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Supporting Information

An efficient ruthenium(II) tris(bipyridyl)-based chemosensor for the specific detection of cysteine and its luminescence imaging in living zebrafish

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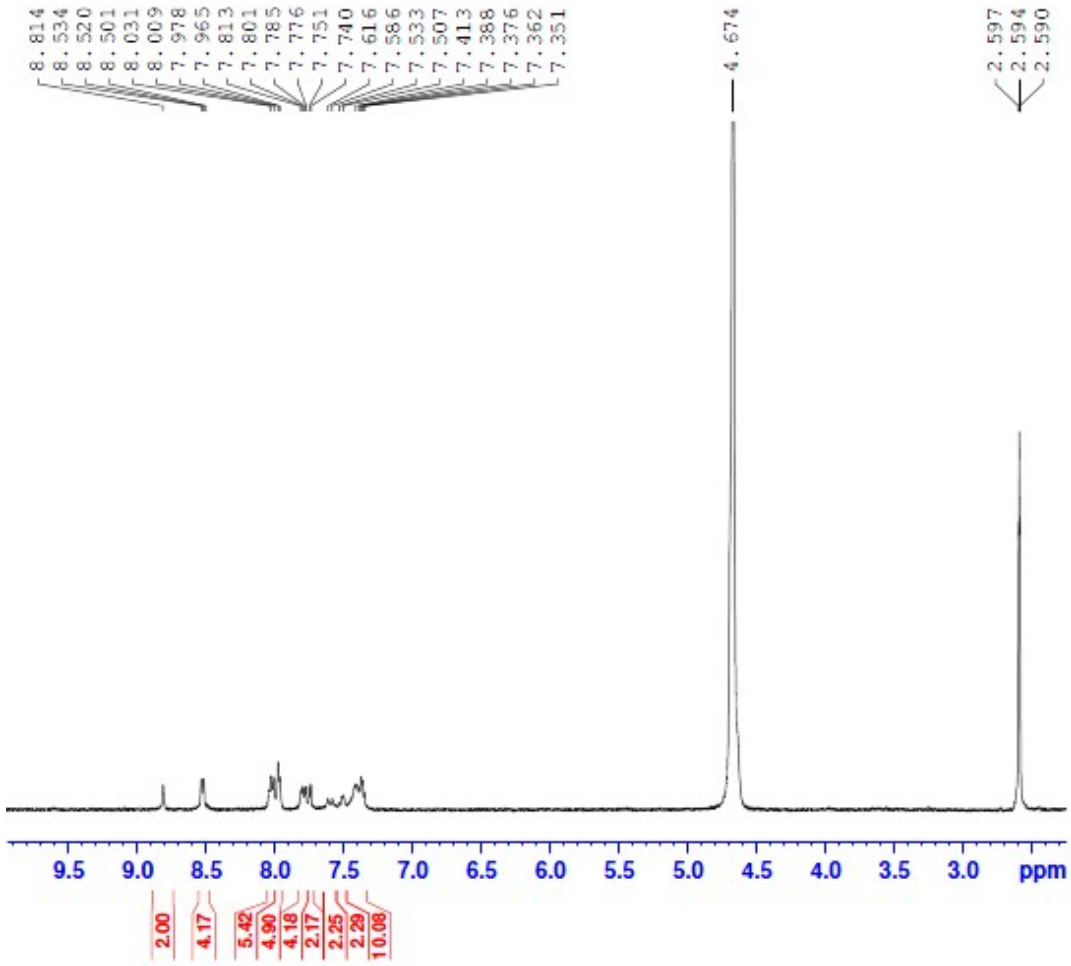


Fig. S1. ^{1}H-NMR spectrum of **Ru-E** in the solution of D_2O and d_6-DMSO (v/v=5:1).

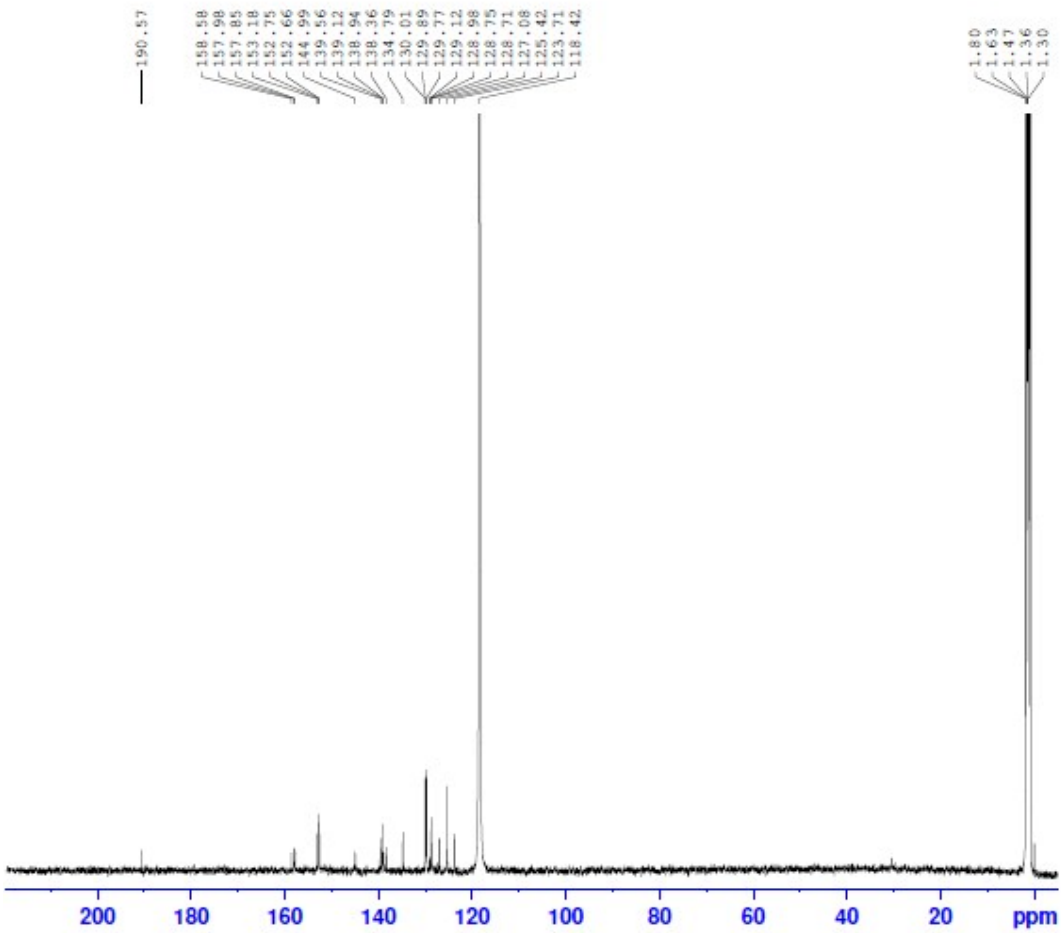


Fig. S2. ^{13}C-NMR spectrum of complex **Ru-E** in CD_3CN.

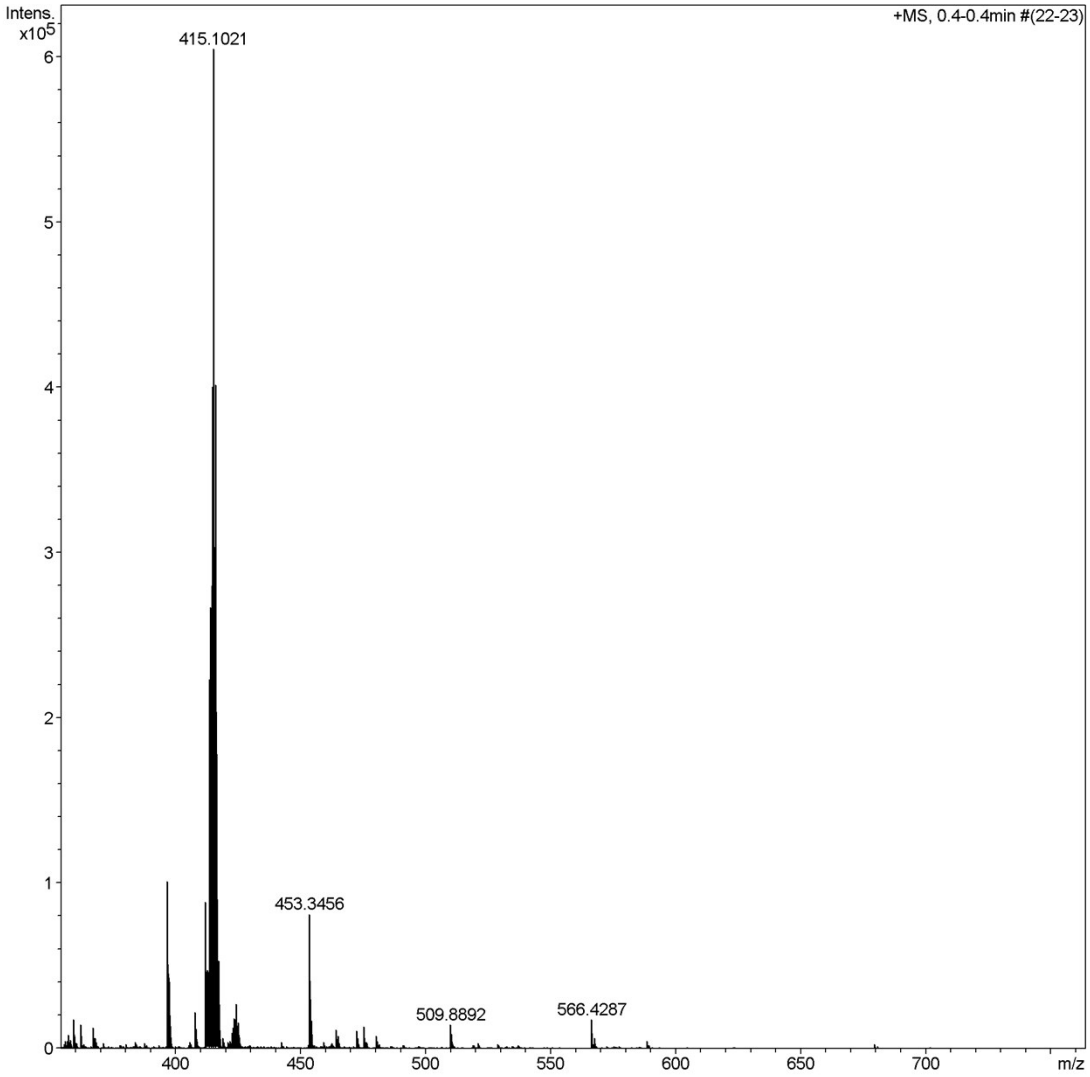


Fig. S3. TOF-Mass spectrum of complex **Ru-E** in H_2O. The peaks at m/z = 415.1021 corresponds to $[Ru\text{-}E]^{2+}$.

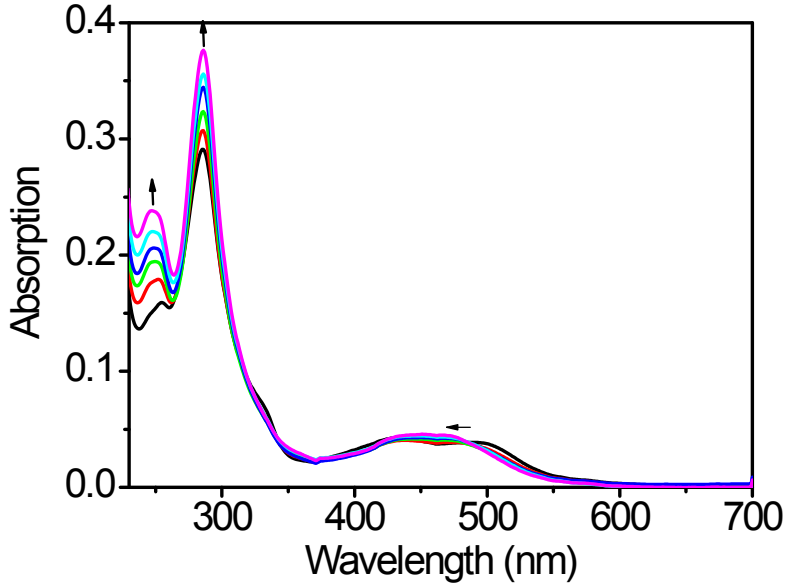


Fig. S4. The UV-Vis titration profiles for **Ru-E** (5 μM) in the presence of varying Cys amounts (0, 0.4, 0.8, 1.2, 1.6, 2 equiv.).

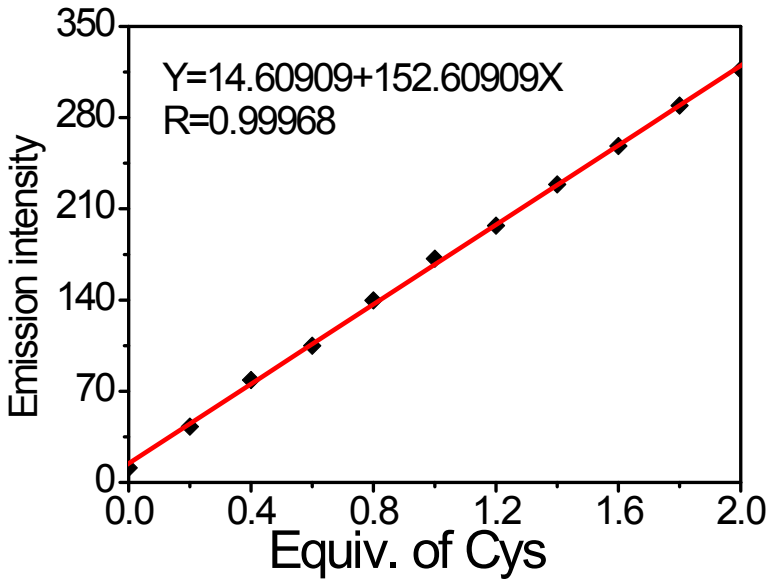


Fig. S5. The relationship between emission intensity at 620 nm Ru-E (10 μM) and Cys amount.

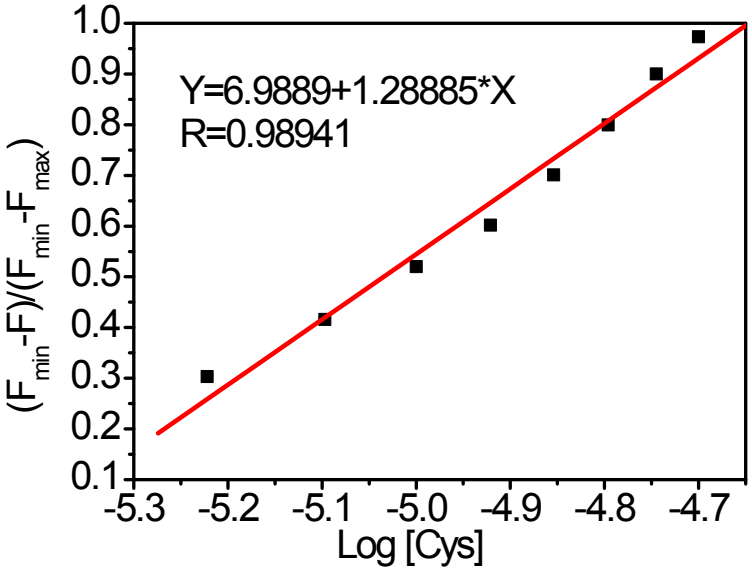


Fig. S6. Luminescence intensity of **Ru-E** (10 μM) in HEPES solutions (10 mM) at each concentration of Cys added, normalized between the minimum fluorescence intensity and the maximum fluorescence intensity. The linear fit was drawn by taking the seven points ([Cys] = 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 2.0 equiv.) of the linear region and the detection limit was determined to be 3.2×10^{-6} M[1-3].

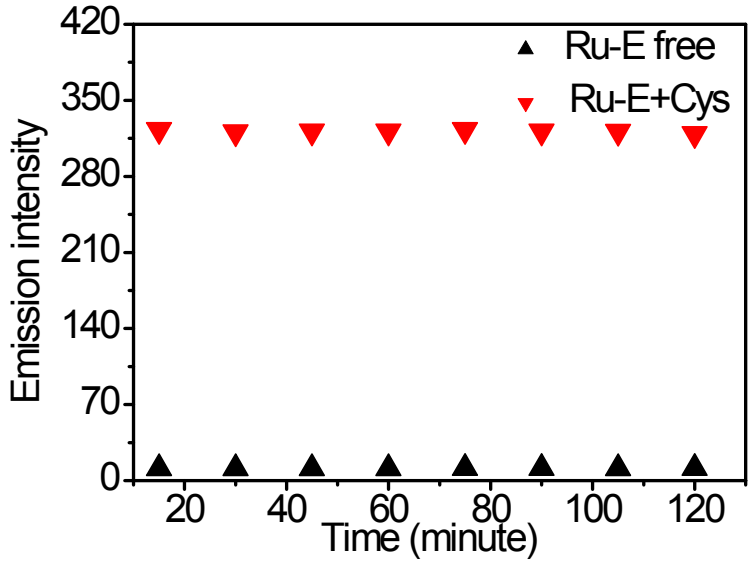


Fig. S7. The luminescence response of **Ru-E** (10 μM) in the absence or presence of Cys over two hours.

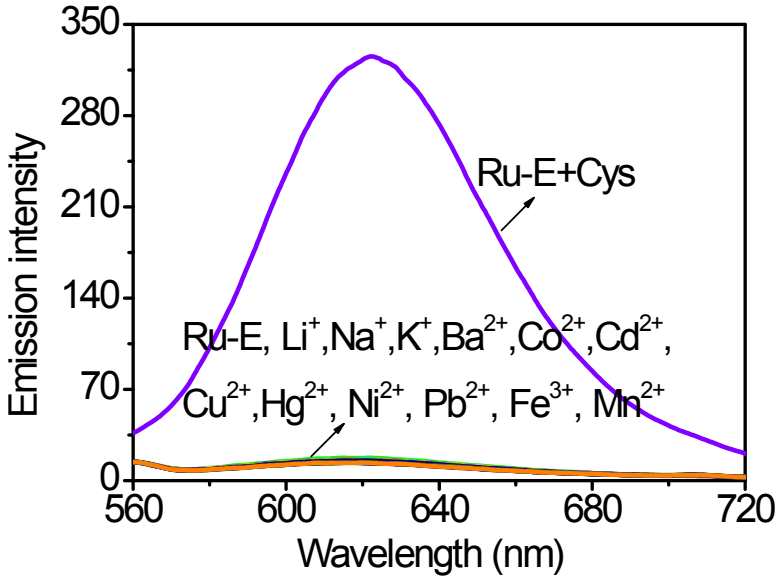


Fig. S8. Luminescence response of 10 μM **Ru-E** upon addition of Cys (50 μM) or excess of common cations (100 μM).

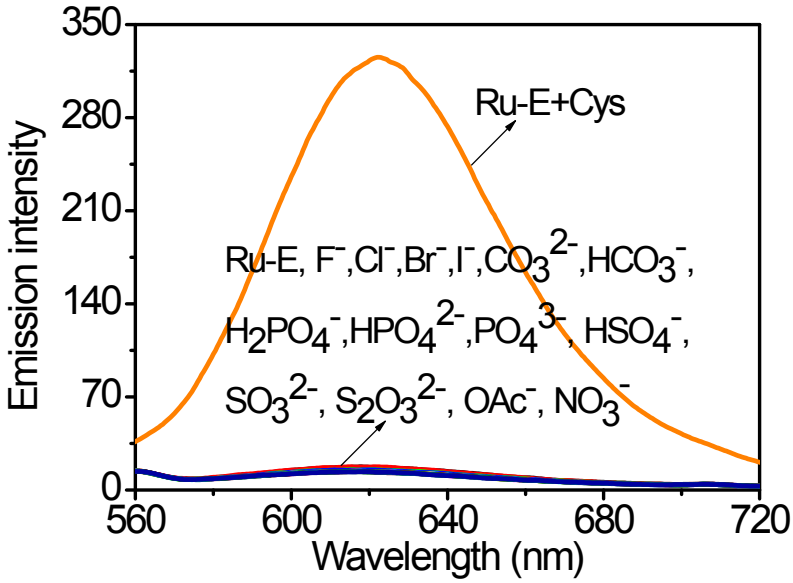


Fig. S9. Luminescence response of 10 μM complex **Ru-E** upon addition of Cys (50 μM) or excess of common anions (100 μM).

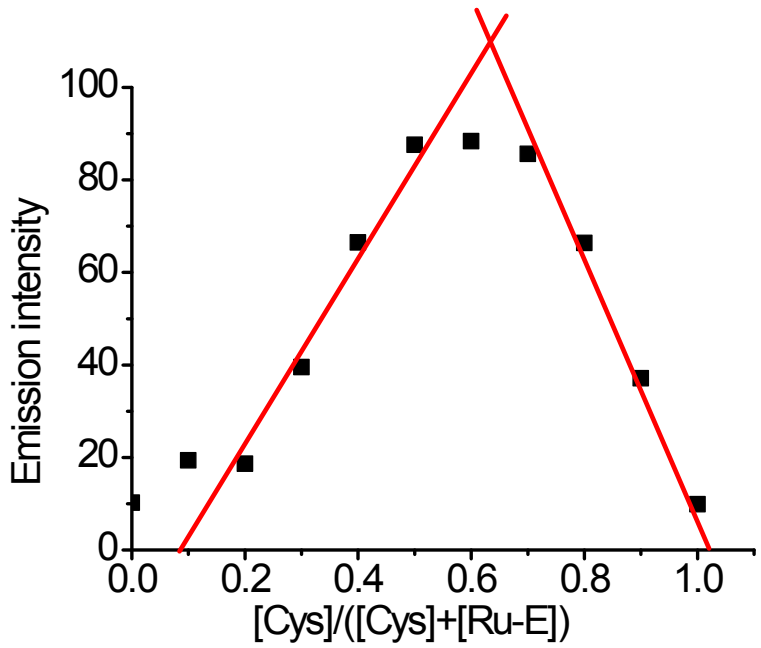


Fig. S10. Job plot for determining the stoichiometry of **Ru-E** and Cys in HEPES solution. The total concentration of **Ru-E** and Cys is 10 μM.

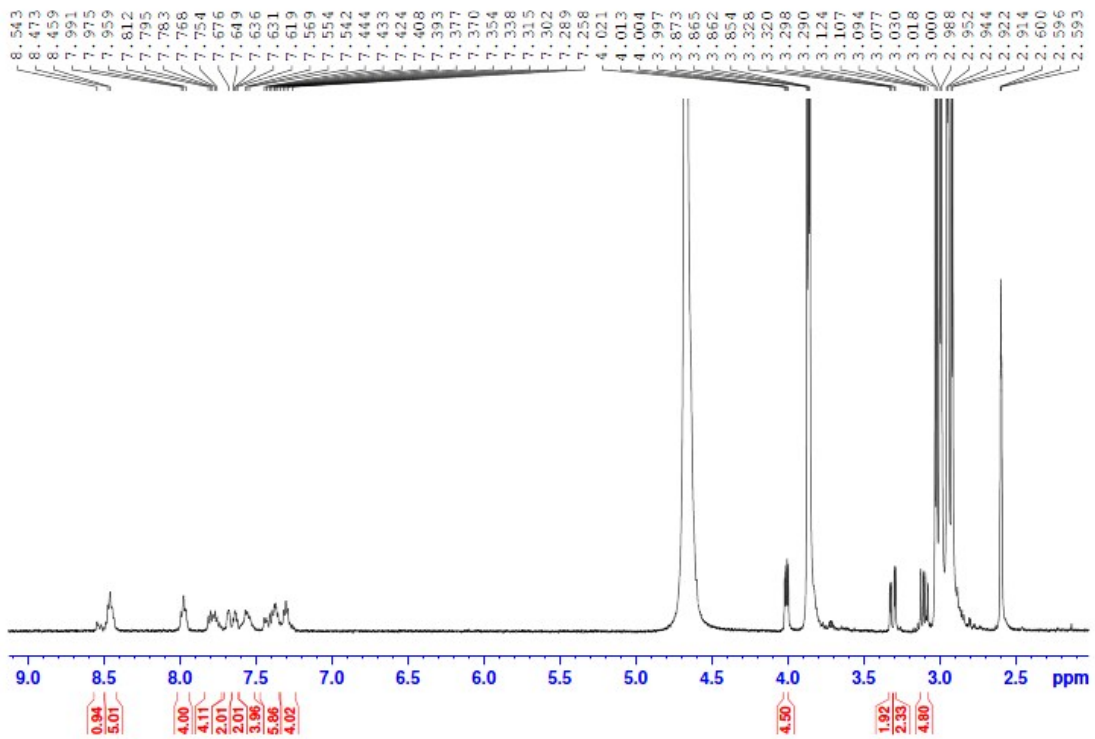


Fig.S11. ^{1}H-NMR spectrum of complex **Ru-E** after addition of excess of Cys in the solution of D_2O and d_6-DMSO (v/v=5:1).

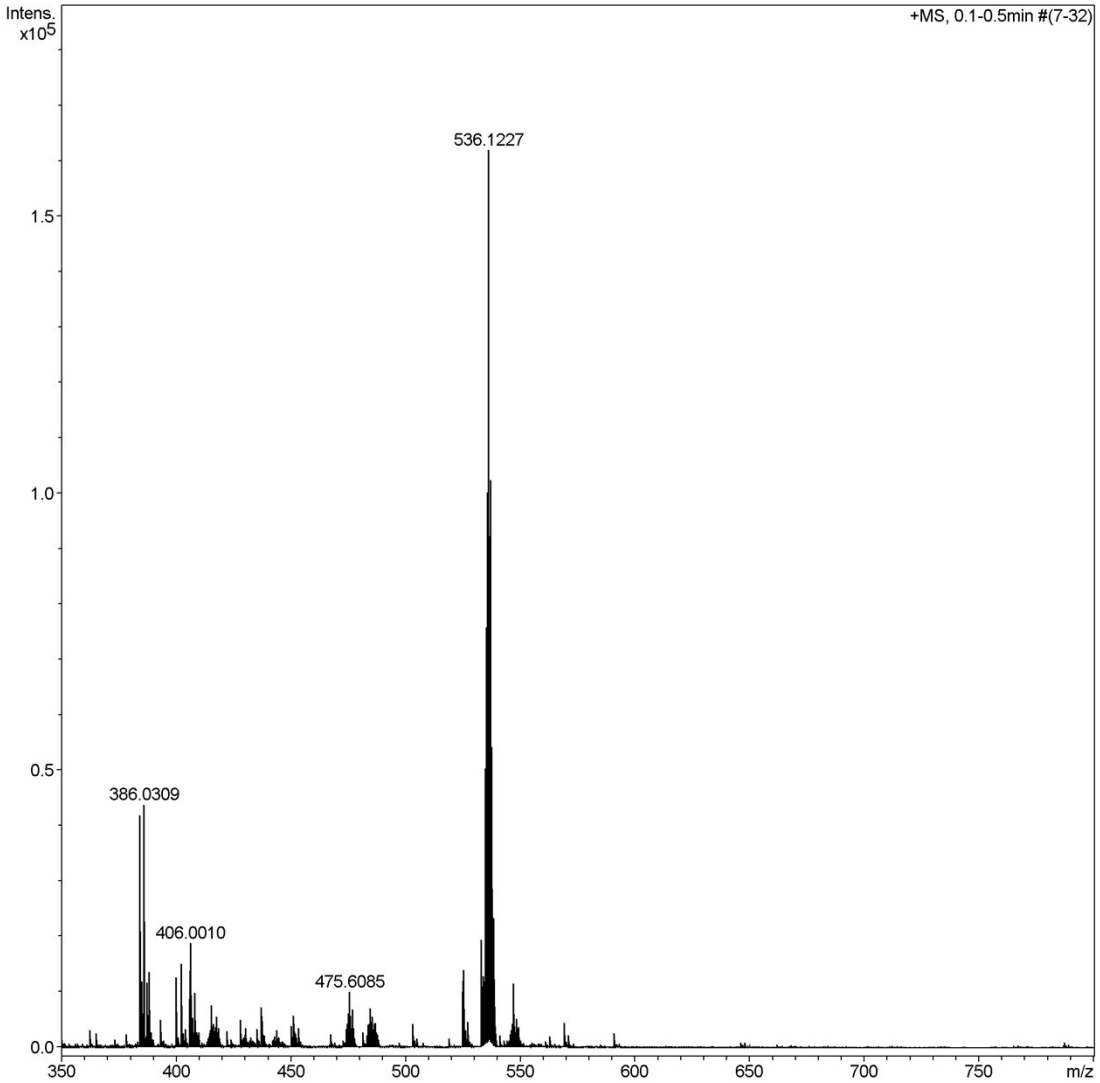


Fig. S12. TOF-Mass spectrum of complex **Ru-E** after addition of Cys in H_2O. The peaks at m/z = 536.1227 corresponds to the addition product $[Ru\text{-}Cys]^{2+}$.

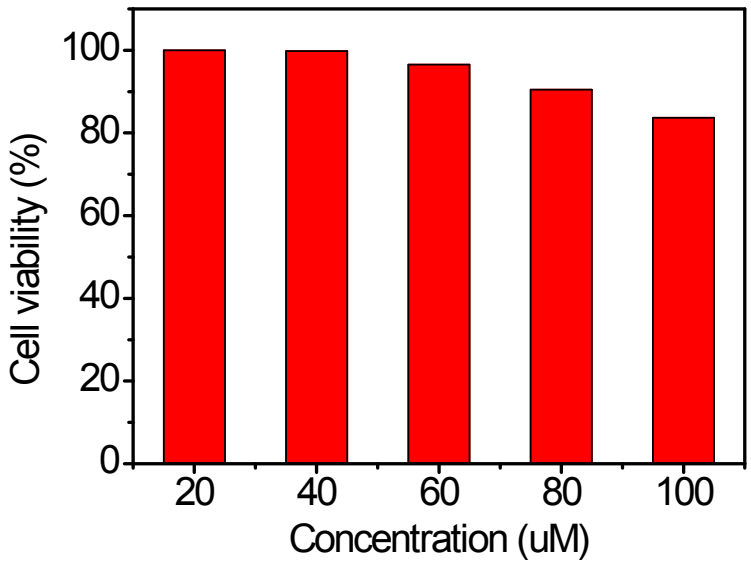
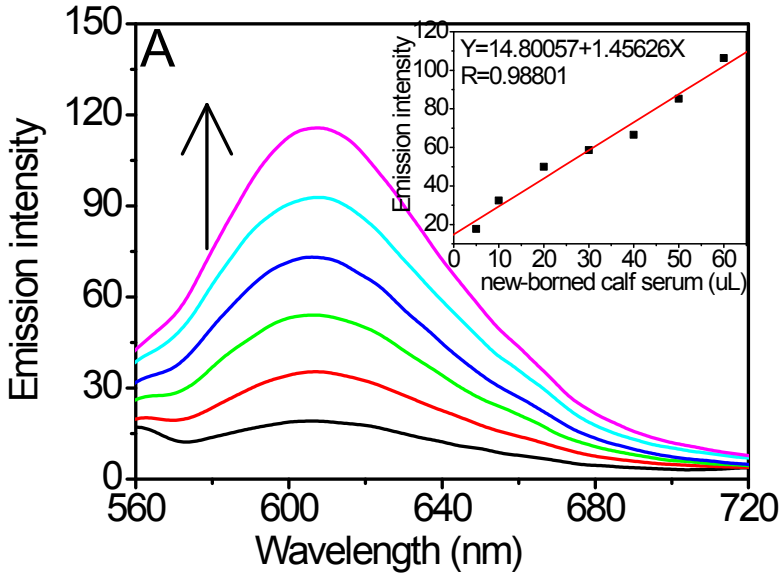


Fig. S13. Cell viability treated with different concentrations of **Ru-E** (20, 40, 60, 80 and 100 μM) in BMSC cells.



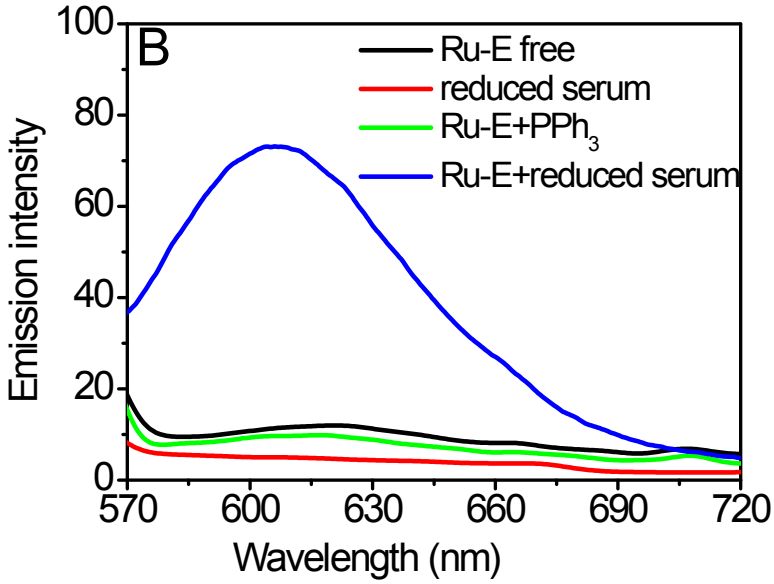


Fig. S14. A: Emission spectra of probe **Ru-E** (10 μM) upon addition of different amounts (5, 10, 20, 30, 40, 50 or 60 μL) of reduced newborn-calf serum solution to the HEPES buffer solution (10 mM, pH 7.4). The inset shows a linear relationship between the emission intensity and the volume of reduced newborn-calf serum added. B: Emission spectra of probe **Ru-E** (10 μM) only (black), the reduced serum solution (40 μL) only (red), **Ru-E** (10 μM) with the addition of $P(Ph)_3$ (green), and **Ru-E** (10 μM) with the addition of reduced serum solution (40 μL) (blue) in HEPES buffer solution (10 mM, pH 7.4).

References

[1] M. Shortreed, R. Kopelman, M. Kuhn, B. Hoyland, *Anal. Chem.*, 1996, **68**, 1414.

[2] W. Lin, L. Yuan, L. Long, C. Guo, J. Feng, *Adv. Funct. Mater*. **2008**, *18*, 2366.

[3] A. Caballero, R. Martınez, V. Lloveras, I. Ratera, J. Vidal-Gancedo, K. Wurst, A. Tarraga, P. Molina, and J. Veciana, *J. Am. Chem. Soc*. **2005**, *127*, 15666.