Electronic supplementary information

Eu^{3+}/Tb^{3+} functionalized Bi-based metal-organic frameworks for tunable white-light emission and multifunctional fluorescence sensing

Lifei Xu,[a] Yan Xu,[a,*] Xianliang Li,[b] Zhuopeng Wang,[a] Xia Zhang[a], Ting Sun[a]

[a] *Department of Chemistry, College of Science, Northeastern University, Shenyang, Liaoning 110819, PR China. E-mail: xuyanjlu@126.com (Y. Xu); Fax: +86-024-83684533; Tel.: +86-024-83684533.*

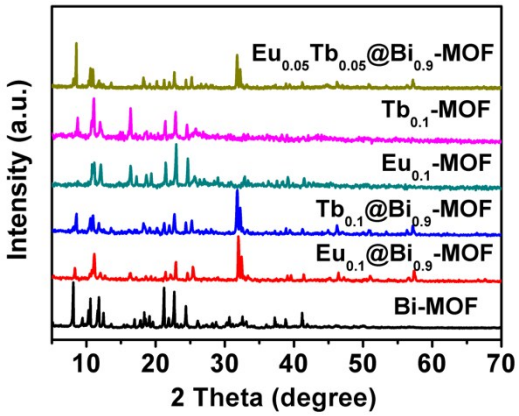

Fig. S1 The XRD patterns of Bi-MOF, $Eu_{0.1}@Bi_{0.9}$-MOF, $Tb_{0.1}@Bi_{0.9}$-MOF, $Eu_{0.1}$-MOF, $Tb_{0.1}$-MOF and $Eu_{0.05}Tb_{0.05}@Bi_{0.9}$-MOF.

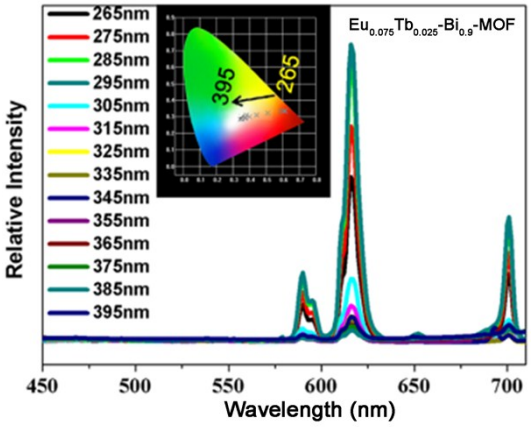

Fig. S2 Fluorescence spectra of **$Eu_{0.075}Tb_{0.025}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

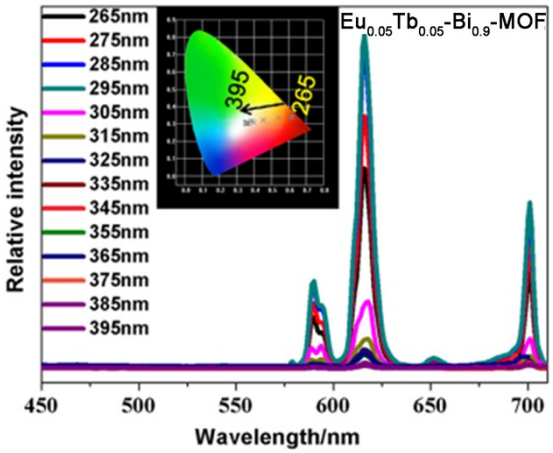

Fig. S3 Fluorescence spectra of **$Eu_{0.05}Tb_{0.05}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

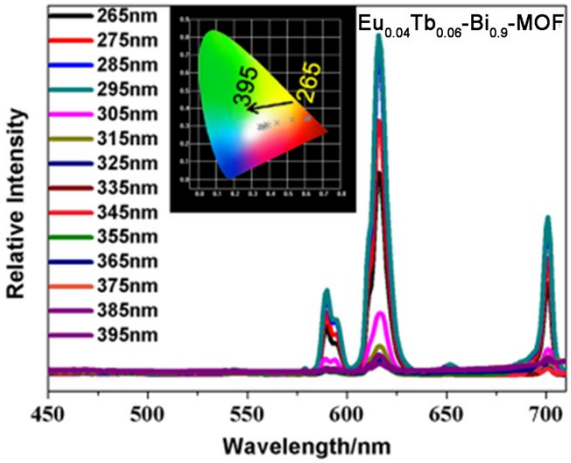

Fig. S4 Fluorescence spectra of **$Eu_{0.04}Tb_{0.06}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

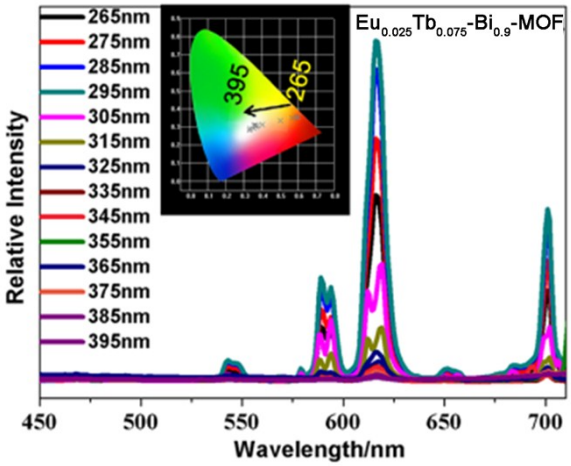

Fig. S5 Fluorescence spectra of **$Eu_{0.025}Tb_{0.075}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

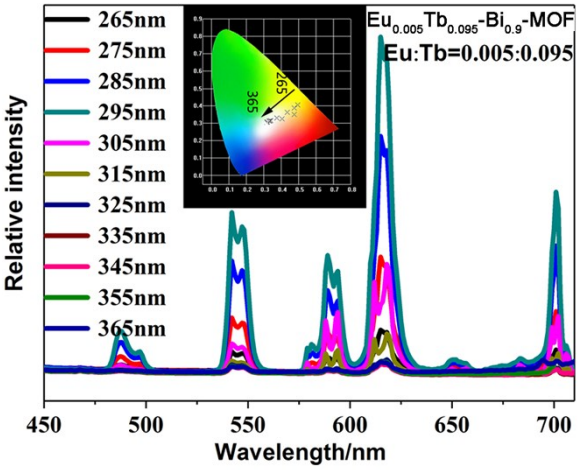

Fig. S6 Fluorescence spectra of **$Eu_{0.005}Tb_{0.095}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

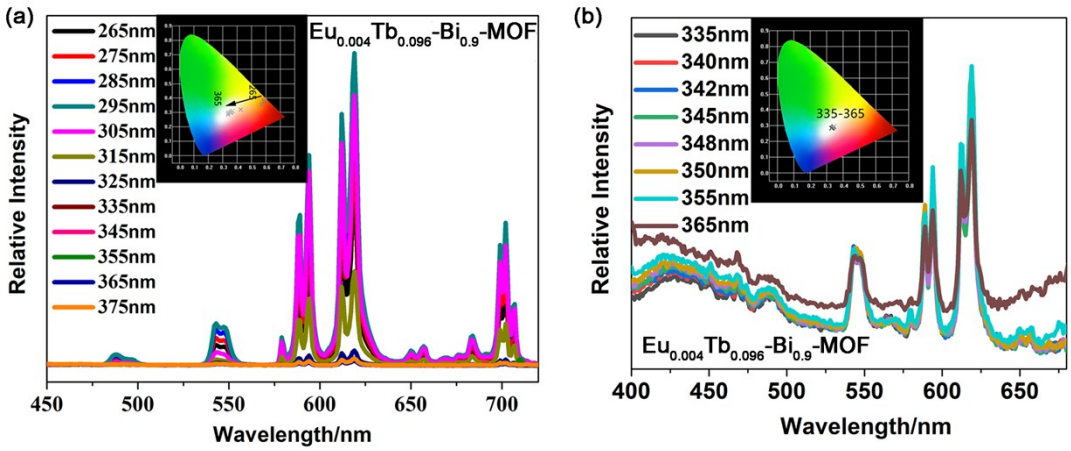

Fig. S7 (a-b) Fluorescence spectra of **$Eu_{0.004}Tb_{0.096}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

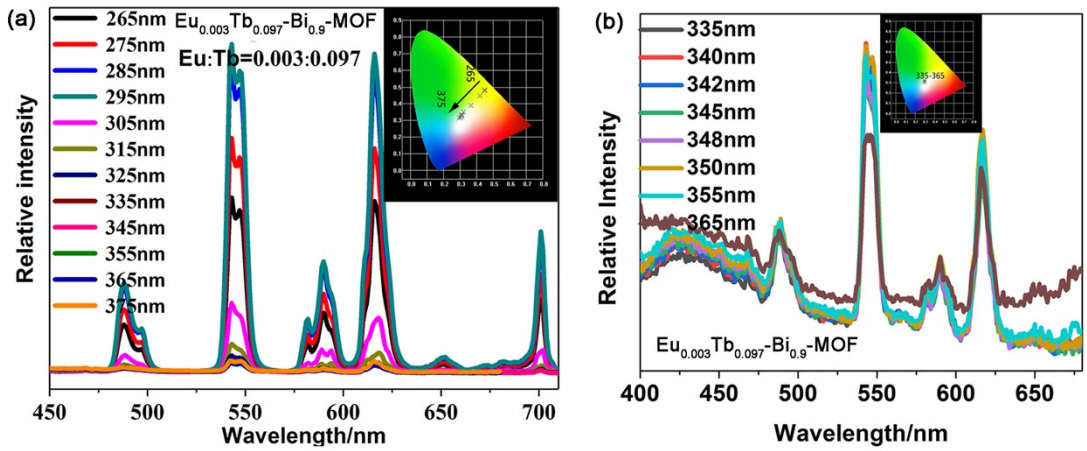

Fig. S8 Fluorescence spectra of **$Eu_{0.003}Tb_{0.097}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

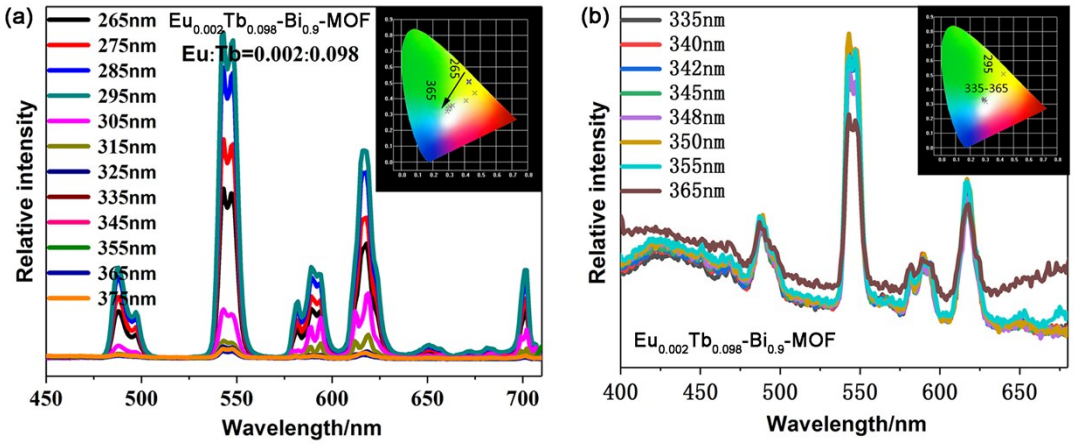

Fig. S9 Fluorescence spectra of **$Eu_{0.002}Tb_{0.098}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

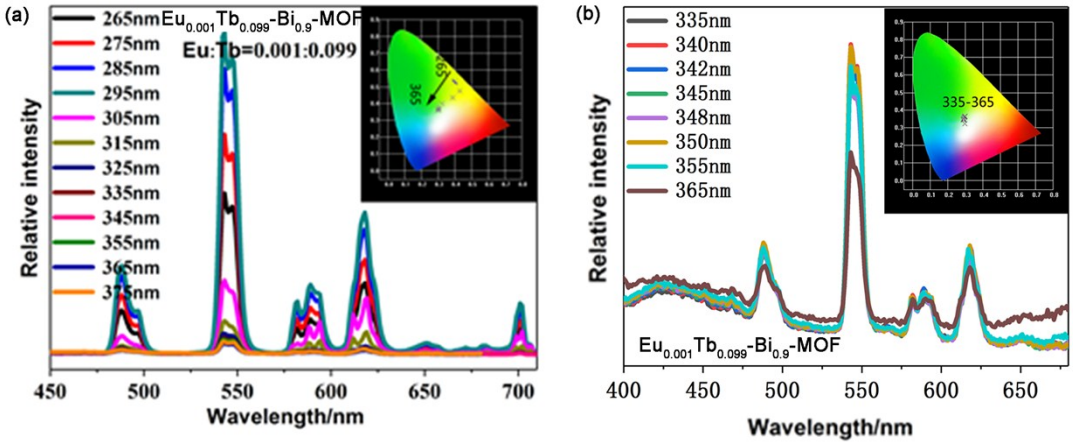

Fig. S10 Fluorescence spectra of **$Eu_{0.001}Tb_{0.099}$-$Bi_{0.9}$-MOF** excited at different excited wavelengths. (Inset: CIE chromaticity diagram).

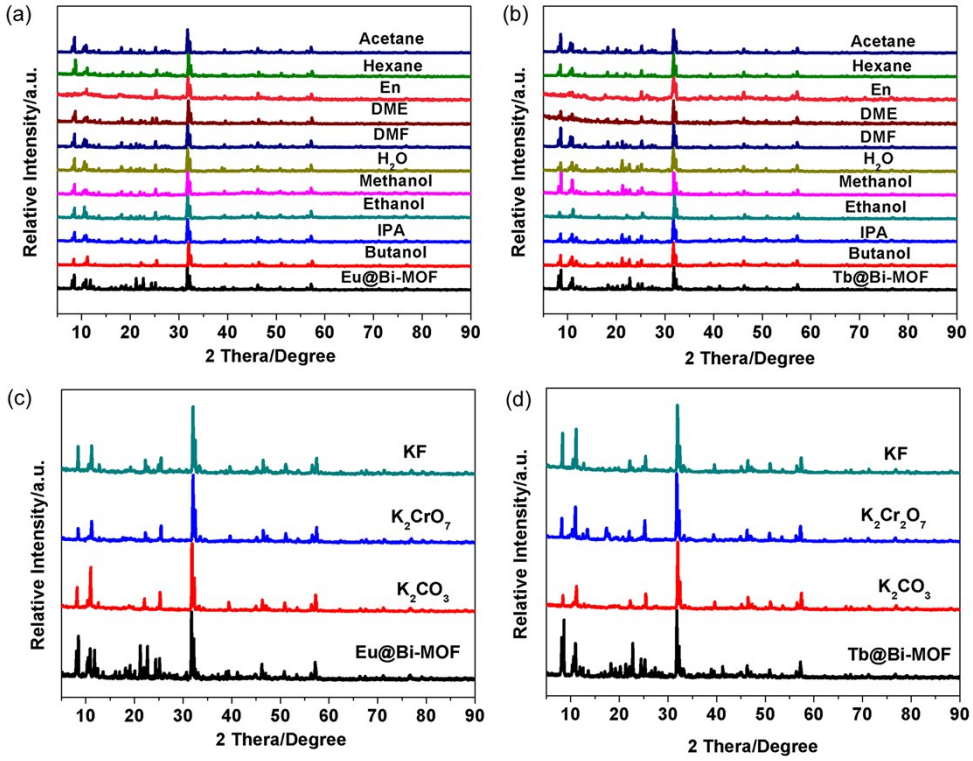

Fig. S11 Powder XRD patterns of (a) Eu@Bi-MOF and (b) Tb@Bi-MOF before and after immersing in different organic small molecules; Powder XRD patterns of (c) Eu@Bi-MOF and (d) Tb@Bi-MOF before and after immersing in F^-, CO_3^{2-}, and $Cr_2O_7^{2-}$ anions.

Table S1 The corresponding CIE coordinates of $Eu_xTb_{0.1-x}$-$Bi_{0.9}$-MOF (x = 0.001, 0.002, 0.003, 0.004, 0.005, 0.025, 0.04, 0.050, 0.075).

Excitation Wavelength/nm	325	335	345	355	365
Sample(Eu:Tb) CIE	X,Y	X,Y	X,Y	X,Y	X,Y
0.075:0.025	0.4001,0.2991	0.3721,0.2874	0.3471,0.2791	0.3331,0.2768	0.3385,0.2908
0.050:0.050	0.3970,0.3098	0.3682,0.2956	0.3489,0.2904	0.3415,0.2908	0.3428,0.3029
0.040:0.060	0.3953,0.3028	0.3656,0.2899	0.3473,0.2838	0.3405,0.2817	0.3397,0.2918
0.025:0.075	0.4035,0.3123	0.3766,0.2963	0.3552,0.2888	0.3504,0.2873	0.3435,0.2927
0.005:0.095	0.3356,0.3127	0.3330,0.3163	0.3259,0.3105	0.3312,0.3120	0.3290,0.3081
0.004:0.096	0.4250,0.3211	0.3440,0.2953	0.3296,0.2830	0.3296,0.283	0.3312,0.2857
0.003:0.097	0.3197,0.3491	0.2993,0.3235	0.2888,0.3065	0.2941,0.3057	0.3037,0.2967
0.002:0.098	0.3241,0.3565	0.3009,0.3387	0.2913,0.3248	0.2967,0.3259	0.3071,0.3148
0.001:0.099	0.3227,0.3976	0.2975,0.3641	0.2895,0.3494	0.2917,0.3462	0.2982,0.3215

Table S2 Performance comparison of various luminescent materials for Fe^{3+} detection.

Luminescent materials	*Detection limits (μM)*	*Reference*
MIL-53(Al)	0.9	1
NTU-9-NS	0.45	2
$[Eu(BTPCA)(H_2O)]\cdot 2DMF\cdot 3H_2O$	10	3
$[Tb(BTB)(DMF)]\cdot 1.5DMF\cdot 2.5H_2O$	10	4
$Eu(C_{22}H_{14}O_2)_3$	100	5
Eu^{3+}@MIL-124	0.28	6
CDs@UiO-66	0.76	7
Carbon dots	0.32	8
Functionalized polyfluorene	0.15	9
Graphene oxide	0.64	10
Eu@Bi-MOF	0.41	This work
Tb@Bi-MOF	0.57	This work

References

1. C. -X. Yang, H. -B. Ren and X. -P. Yan, *Anal. Chem.*, 2013, 85, 7441–7446.
2. H. Xu, J. Gao, X. Qian, J. Wang, H. He, Y. Cui, Y. Yang, Z. Wang and G. Qian, *J. Mater. Chem. A*, 2016, 4, 10900-10905.
3. Q. Tang, S. Liu, Y. Liu, J. Miao, S. Li, L. Zhang, Z. Shi and Z. Zheng, *Inorg. Chem.*, 2013, 52, 2799–2801.
4. H. Xu, H. -C. Hu, C. -S. Cao and B. Zhao, *Inorg. Chem.*, 2015, 54, 4585–4587.
5. M. Zheng, H. Tan, Z. Xie, L. Zhang, X. Jing and Z. Sun, *ACS Appl. Mater. Interfaces*, 2013, 5, 1078–1083.
6. X. Y. Xu and B. Yan, *ACS Appl. Mater. Interfaces*, 2015, 7, 721-729.
7. C. Yao, Y. Xu and Z. Xia, *J. Mater. Chem. C*, 2018, 6, 4396-4399.
8. K. Qu, J. Wang, J. Ren and X. Qu, *Chem.–Eur. J.*, 2013, 19, 7243–7249.
9. X. Wu, B. Xu, H. Tong and L. Wang, *Macromolecules*, 2010, 43, 8917–8923.
10. Q. Mei and Z. Zhang, *Angew. Chem., Int. Ed.*, 2012, 51, 5602–5606.