Supporting information

Lanthanide Coordination Polymer Nanoparticles as an Excellent Artificial Peroxidase for Hydrogen Peroxide Detection

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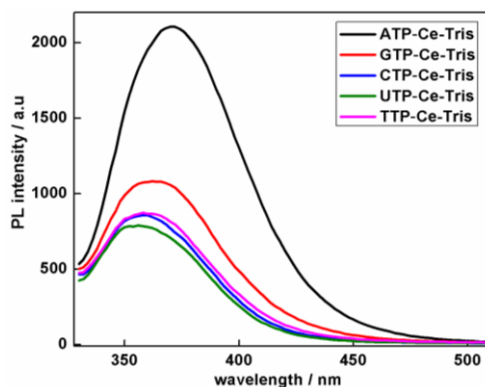
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Figure S1 PL spectra of the ATP-Ce-Tris CPNs (black line), GTP-Ce-Tris CPNs (red line), CTP-Ce-Tris CPNs (blue line), UTP-Ce-Tris CPNs (green line) and TTP-Ce-Tris CPNs (pink line) in Tris-HCl buffer (50 mM, pH 7.4), λex = 310 nm. The concentrations of ATP-Ce-Tris, GTP-Ce-Tris, CTP-Ce-Tris, UTP-Ce-Tris, TTP-Ce-Tris CPNs were 0.4 mM.
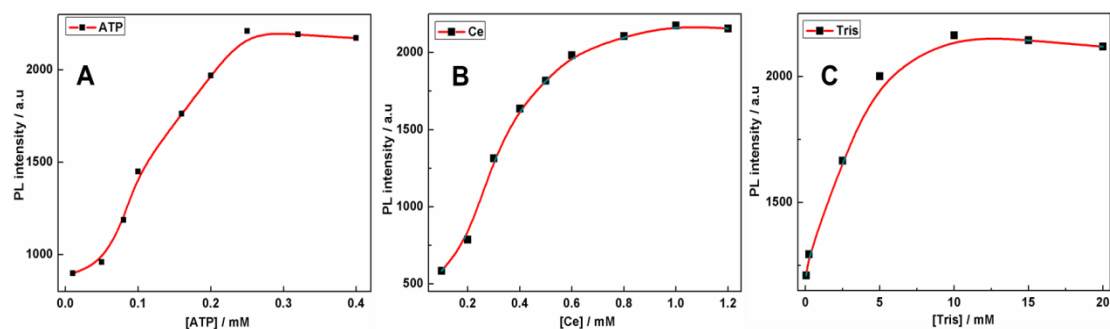

Figure S2 Dependence of the PL intensity of ATP-Ce-Tris CPNs on the concentrations of (A) ATP, (B) Ce, and (C) Tris.

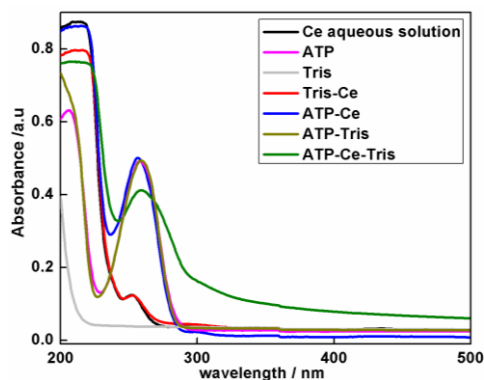Figure S3 UV-vis absorption spectra of the cerium nitrate aqueous solution (black line), ATP aqueous solution (pink line), Tris-HCl aqueous solution (gray line), Tris-Ce aqueous solution (red line), ATP-Ce aqueous solution (blue line), ATP-Tris aqueous solution (light green line), ATP-Ce-Tris aqueous solution (green line). The concentrations of cerium nitrate, Tris-Ce, ATP-Ce, ATP-Ce-Tris CPNs were 0.4 mM.
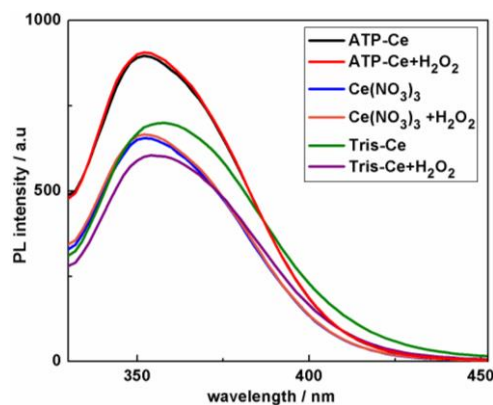
Figure S4 PL spectra of the ATP-Ce aqueous solution (black and red line), $Ce(NO_3)_3$ (blue and orange line), Tris-Ce aqueous solution (green and purple line) in the absence and presence of H_2O_2 (10 μM) in Tris-HCl buffer (50 mM, pH 7.4), λex = 310 nm. The concentrations of cerium nitrate, Tris-Ce, ATP-Ce were 0.4 mM.
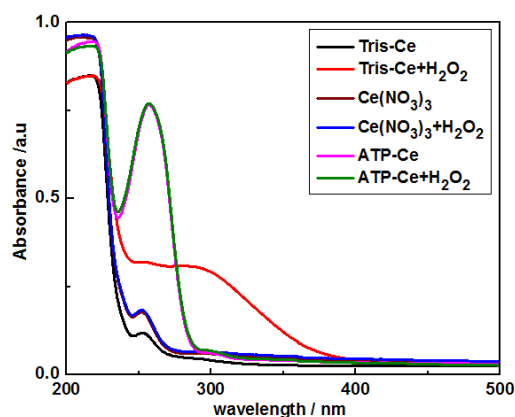

Figure S5 UV-vis absorption spectra of the Tris-Ce aqueous solution (black and red line), $Ce(NO_3)_3$ (purple and blue line), ATP-Ce aqueous solution (pink and green line) in the absence and presence of H_2O_2 (1 mM). The concentrations of Tris-Ce, $Ce(NO_3)_3$, ATP-Ce were 0.4 mM.

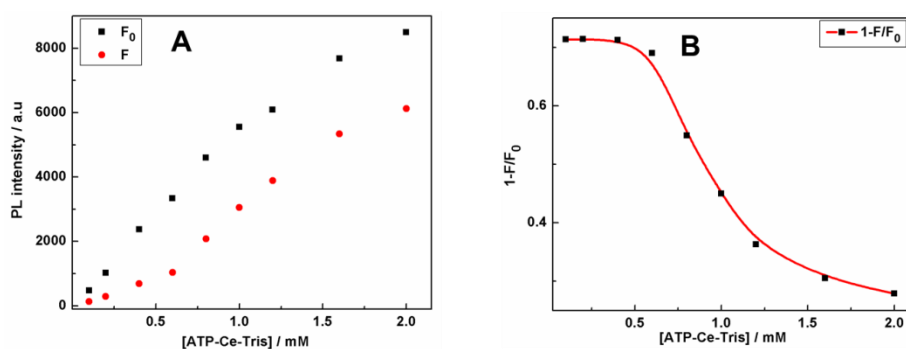Figure S6 (A) The PL intensity of ATP-Ce-Tris CPNs with different concentration before (F_0) and after (F) adding H_2O_2 (10 μM). (B) The FL quenching efficiency (1-F/F_0) of different concentrations of ATP-Ce-Tris CPNs upon H_2O_2 (10 μM).
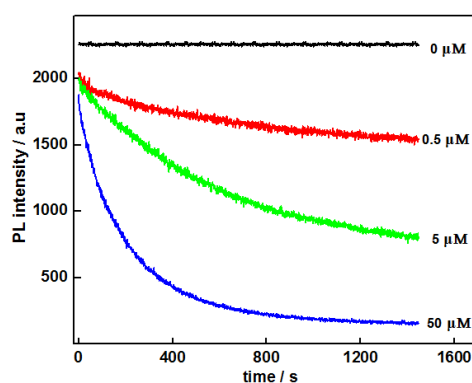
Figure S7 Time-dependent PL responses of ATP-Ce-Tris CPNs (0.4 mM) upon addition of different concentrations of H_2O_2, 0 μM (black line), 0.5 μM (red line), 5 μM (green line), 50 μM (blue line).

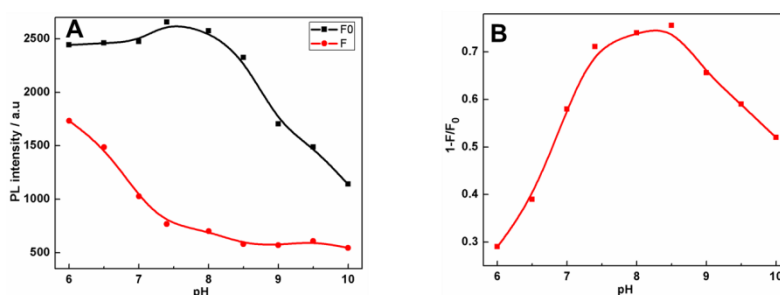Figure S8 (A) Effect of pH on the PL intensity of ATP-Ce-Tris CPNs (0.4 mM) in the absence (black dot) and presence (red dot) of H_2O_2 (10 μM). (B) The fluorescence quenching efficiency ($1-F/F_0$) of ATP-Ce-Tris CPNs toward H_2O_2, where F_0 and F are the PL intensities of ATP-Ce-Tris CPNs at 370 nm before and after adding H_2O_2, respectively.
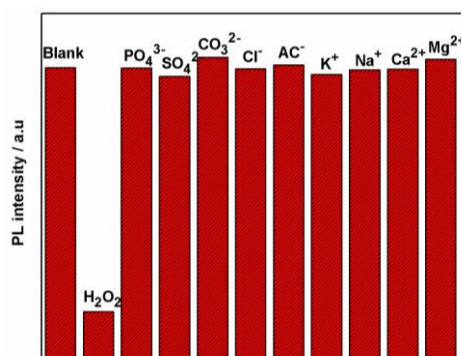

Figure S9 Selectivity competition experiments for ATP-Ce-Tris CPNs (0.4 mM) toward different interferences in Tris-HCl buffer (50 mM, pH 7.4). H_2O_2 was at a concentration of 5 μM; other control substances are at a concentration of 0.1 mM.

Table S1. Results for detection of glucose from real blood samples

Samples	Added (mM)	Detected (mean, mM)	RSD (n=3, %)	Recovery (%)
1	0	4.92	2.3	
2	1	5.98	3.1	106
3	2	6.89	1.9	98.5
4	3	8.03	3.0	103.7

Serum samples were diluted 100-folds. Mean value of three determinations. The detection concentration is 4.90 mM by the local hospital.

The method of determining detection limit (LOD):

In this work, the LOD is calculated by using the following formula (1):[1-3]

$$LOD = 3\sigma/S \qquad (1)$$

Where 'S' is the slope of calibration curve, and 'σ' is the standard deviation of 11 blank samples, which is calculated by using the following formula (2):

$$\sigma = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(l_i - \bar{L})^2} \qquad (2)$$

Where 'l_i' is the PL intensity of each blank sample (i =1-11), and 'L' is the average PL intensity of 11 blank samples (n=11).

For example, in the calculation of LOD of glucose detection, 'S' is 0.46, which is achieved from the calibration curve equation, and the 'σ' is about 1%, which is obtained by the standard deviation of 11 blank samples. By using formula (1), the LOD of glucose detection can be calculated and equal 65 nM.

References:

(1) Derayea, S. M. *Anal. Methods* **2014**, *6*, 2270-2275.

(2) Wee, S. S.; Ng, Y. H.; Ng, S. M. *Talanta* **2013**, *116*, 71-76.

(3) Liu, Z.; He, W.; Pei, M.; Zhang, G. *Chem. Commun.* **2015**, *51*, 14227-14230.