

## Supplementary material

### **Eu-Functionalized Hydrogen-Bonded Organic Frameworks as a Ratiometric Fluorescent Sensor for Highly Sensitive Detection of Zearalenone**

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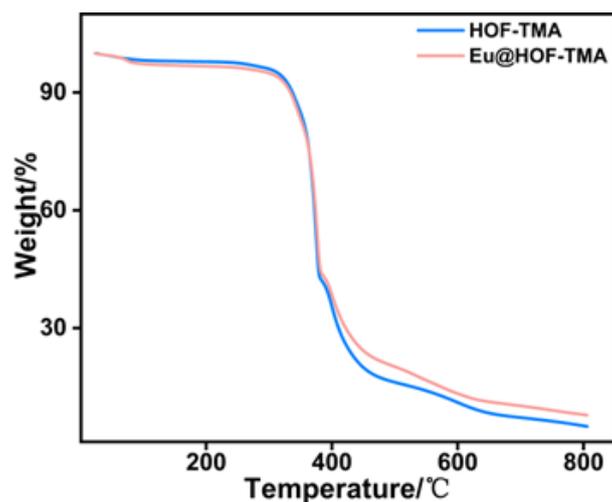


Fig. S1. TGA analysis of HOF-TMA and Eu@HOF-TMA.

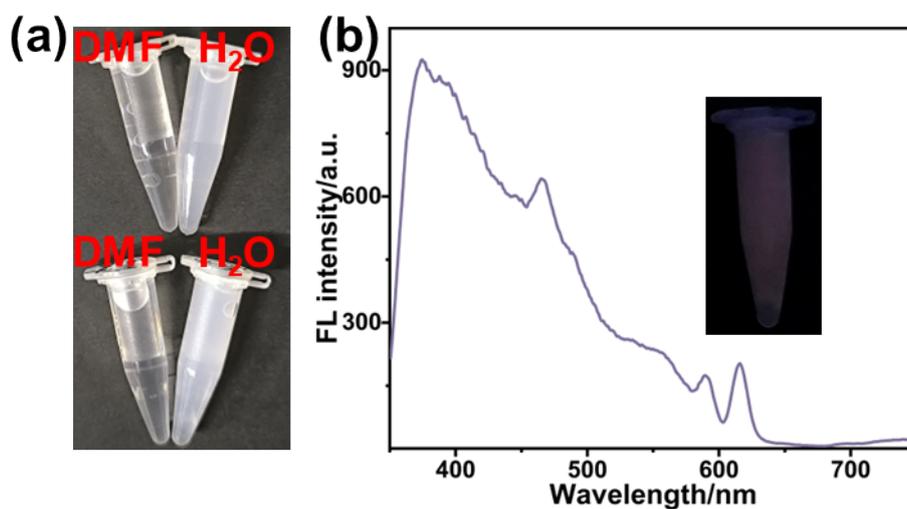
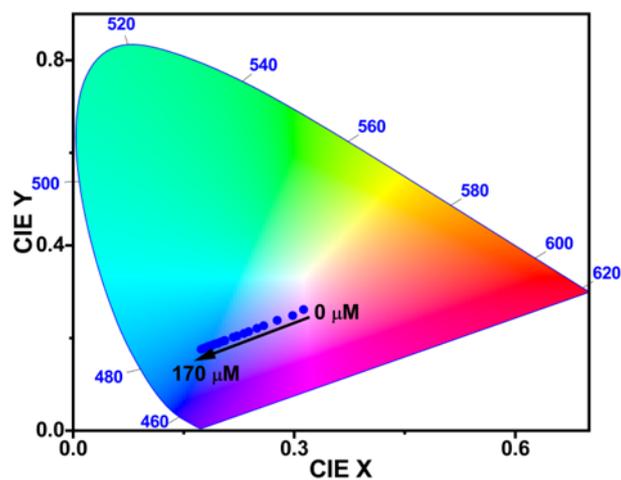
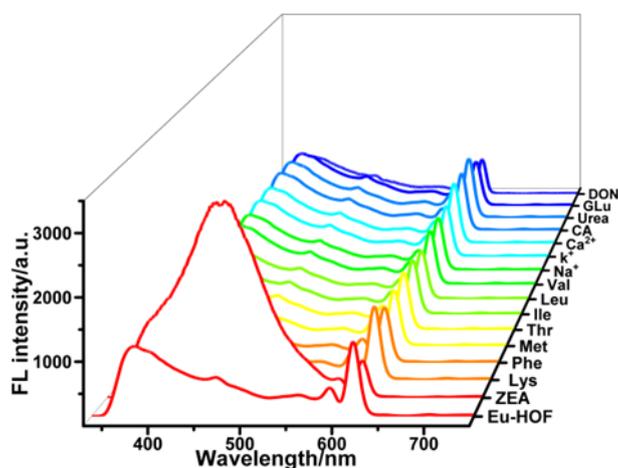


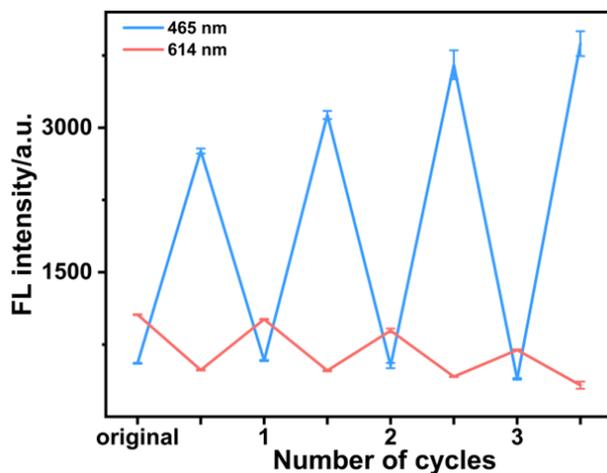
Fig. S2. (a) Photos of HOF-TMA and Eu@HOF-TMA in DMF and H<sub>2</sub>O (The upper layer is HOF-TMA, and the lower layer is Eu@HOF-TMA). (b) Fluorescence emission spectrum of Eu@HOF-TMA in H<sub>2</sub>O.



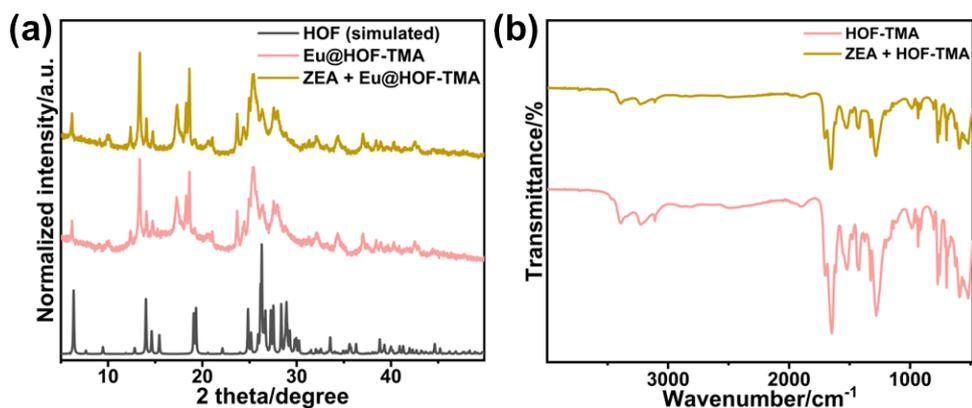
**Fig. S3.** Change in CIE coordinates of Eu@HOF-TMA suspension after adding different concentrations of ZEA.



**Fig. S4.** Fluorescence emission spectra of Eu@HOF-TMA with various substances.



**Fig. S5.** Three regeneration cycles of sensor Eu@HOF-TMA used in the detection of ZEA.



**Fig. S6.** (a) PXRD patterns and (b) FT-IR spectra of Eu@HOF-TMA and ZEA + Eu@HOF-TMA.

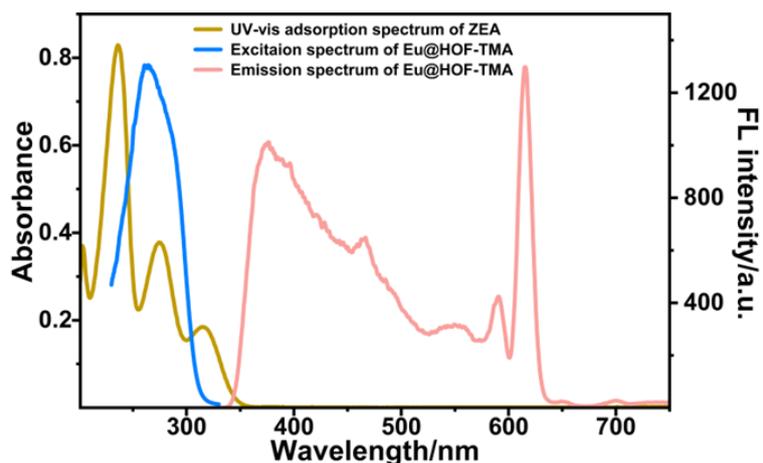


Fig. S7. UV-vis adsorption spectrum of ZEA and fluorescence excitation/emission spectrum of Eu@HOF-TMA.

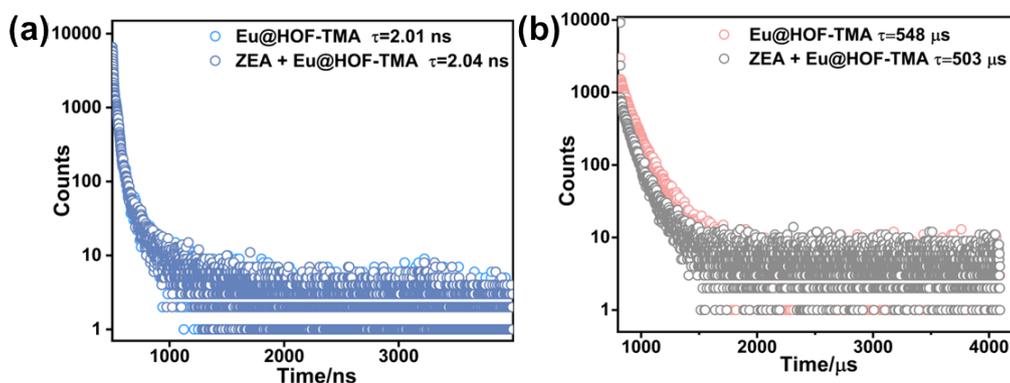


Fig. S8. The fluorescence lifetime of A at (a) 465 nm and (b) 614 nm, after adding ZEA.

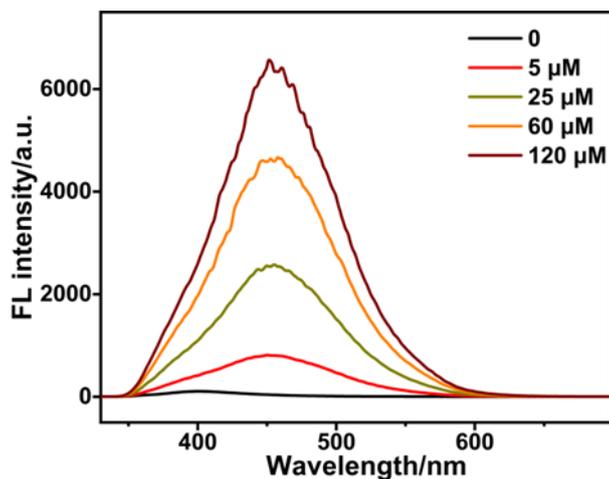


Fig. S9. Fluorescence emission spectrum of ZEA in ethanol solvent.

Table S1. Comparison with other detection methods for detecting ZEA.

Method	LOD	Linear range	Response time	Real sample	Reference
Electrochemical	0.1 μg/mL	1-40 μg/mL	NM*	Wheat flour	1

method					
Chemiluminescence immunoassay	0.01 ng/mL	0.03–2.43 ng/mL	NM*	Grain, Feed	2
Biosensor	0.29 ng/mL	1 -300 ng/mL	40 min	Corn	3
Colorimetric aptasensor	10 ng/mL	10–250 ng/mL	20 min	Corn, Corn oil	4
Aptamer-based					
Lateral Flow Test Strip	20 ng/mL	5-200 ng/mL	15 min	Corn	5
Electrochemical biosensor	6 ng/mL	50-500 ng/mL	7 h	Peanut oil, Corn oil	6
Indirect competitive					
enzyme-linked immunosorbent assay	0.06 ng/mL	2.89-115.36 ng/mL	5 h	Fodder	7
	5 pg/mL	0.01–100 ng/mL	NM*	Wheat, Corn flour	8
	0.003 ng/mL	0.01–10 ng/mL	NM*	Barley	9
Fluorescence method	7.5 nM	31.4-628 nmol/L	NM*	NM*	10
	0.57 $\mu$ M	1-170 $\mu$ M	< 30 s	Corn flour, Drinking water	This work

NM\*: Not mentioned.

**Table S2.** The average RGB values obtained from fluorescence images of Eu@HOF-TMA suspension with different concentrations of ZEA.

$C_{ZEA}$ ( $\mu$ M)	R value	G value	B value
0	153	48	92
1	148	54	96
10	143	62	106
20	133	64	112
30	116	69	103

40	109	68	108
50	115	70	118
60	110	75	117
70	105	79	125
80	99	79	122
90	95	77	125
100	99	85	135
110	65	99	167
130	42	88	170
150	44	105	205
170	43	103	207

**Table S3.** The RGB values read from the Eu@HOF-TMA suspension images of with different substances.

Substances	Selective images			Anti-interference photo		
	R value	G value	B value	R value	G value	B value
Sensor	154	48	92			
ZEA	99	85	136			
Lys	166	44	109	128	118	177
Phe	157	50	96	111	110	156
Met	158	49	96	116	114	153
Thr	135	51	111	112	109	156
Ile	136	49	92	114	109	155
Leu	138	45	90	96	93	137
Val	150	52	91	115	110	151
Na <sup>+</sup>	150	59	103	111	107	140
K <sup>+</sup>	158	61	117	99	106	139
Ca <sup>2+</sup>	166	50	99	113	104	149
CA	145	51	111	116	121	159
Urea	153	56	101	117	112	166

GLU	135	54	99	101	103	134
DON	161	61	90	113	127	154

### Reference:

- 1 W. Hu, D. Jiang, X. Xiang, C. Chen, N. Wang, H. Jiang, N. Zhang, and L. Wang, *Food Anal. Methods*, 2026, **19**, article number 35.
- 2 B. Zhang, H. Li, Y. Li, X. Fu, and D. Du, *Eur. Food Res. Technol.*, 2021, **247**, 2171–2181.
- 3 T. Xia, Y. Zuo, L. Liu, X. Feng, M. Xiong, J. Zhang, L. Long, K. Wang, and N. Hao, *Biosens. Bioelectron.*, 2024, **260**, 116455.
- 4 S. Sun, R. Zhao, S. Feng, and Y. Xie, *Microchim. Acta*, 2018, **185**, 535.
- 5 S. Wu, L. Liu, N. Duan, Q. Li, Y. Zhou, and Z. Wang, *J. Agric. Food Chem.*, 2018, **66**, 1949-1954.
- 6 Y. Chen, Y. Yang, Y. Wang, Y. Peng, J. Nie, G. Gao, and J. Zhi, *Bioelectrochemistry*, 2020, **133**, article 107453.
- 7 X. Jiang, X. Li, Z. Yang, S.A. Eremin, and X. Zhang, *Food Anal. Methods*, 2017, **10**, 256-262.
- 8 H. Singh, A. Deep, S. Puri, M. Khatri, and N. Bhardwaj, *Food Control*, 2024, **163**, 110497.
- 9 K. Majer-Baranyi, A. Barócsi, P. Gáboros, L. Kocsányi, A. Székács, and N. Adányi, *Toxins*, 2022, **14**(12), 866.
- 10 X. Tan, X. Wang, A. Hao, Y. Liu, X. Wang, T. Chu, L. Jiang, Y. Yang, and D. Ming, *Microchem. J.*, 2020, **157**, 104943.