Supporting Information to Accompany "**A Highly Selective and On-Off-On Responsive Lanthanide (III) based Probe for Recognition of Copper and Hydrogen Sulfide**"

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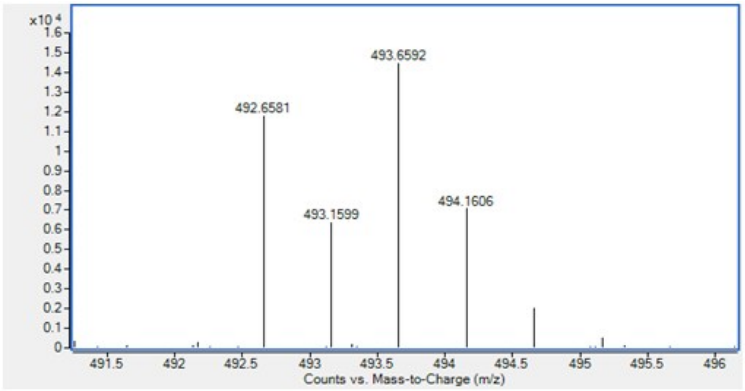

Figure S1. High resolution mass spectrum of **EuL1**.

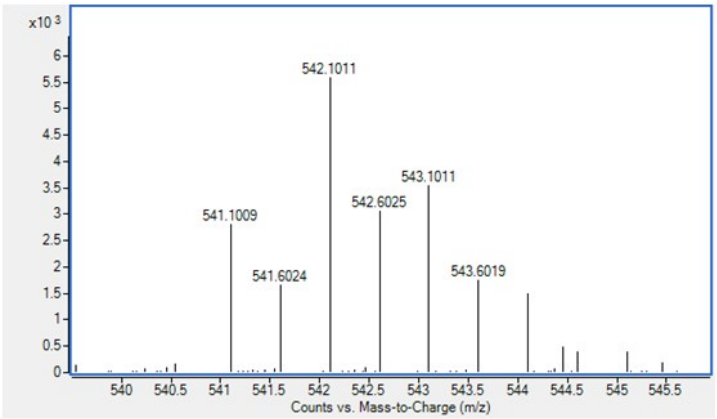

Figure S2. High resolution mass spectrum of **EuL1Cu**.

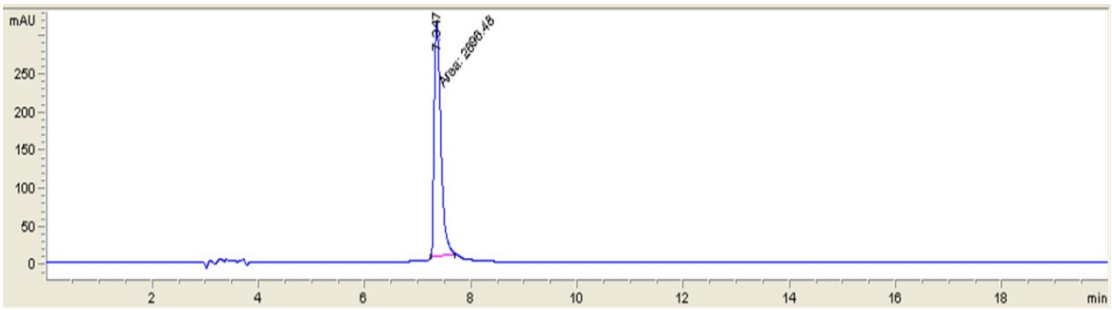

Figure S3. HPLC chromatogram of **EuL1**.

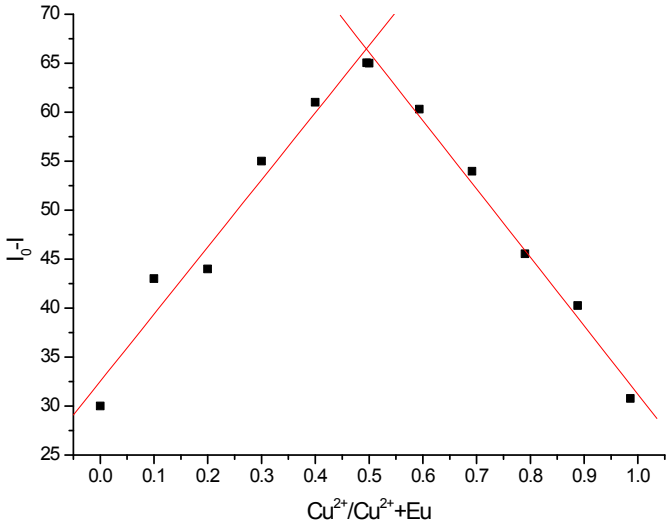

Figure S4. Job's plot of **EuL1** and Cu^{2+} ion. I and I_0 were measured at 612nm.

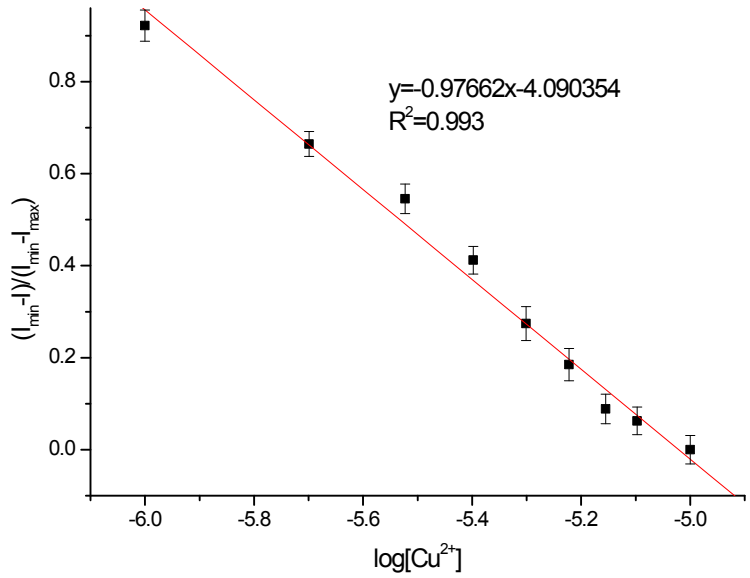

Figure S5. Luminescence response to changing Cu^{2+} ion concentration.

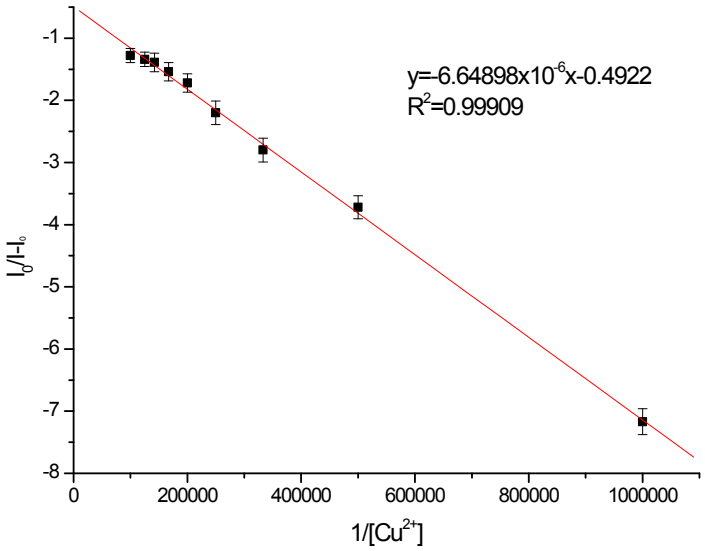

Figure S6. Fitting of fluorescence Cu^{2+} ion titration curve of **EuL1**.

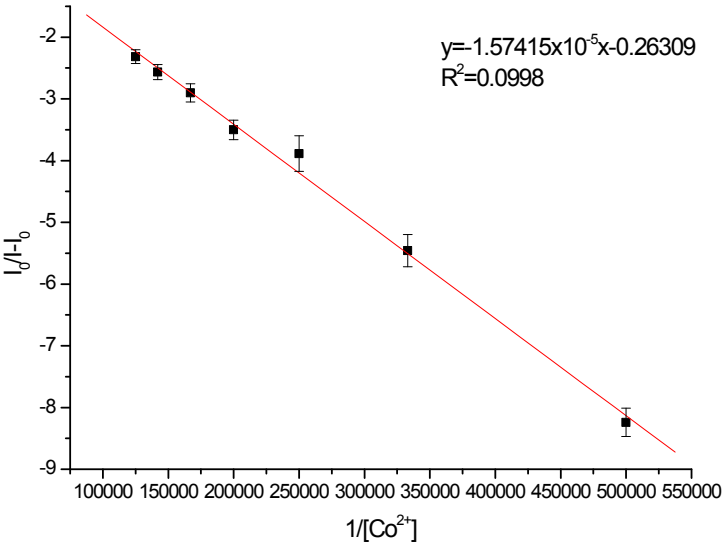

Figure S7. Fitting of fluorescence Co^{2+} ion titration curve of **EuL1**.

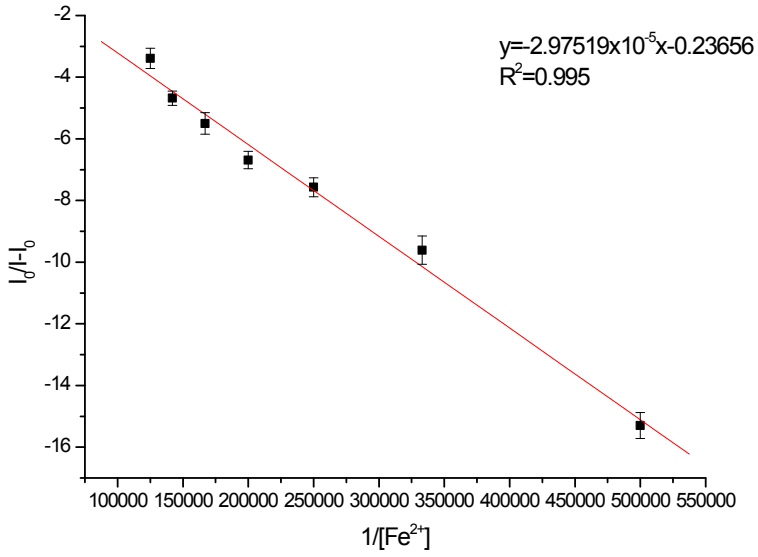

Figure S8. Fitting of fluorescence Fe^{2+} ion titration curve of **EuL1**.

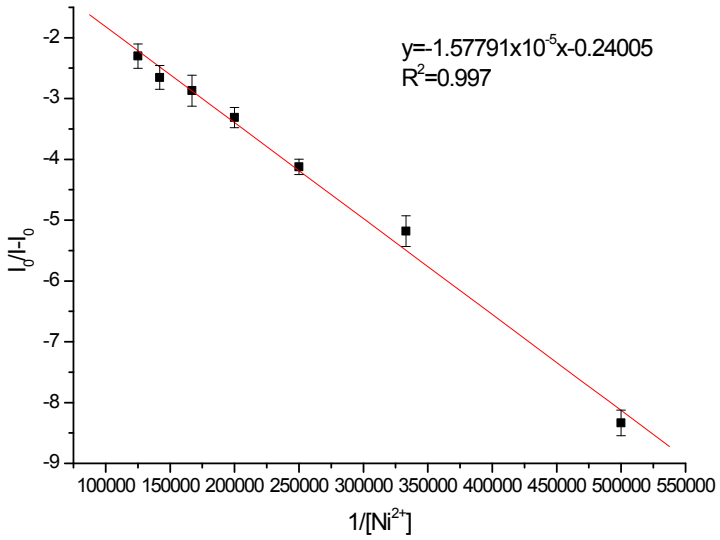

Figure S9. Fitting of fluorescence Ni^{2+} ion titration curve of **EuL1**.

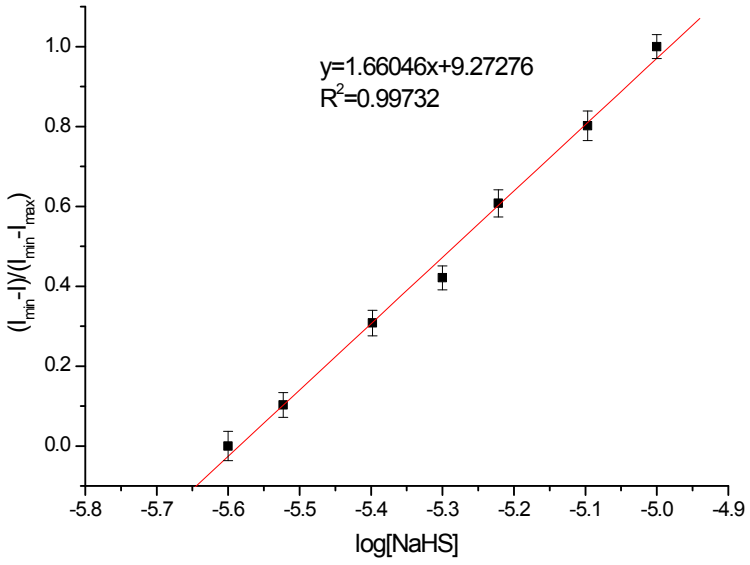

Figure S10. Luminescence response to changing NaHS concentration.

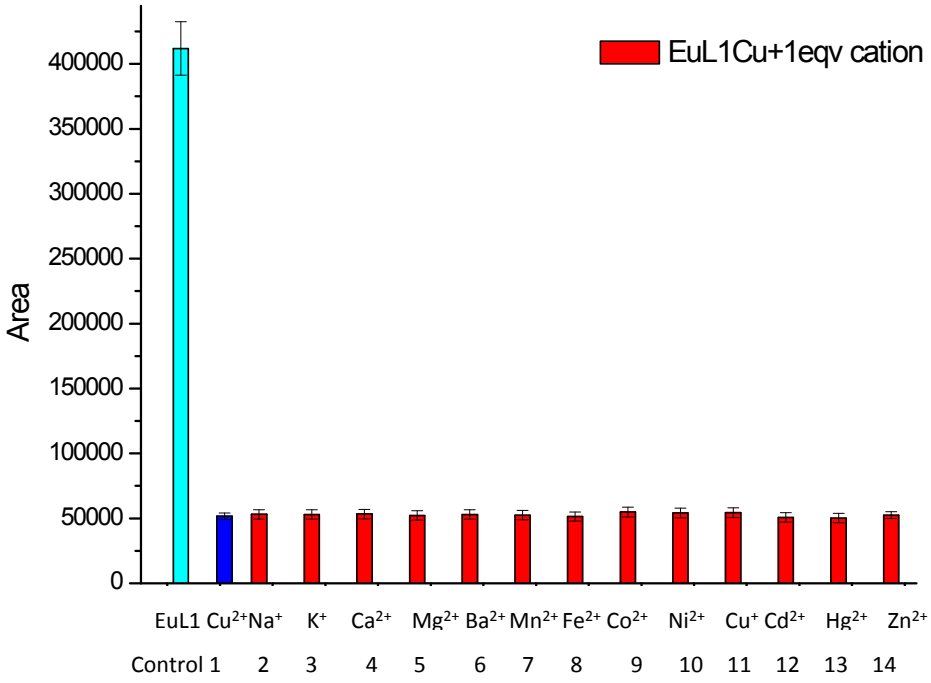

Figure S11. The luminescence intensity changes of [**EuL1Cu**] (10 μM) in 10 mM Hepes (reverse titration for 1 to 14: Cu(II) ion was first added to **EuL1** then cation was added) (excitation: 350 nm). Control : **EuL1 only**, 1: **EuL1**+1eqv Cu(II) ion , 2: 0.1MNa(I)ion, 3: 0.1MK (I) ion, 4: 0.1mM Ca (II) ion,5: 0.1mM Mg (II) ion,6: 1eqv Ba(II) ion,7: 1eqv Mn (II) ion,8. 1eqv Fe(II) ion, 9. 1eqv Co (II) ion, 10. 1eqv Ni (II) ion, 11. 1eqv Cu (I) ion, 12: 1eqv Cd (II) ion, 13: 1eqv Hg (II) ion, 14: 1eqv Zn (II) ion.

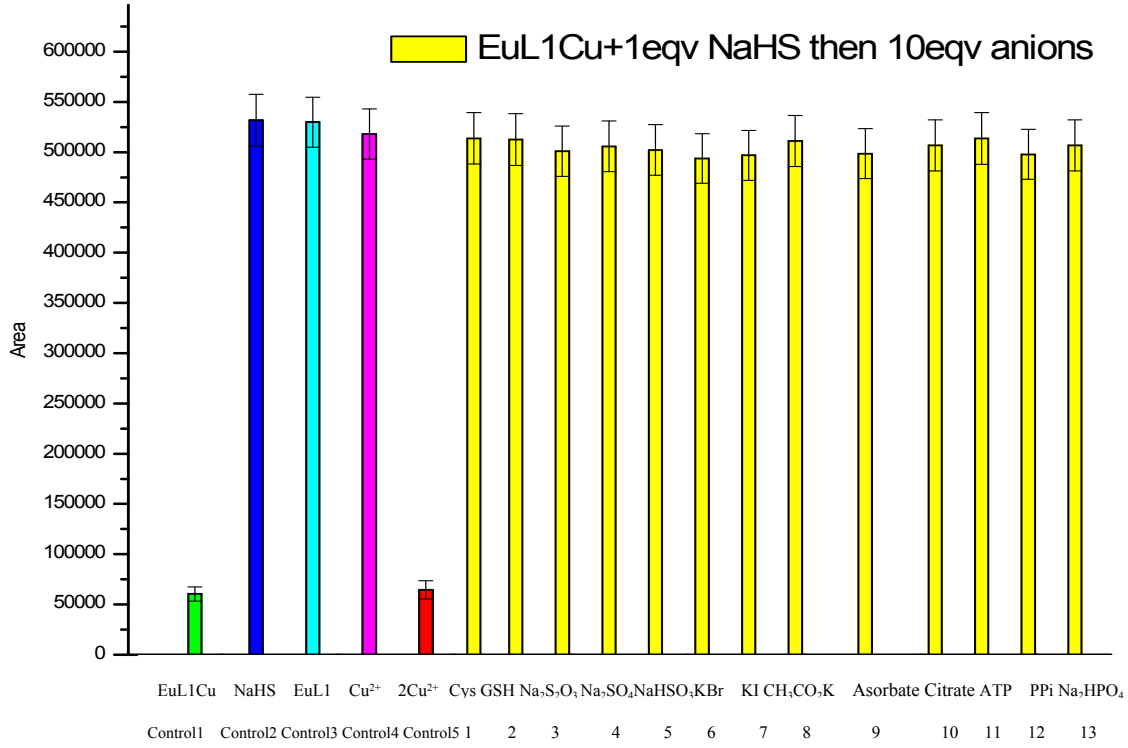

Figure S12. The luminescence intensity changes of [**EuL1Cu**] (10 μM) in 10 mM Hepes (excitation: 350 nm). Control 1: **EuL1Cu**, Control 2: **EuL1Cu** + 1eqv NaHS, Control 3: **EuL1** + 1eqv NaHS, Control 4: **EuL1** + 1eqv NaHS+ 1eqv Cu (II) ion, Control 5: **EuL1** + 1eqv NaHS+ 2eqv Cu (II) ion, 1: Cysteine (Cys), 2: Glutathione (GSH), 3: $Na_2S_2O_3$,4: Na_2SO_4, 5: $NaHSO_3$,6: KBr, 7: KI, 8: potassium acetate, 9: sodium ascorbate, 10: Sodium citrate, 11:ATP, 12: Pyrophospate (PPi),13: Na_2HPO_4.

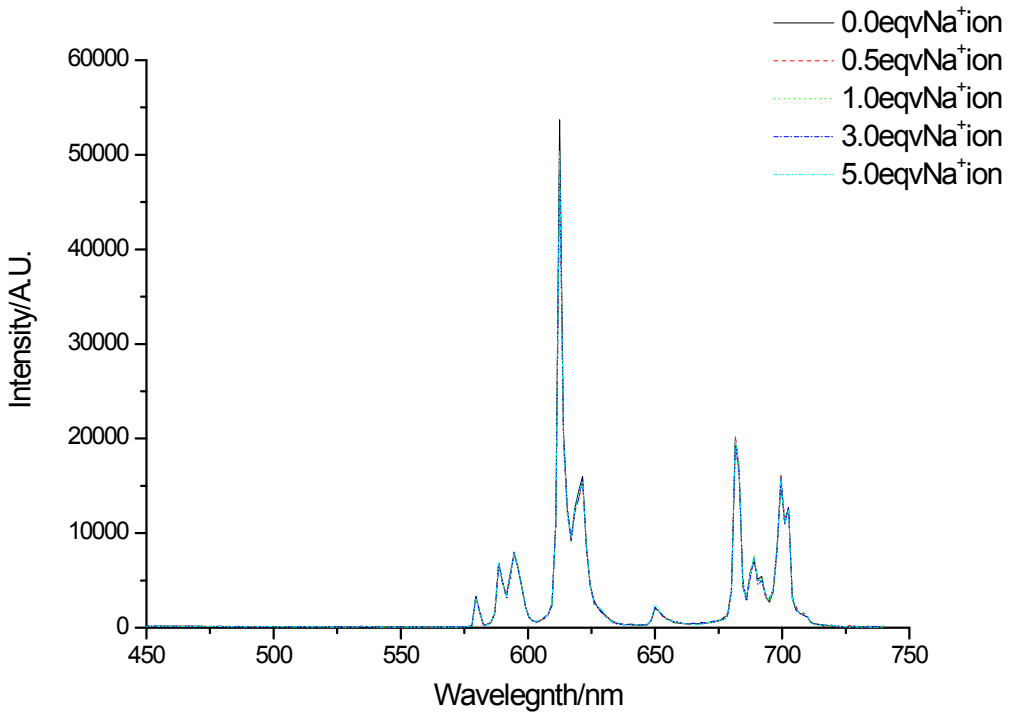

Figure S13. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Na(I) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

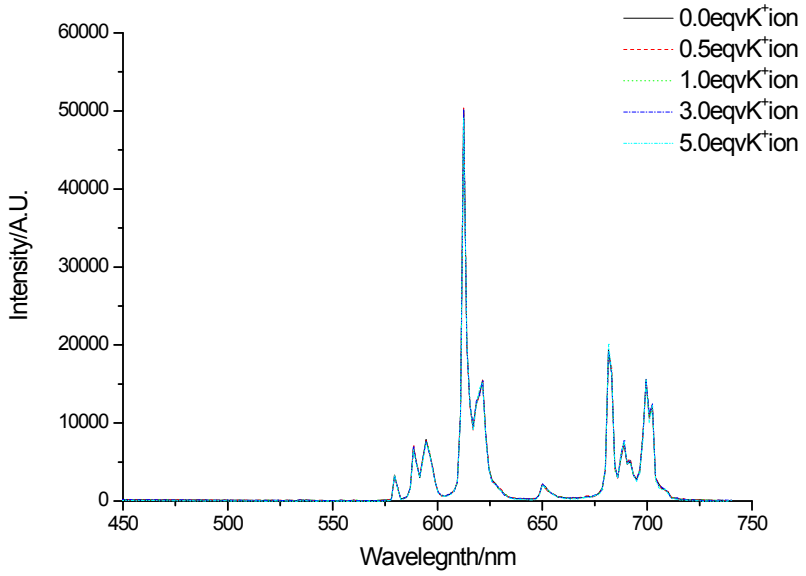

Figure S14. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of K (I) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

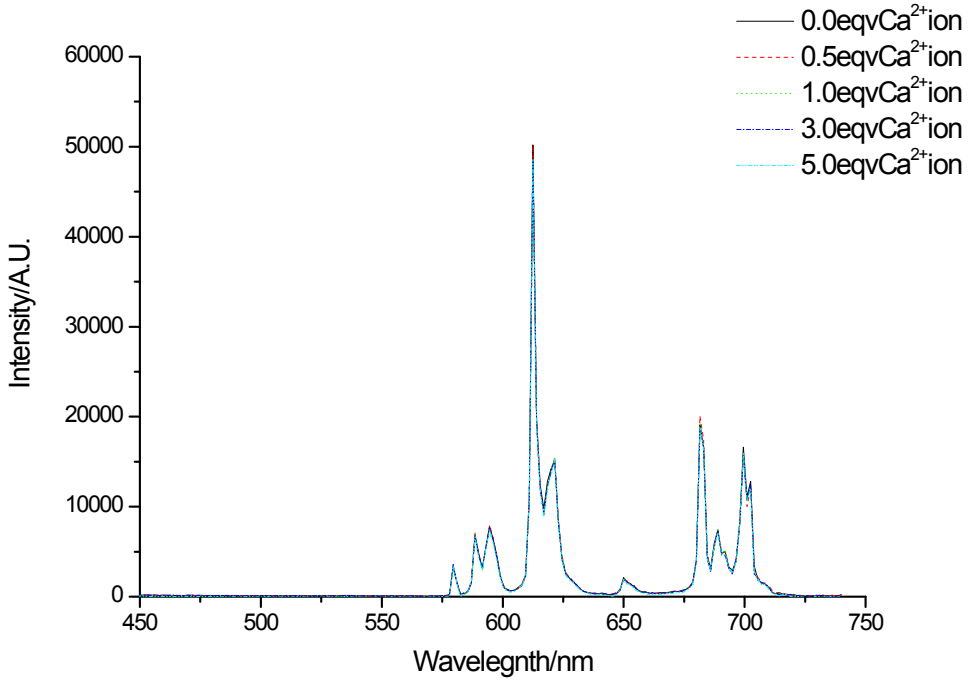

Figure S15. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Ca (II) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

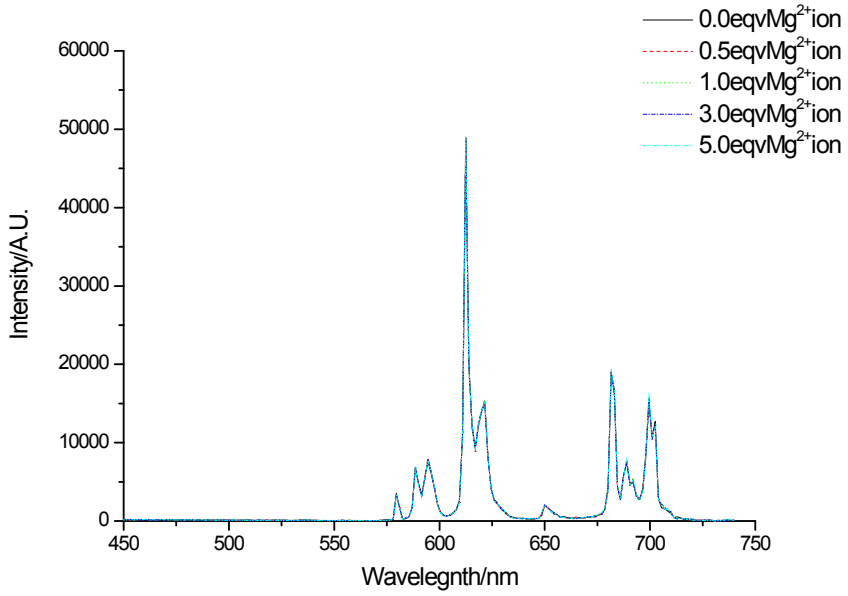

Figure S16. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Mg (II) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

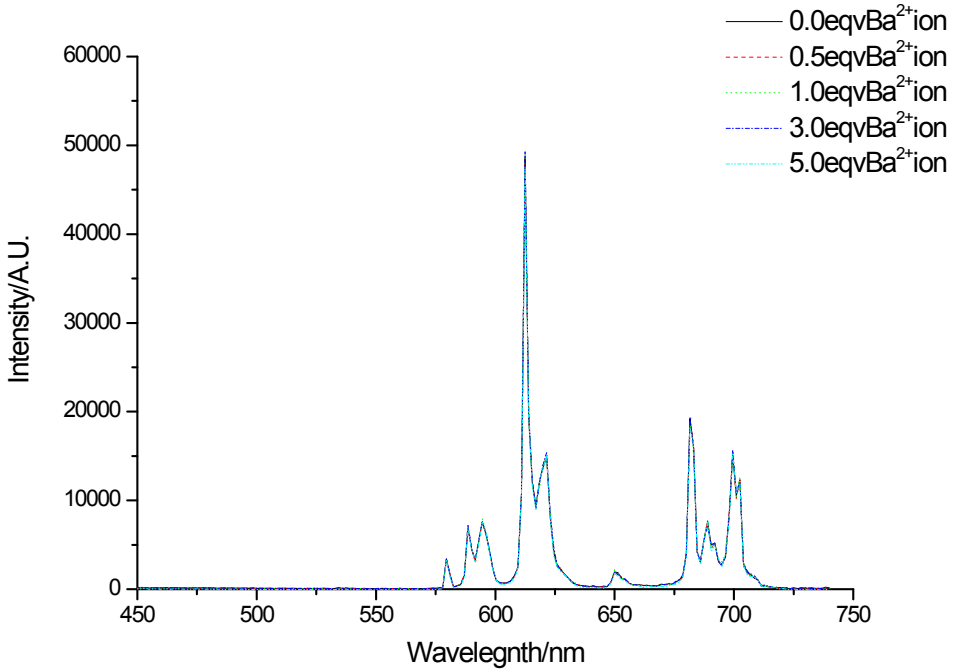

Figure S17. Emission spectra of 10 µM aqueous solution upon addition of aliquots of various equiv of Ba (II) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

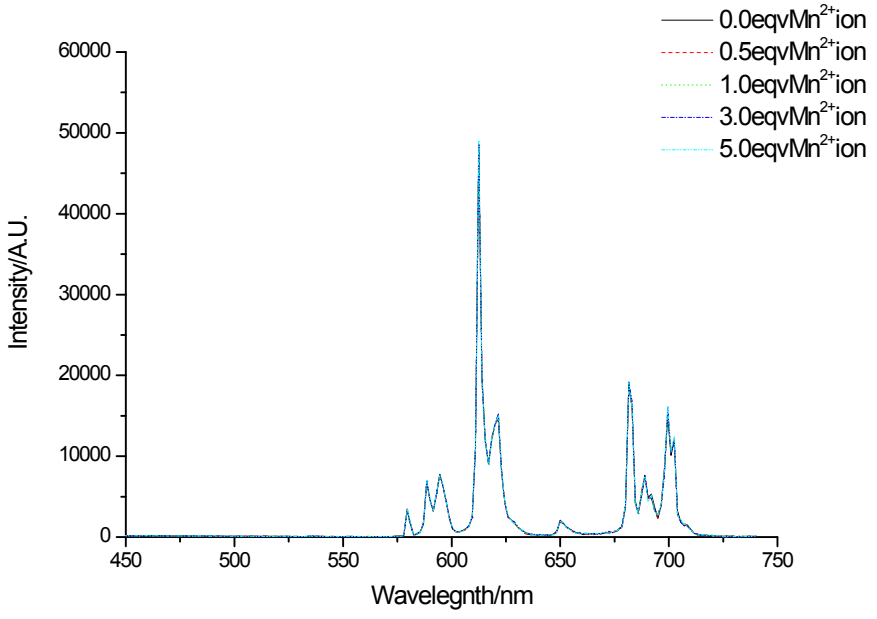

Figure S18. Emission spectra of 10 µM aqueous solution upon addition of aliquots of various equiv of Mn (II) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

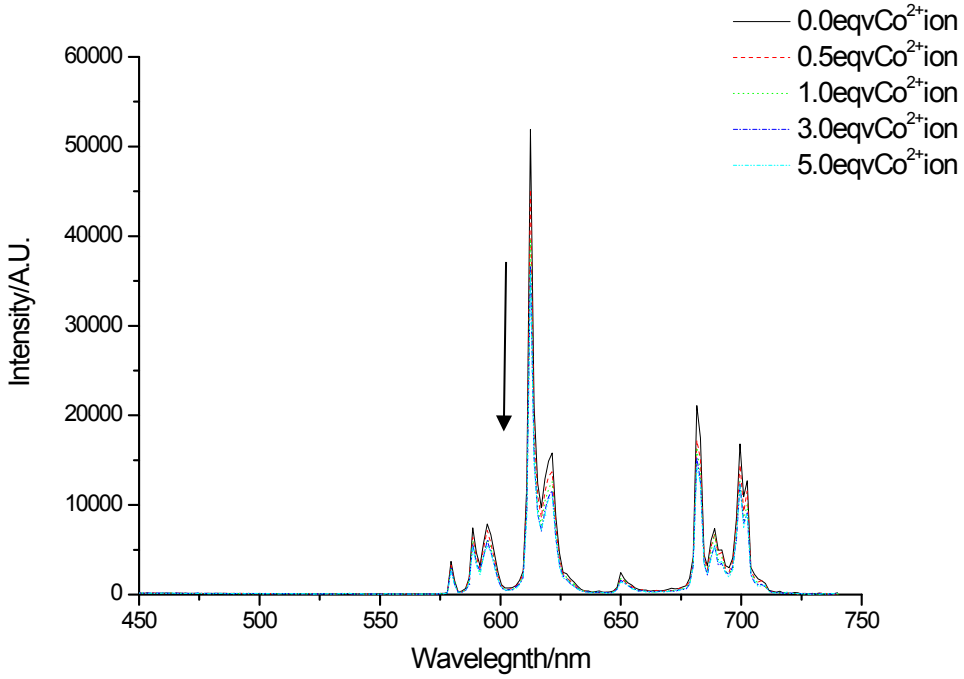

Figure S19. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Co (II) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

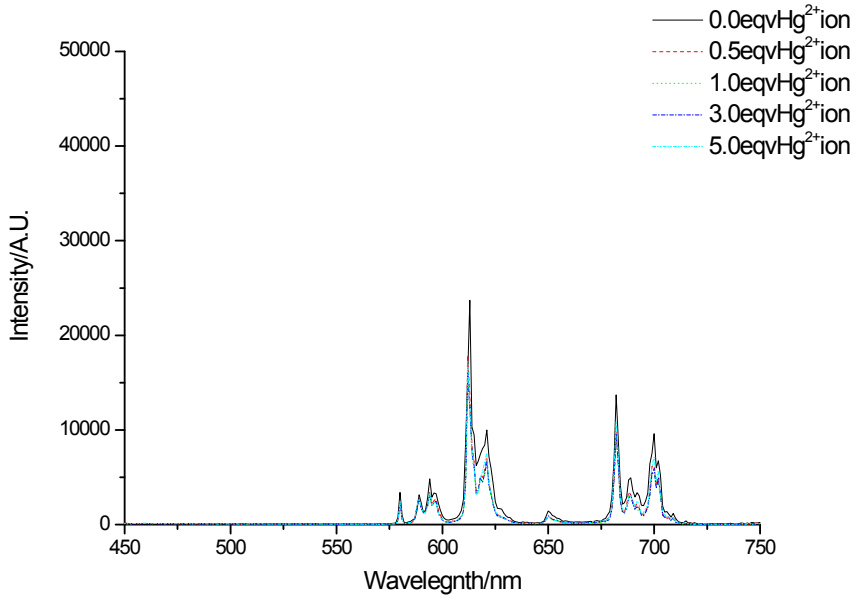

Figure S20. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Hg (II) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

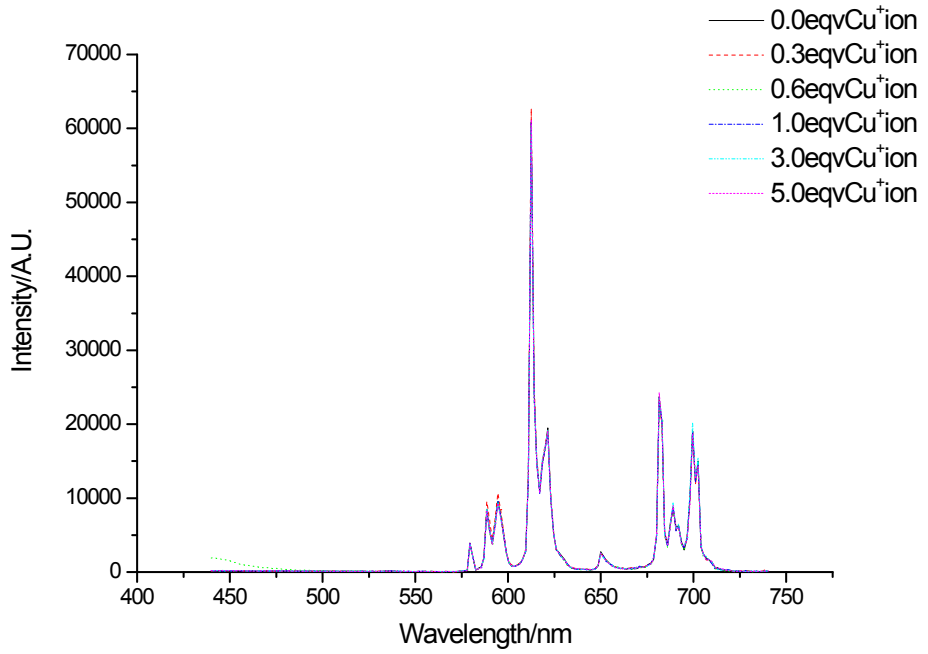

Figure S21. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Cu (I) ions with respect to **EuL1** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

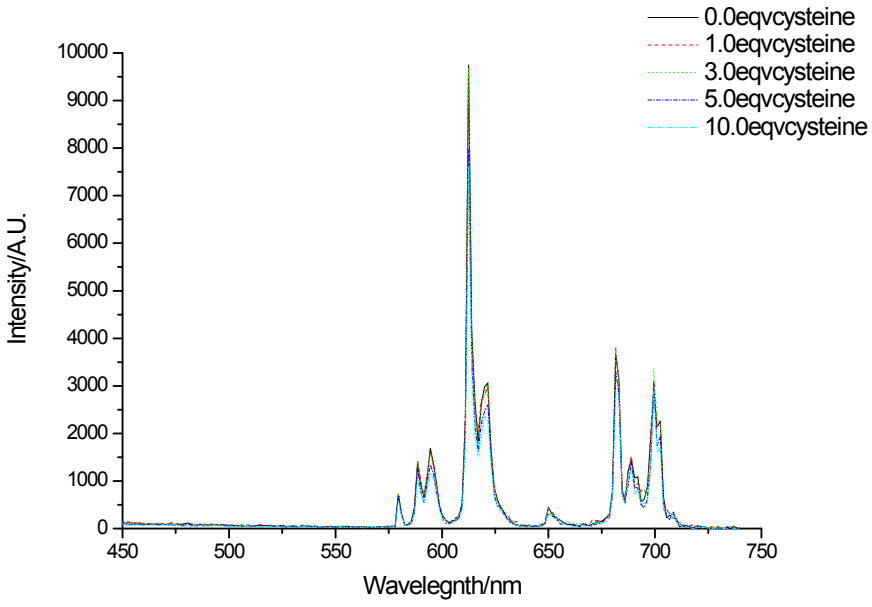

Figure S22. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Cysteine with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

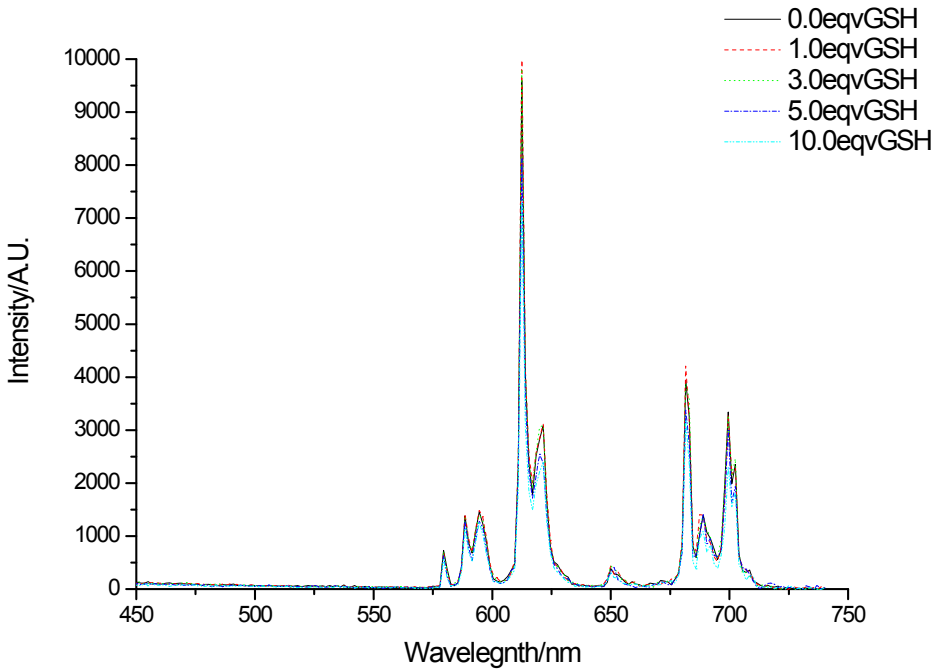

Figure S23. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of GSH with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

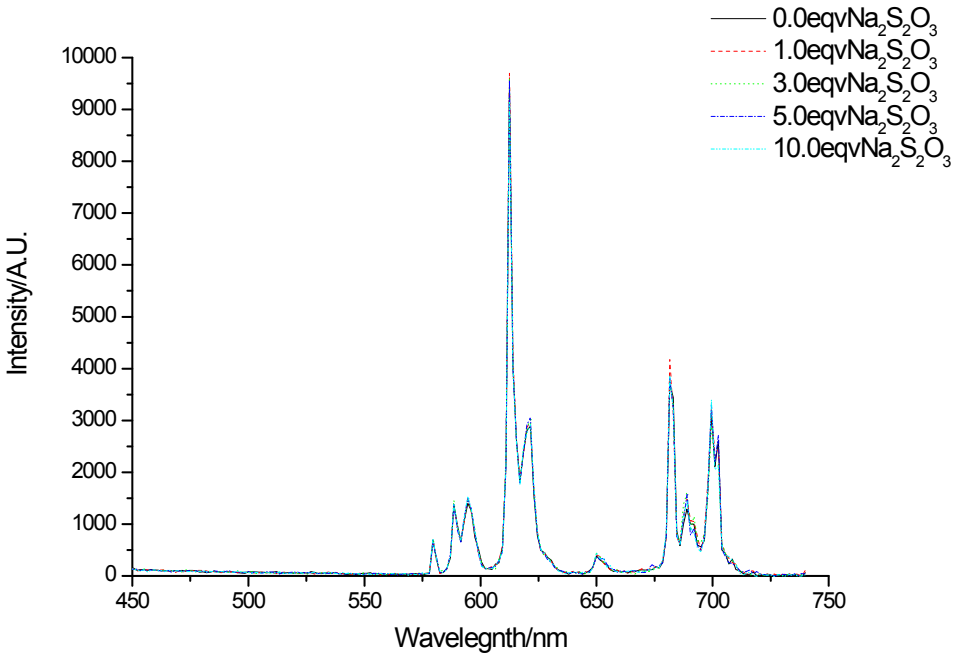

Figure S24. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of $Na_2S_2O_3$ with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

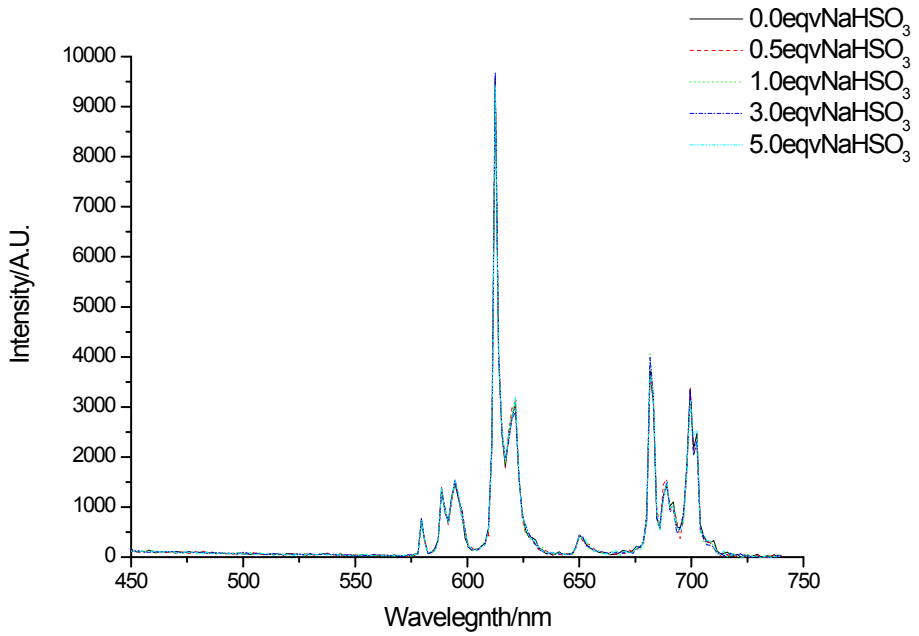

Figure S25. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of $NaHSO_3$ with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

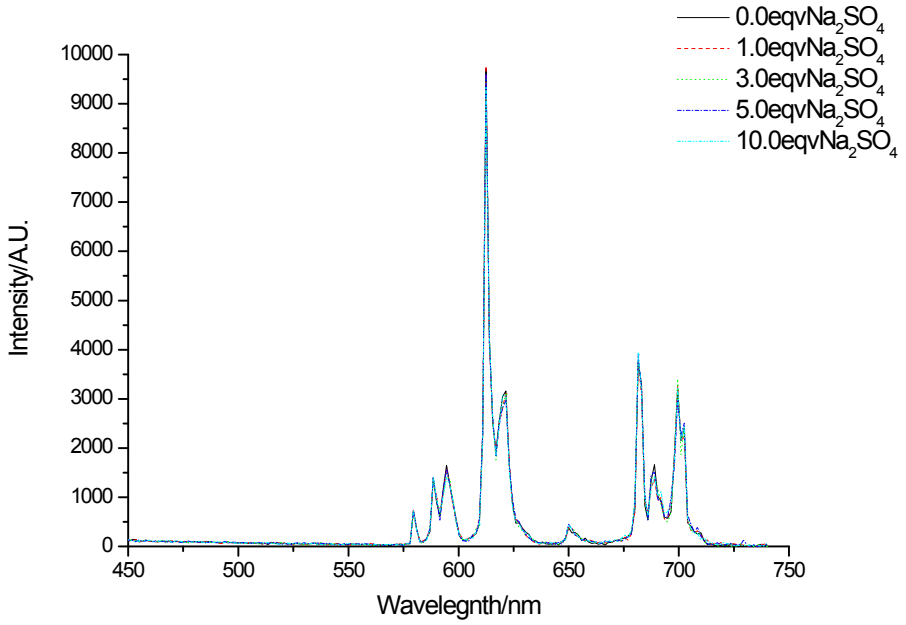

Figure S26. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of Na_2SO_4 with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

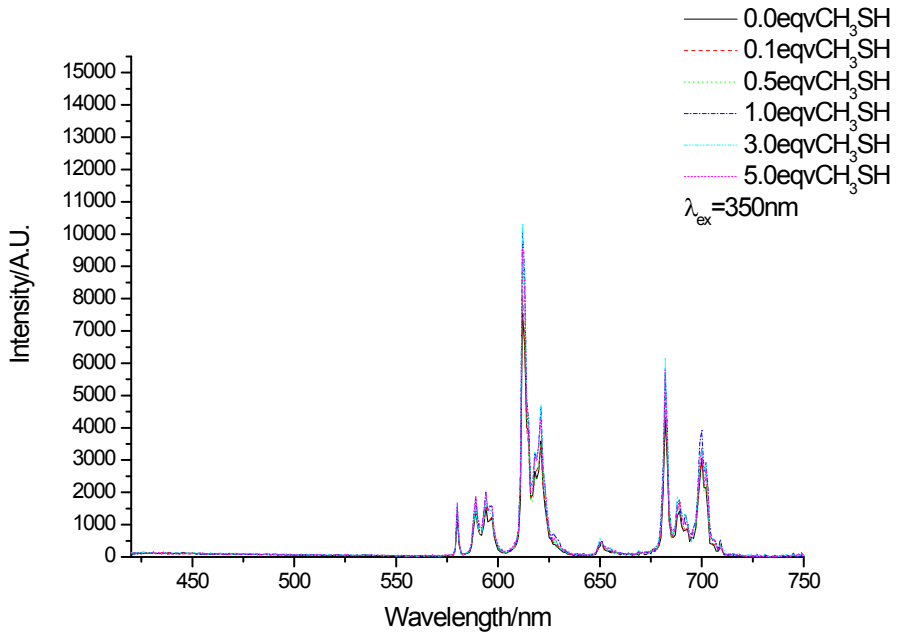

Figure S27. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of CH_3SH with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

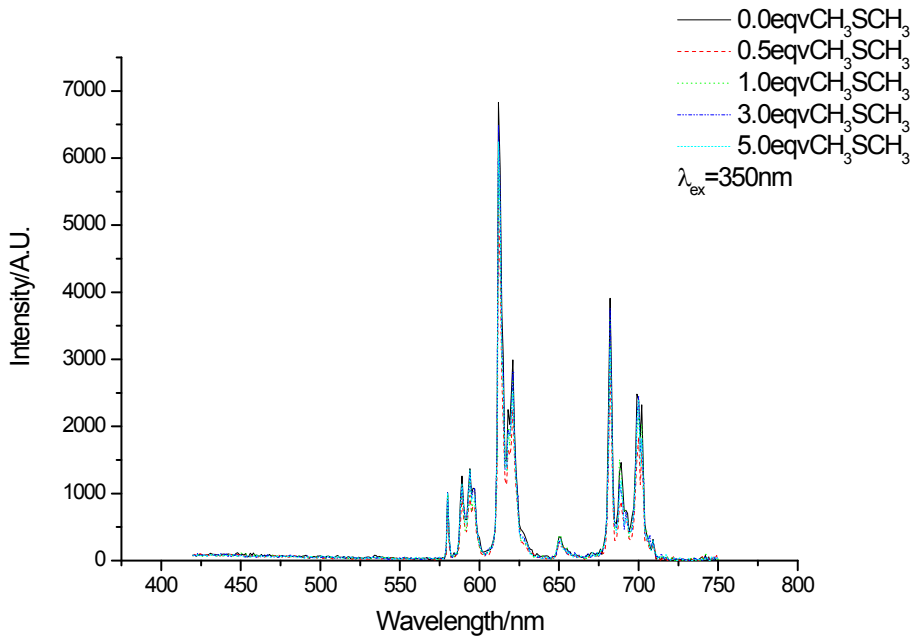

Figure S28. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of CH_3SCH_3 with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

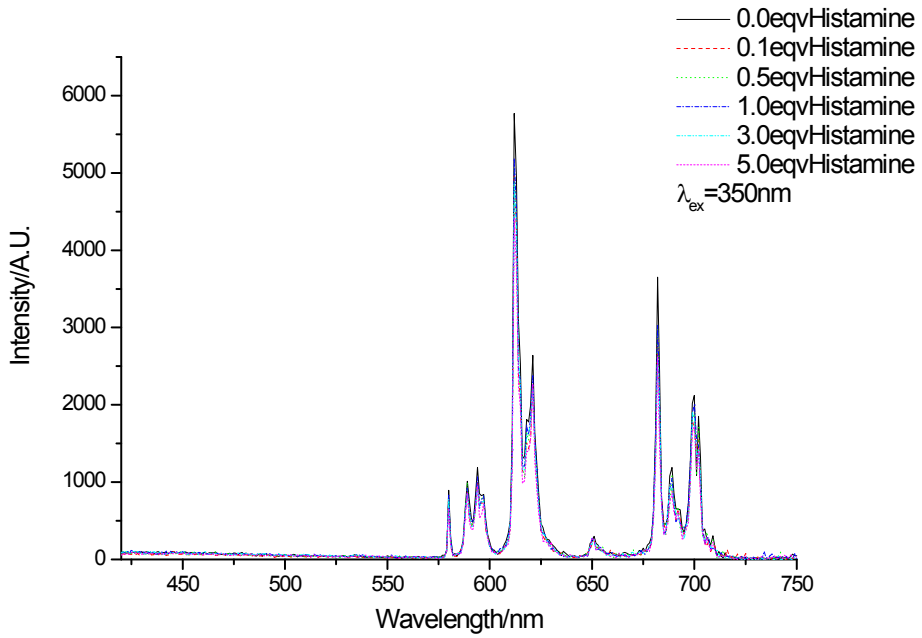

Figure S29. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of histamine with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

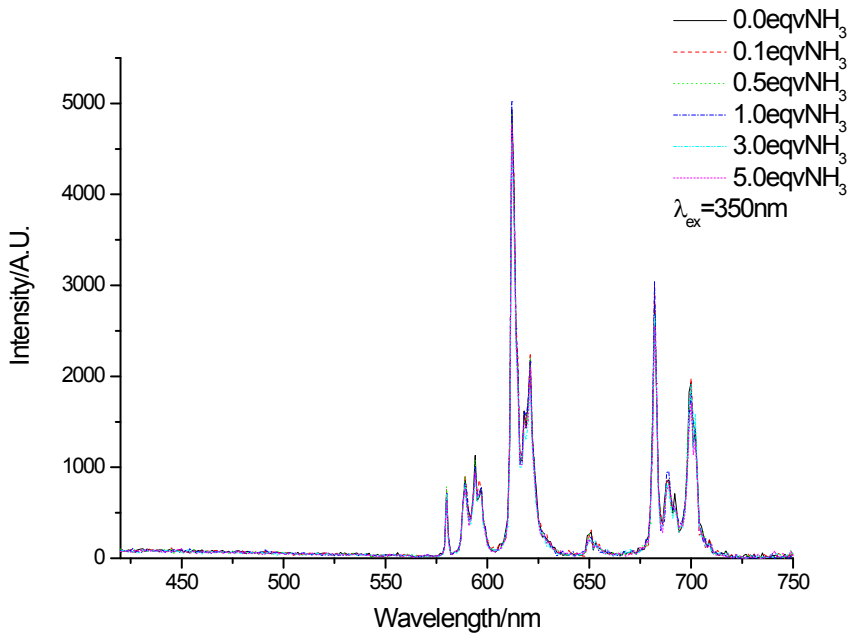

Figure S30. Emission spectra of 10 μM aqueous solution upon addition of aliquots of various equiv of NH_3 with respect to **EuL1Cu** (0.01M Hepes, pH=7.4, λ_{ex}=350nm) .

Cations/Anions	Titration range	Effect

Na(I) ion	0 eqv to 5 eqv	No significant change
K (I) ion	0 eqv to 5 eqv	No significant change
Ca (II) ion	0 eqv to 5 eqv	No significant change
Mg(II) ion	0 eqv to 5 eqv	No significant change
Ba (II) ion	0 eqv to 5 eqv	No significant change
Mn (II) ion	0 eqv to 5 eqv	No significant change
Fe (II) ion	0 eqv to 5 eqv	Slightly quenched
Co (II) ion	0 eqv to 5 eqv	quenched
Ni (II) ion	0 eqv to 5 eqv	quenched
Cu (I) ion	0 eqv to 5 eqv	No significant change
Cd (II) ion	0 eqv to 5 eqv	Slightly quenched
Hg (II) ion	0 eqv to 5 eqv	Slightly quenched
Zn (II) ion	0 eqv to 5 eqv	Slightly quenched
BSA	0 eqv to 5 eqv	No significant change
ATP	0 eqv to 5 eqv	No significant change
GSH	0 eqv to 5 eqv	No significant change
Cysteine	0 eqv to 5 eqv	No significant change

Tabele S1. Summary of titration result of **EuL1** with various cations/anions.

Anions	**Titration range**	**Effect**
Cysteine	0 eqv to 10 eqv	No significant change
GSH	0 eqv to 10 eqv	No significant change
$NaHSO_3$	0 eqv to 10 eqv	No significant change
$NaSO_4$	0 eqv to 10 eqv	No significant change
$Na_2S_2O_3$	0 eqv to 10 eqv	No significant change
ATP	0 eqv to 10 eqv	No significant change
pyrophosphate	0 eqv to 10 eqv	No significant change
Na_2HPO_4	0 eqv to 10 eqv	No significant change
KI	0 eqv to 10 eqv	No significant change
KBr	0 eqv to 10 eqv	No significant change
Potassium acetate	0 eqv to 10 eqv	No significant change
Sodium citrate	0 eqv to 10 eqv	No significant change
Sodium asorbate	0 eqv to 10 eqv	No significant change

Tabele S2. Summary of titration result of **EuL1Cu** with various anions.