Electronic Supplementary Material (ESI) for RSC Advances.


## *Supporting Information*

# Cascade reaction based rapid and ratiometric detection of $H_2S/S^{2-}$ over bio-thiols with live cell-imaging: demasking of ESIPT approach

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**1. Calculation of the detection limit:**

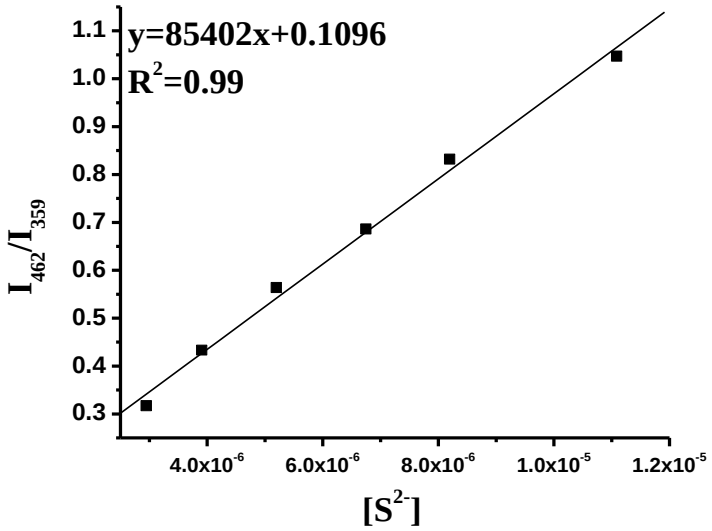



**Figure S1**: Fl. Intensity ratio ($I_{462\ nm}$/ $I_{359\ nm}$) Vs. Conc. of $S^{2-}$ plot.

The detection limit DL of **FBBP** for $S^{2-}$ was determined from the following equation. [S1]

DL = K* Sb1/S

Where K = 2 or 3 (we take 2 in this case);

Sb1 is the standard deviation and S is the slope of the calibration curve.

From the graph we get slope = 85402, and Sb1 value is 0.021958.

Thus using the formula we get the Detection Limit = 0.51 μM i.e. FBBP can detect $S^{2-}$ in this minimum level.

**2. Calculation of rate constant:**

From Fl. Intensity ratio ($I_{462}/I_{359}$) vs. time (sec.) plot using first order rate equation (Figure S2), we get rate constant K = slope × 2.303 = 0.0086 × 2.303 = $1.9 \times 10^{-2}$ $sec^{-1}$

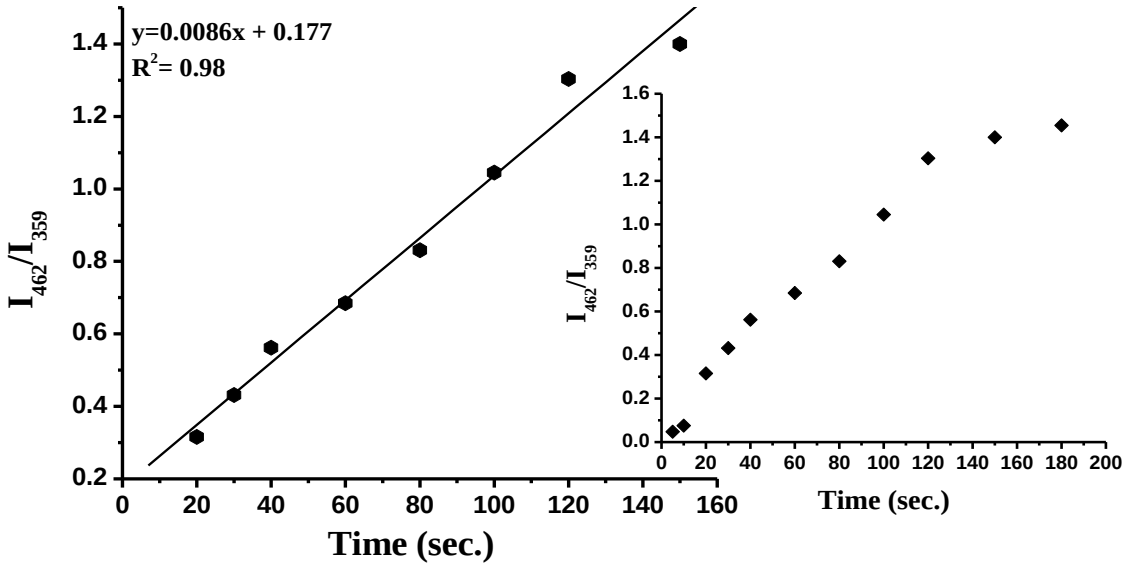



**Figure S2**: The time vs. Fl. Intensity ratio ($I_{462\ nm}$/ $I_{359\ nm}$) plot between 20 to 160 secend and the full plot is in inset.

**3. Fluorescence responses of FBBP + various species + $S^{2-}$:**

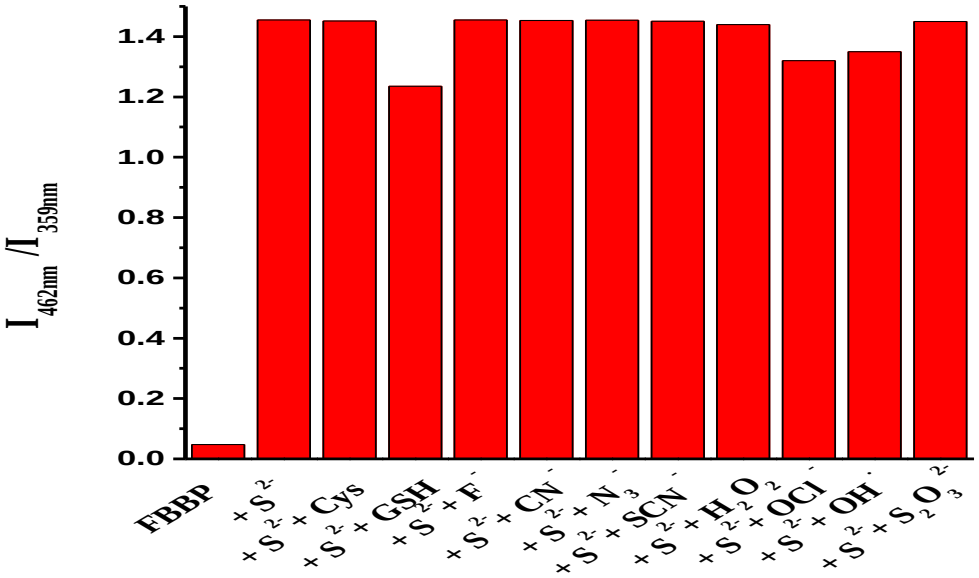
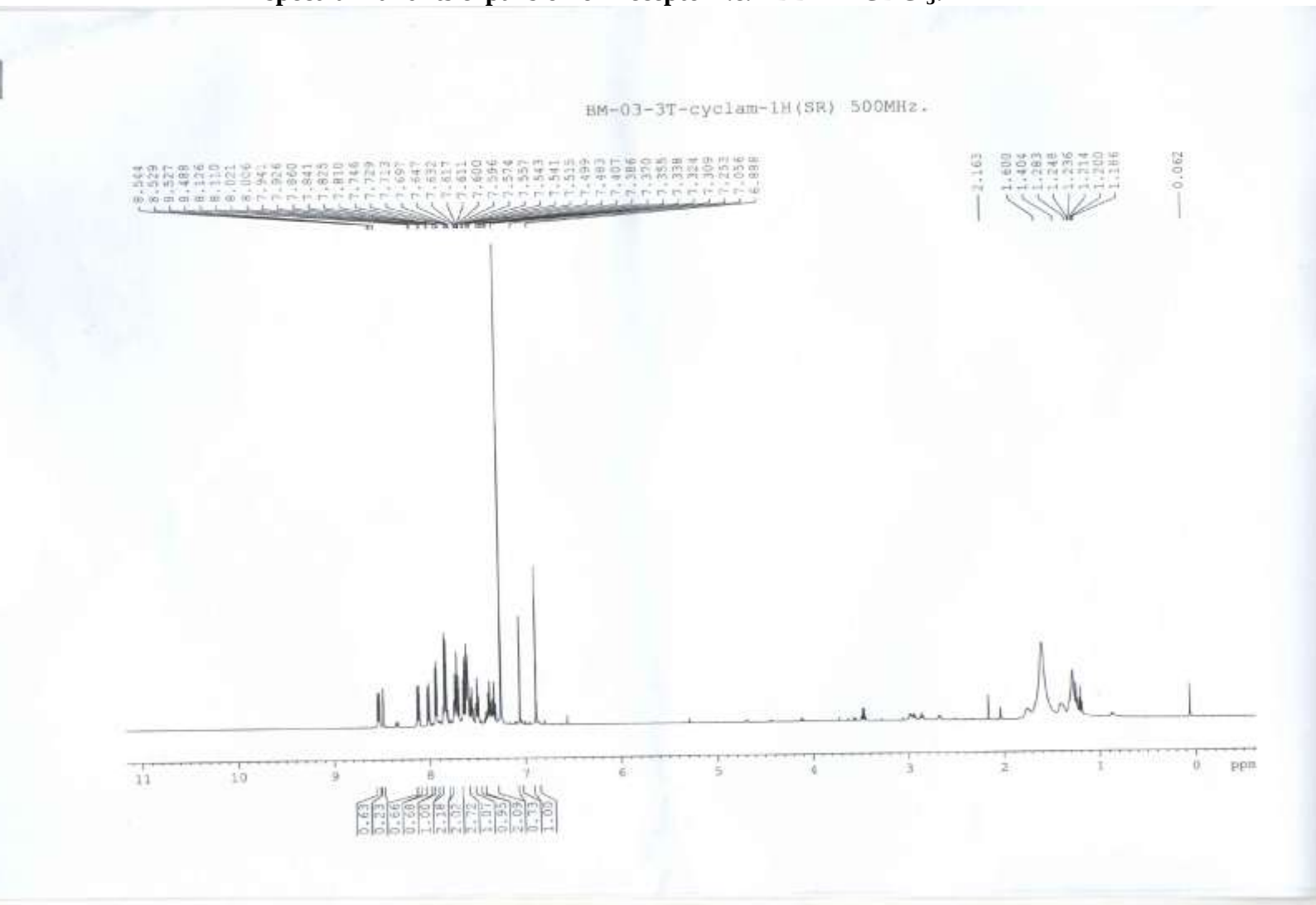
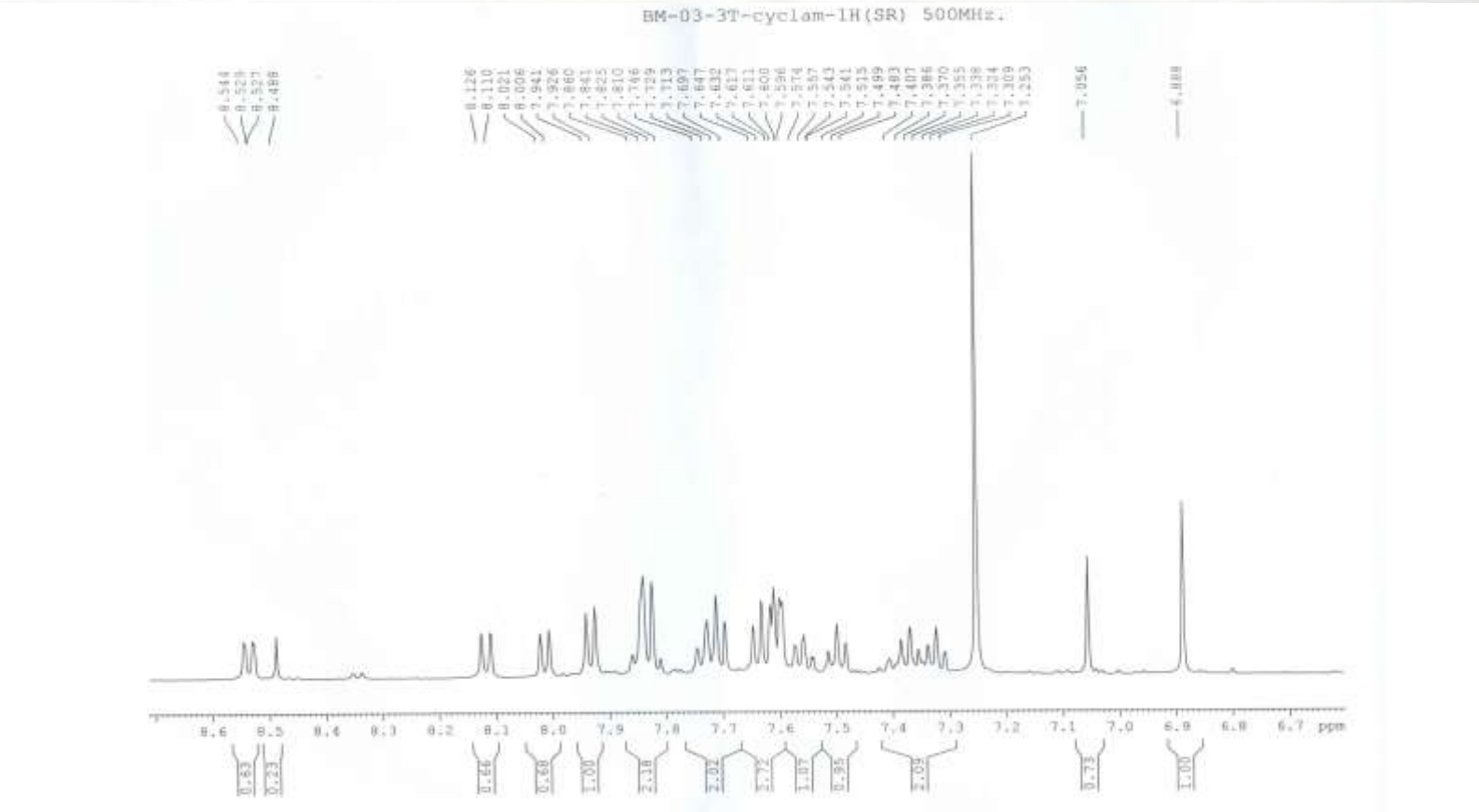



**Figure S3**: Ratiometric fluorescence responses ($I_{462nm}/I_{359nm}$) of FBBP (c = 1.0 x $10^{-5}$ M) to $S^{2-}$ (1 equiv) containing 10 equiv of various metal species.

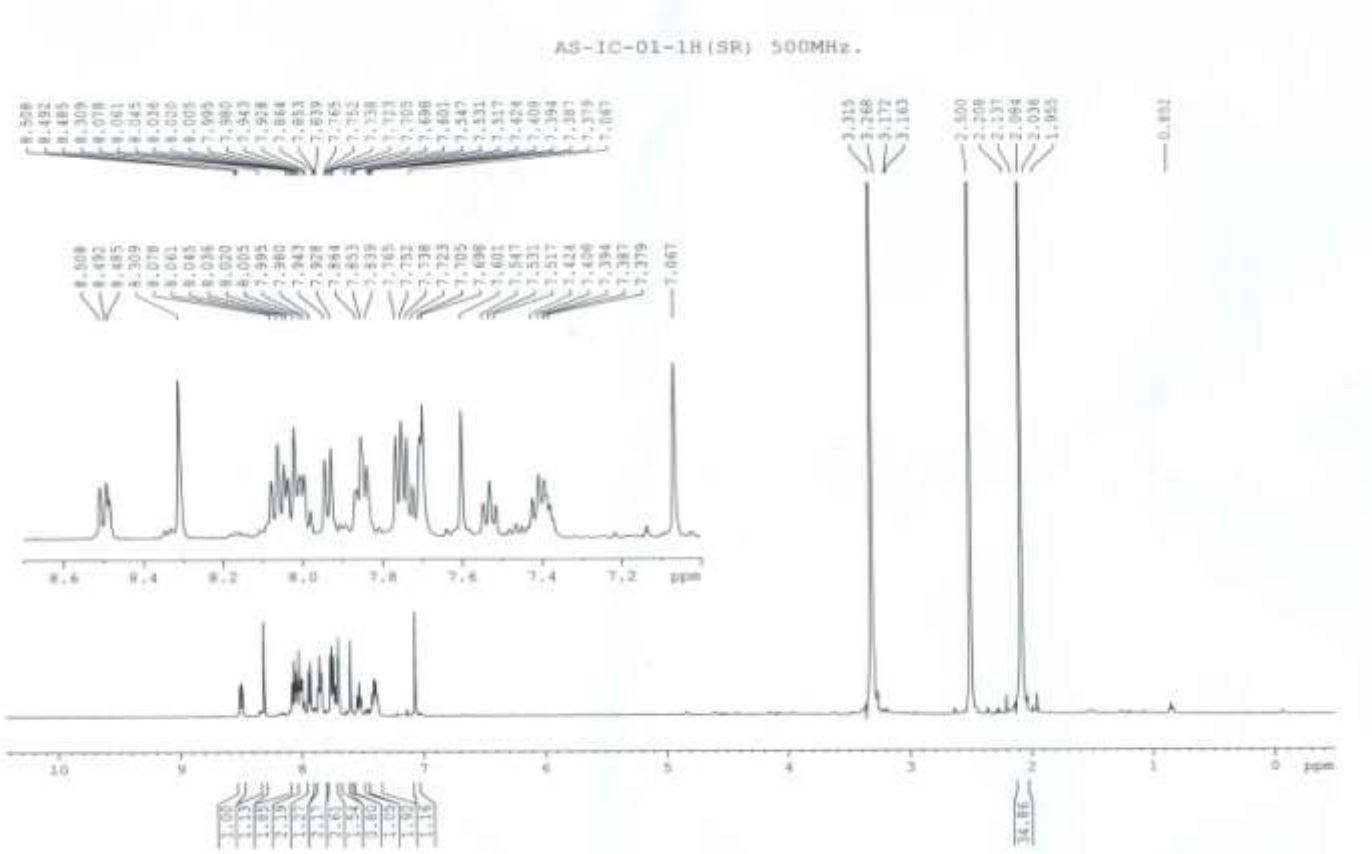
**4. $^{1}$H NMR, $^{13}$C NMR and ESI MS spectra:**

**$^{1}$H NMR spectrum and its expansion of Receptor i.e. FBBP in $CDCl_3$:**

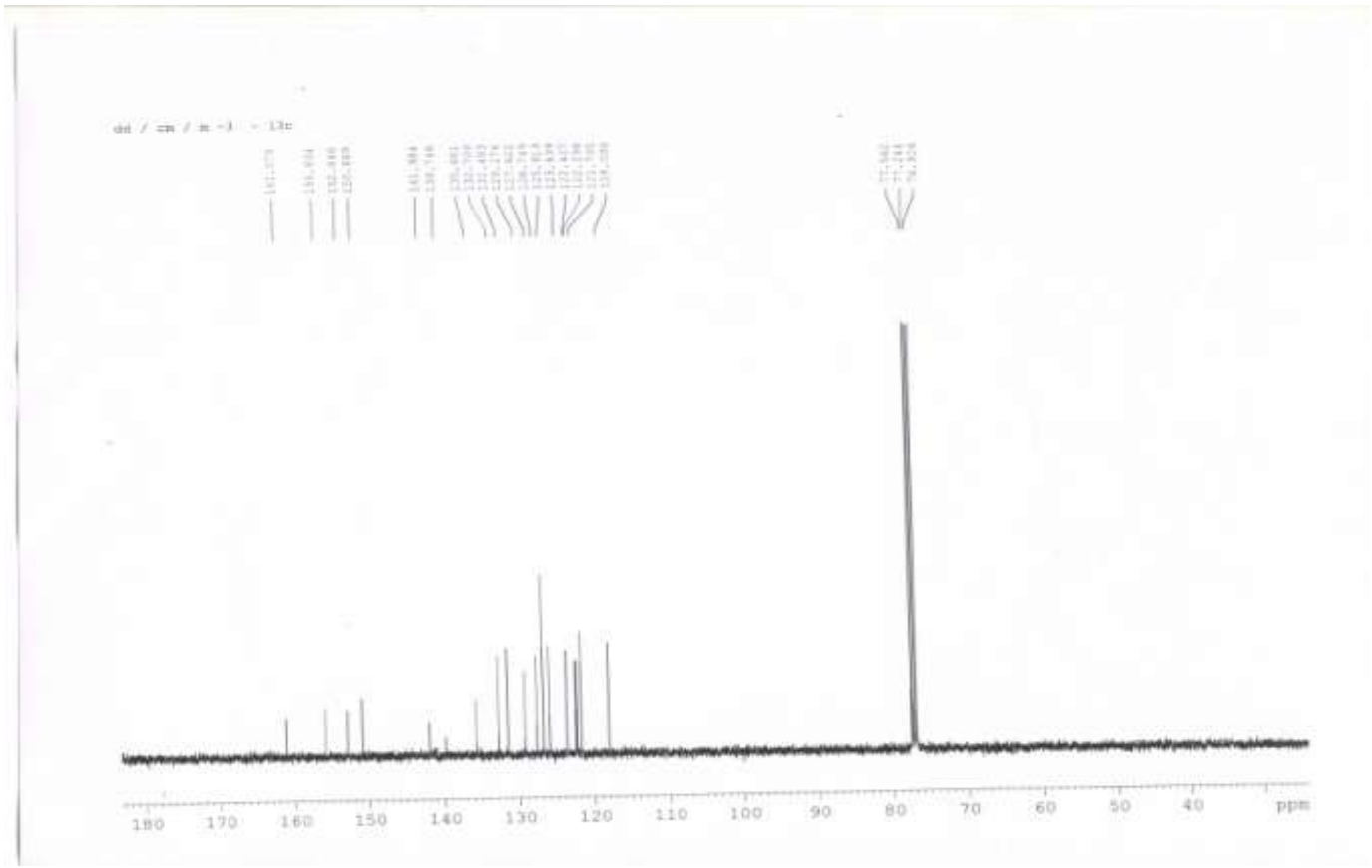


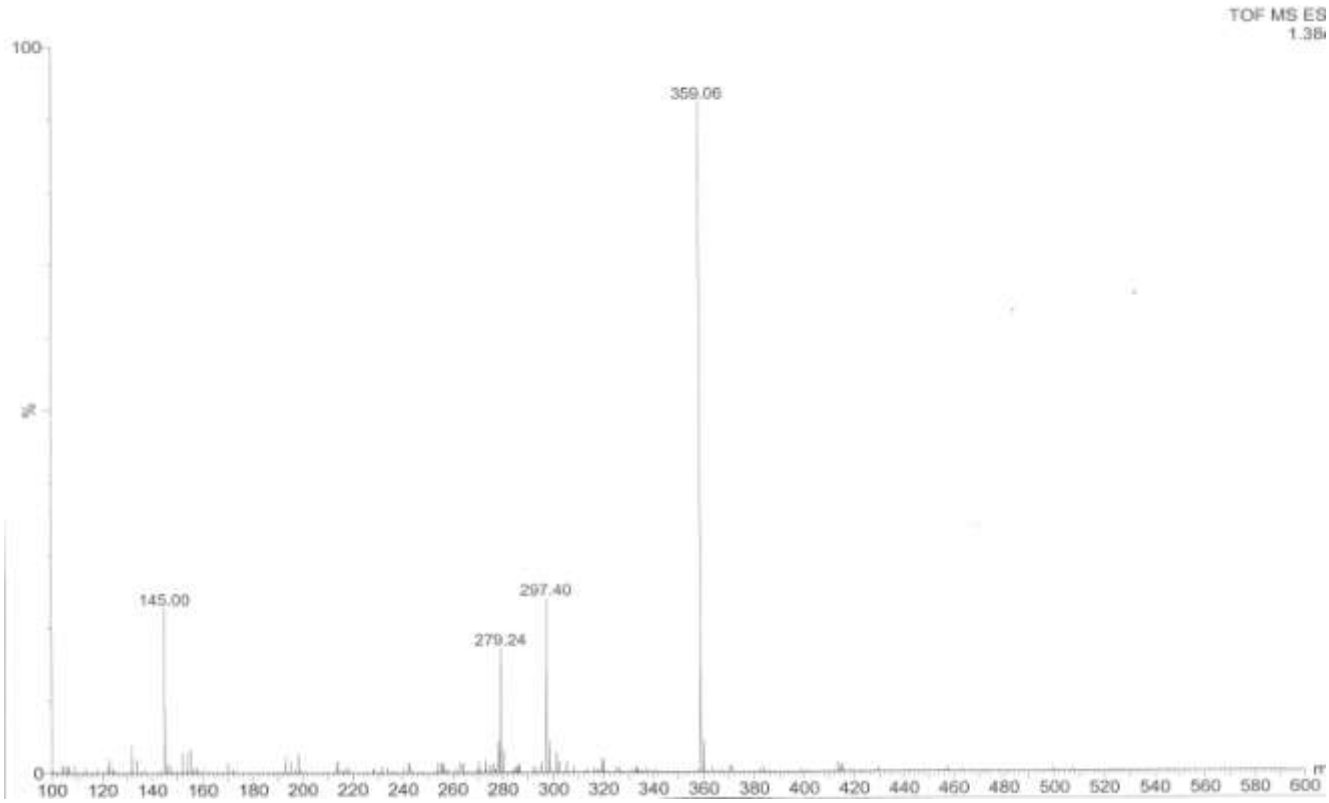
**$^{1}$H NMR spectrum and its expansion of Receptor i.e. FBBP in $d_6$-DMSO:**



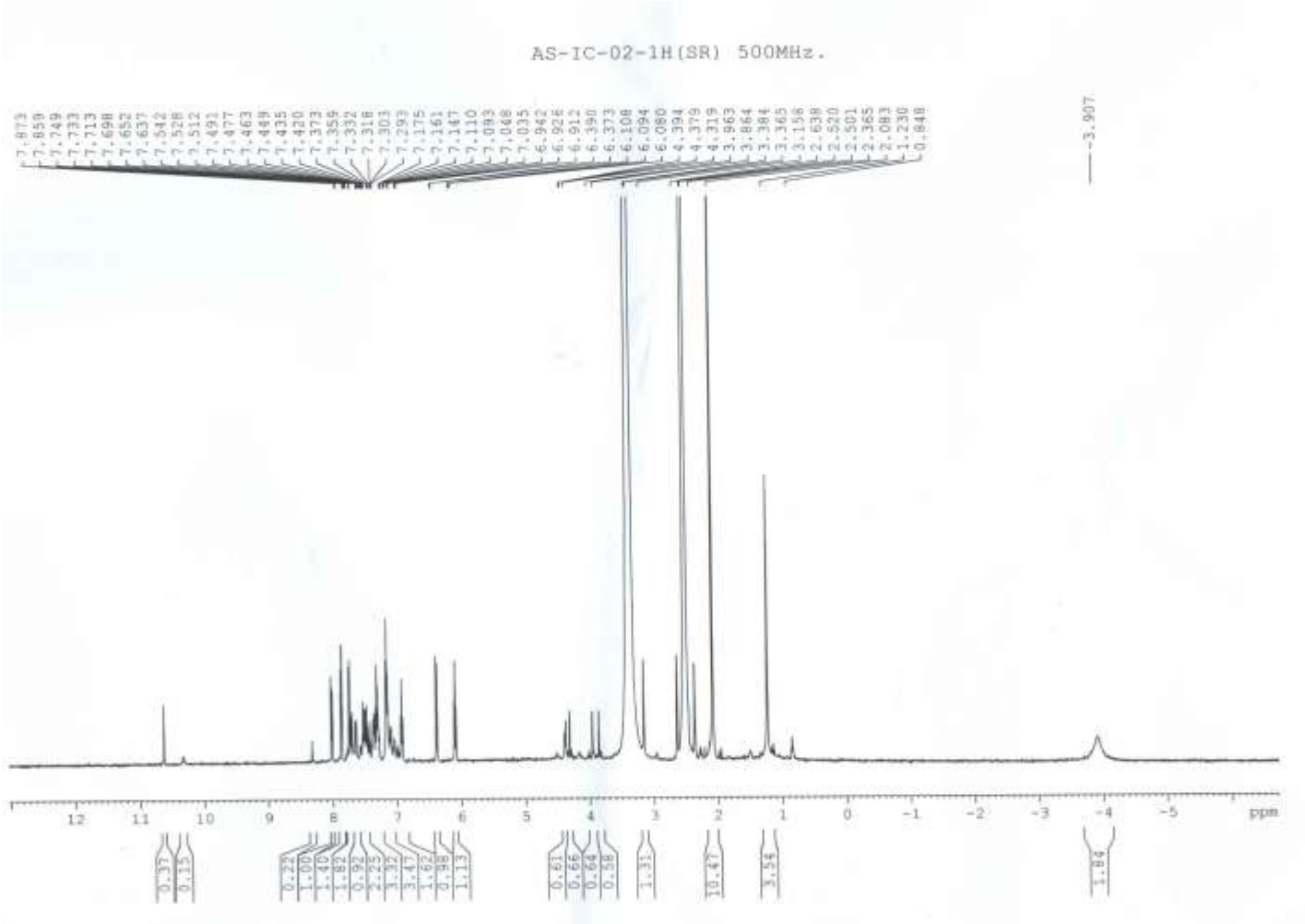

**$^{13}$C NMR spectrum of Receptor i.e. FBBP:**

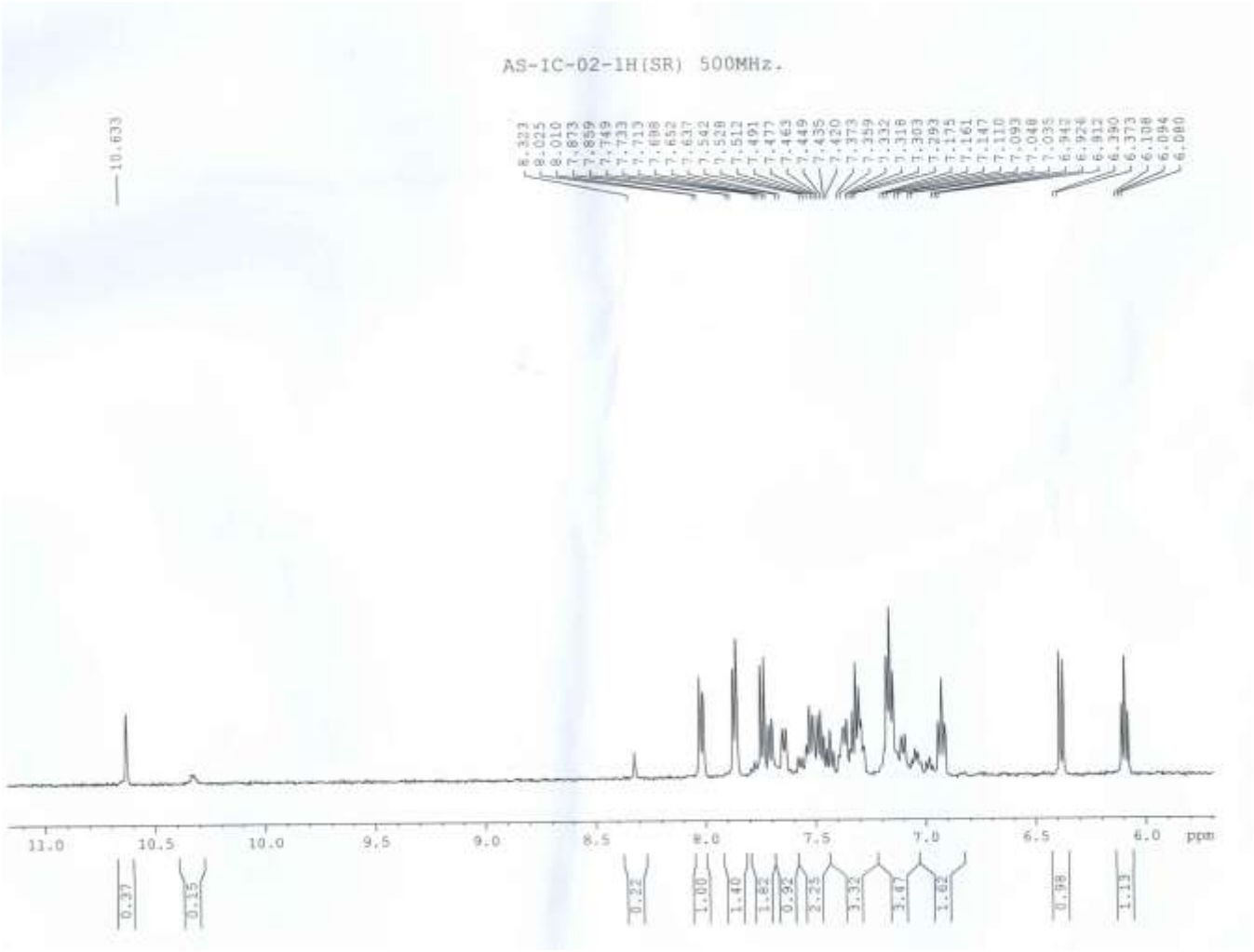


**ESI MS Mass Spectrum of FBBP:**

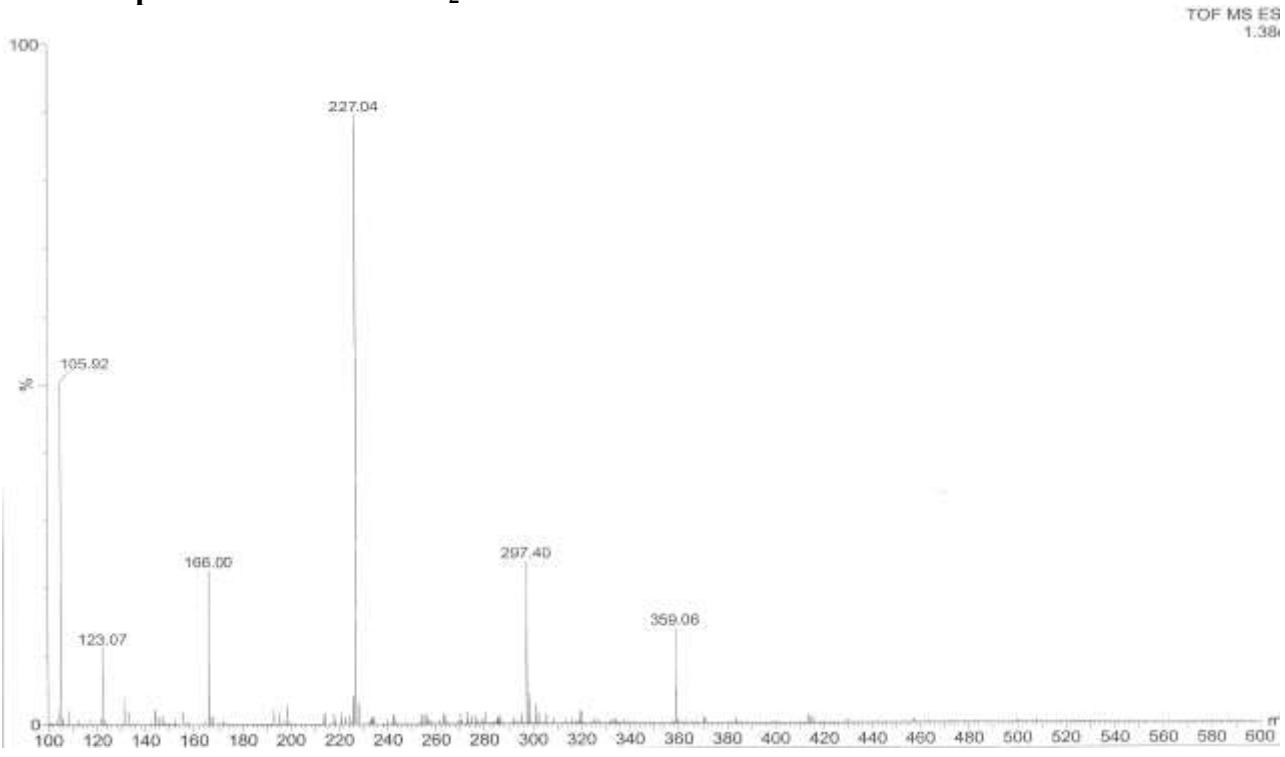



**$^1$H NMR spectrum and its expansion of FBBP + $Na_2S$ in $d_6$-DMSO:**

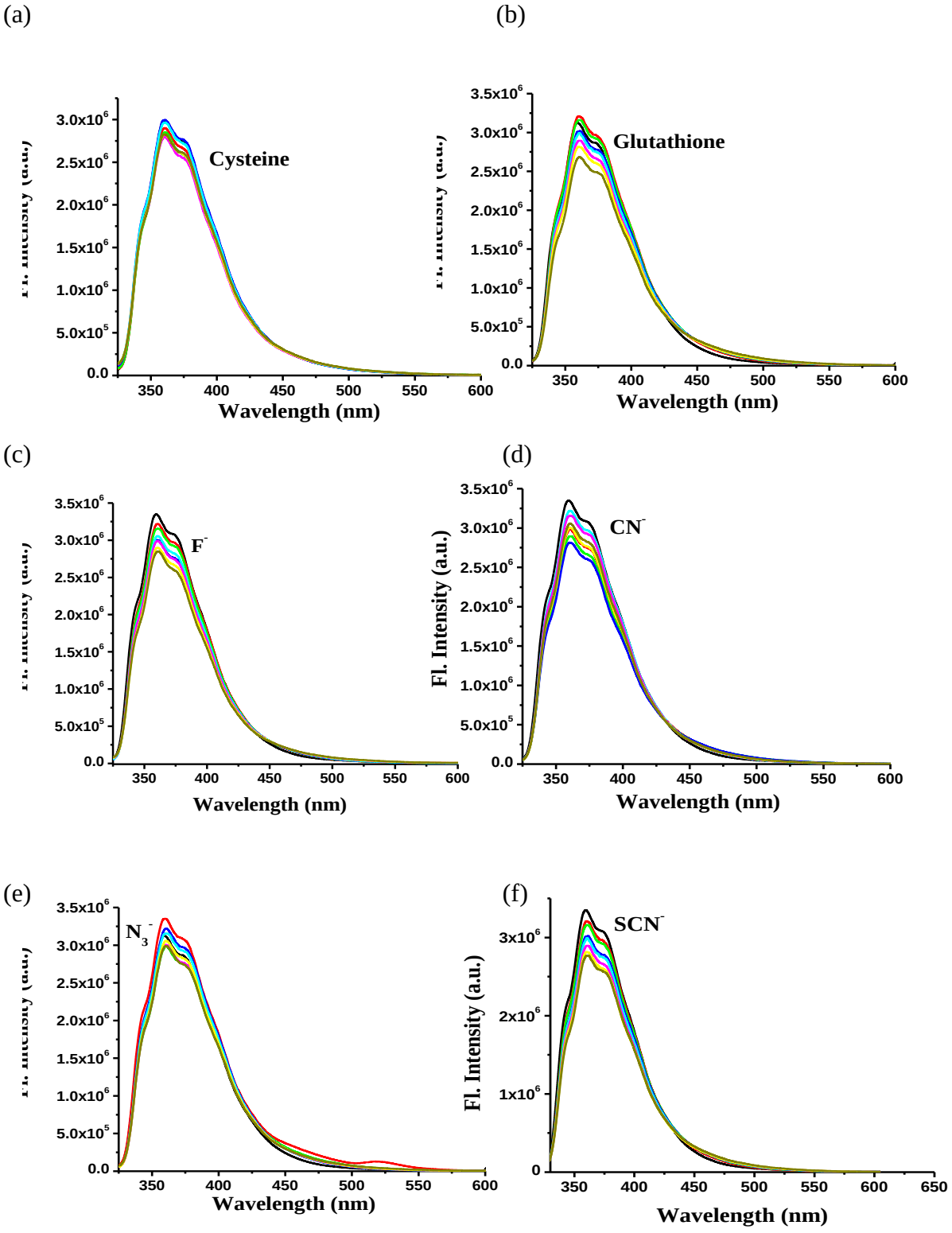




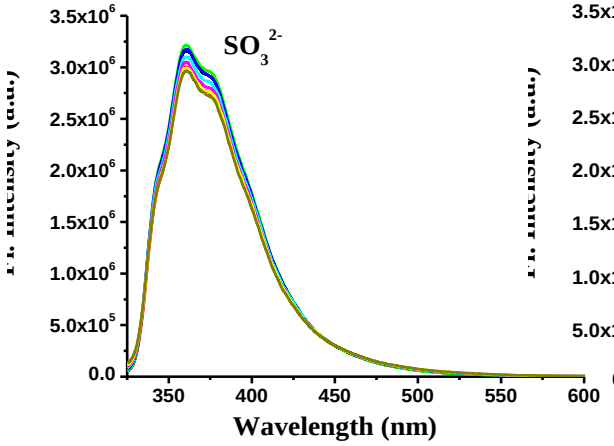

**ESI MS Spectrum of FBBP + $Na_2S$:**



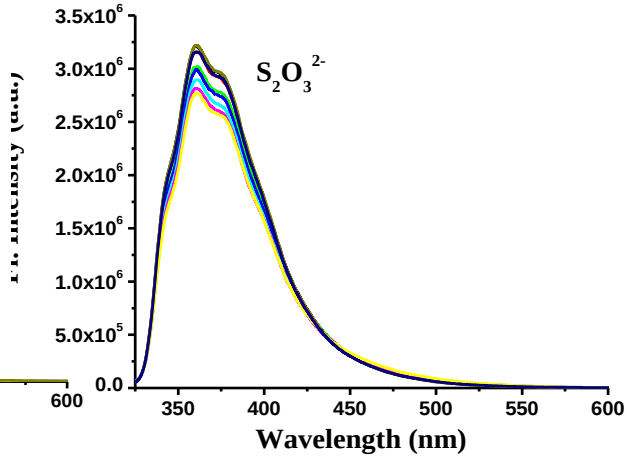
**5. Fluorescence emission spectra of FBBP with different species such as Cysteine, Glutathione, $F^-$, $CN^-$, $N_3^-$, $SCN^-$, $SO_3^{2-}$, $S_2O_3^{2-}$, $H_2O_2$, $HSO_3^-$, Hydroxyl radical, Hypochlorite, Ascorbic Acid, $NH^{4+}$, $Co^{2+}$, $Al^{3+}$, $Hg^{2+}$ and $Cu^{2+}$ in $CH_3CN$ : $H_2O$ (2:8, v/v) (The solutions of anions and oxidants were prepared from Cysteine, Glutathione, TBAF, KCN, $NaN_3$, KSCN, $KSO_3$, $K_2S_2O_3$, $NaHSO_3$, $H_2O_2$, Femton's reagent, NaOCl, Ascorbic Acid, $NH_4Cl$, $CoCl_2$, $Al(NO_3)_3$, $9H_2O$, $HgCl_2$ and $CuCl_2$ respectively in $H_2O$).**



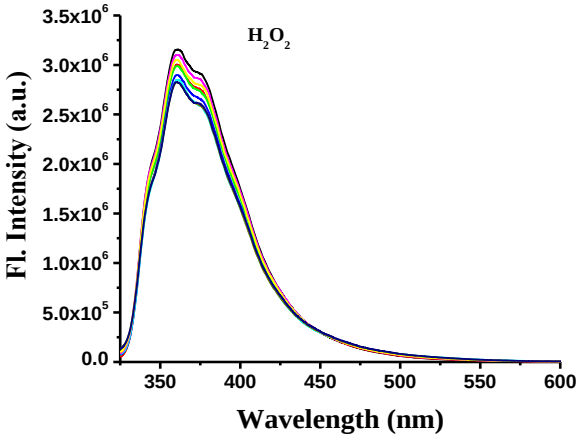
(g)


SO3 2-
Fl. Intensity (a.u.)
Wavelength (nm)

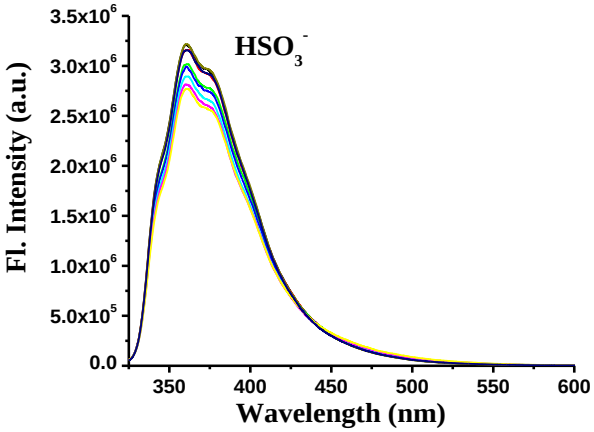
(h)


S2O3 2-
Fl. Intensity (a.u.)
Wavelength (nm)

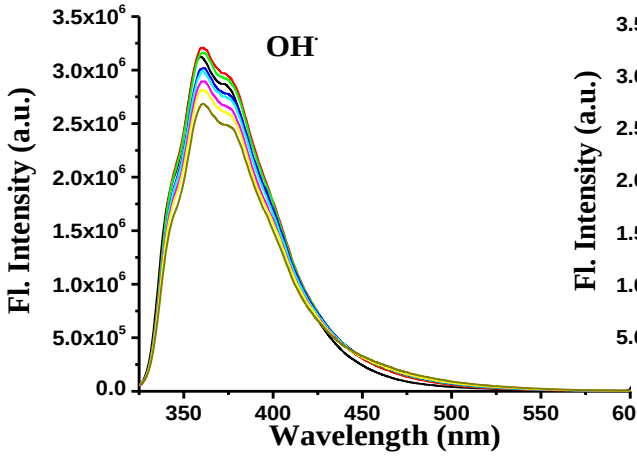
(i)


H2O2
Fl. Intensity (a.u.)
Wavelength (nm)

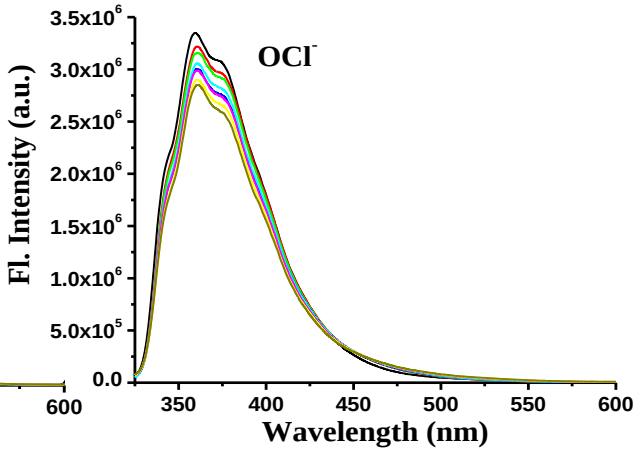
(j)


HSO3 -
Fl. Intensity (a.u.)
Wavelength (nm)

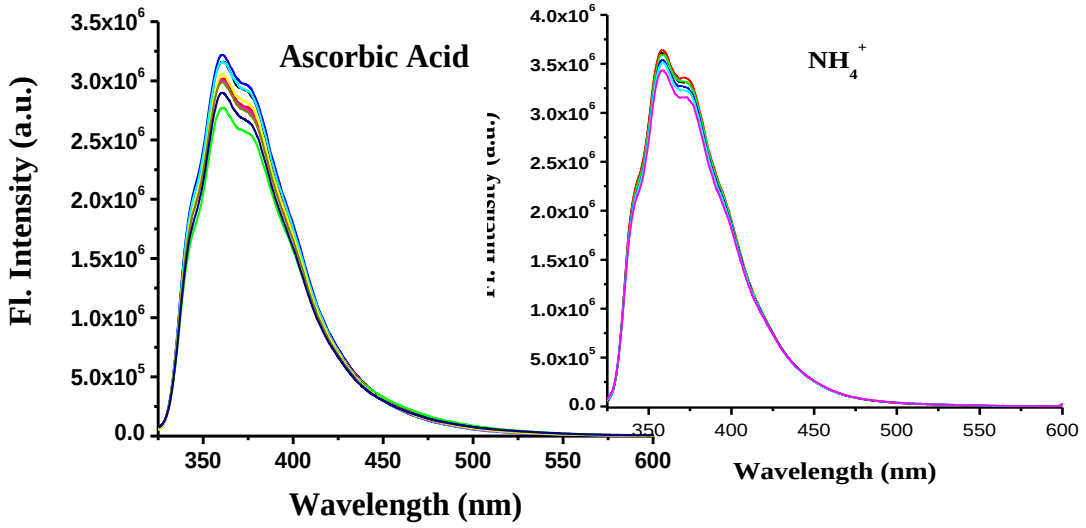
(k)


OH-
Fl. Intensity (a.u.)
Wavelength (nm)

(l)


OCl-
Fl. Intensity (a.u.)
Wavelength (nm)

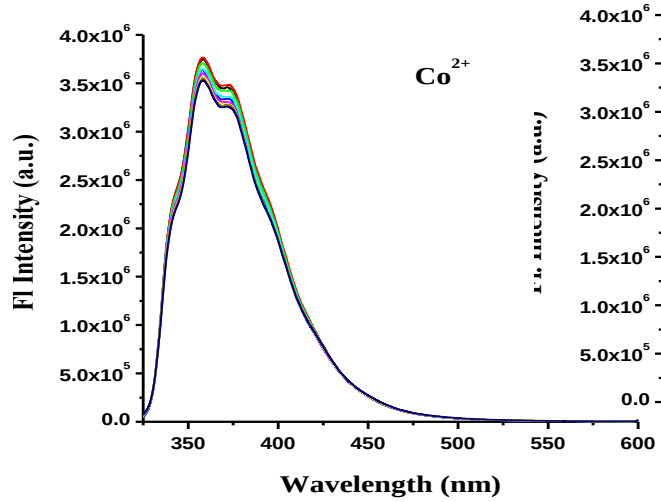
(m)


Ascorbic Acid
Fl. Intensity (a.u.)
Wavelength (nm)

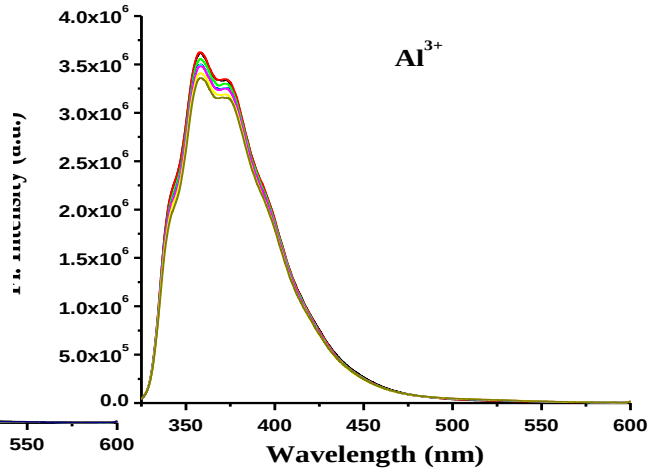
(n)


NH4+
Wavelength (nm)

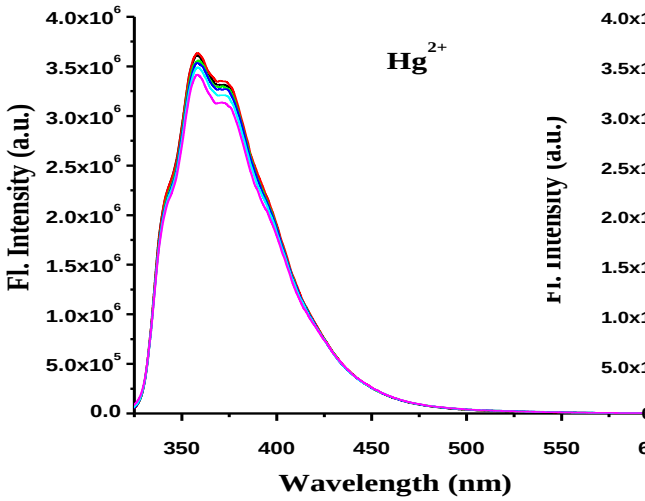
(o)


Co2+
Fl Intensity (a.u.)
Wavelength (nm)

(p)


Al3+
Wavelength (nm)

(q)


Hg2+
Fl. Intensity (a.u.)
Wavelength (nm)

(r)

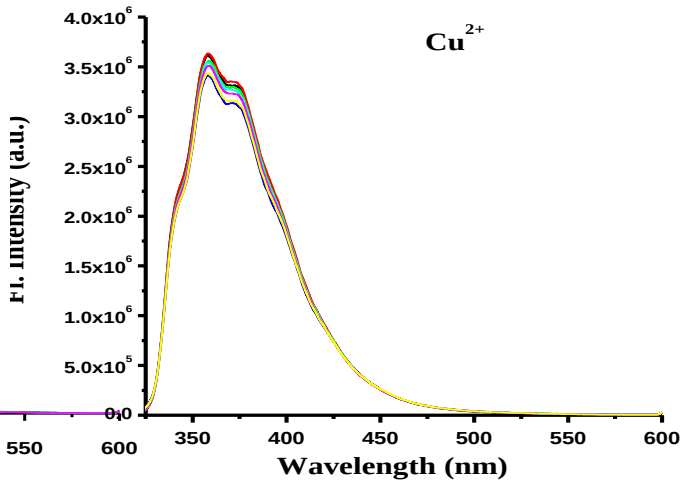

Cu2+
Wavelength (nm)

**Figure S4-S22:** Fluorescence emission spectra of FBBP with different species such as Cysteine, Glutathione, $F^-$, $CN^-$, $N_3^-$, $SCN^-$, $SO_3^{2-}$, $S_2O_3^{2-}$, $H_2O_2$, $HSO_3^-$, Hydroxyl radical, Hypochlorite, Ascorbic Acid, $NH^{4+}$, $Co^{2+}$, $Al^{3+}$, $Hg^{2+}$ and $Cu^{2+}$ in $CH_3CN$ : $H_2O$ (2:8, v/v) respectively.

**6. Fluorescence emission spectra of FBBP with $Na_2S$ (excitation at 405 nm):**

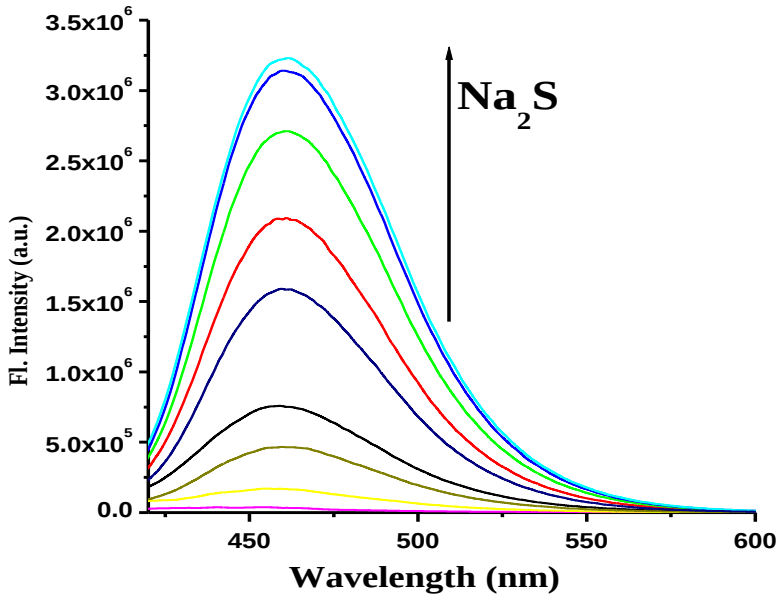



**Figure S23:** Fluorescence emission spectra of FBBP (c = 1.0 x $10^{-5}$ M) with $Na_2S$ (c = 1.0 x $10^{-5}$ M) at pH 7.5 in $CH_3CN$: $H_2O$ (2:8, v/v) (excitation at 405 nm).

## 7. MTT assay of the probe FBBP:

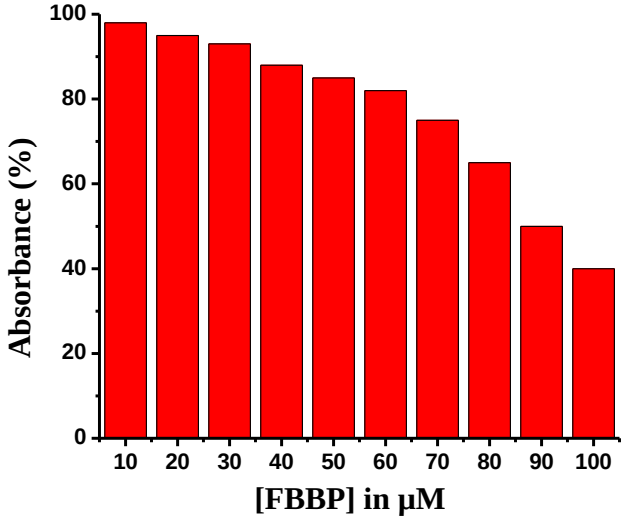



**Figure S24:** MTT assay with different concentration of probe (FBBP) after 24h.

## 8. References:

[S1] M. Zhu, M. Yuan, X. Liu, J. Xu, J. Lv, C. Huang, H. Liu, Y. Li, S. Wang, D. Zhu, *Org. Lett.* 2008**, 10**, 1481-1484.