Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Fast and ratiometric " Naked eye" detection of hydrazine both solid and vapour phase sensing

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1. Bar Diagram of PBF towards different amine containing compound in UV-vis and fluorescence titration methods:

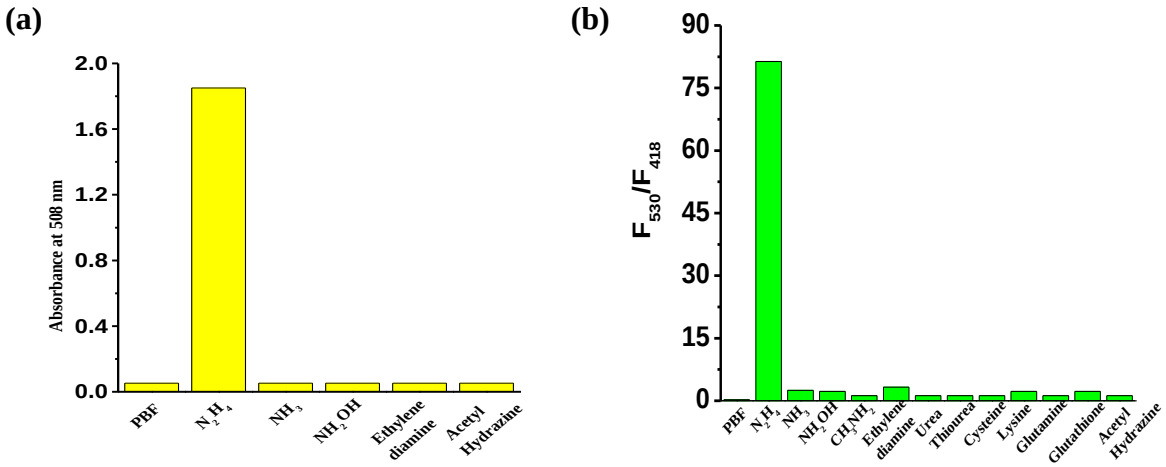


Figure S1: (a) Relative absorbance of the PBF in presence of other amine containing compounds (b) Bar chart illustrating fluorescence response of free ligand and two equivalent of other amine containing compounds in CH_3CN-H_2O (6:4, v/v, 25 ° C) .

2. Fluorescence intensity vs conc. of hydrazine plot:

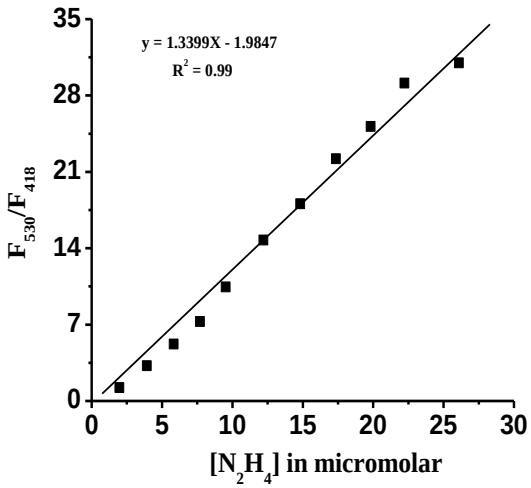
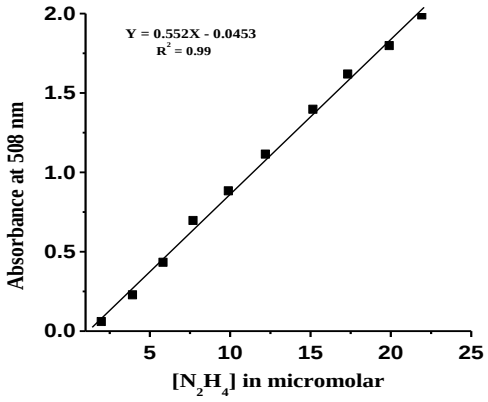


Figure S2: Fluorescence intensity ratio changes (F_{530}/F_{418}) of PBF upon gradual addition of hydrazine.

3. Calculation of the detection limit:



The detection limit DL of **PBF** for hydrazine was determined from the following equation[1]:

DL = K* Sb1/S

Where K = 2 or 3 (we take 2 in this case); Sb1 is the standard deviation of the blank solution; S is the slope of the calibration curve.

From the graph we get slope = 0.552, and Sb1 value is 0.113009.

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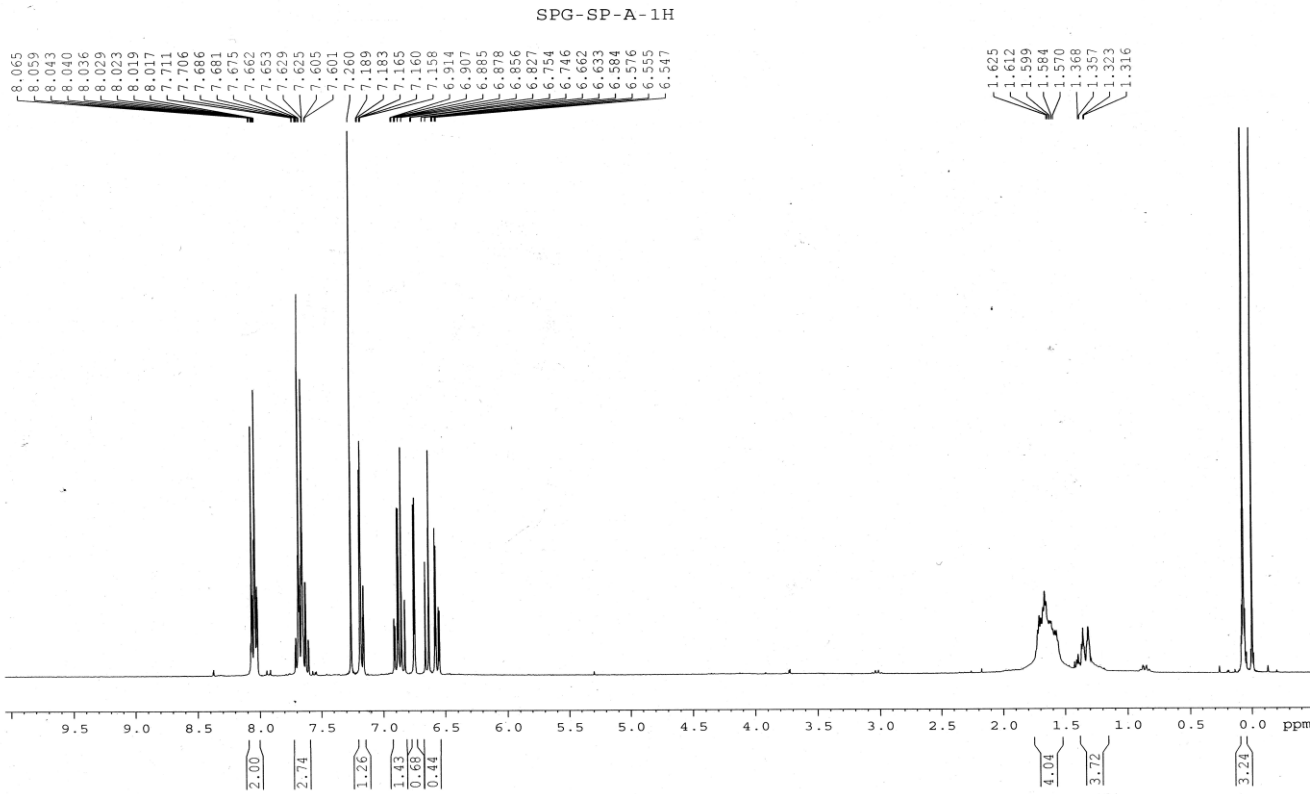
Thus using the formula we get the Detection Limit = 0.41 µM i.e. PBF can detect hydrazine in this minimum concentration.

4. Calculation of rate constant:

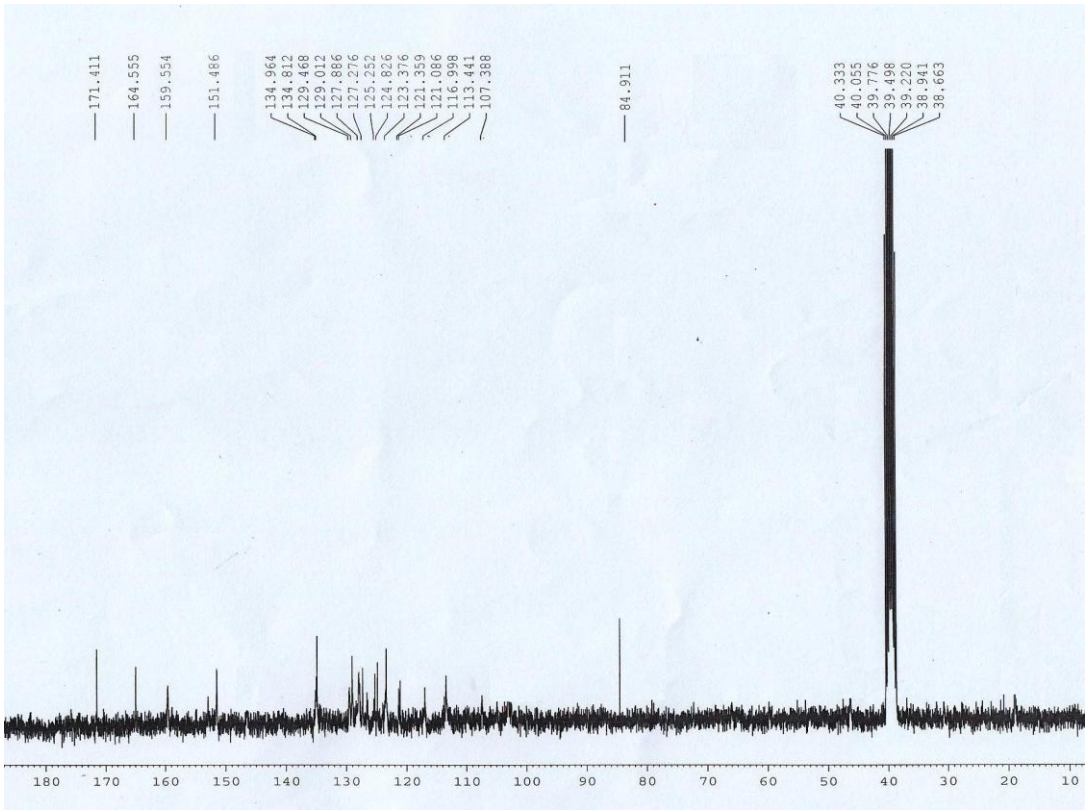
From the time vs. Fl. Intensity vs. time (sec.) plot at fixed wavelength (530nm) using first order rate equation (Figure 5), we get rate constant K = slope X 2.303 = 0.067 X 2.303 = 15.43 X 10^{-2} sec^{-1}

5. ^{1}H NMR, ^{13}C NMR and HR MS spectra of PBF and corresponding hydrazone product:

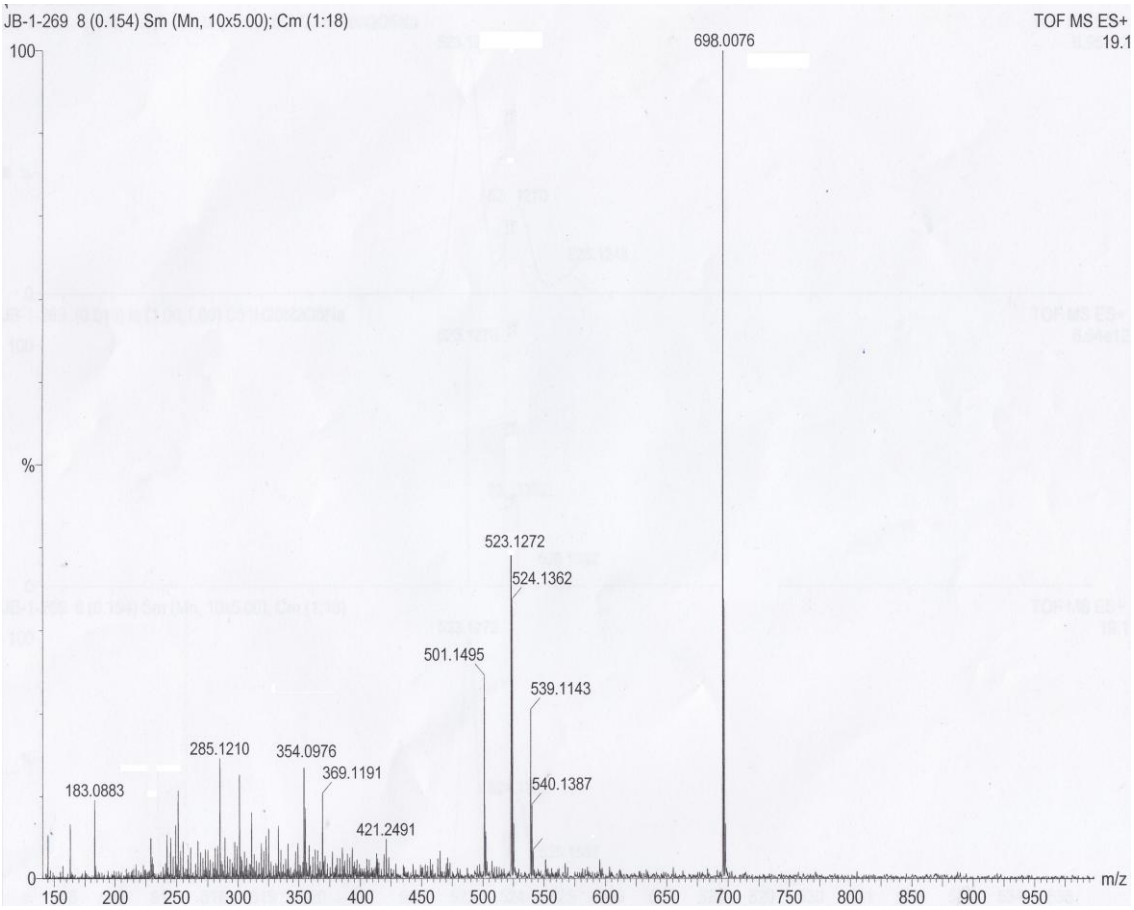
^{1}H NMR spectrum of Receptor i.e. PBF:



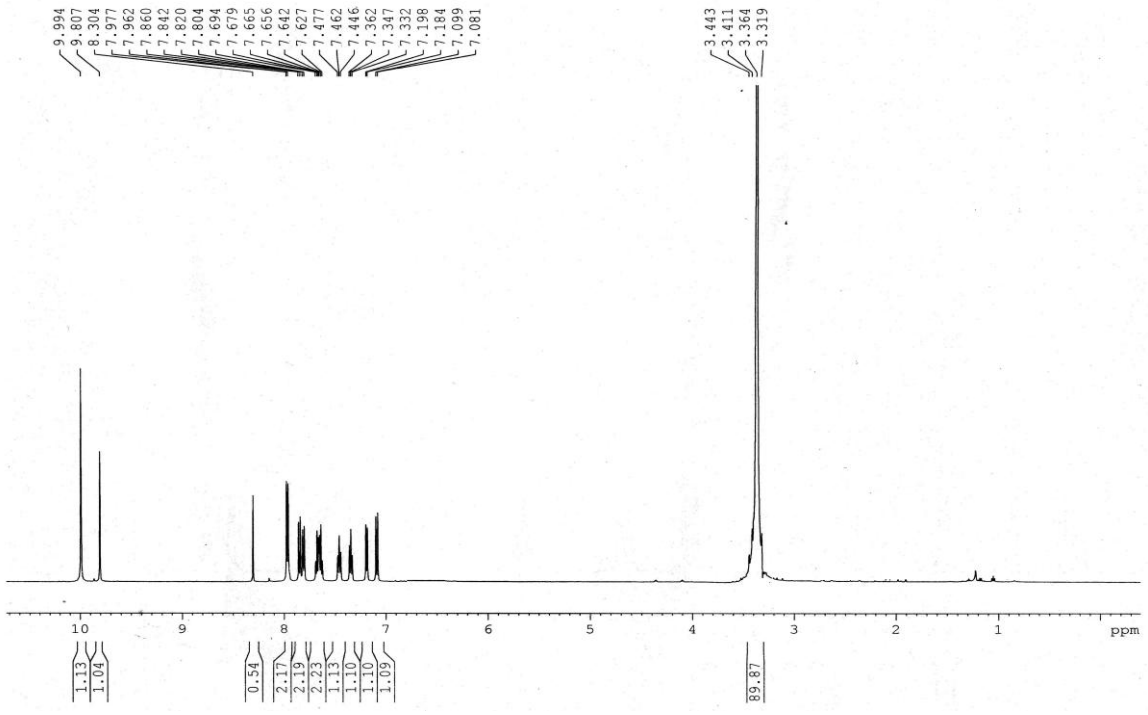
^{13}C NMR spectrum of PBF:



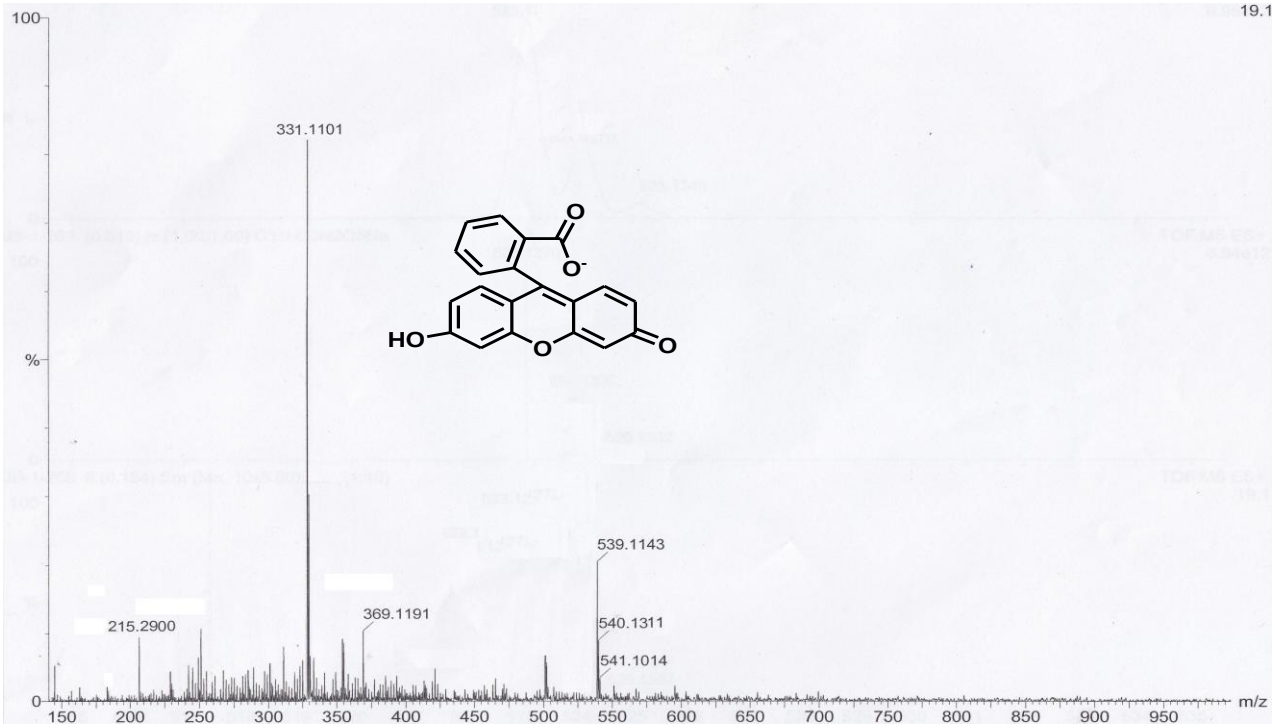
HR MS Mass Spectra of PBF:



^{1}H NMR spectrum of Hydrazone product i.e. PBF + Hyd:

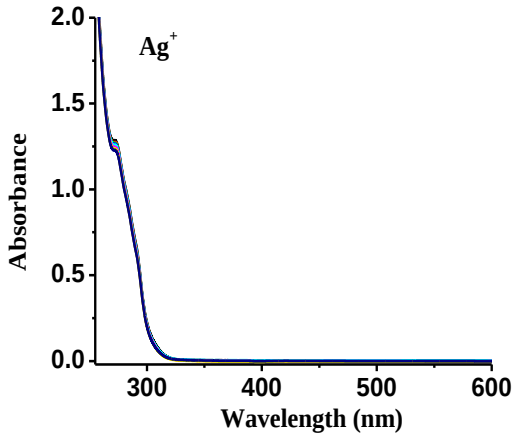


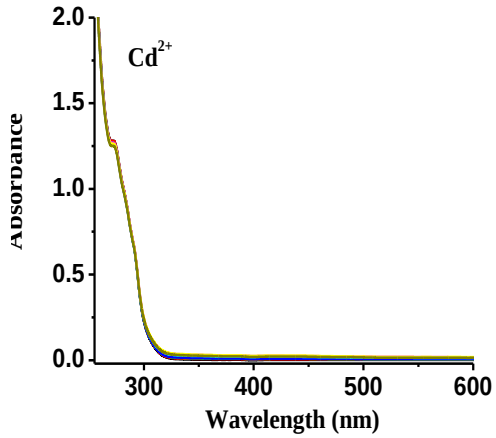
HR MS Spectra of PBF+ Hyd:



6. UV-vis absorption spectra of PBF with different cations as Ag^{+}, Cd^{2+}, Co^{2+}, Cu^{2+}, Fe^{3+}, Mn^{2+} , Pd^{2+} (The solutions of metal ions were prepared from $AgNO_3$, $Cd(ClO_4)_2{\cdot}H_2O$, $Co(ClO_4)_2{\cdot}6H_2O$, $Cu(ClO_4)_2{\cdot}6H_2O$, $FeCl_3$, $MnCl_2$, $Pb(ClO_4)_2$, $Zn(ClO_4)_2{\cdot}6H_2O$, and $NaClO_4$, respectively in CH_3CN-H_2O), different anions Cl^{-}, Br^{-}, I^{-} as their tetra butyl salt and SO_4^{2-}, SO_3^{2-}, ClO_4^{-}, HPO_4^{-} as their sodium salt in CH_3CN : H_2O (6:4, v/v).

(a) (b)





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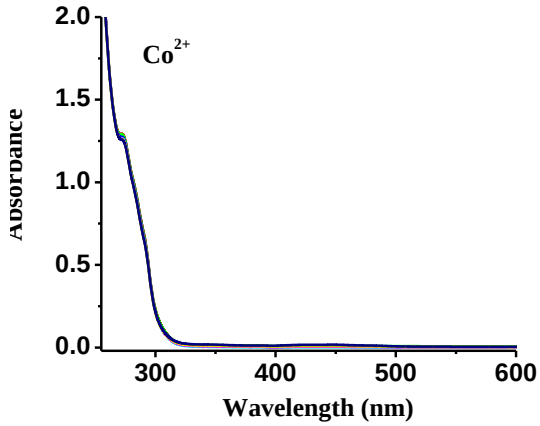
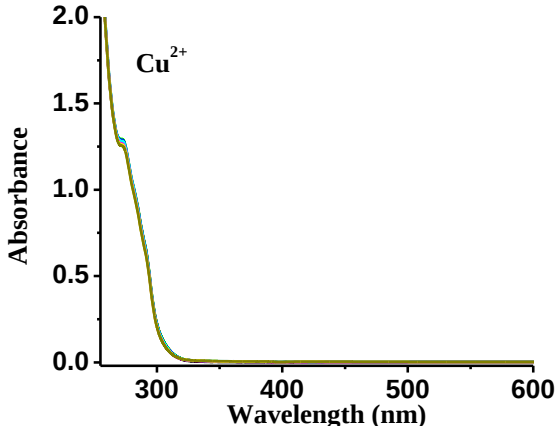
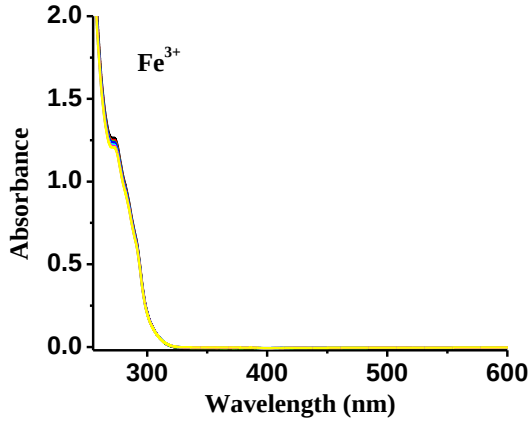

Co2+
Absorbance
Wavelength (nm)

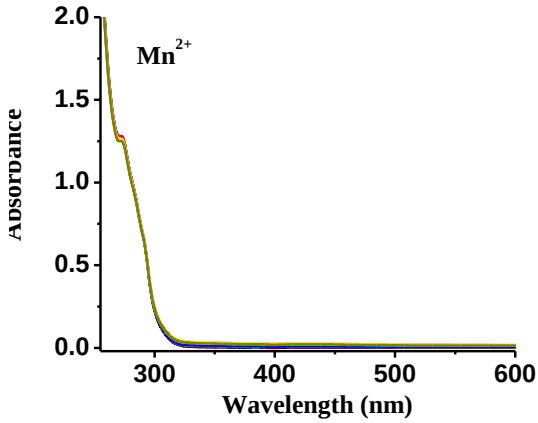
(d)


Cu2+
Absorbance
Wavelength (nm)

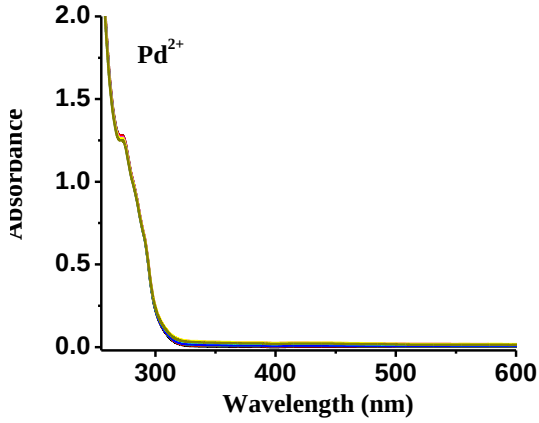
(e)


Fe3+
Absorbance
Wavelength (nm)

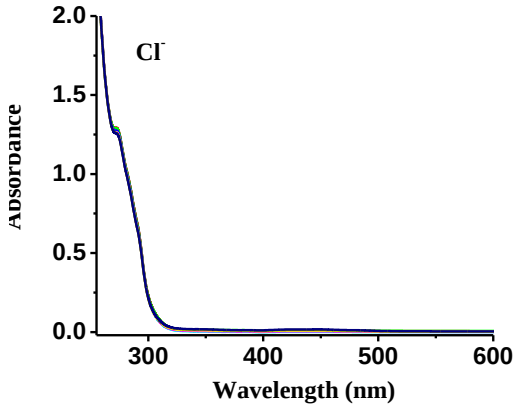
(f)


Mn2+
Absorbance
Wavelength (nm)

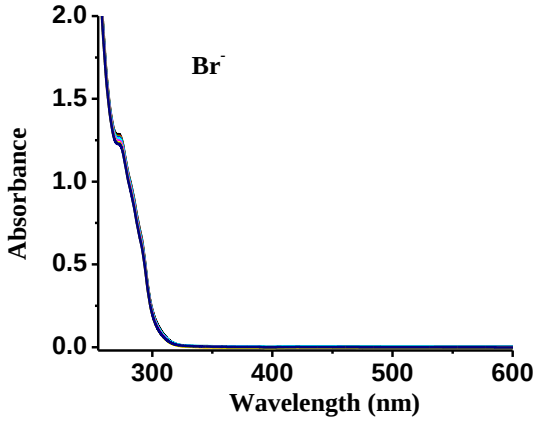
(g)


Pd2+
Absorbance
Wavelength (nm)

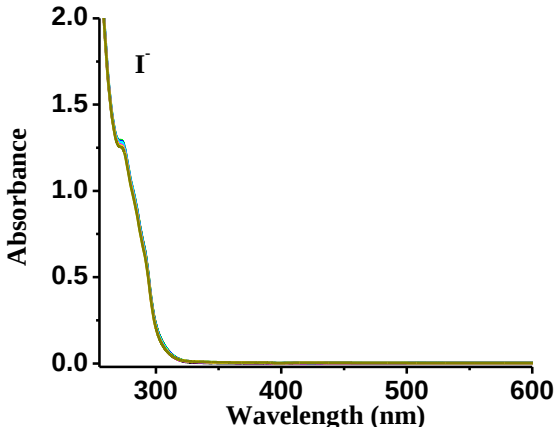
(h)


Cl-
Absorbance
Wavelength (nm)

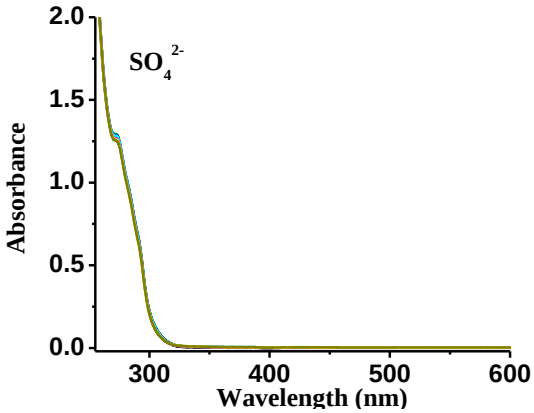
(i)


Br-
Absorbance
Wavelength (nm)
2.0
1.5
1.0
0.5
0.0
300
400
500
600

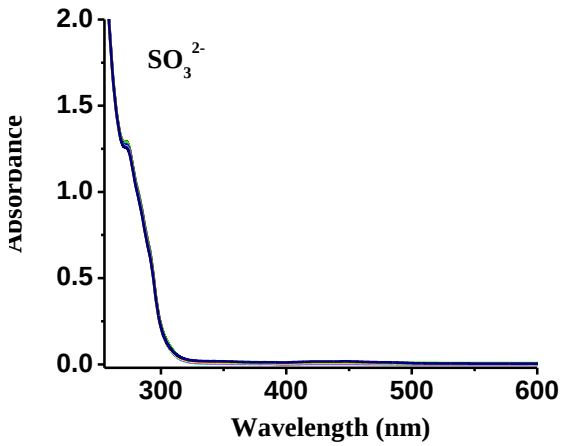
(j)


I-
Absorbance
Wavelength (nm)
2.0
1.5
1.0
0.5
0.0
300
400
500
600

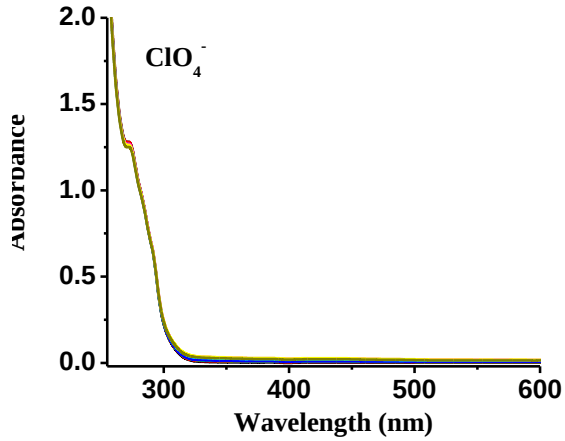
(k)


SO4 2-
Absorbance
Wavelength (nm)
2.0
1.5
1.0
0.5
0.0
300
400
500
600

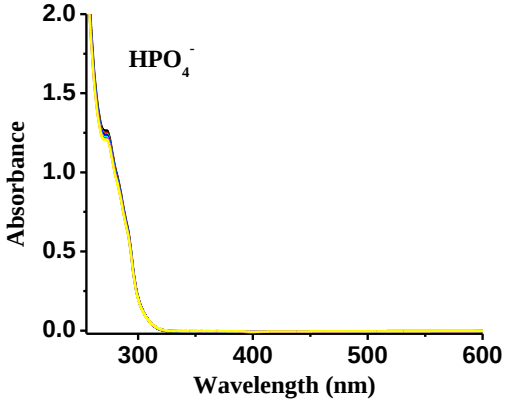
(l)


SO3 2-
Absorbance
Wavelength (nm)
2.0
1.5
1.0
0.5
0.0
300
400
500
600

(m)

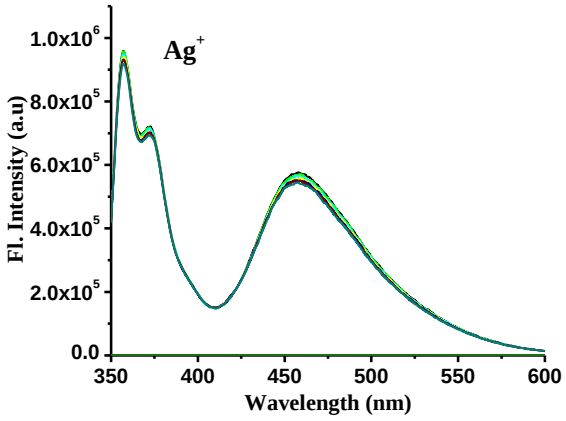

ClO4 -
Absorbance
Wavelength (nm)
2.0
1.5
1.0
0.5
0.0
300
400
500
600

(n)

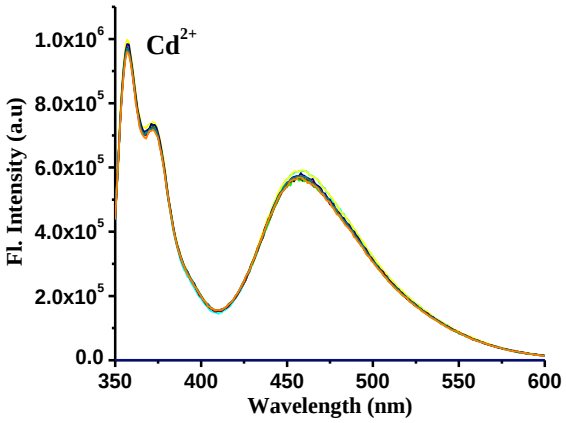

HPO4 -
Absorbance
Wavelength (nm)
2.0
1.5
1.0
0.5
0.0
300
400
500
600

7. Fluorescence emission spectra of PBF with different cations as Ag^{+}, Cd^{2+}, Co^{2+}, Cu^{2+}, Fe^{3+}, Mn^{2+} , Pb^{2+}, Zn^{2+}, Na^{+} (The solutions of metal ions were prepared from $AgNO_3$, $Cd(ClO_4)_2 \cdot H_2O$, $Co(ClO_4)_2 \cdot 6H_2O$, $Cu(ClO_4)_2 \cdot 6H_2O$, $FeCl_3$, $MnCl_2$, $Pb(ClO_4)_2$, $Zn(ClO_4)_2 \cdot 6H_2O$, and $NaClO_4$, respectively in CH_3CN-H_2O), different anions Cl^{-}, Br^{-}, I^{-} as their tetra butyl salt and ClO_4^{-}, HPO_4^{2-}, SO_3^{2-}, SO_4^{2-} as their sodium salt in CH_3CN : H_2O (8:2, v/v).

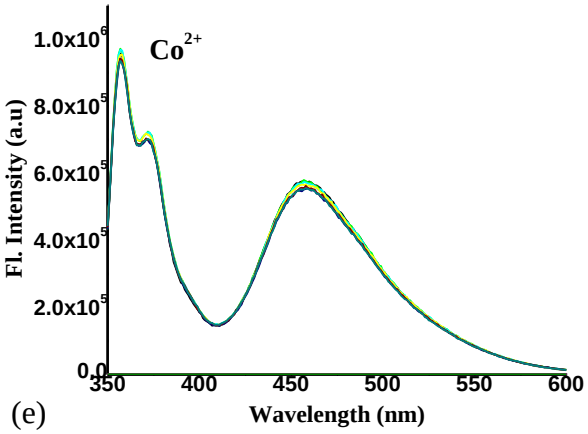
(a)



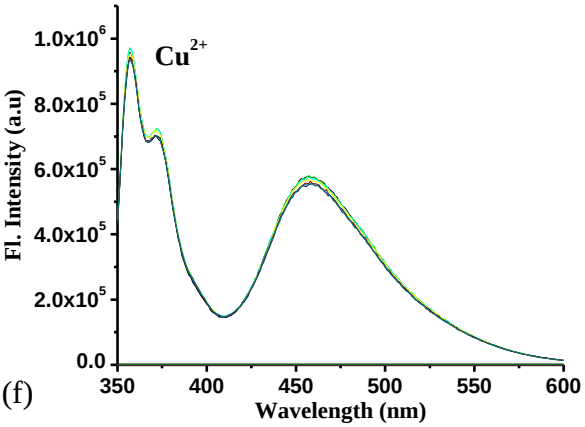
(b)



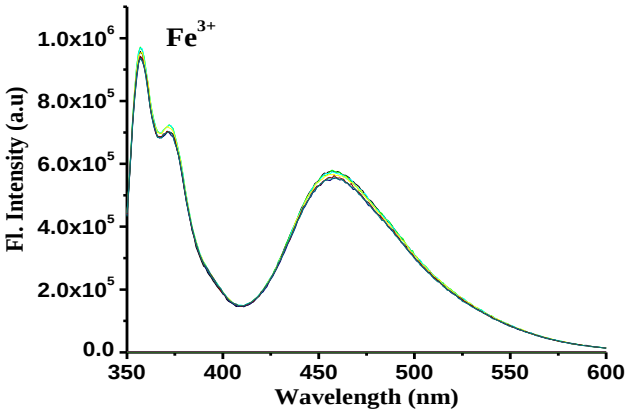
(c)



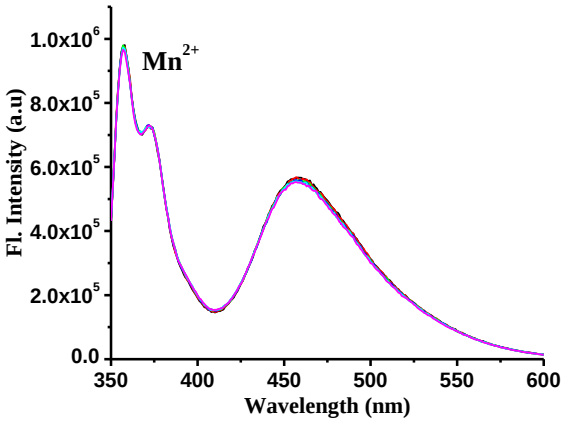
(d)



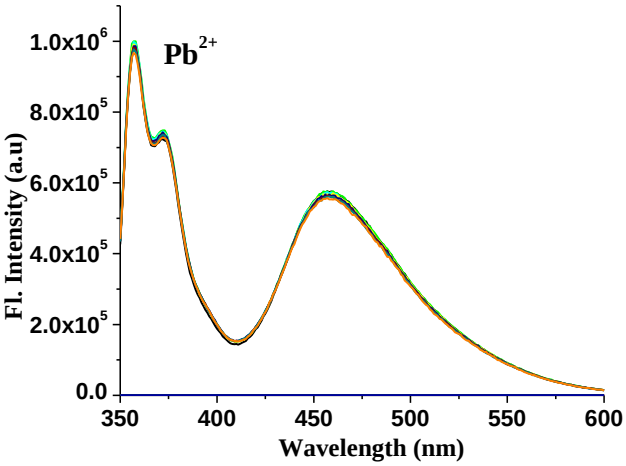
(e)



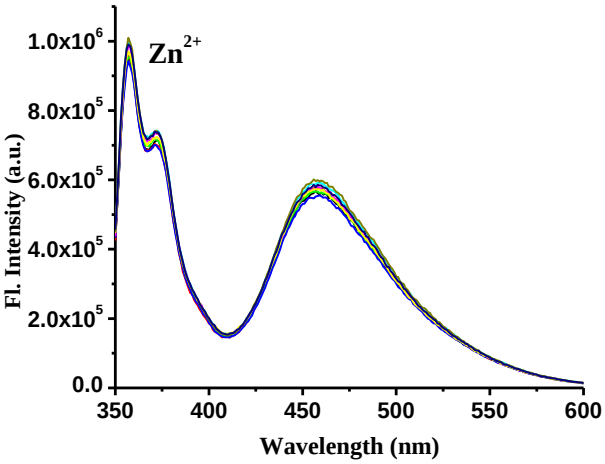
(f)



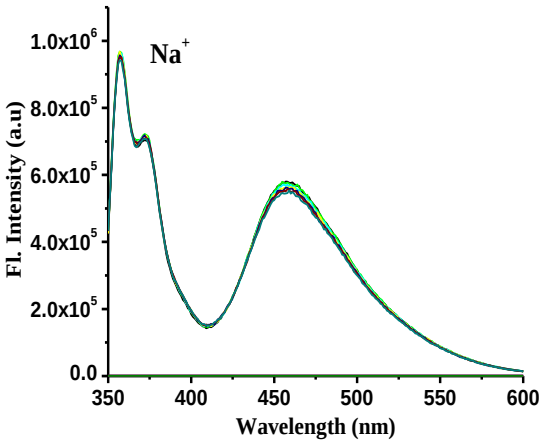
(g)


Pb2+
Fl. Intensity (a.u)
Wavelength (nm)

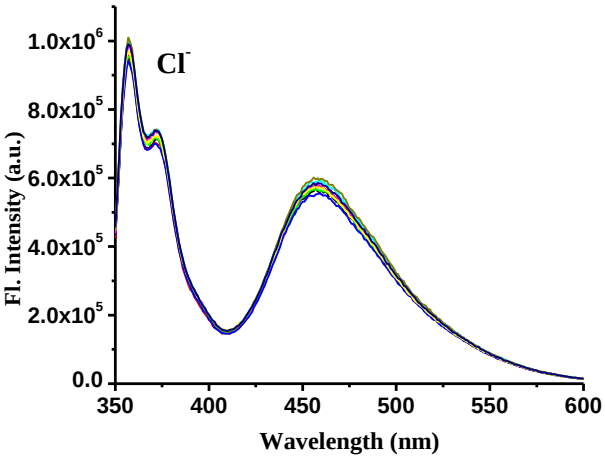
(h)


Zn2+
Fl. Intensity (a.u)
Wavelength (nm)

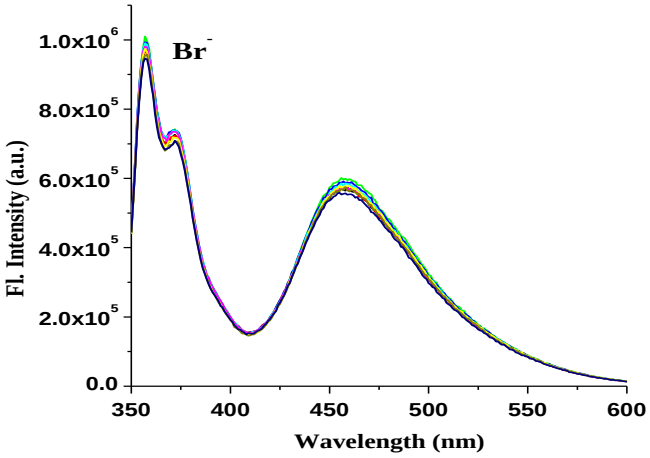
(i)


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

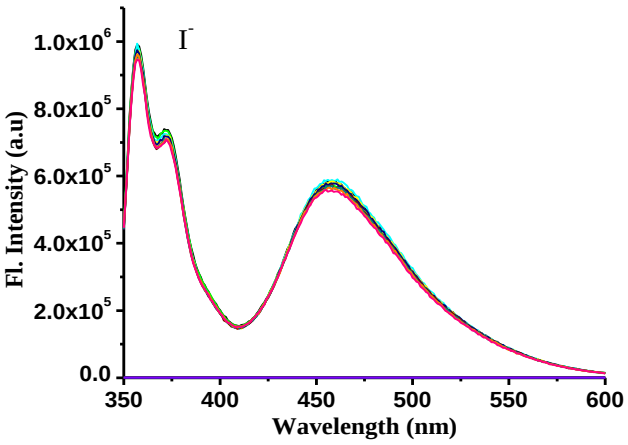
(j)


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

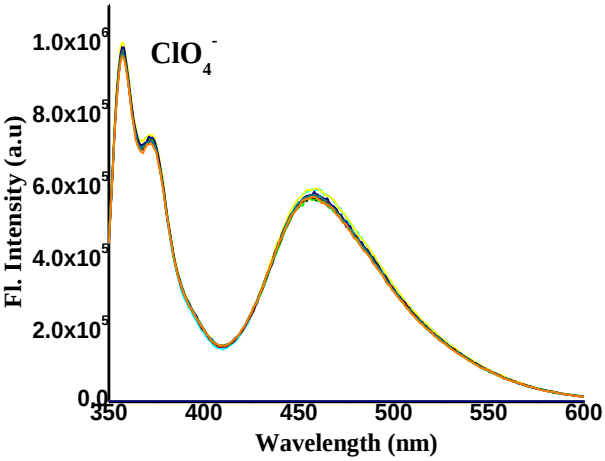
(k)


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

(l)


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

(m)



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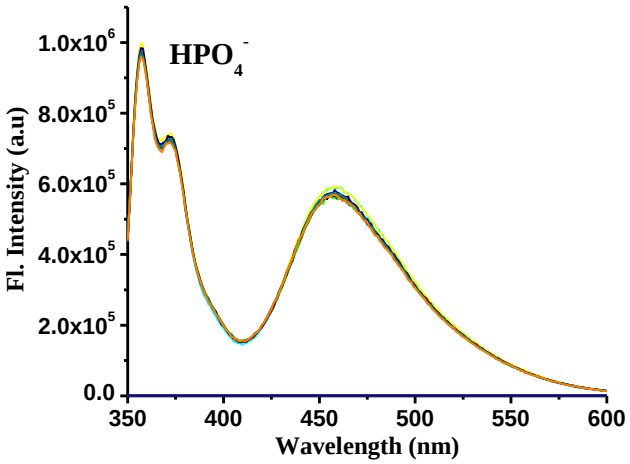

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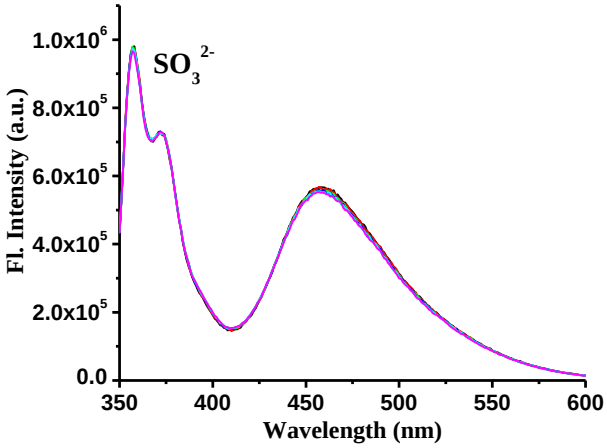

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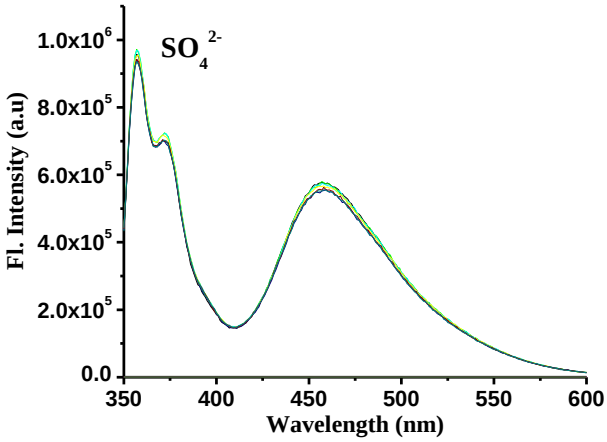
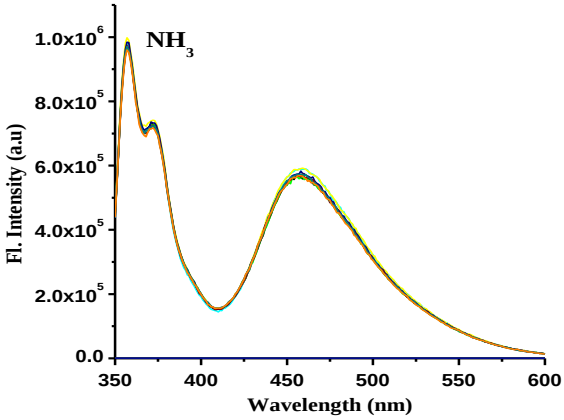
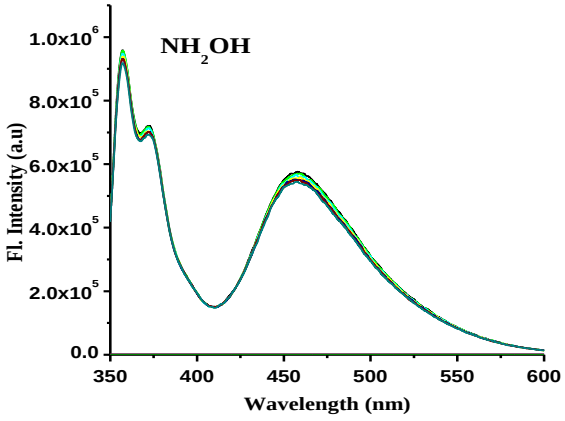


8. Fluorescence emission spectra of PBF with different amines

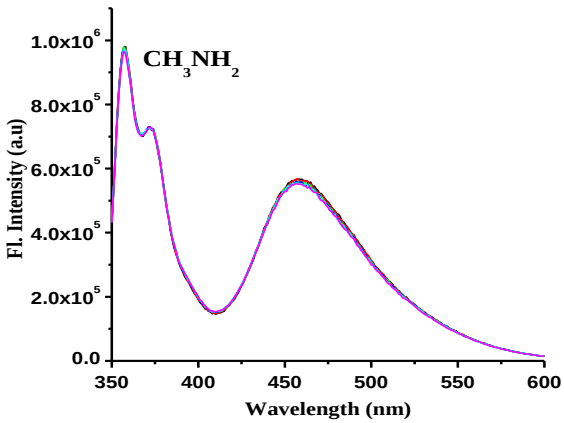
(a)



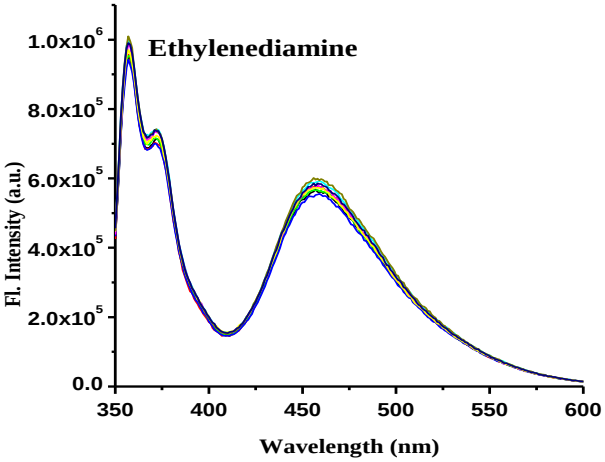
(b)



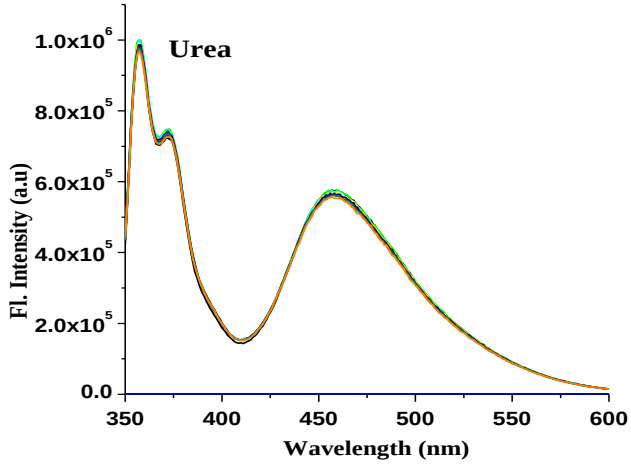
(c)


CH3NH2
Fl. Intensity (a.u)
Wavelength (nm)

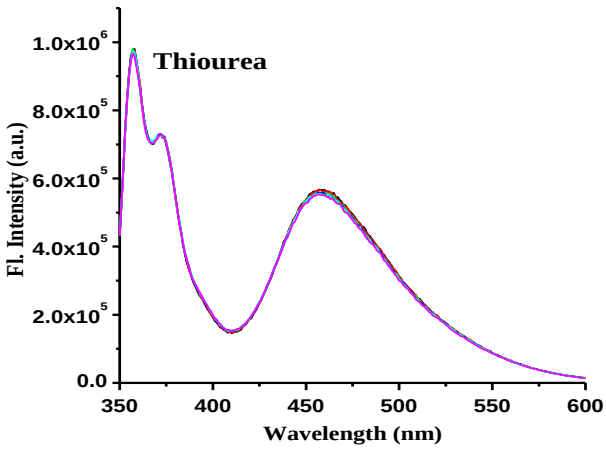
(d)


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

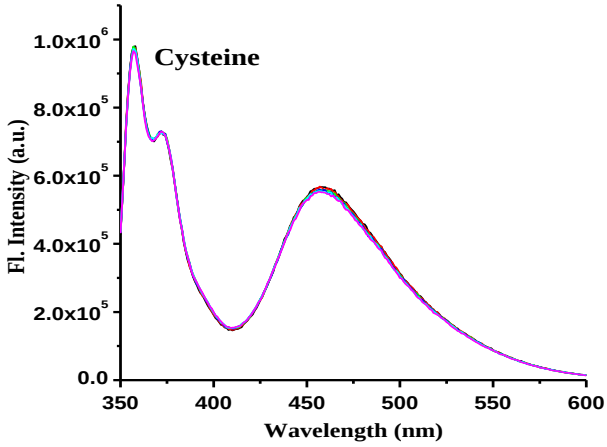
(e)


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

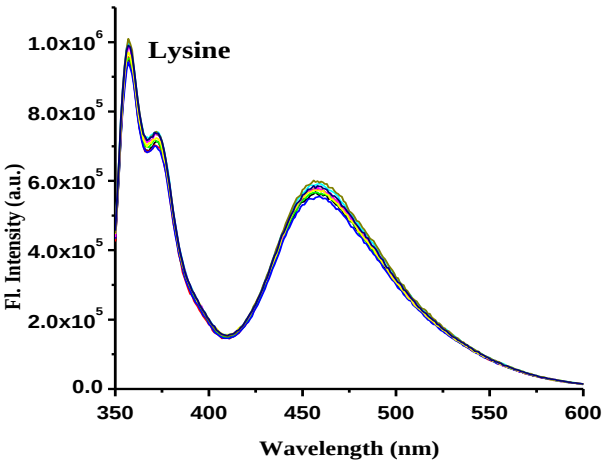
(f)


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

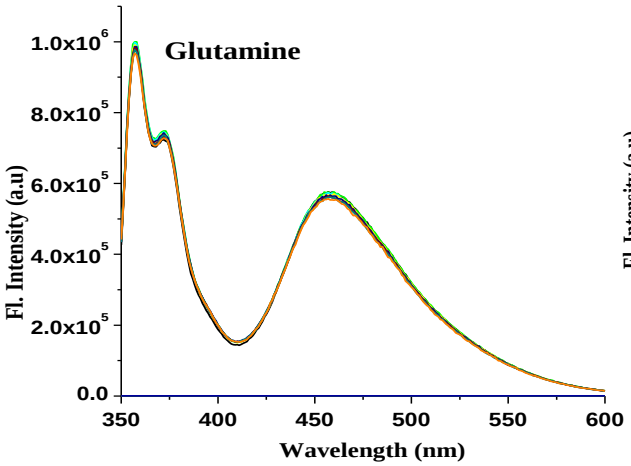
(g)


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

(h)


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

(i)



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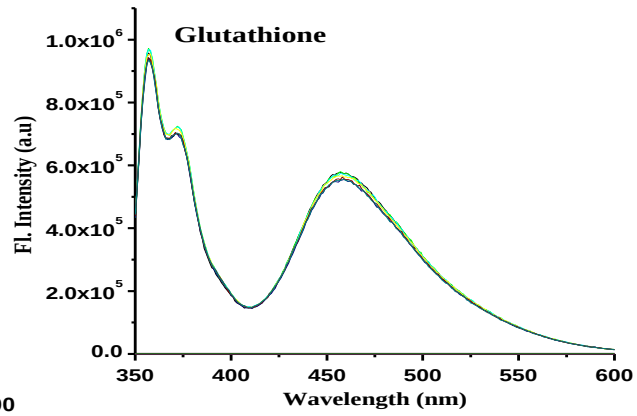

9. References:

1. 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