Supporting information

Lanthanide functionalized MOFs thin films as effective luminescent materials and chemical sensor for ammonia

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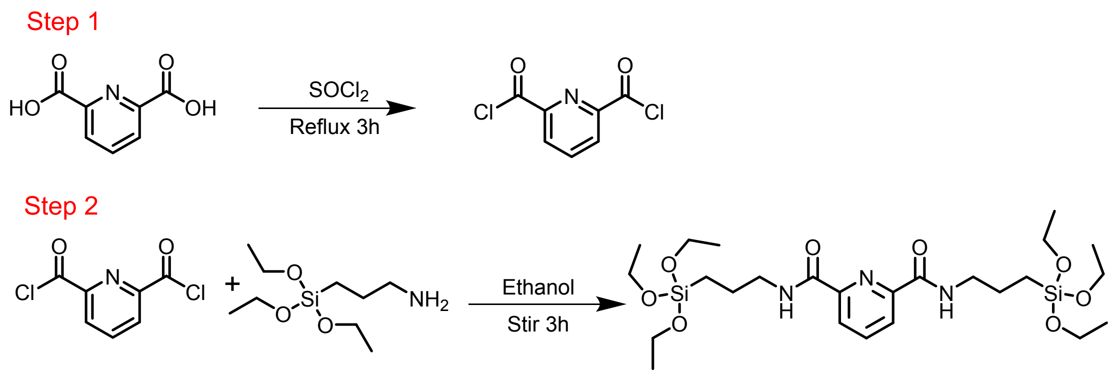


Fig. S1. The synthesis process of Linker (**L**)

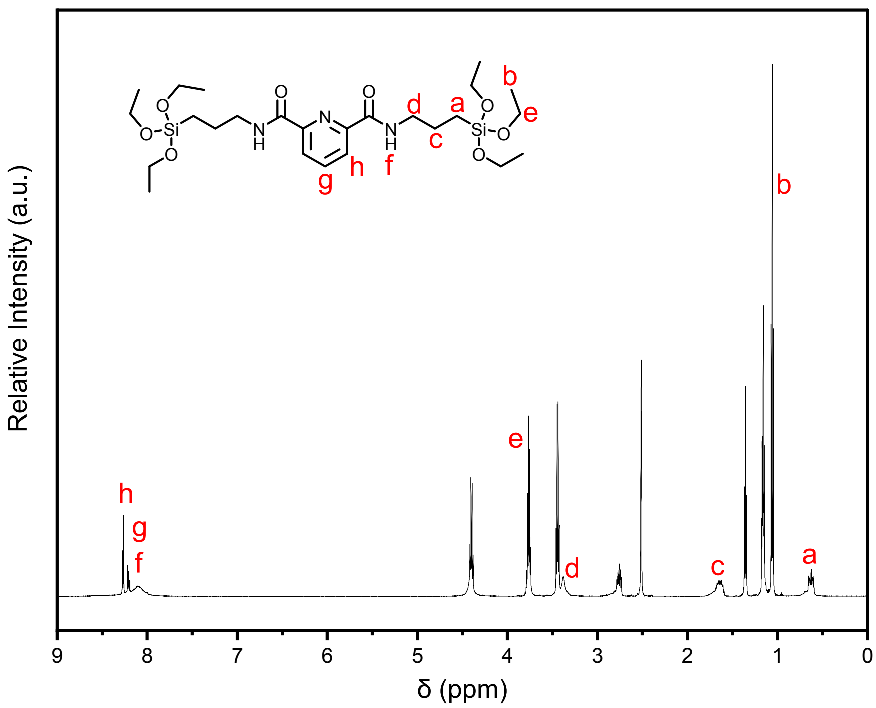


Fig. S2. The 1H NMR (DMSO-D_6, 600 MHz) spectra of **L**

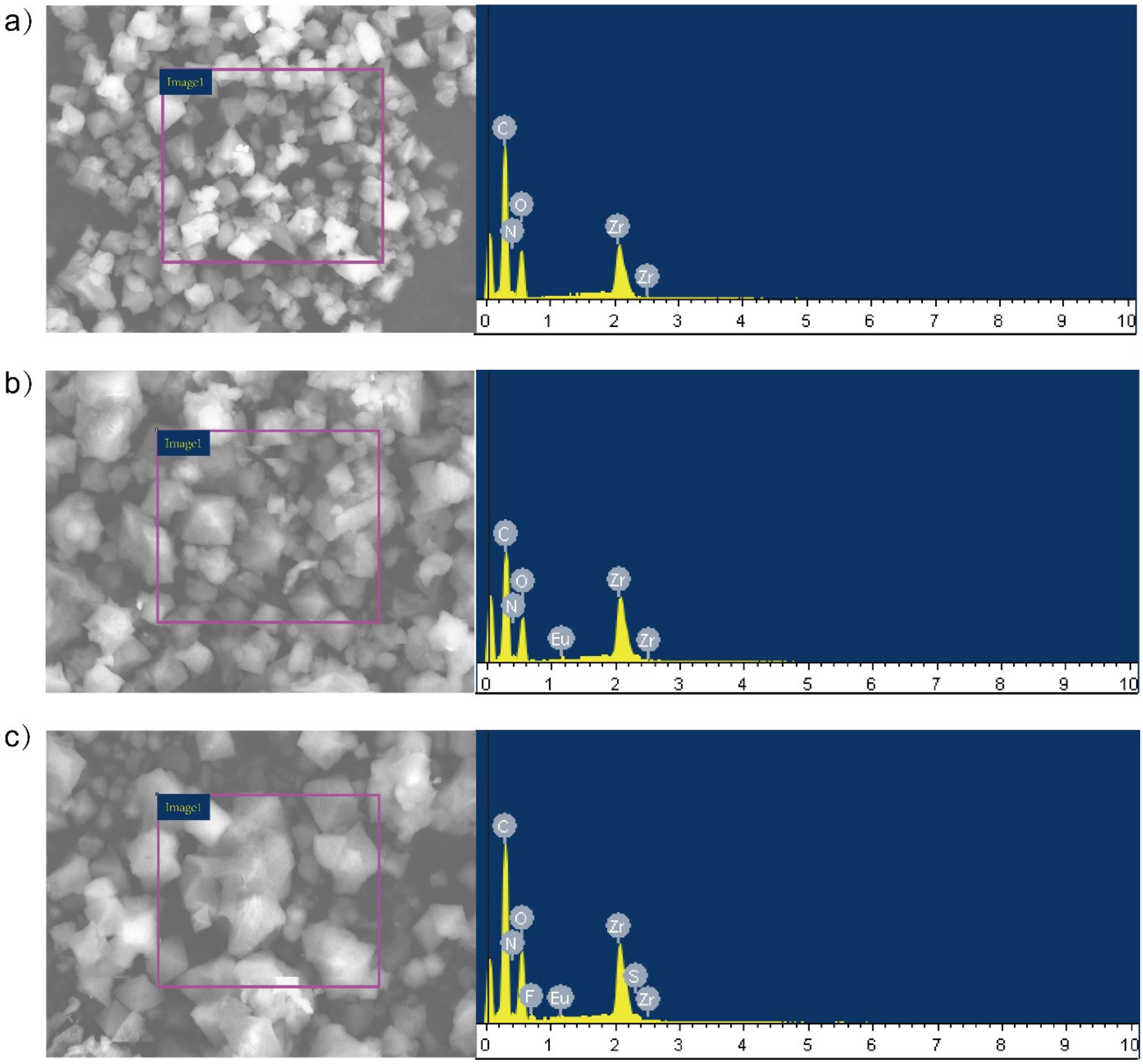


Fig. S3. The EDS spectra of **UMOF** (a), **Eu@UMOF** (b), **Eu(TTA)@UMOF** (c)

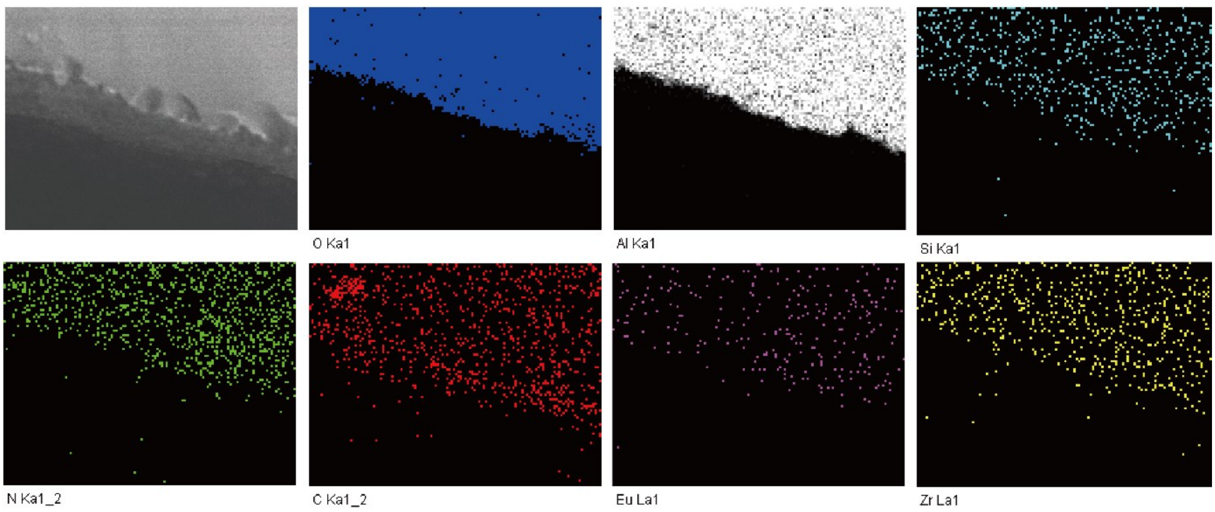
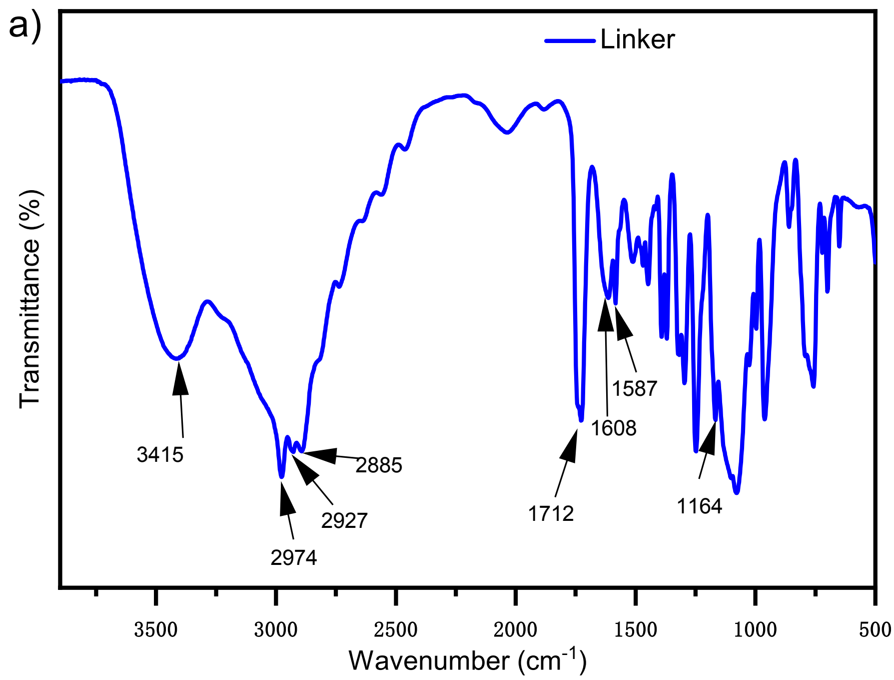


Fig. S4. The EDS mapping of **Eu@UMOF-Eu-LA** film's cross-section



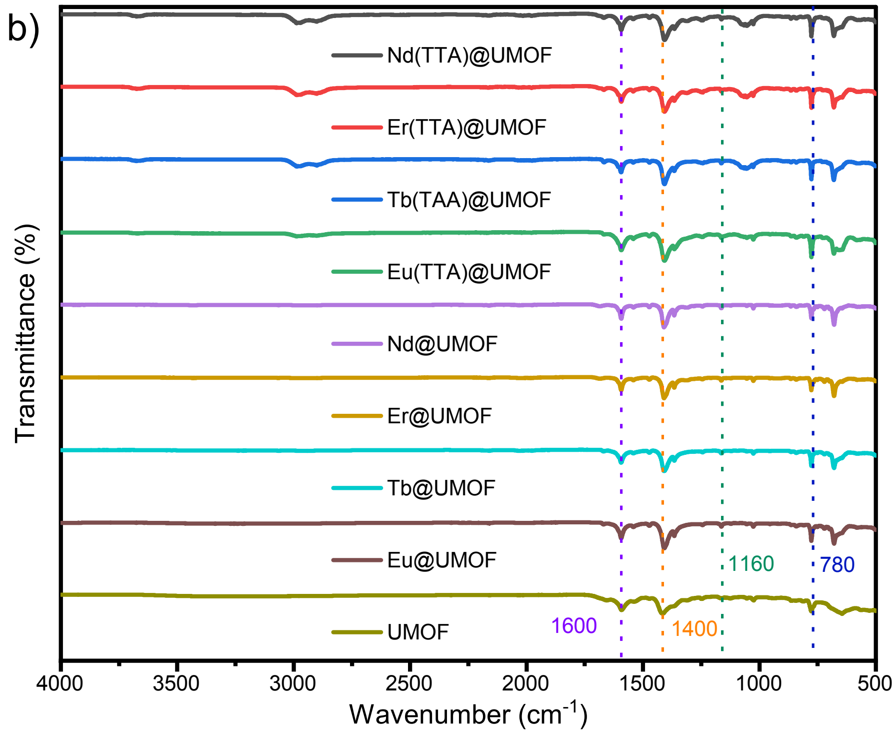


Fig. S5. (a) The FTIR spectra of **L**. (b)The FTIR spectra of **UMOF**, **Ln@UMOF** and **Ln(TTA/TAA)@UMOF**.

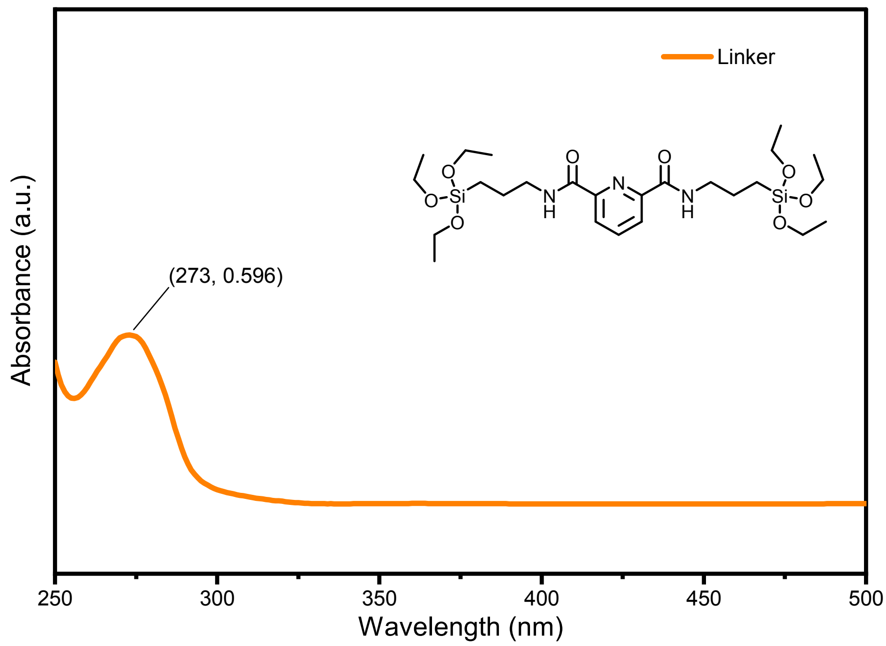


Fig. S6. The UV-Vis absorption spectra of **L**.

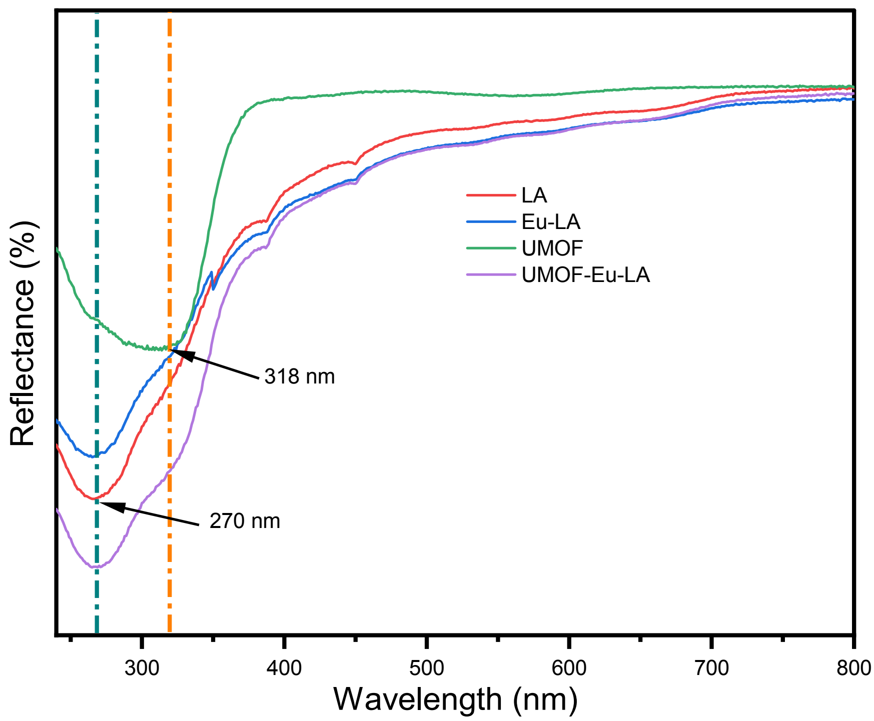


Fig. S7. The UV-Vis diffuse reflection spectra of **LA**, **Eu-LA**, **UMOF**, **UMOF-LA**.

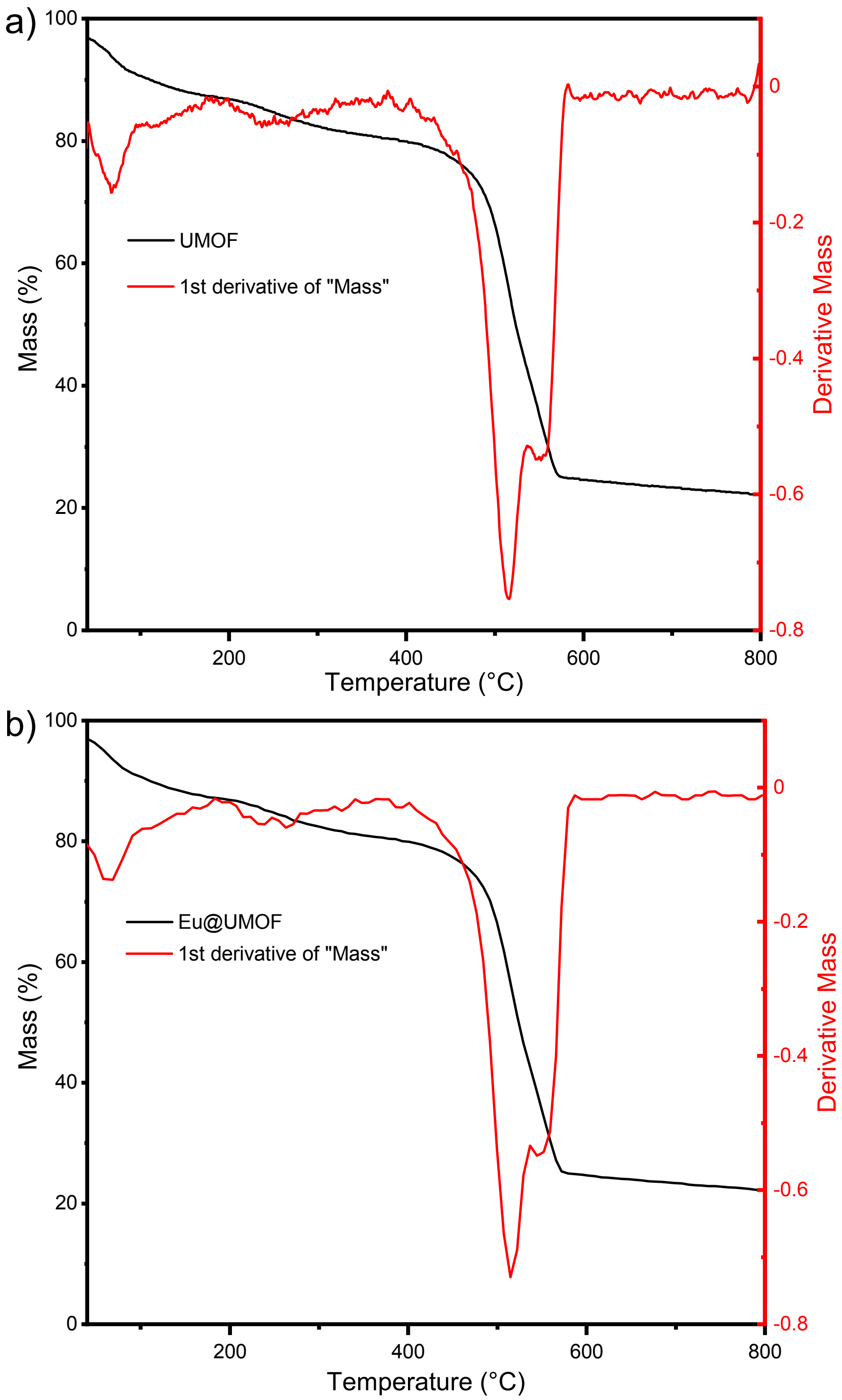


Fig. S8. The TG and DTG curve of **UMOF** (a) and **Eu@UMOF** (b) at temperature range of 40-800 ℃

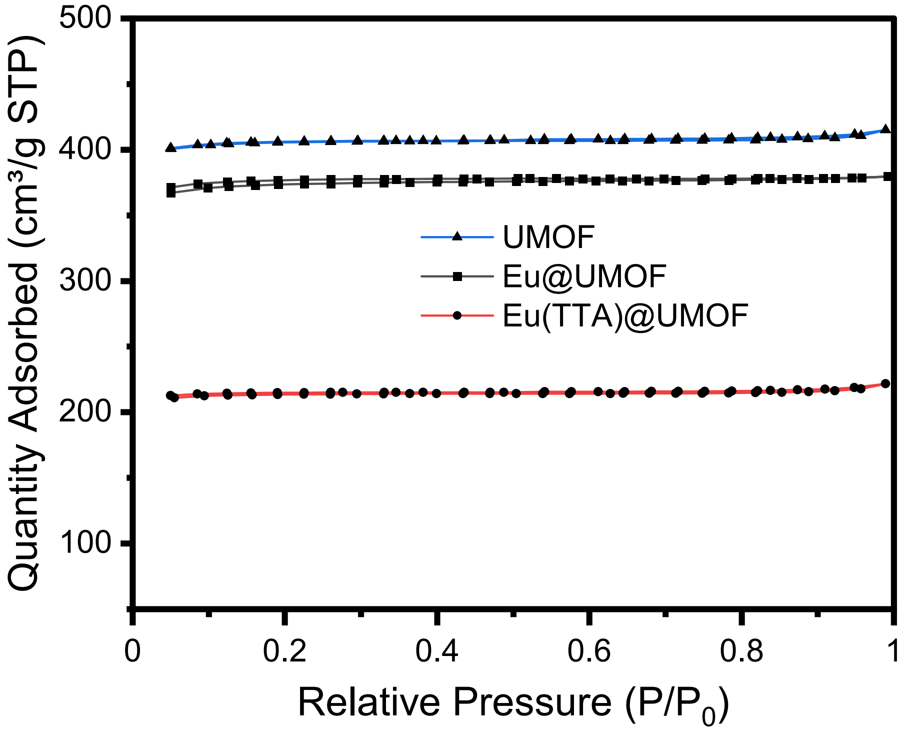


Fig. S9. N_2 adsorption-desorption isotherms of **UMOF**, **Eu@UMOF** and **Eu(TTA)@UMOF**.

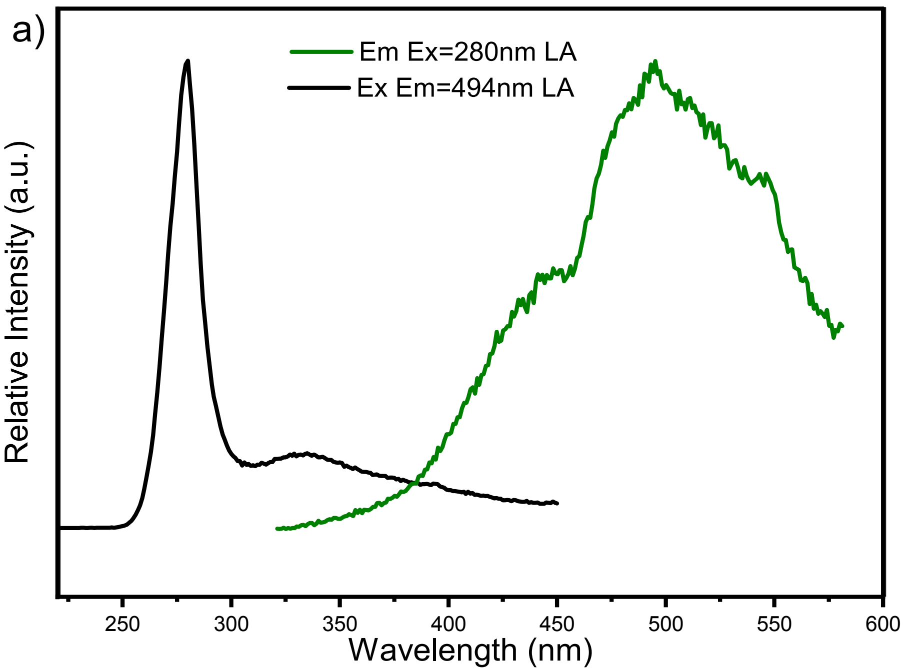


Fig. S10. The emission spectra of **LA** under the excitation of 280 nm

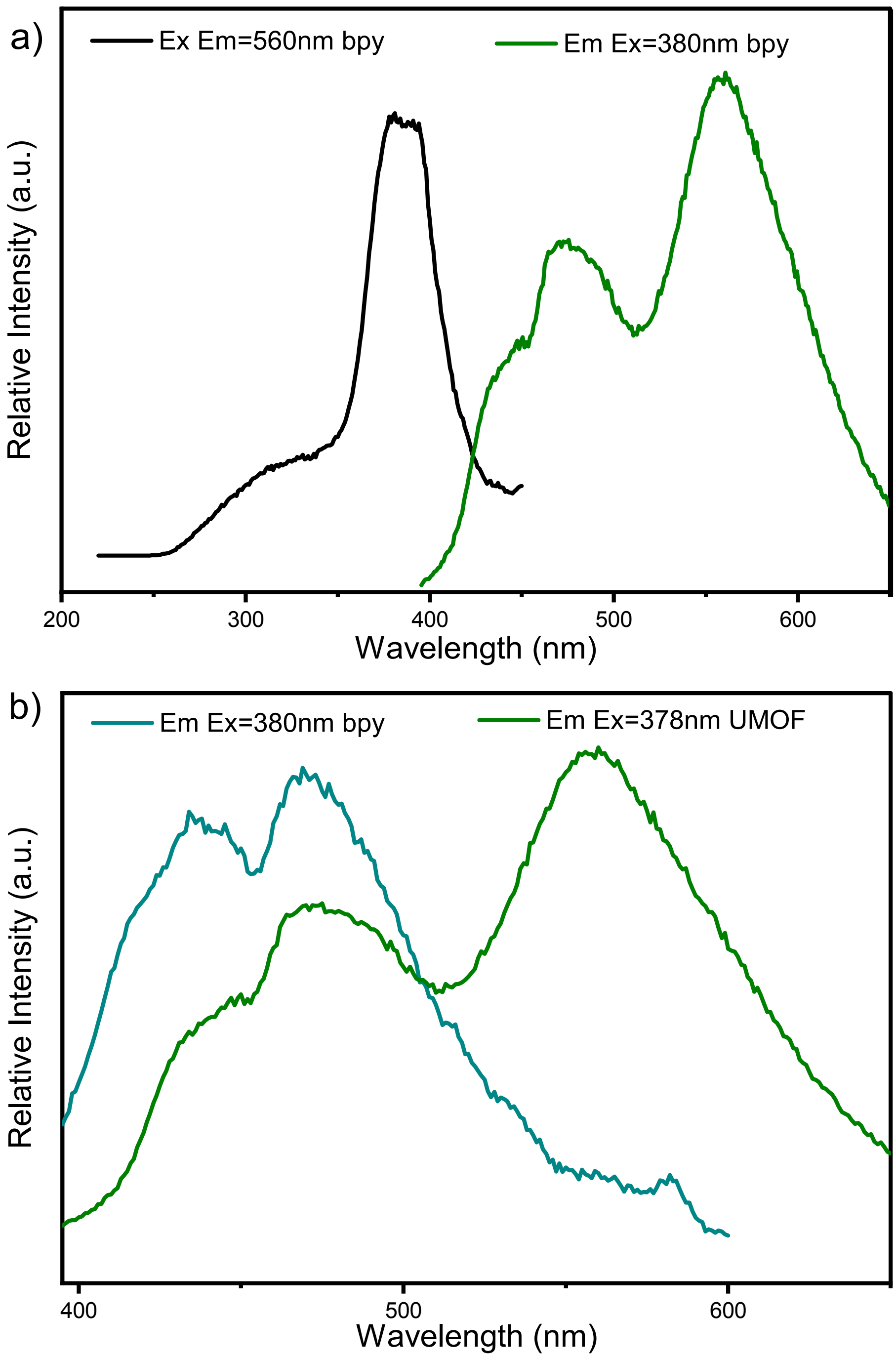


Fig. S11. The emission spectra of bpy (2,2-bipyridine-5,5-dicarboxylic acid) (a), **UMOF** and bpy (b)

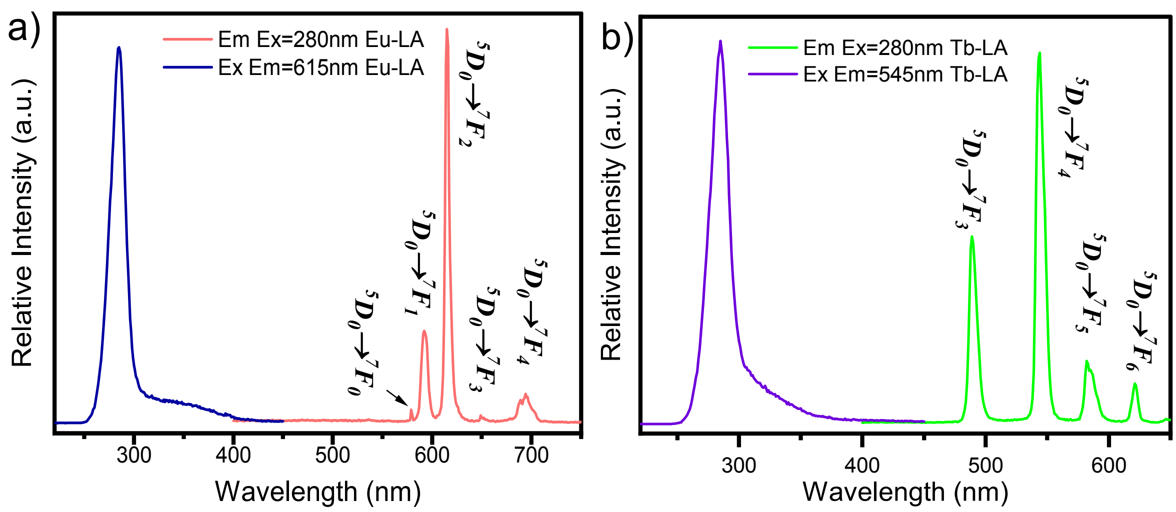


Fig. S12. The emission spectra of **Eu-LA** (a) and **Tb-LA** (b), under the excitation of 280nm

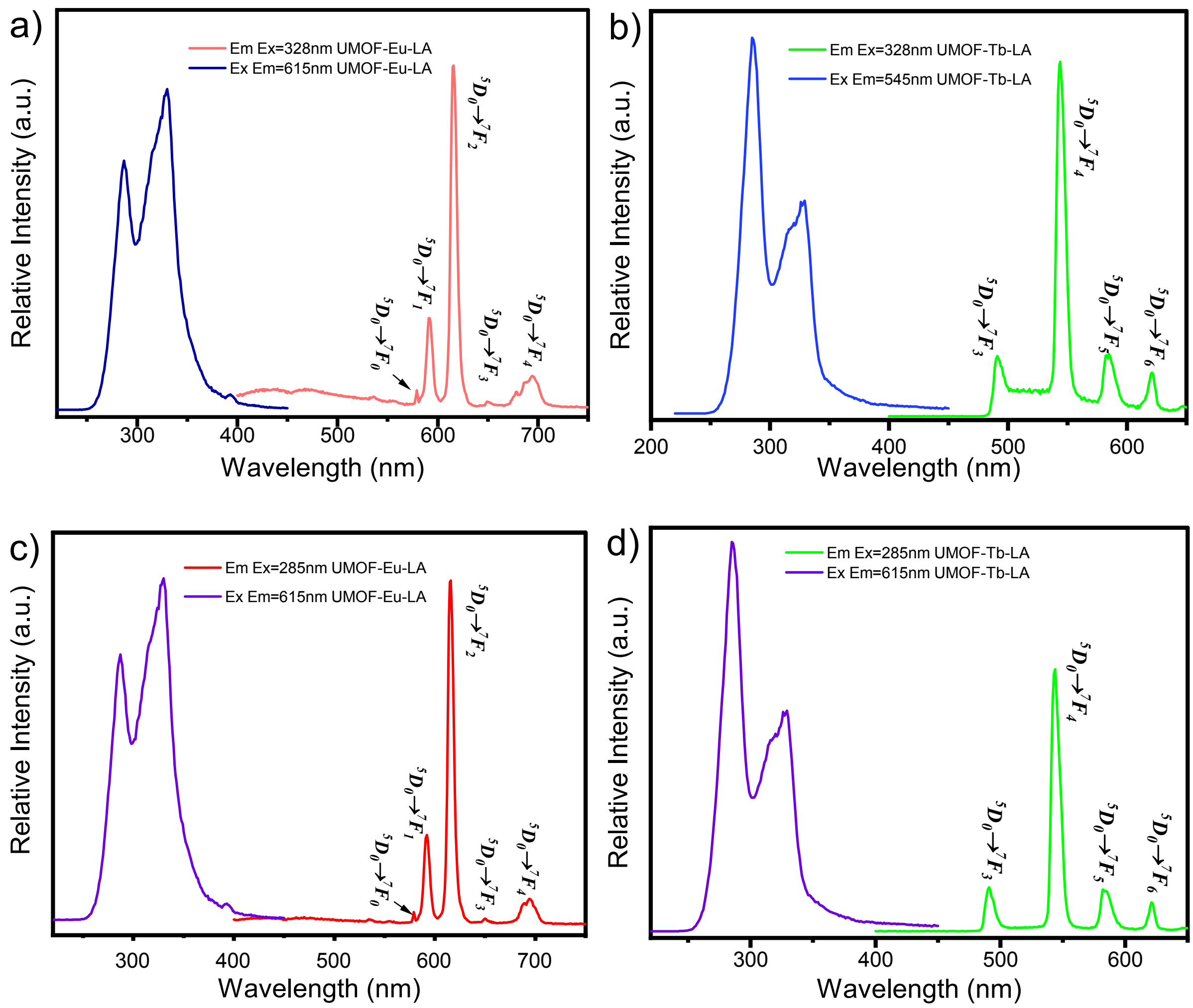


Fig. S13. The emission spectra of **UMOF-Eu-LA**, **UMOF-Tb-LA** under 328 nm (a,b), under 285 nm (c,d)

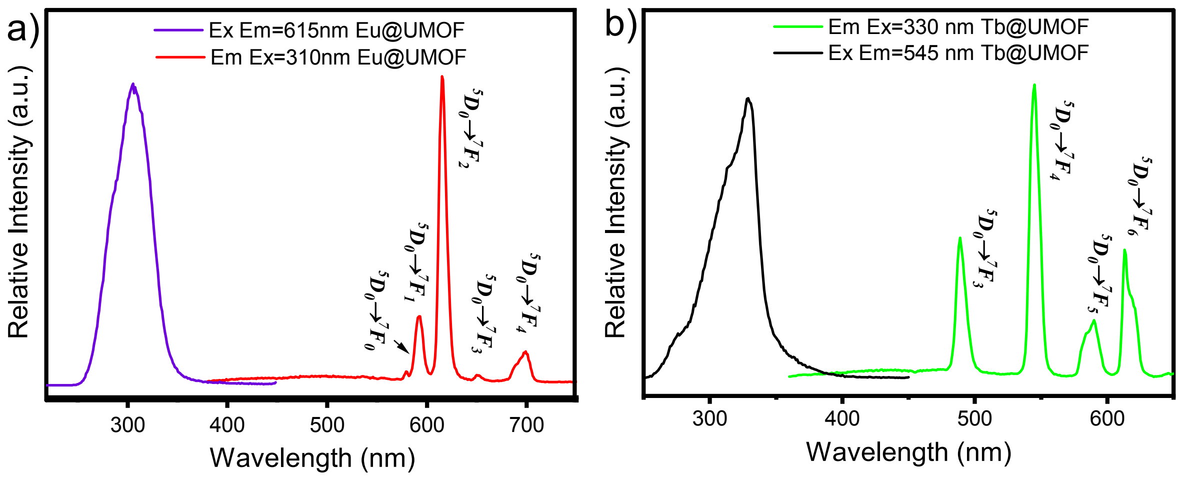


Fig. S14. The emission spectra of **Eu@UMOF** (a) and **Tb@UMOF** under the excitation of 310 nm and 330 nm, respectively.

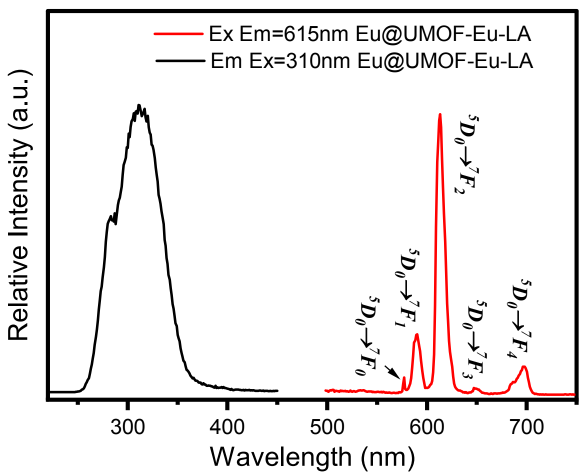


Fig. S15. The emission spectra of **Eu@UMOF-Eu-LA** film under the excitation of 310 nm

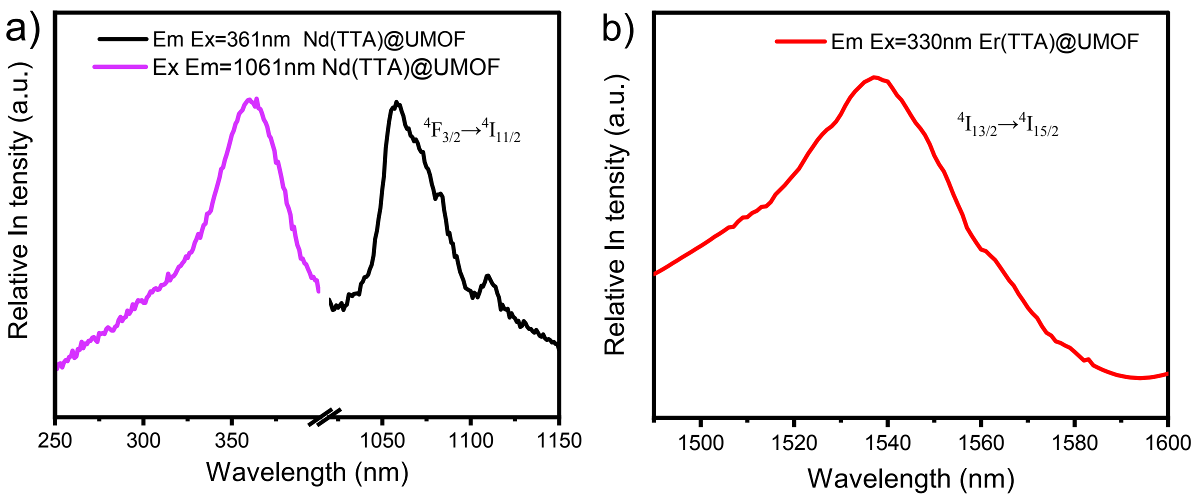


Fig. S16. The emission spectra of **Nd(TTA)@UMOF** under the excitation of 361 nm(a). the emission spectra of **Er(TTA)@UMOF** under the excitation of 330nm

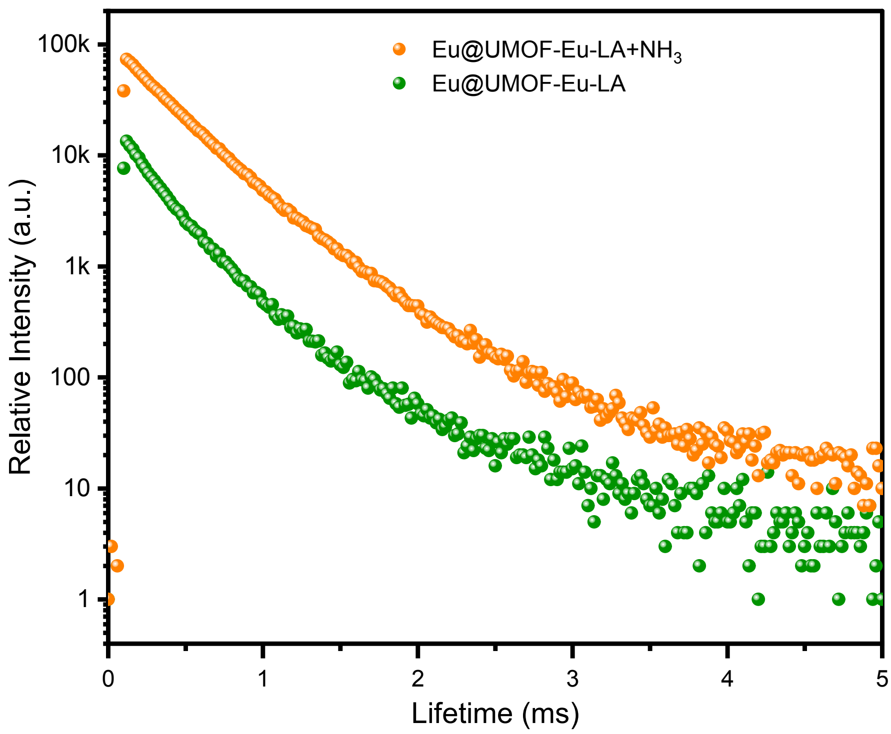


Fig. S17. The decay curve of **Eu@UMOF-Eu-LA** before and after exposed to NH_3

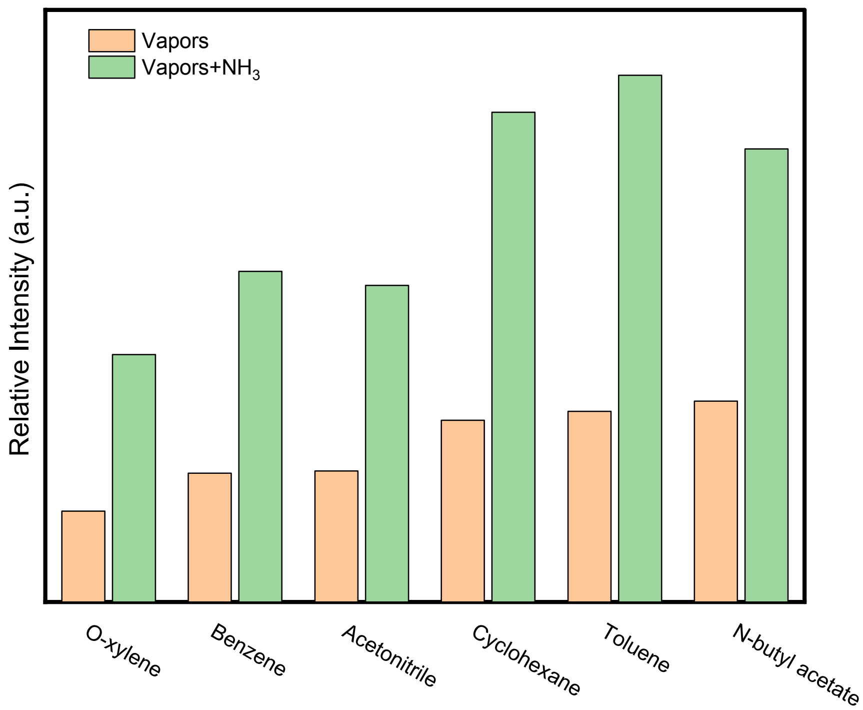


Fig. S18. The emission intensity of **Eu@UMOF-Eu-LA** at 615 nm after exposing to the pure vapors and mixed vapors with NH_3

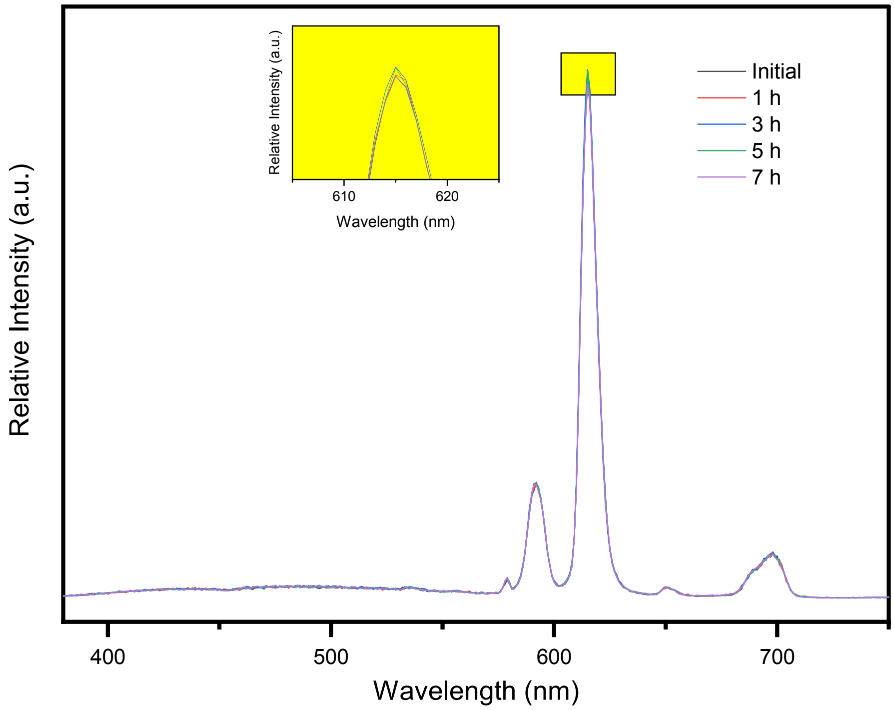


Fig. S19. The luminescent stablity of **Eu@UMOF-Eu-LA** after 1 h, 3 h, 5 h, 7 h, under the excitation of 310 nm.

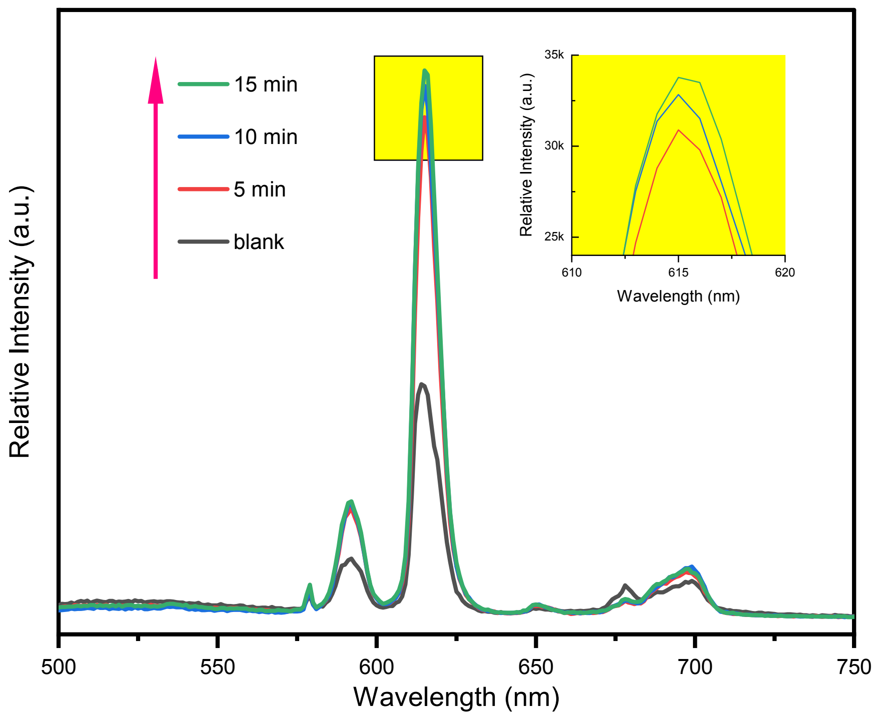


Fig. S20. The time response diagram of **Eu@UMOF-Eu-LA** film in the presences of NH_3

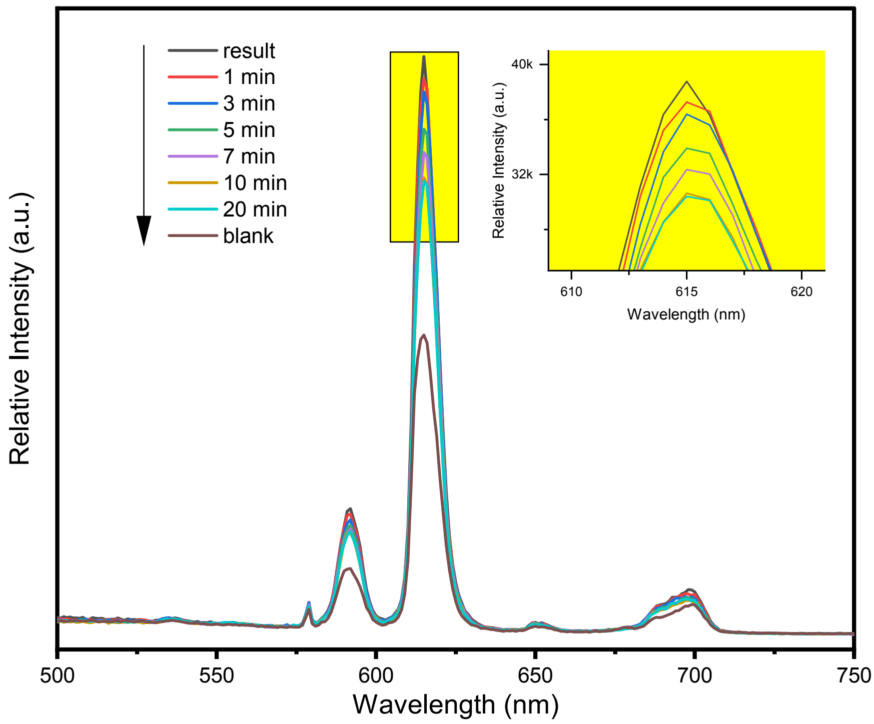


Fig. S21. The recover curve of **Eu@UMOF-Eu-LA** in the 40 ℃ oven

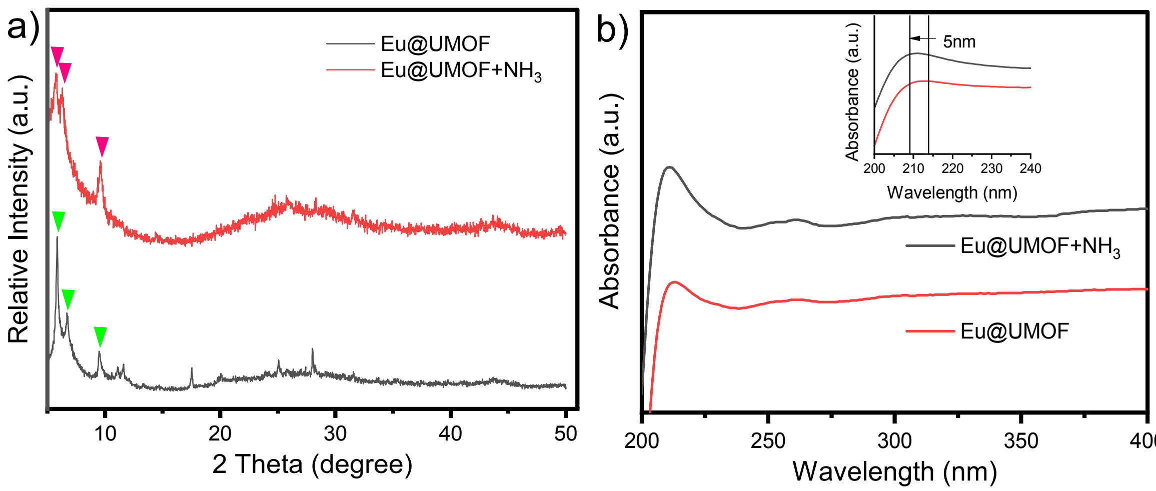


Fig. S22. The PXRD pattern (a) and the UV-Vis absorption spectra (b) of **Eu@UMOF** before and after exposed to NH_3

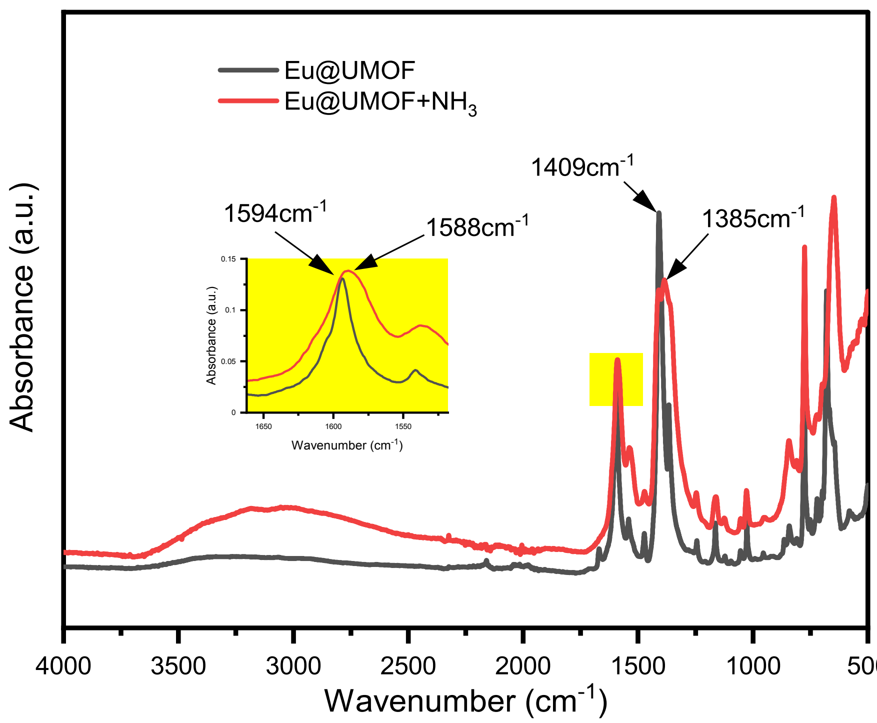


Fig. S23. The FTIR spectra of **Eu@UMOF** before and after exposed to NH_3

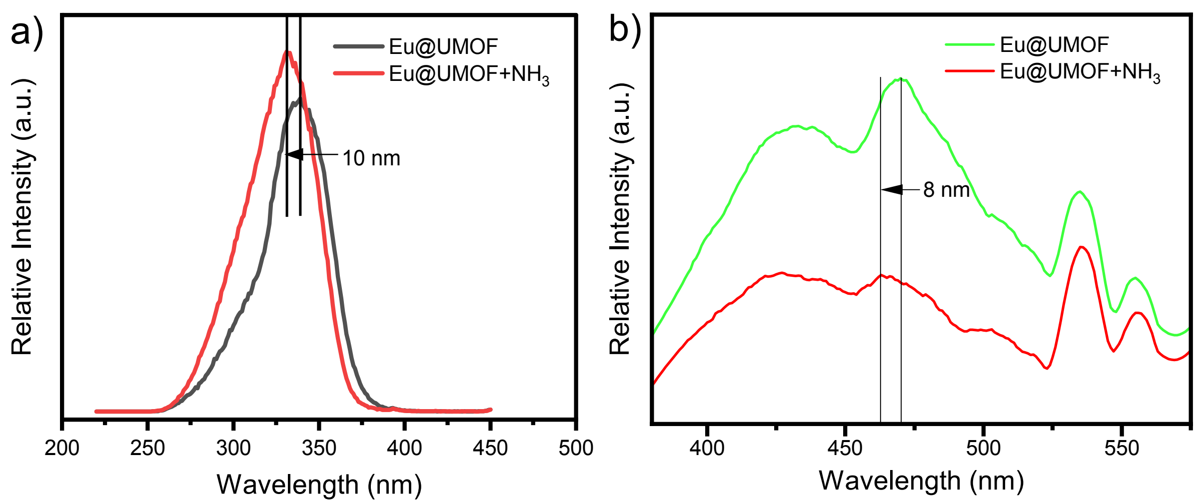


Fig. S24. The excitation spectra of **Eu@UMOF** and the emission spectra of ligand in **Eu@UMOF** before and after exposed to NH_3

Table. S1. The element weight percentages of **UMOF**, **Eu@UMOF**, **Eu(TTA)@UMOF**

Element	Atomic percentages UMOF	Atomic percentages Eu@UMOF	Atomic percentages Eu(TTA)@UMOF
C	69.30	67.87	66.22
N	8.79	8.08	8.10
O	18.24	18.63	19.75
F	0	0	1.35
S	0	0	0.32
Zr	3.67	5.09	4.06
Eu	0	0.32	0.20

Table. S2. The FTIR absorption peak and the related vibration of Linker

Vibration	Absorption peak (cm^{-1})
V(NH)	3415
aromatic	3070
Vas(CH_3)	2974
Vas(CH_2)	2927
Vs(CH_3-CH_2)	2885
V(C=O)	1675-1771
aromatic	1608
δ(NH)-V(CN)	1587
V(Si-OEt)	1164-1103

Table. S3. The triplet energy level of **L** and **UMOF**, and the difference with $^5D_0$ of Eu^{3+} ions

	T_1-S_0 (cm^{-1})	$^5D_0$ of Eu^{3+}(cm^{-1})	Difference
L	19763	17500	2263
UMOF	19646	17500	2146