Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

A Dual Luminescent Lanthanide Coordination Polymers for Ratiometric Sensing and Efficient Removal of Hg^{2+}

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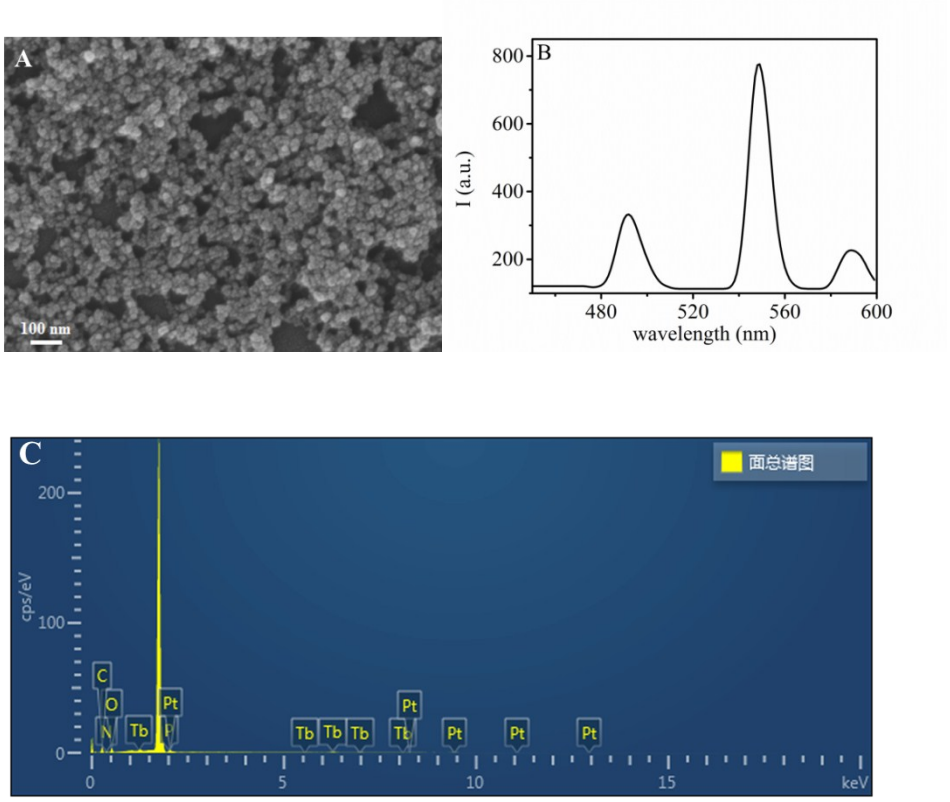

Figure S1. (A) SEM image of the GMP-Tb; (B) Fluorescence spectra of GMP-Tb (λ_{ex}= 310 nm). (C) The Energy-dispersive X-ray (EDX) spectra of GMP-Tb.

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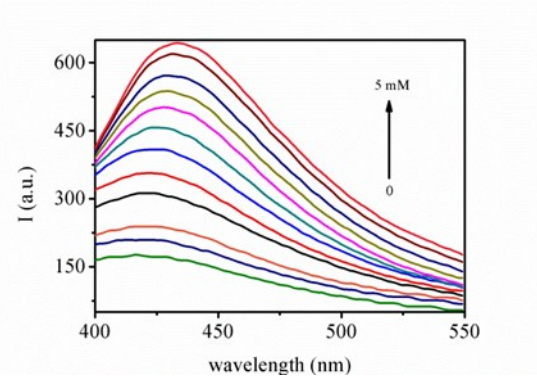

Figure S2. Fluorescence spectra of luminol (50 μM) in the presence of different concentrations of Tb^{3+} from 0 to 5 mM (λ_{ex}= 310 nm).

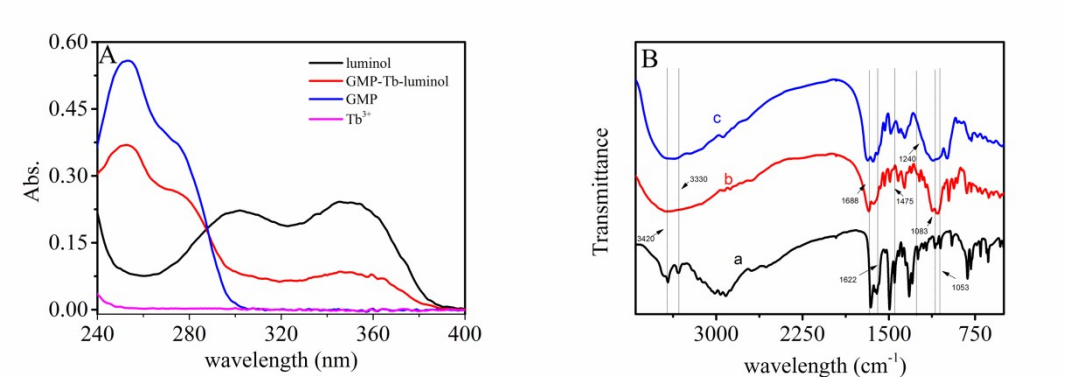

Figure S3 (A) UV-vis spectra of GMP, luminol, Tb^{3+} and GMP-Tb-luminol, respectively; (B) FTIR spectra of luminol (curve a), GMP (curve b) and GMP-Tb-luminol (curve c), respectively.

To verify the formation of GMP-Tb-luminol, the UV–vis spectra of luminol, GMP, and GMP-Tb-luminol were examined. As shown in Figure S3A, GMP displayed an obvious absorption peak at 260 nm, which was assigned to the π–π* transition of adenine base.[1] The absorption peaks at 300 nm and 347 nm were attributed to luminol.[2] The GMP-Tb-luminol exhibited broaden UV absorption peak at 260 nm and 347 nm, respectively. The above phenomenon indicated the coordination between GMP and luminol with Tb^{3+}.[3]

The formation of GMP-Tb-luminol was also confirmed by FT-IR spectra (Figure S3B). The peaks at 3420 and 3330 cm^{-1} of luminol belonged to the N−H stretching vibrations.[3] The peaks at 1053 and 1620 cm^{-1} of luminol (curve a) were attributed to NH_2 rocking vibrations and C=O stretching vibrations,[4] respectively. For GMP, the

peaks at 1083, 1240, 1475, and 1688 cm^{-1}, (curve b) belonged to the symmetric (νsPO_2), the phosphate antisymmetric ($\nu asPO_2$), N_7-C_8 stretching (νN_7-C_8) and P-OH stretching band (νP-OH) band in the guanine subunit, respectively. [5, 6] For GMP-Tb-luminol, the corresponding peaks at 1083, 1240, 1475 and 1688 cm^{-1} (curve c) of GMP slightly shifted, indicated that the nucleobase moieties and phosphate groups of GMP were involved in the coordination process. [7] Meanwhile, the typical peaks of the amino group in the luminol spectrum at 3330 and 3420 cm^{-1} disappeared. The peak of luminol at 1053 cm^{-1} shifted. The above phenomenon indicated a reflection of the covalent interaction between the Tb^{3+} and amino group.[8] In addition, for GMP-Tb-luminol, the peak at around 1622 cm^{-1} corresponding to the stretching vibrations of C=O slightly shifted, which provided evidence of the successful preparation of GMP-Tb-luminol.[9] All of these results demonstrated that the dual ligand, dual emission GMP-Tb-luminol CPs was obtained.

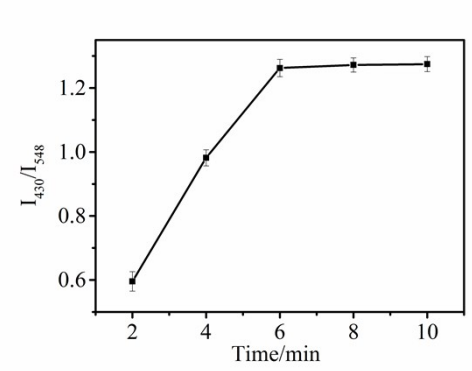

Figure S4. Time-dependent fluorescence intensity ratio (I_{430}/I_{548}) of the GMP-Tb-luminol after addition of 40 μM Hg^{2+}.

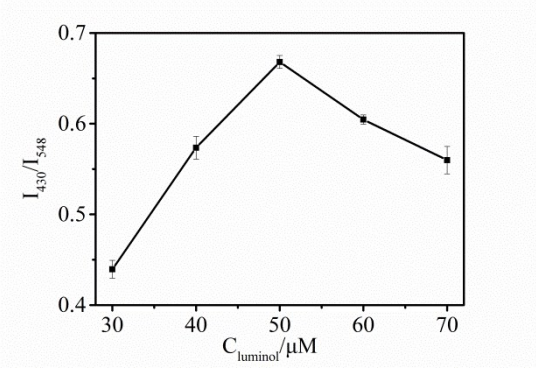

Figure S5. Effects of luminol concentration on the fluorescence intensity ratio

(I_{430}/I_{548}) of GMP-Tb-luminol in the presence of 10 μM Hg^{2+} (λ_{ex}= 310 nm).

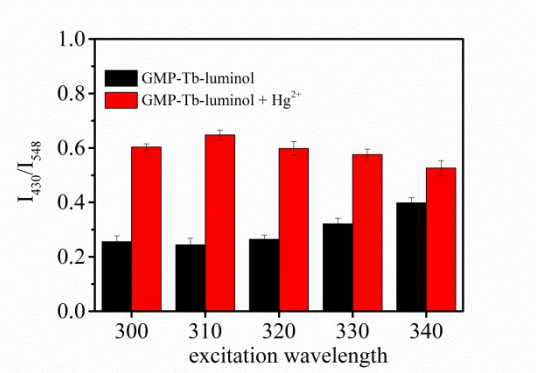

Figure S6. The fluorescence intensity ratio (I_{430}/I_{548}) of GMP-Tb-luminol in the absence (black column) and presence (red column) of Hg^{2+} (10 μM) at different excitation wavelengths.

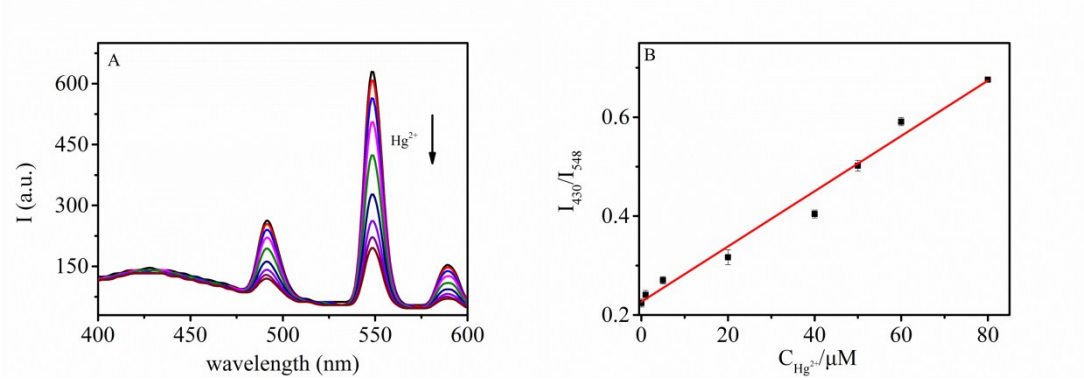

Figure S7. (A) Fluorescent spectra of the GMP-Tb-luminol (depurated) with different concentrations of Hg^{2+} (λ_{ex}=310 nm); (B) Plot of the ratios I_{430}/I_{548} versus the concentration of Hg^{2+}.

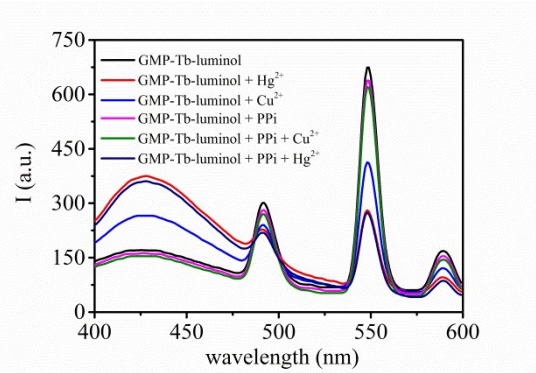

Figure S8. The emission spectra of GMP-Tb-luminol, GMP-Tb-luminol + Hg^{2+}, GMP-Tb-luminol + Cu^{2+}, GMP-Tb-luminol + PPi, GMP-Tb-luminol + PPi + Cu^{2+} and GMP-Tb-luminol + PPi + Hg^{2+} (Hg^{2+}: 40 μM; Cu^{2+}: 40 μM; PPi: 0.5 mM).

References

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