Electronic Supplementary Information

Fluorescent Assay for Alkaline Phosphatase Activity based on Energy Transfer from Terbium to Europium in Lanthanide Coordination Polymer Nanoparticles

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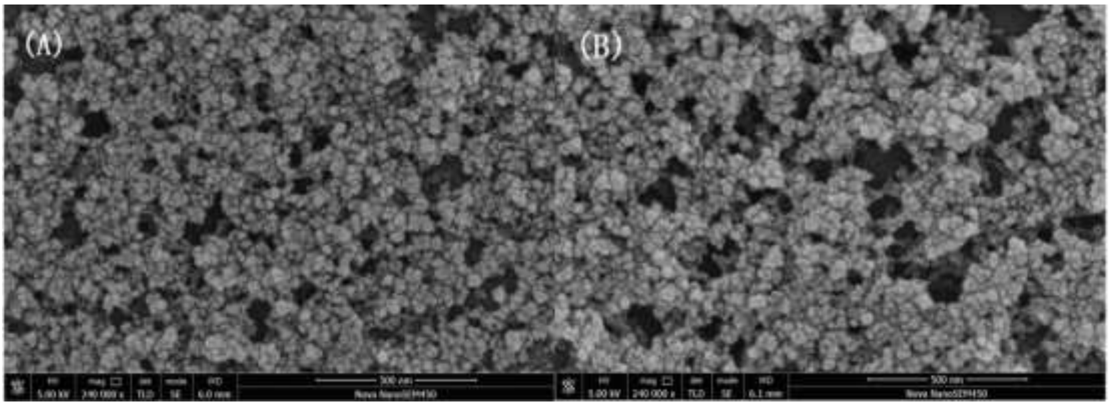

Fig. S1 SEM image of Tb-GMP (A) and Tb-GMP-Eu CPNs (B).

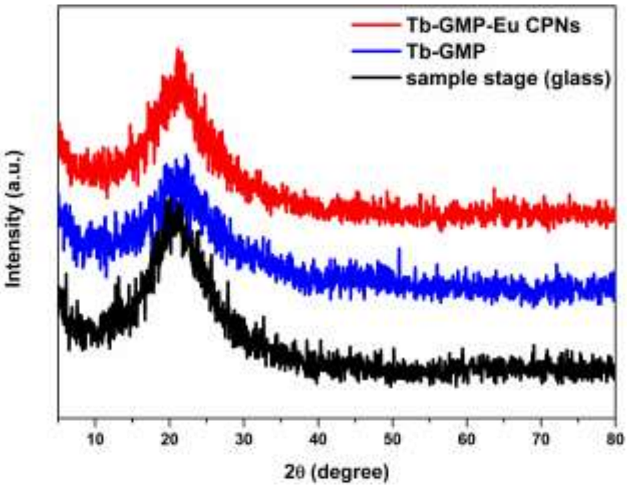

Fig.S2 X-ray diffraction (XRD) patterns of powdery Tb-GMP-Eu CPNs (red line) and Tb-GMP (blue line) and sample stage (black line).

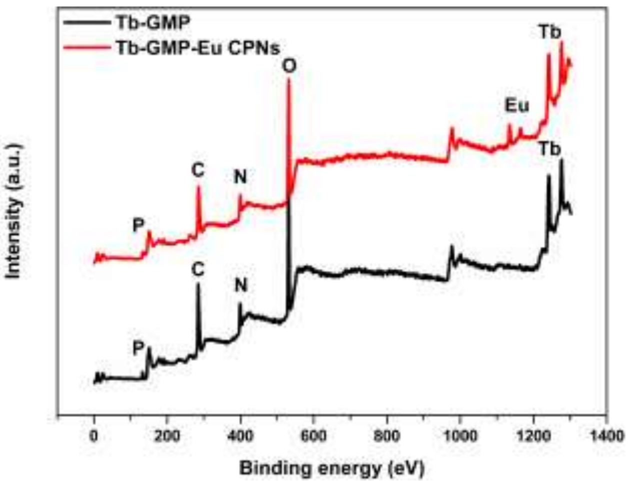

Fig.S3 XPS survey scan of Tb-GMP-Eu CPNs (red line) and Tb-GMP (black line).

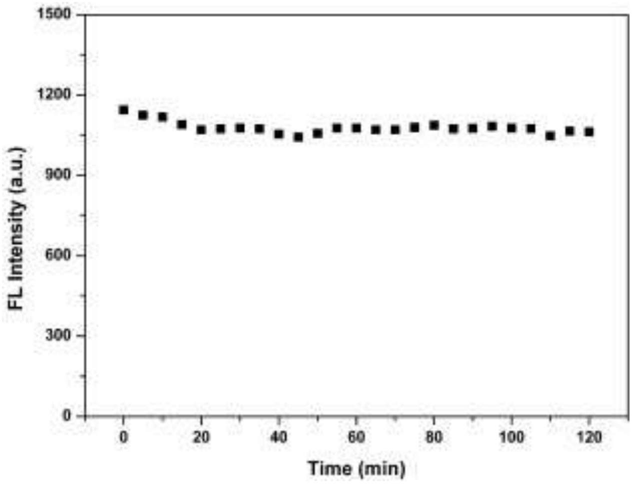

Fig.S4 Fluorescence intensity of Tb-GMP-Eu CPNs dispersed in 10 mM pH 7.4 Tris-HCl buffer solution.

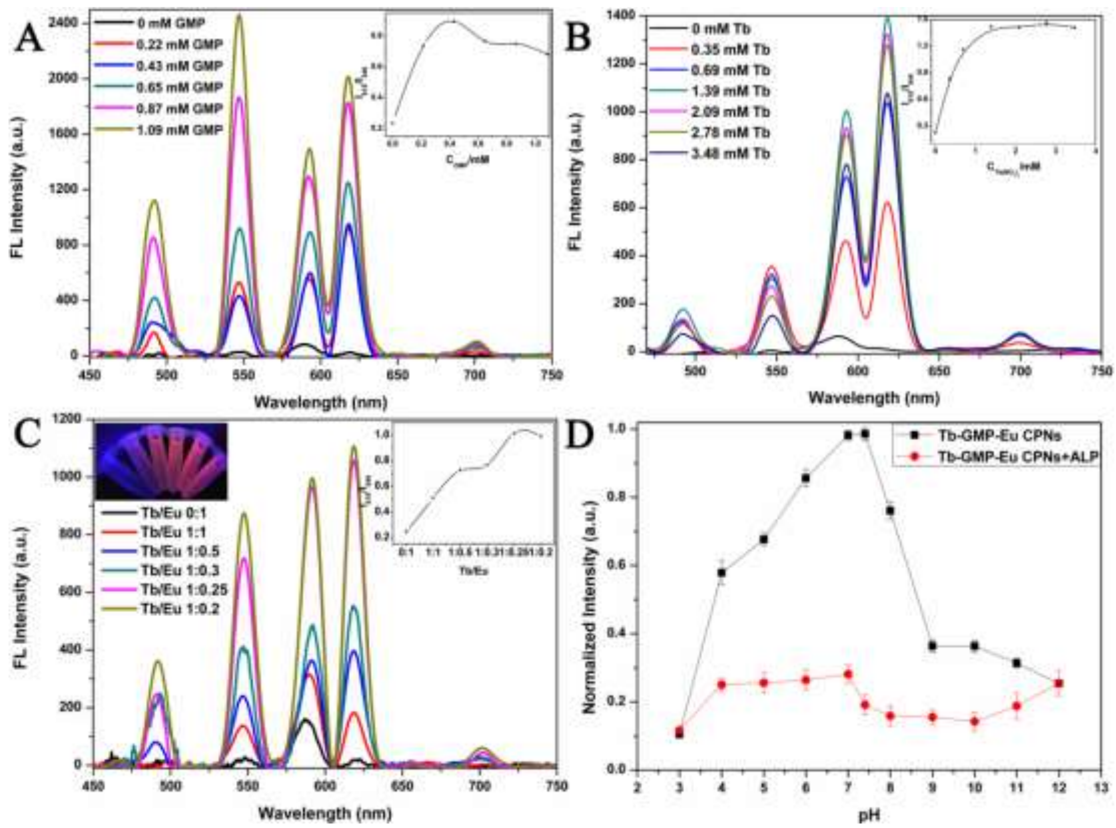

Fig.S5 Concentration optimization of GMP (A) and Tb $(NO_3)_3$ at 0.35 mM of Eu $(NO_3)_3$ (B) and molar ratio investigation of Tb/Eu from 0:1 to 1:0.2 at 0.35 mM of Tb $(NO_3)_3$ (Inset: photograph of different Tb/Eu molar ratio from left to right corresponding to 0:1, 1:1, 1:0.5, 1:0.3, 1:0.25, 1:0.2) (C) and Effects of pH of reaction media on the fluorescence intensity of Tb-GMP-Eu CPNs in the absence (black line) and presence (red line) of ALP at 618 nm (D).   .

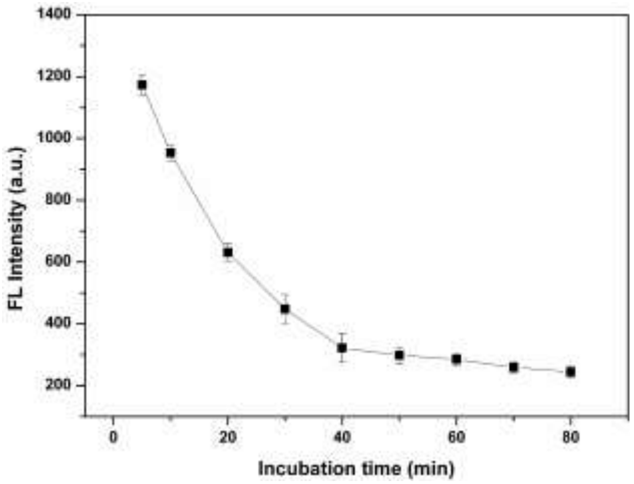

Fig.S6 The fluorescence intensity of Tb-GMP-Eu CPNs in the presence of ALP (40 U L^{-1}) versus incubation time

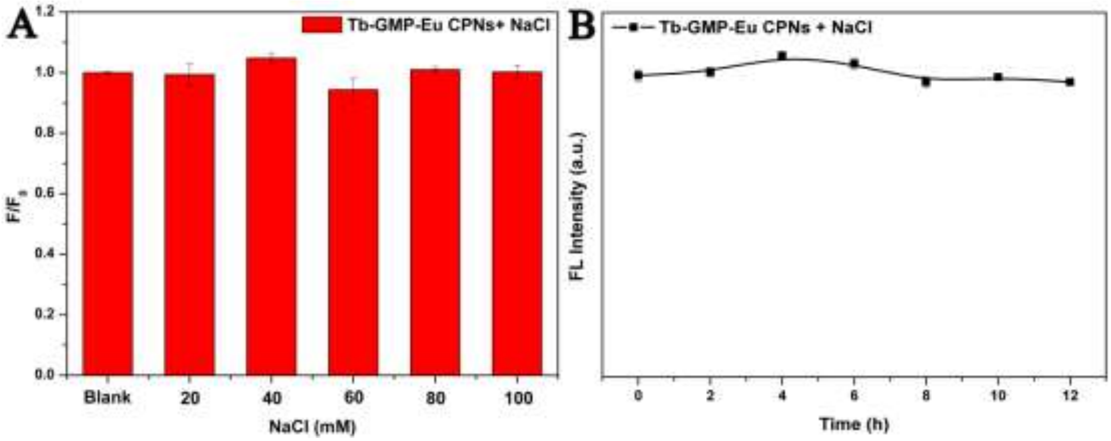

Fig.S7 (A) Effect of different concentrations of salt solution on the fluorescence intensity of Tb-GMP-Eu CPNs (B) The fluorescence stability of Tb-GMP-Eu CPNs in high strength ionic solution (100 mM)

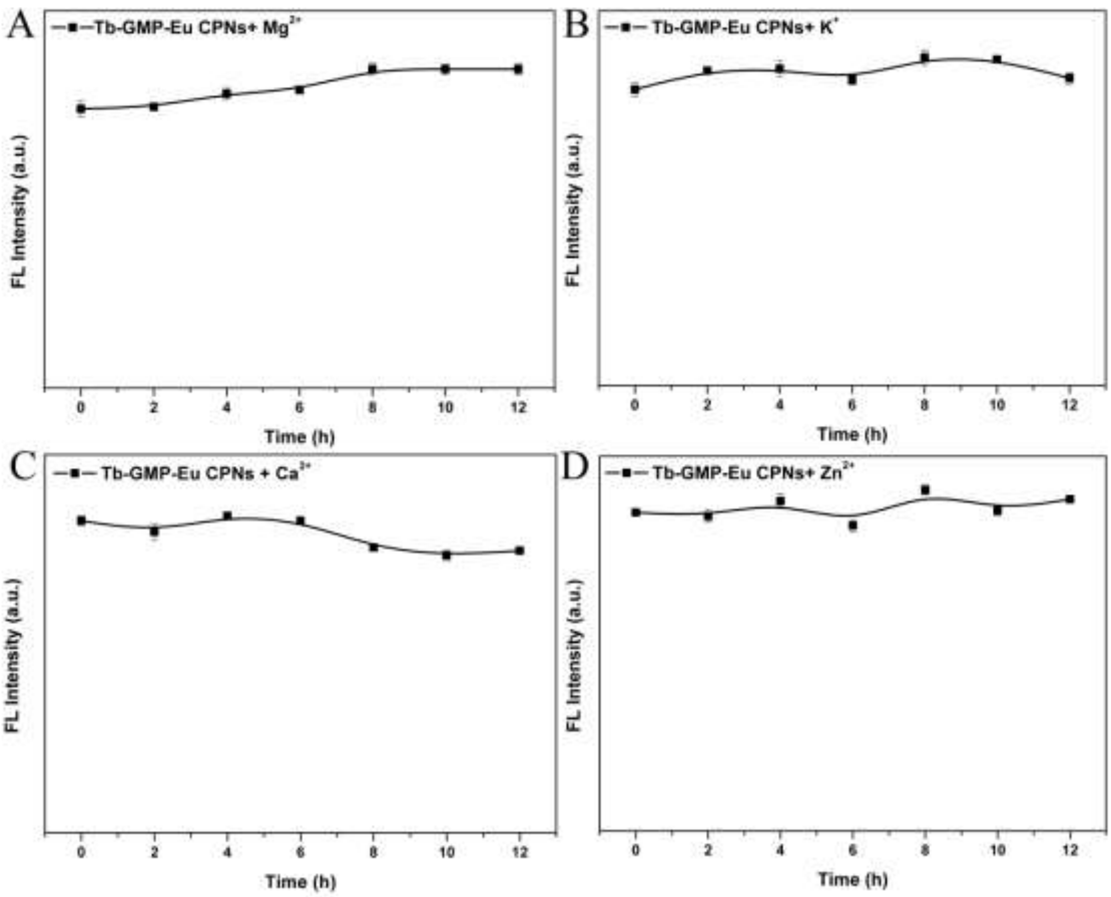

Fig. S8 The fluorescence stability of Tb-GMP-Eu CPNs in the presence of common metal ions (50 μM) including Mg^{2+}, K^{+}, Ca^{2+}, Zn^{2+}.

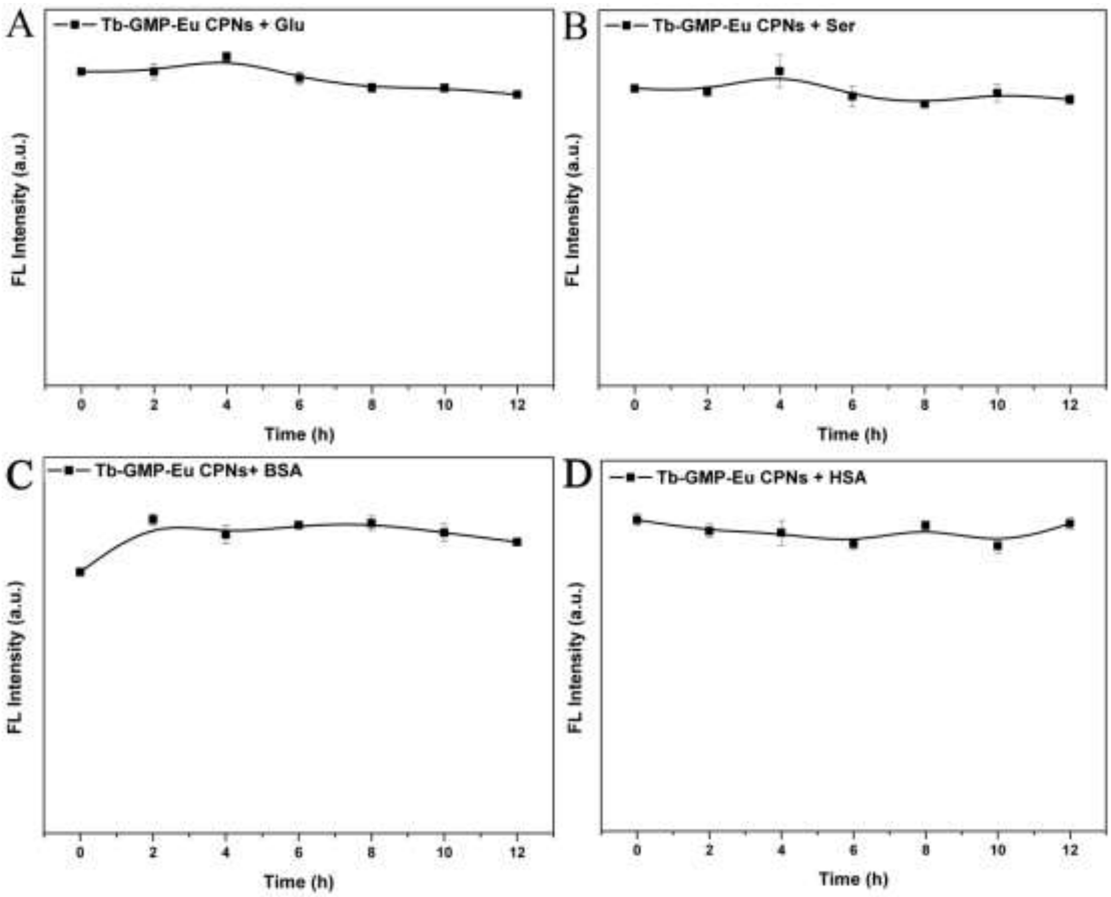

Fig. S9 The fluorescence stability of Tb-GMP-Eu CPNs in the presence of glutamic acid (Glu) (A), serine (Ser) (50 μM) (B) and bovine serum albumin (BSA) (C), human serum albumin (HSA) (0.25 mg mL^{-1}) (D)

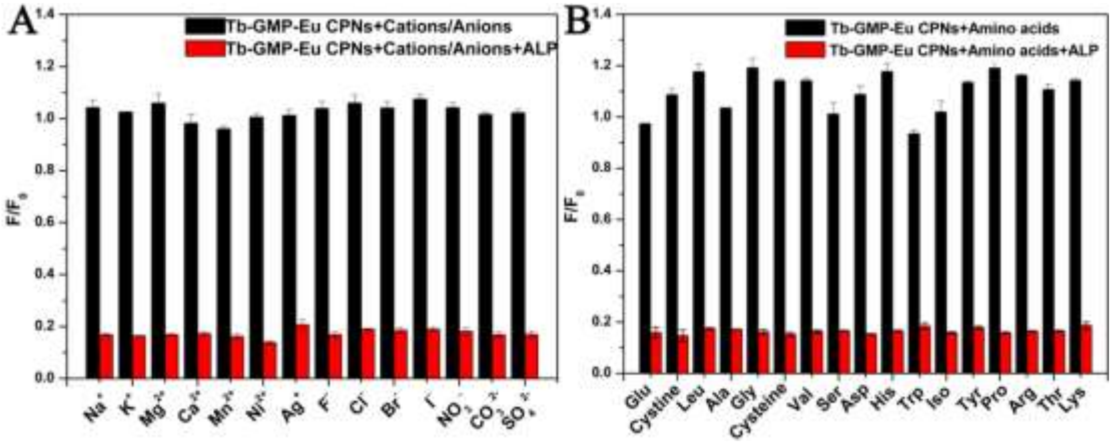

Fig.S10 (A) Fluorescence responses of Tb-GMP-Eu CPNs (0.12 mg·mL^{-1}) upon the addition of differents amino acids (50 μM) in the absence and presence of ALP (40 U L^{-1}) (λ_{ex}=290 nm); (B) Fluorescence responses of Tb-GMP-Eu CPNs (0.12 mg·mL^{-1}) upon the addition of different metal ions (50 μM) and anions (50 μM) in the absence and presence of ALP (40 U L^{-1}) (λ_{ex}=290 nm), where F and F_0 were the fluorescence intensities at 618 nm in presence and absence of ALP, respectively.

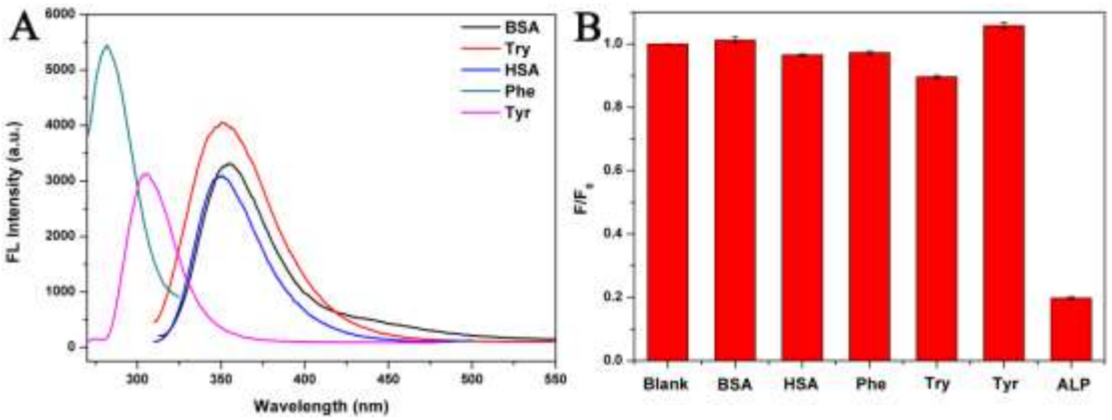

Fig. S11 (A) The emission spectra of fluorescent biomolecules including bovine serum albumin (BSA), human serum albumin (HSA), tryptophan (Try), phenylalanine (Phe), tyrosine (Tyr), glucose oxidase (GOX). (B) The fluorescence intensity ratio (F/F_0) in respond to tested substances including bovine serum albumin (BSA), human serum albumin (HSA), glucose oxidase (GOX), phenylalanine (Phe), tryptophan (Try), tyrosine (Tyr) and ALP, where F and F_0 were the fluorescence intensities at 618 nm in presence and absence of tested substances.

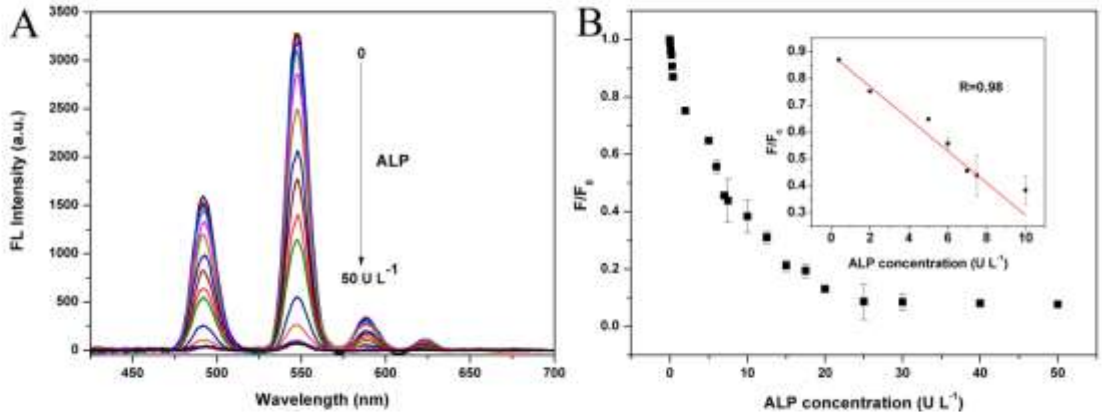

Fig. S12 (A) Fluorescence emission spectra of Tb-GMP in the presence of different concentrations of ALP from 0 to 50 U L^{-1} in Tris-HCl buffer solution (10 mM, pH 7.4) (B) Plot of F/F_0 versus the concentration of ALP from 0.4 to10 U L^{-1} Inset: The linear regression curve with linear relationship from 0.4 to 10 U L^{-1}.

Table S1

Comparison of varied analysis materials for the detection of ALP activity

Analysis Material	Analytes	Linear range(U L^{-1})	Detection limit(U L^{-1})	Real sample	Reference
coumarin@Tb-GMP	ALP	25-200	10	No	1
$NaGdF_4$:Yb/Tm UCNPs	ALP	62.5-875	19	Bovine serum	2
Au NCs	ALP	0.1-10	0.1	No	3
CQDs	ALP	4.6 - 383.3	1.4	No	4
AgNCs	ALP	30-240	5	No	5
g-C_3N_4 nanosheet	ALP	0.1-1000	0.08	No	6
GQDs	ALP	1-90	0.45	Human serum	7
Copper Nanoparticles	ALP	0.06-600	0.035	Human serum	8
N-CDs	ALP	2.5-45	0.4	Human serum	9
Copper nanoparticles	ALP	0.3-7.5	0.3	Human serum	10
CdTe quantum dots	ALP	-	10	No	11
CDs	ALP	16.7-782.6	1.1	No	12
Tb-GMP-Eu CPNs	ALP	0.05-20	0.004	Human serum	This work

References

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