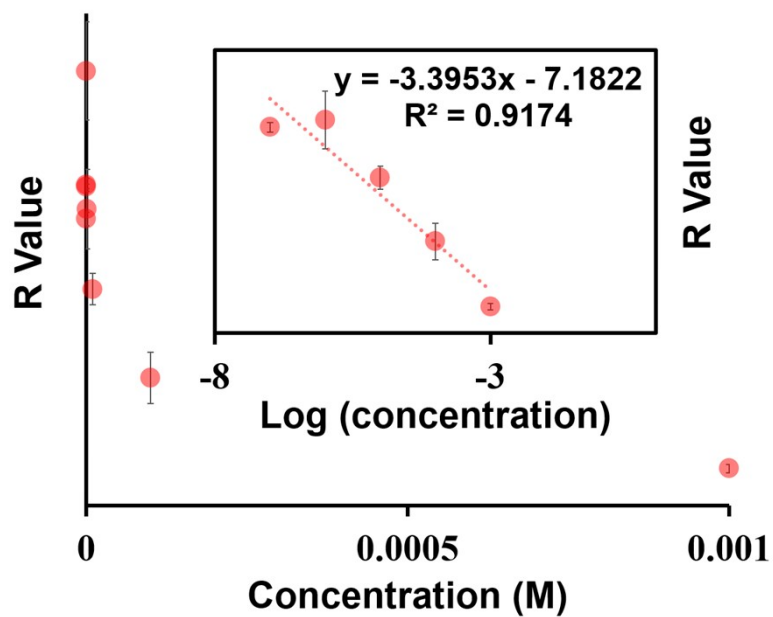


Fig. S27 R values obtained for various paper test strips after exposure to various concentrations of Cr(VI) solutions. (inset: a linear plot of R-value vs Log (concentration of Cr(VI))).

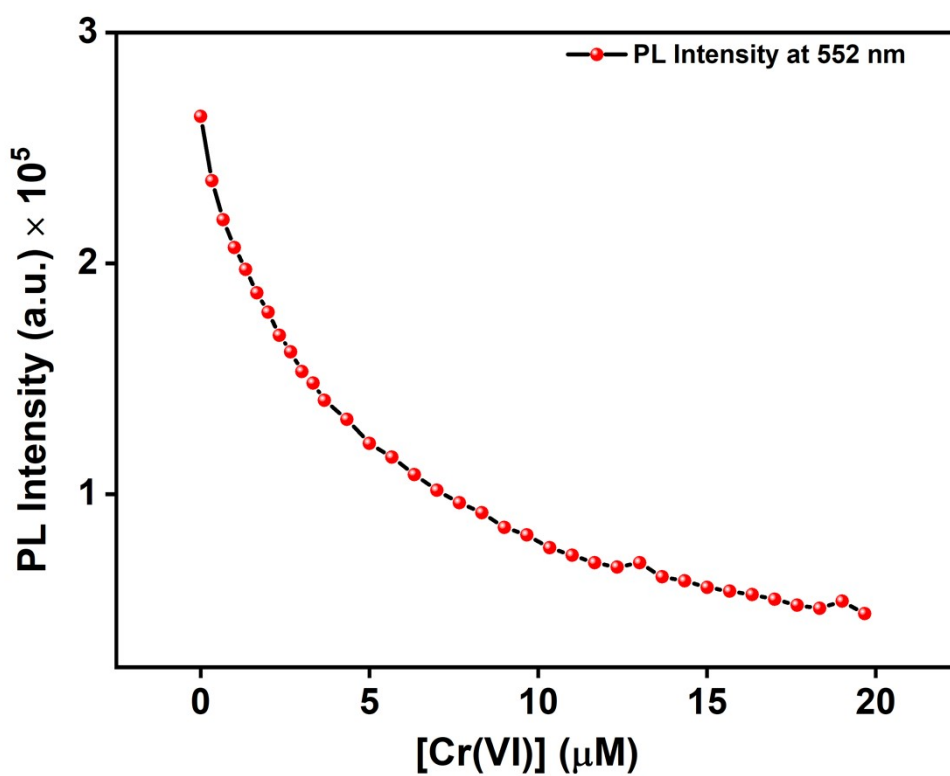


Fig. S28 Calibration plot obtained for Cr(VI).

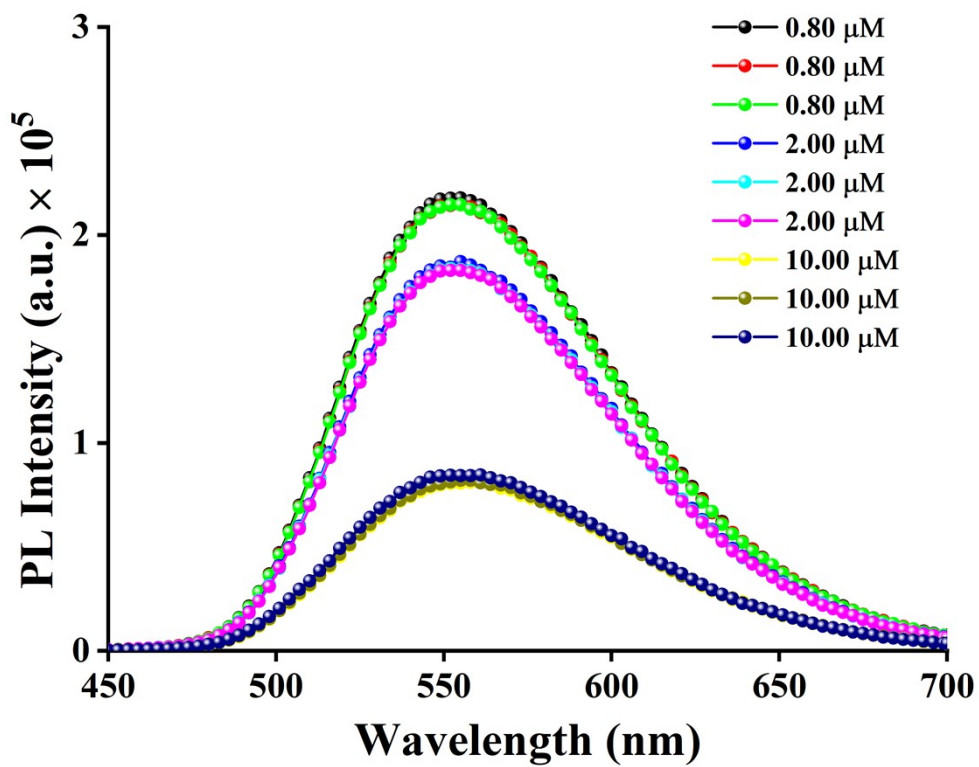


Fig. S29 PL spectra of PFPy with different samples of lake water spiked with different Cr(VI) concentrations.