Selectively detecting toluene and benzaldehyde by two stable lanthanide–organic frameworks as luminescent probes

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Experimental Section

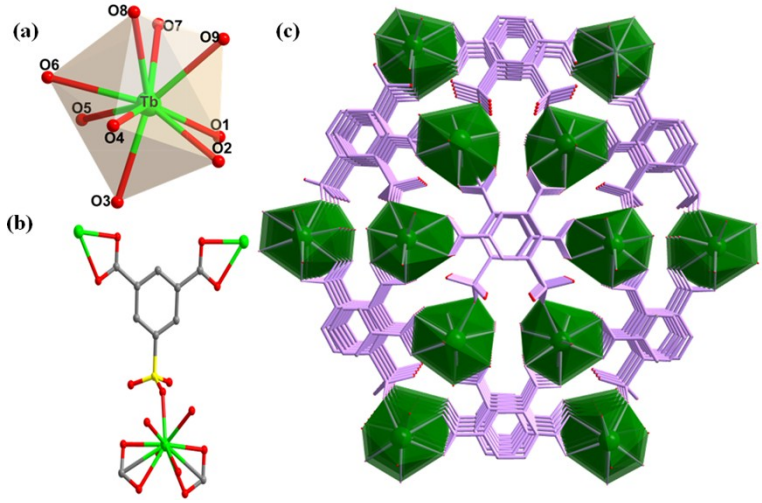

Fig. S1(a)The coordinated environments of Tb(Ⅲ),(b)the polyhedral representation of Tb(Ⅲ),(c)3D structure of compound **1** along the *a* direction by hydrogen bonds.

Table S1. Crystal data and structure refinement details for **1** and **2**.

Compound	**1**	**2**
Empirical formula	$C_8H_{10}O_{11}STb$	$C_8H_{11}EuO_{11}S$
Formula weight	473.14	467.19
Crystal system	orthorhombic	orthorhombic
Space group	$Pna2_1$	$Pna2_1$
a (Å)	7.1753(14)	7.14380(14)
b (Å)	10.353(2)	16.4808(3)
c (Å)	16.497(3)	10.3419(2)
α (°)	90.00	90
β (°)	90.00	90
γ (°)	90.00	90

V (Å^3)	1225.5(4)	1217.62(4)
Z	4	4
F(000)	908.0	904.0
GOOF on F^2	1.119	1.051
Final R indices [$I>2\sigma$ (I)]	R_1 = 0.0256, wR_2 = 0.0630	R_1 = 0.0292, wR_2 = 0.0761
Final R indices (all data)	R_1 = 0.0278, wR_2 = 0.0641	R_1 = 0.0298, wR_2 = 0.0773

The Powder X-Ray Diffraction analysis and TG analysis

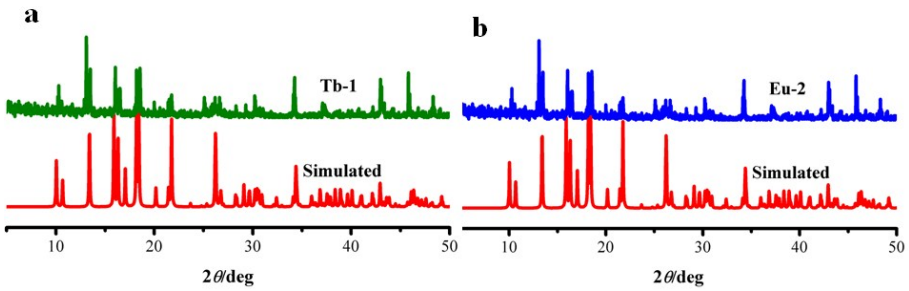

Fig. S2 (a) The Powder XRD patterns of the compound **1** and simulated .(b) The Powder XRD patterns of the compound **2** and simulated .

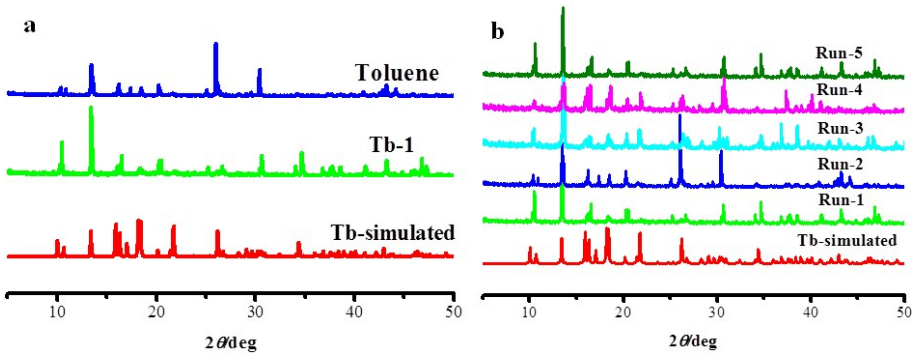

Fig. S3 (a)The PXRD patterns of **1** soaked in toluene.(b)The PXRD patterns of **1** after five luminescent recycling compared with the simulated one.

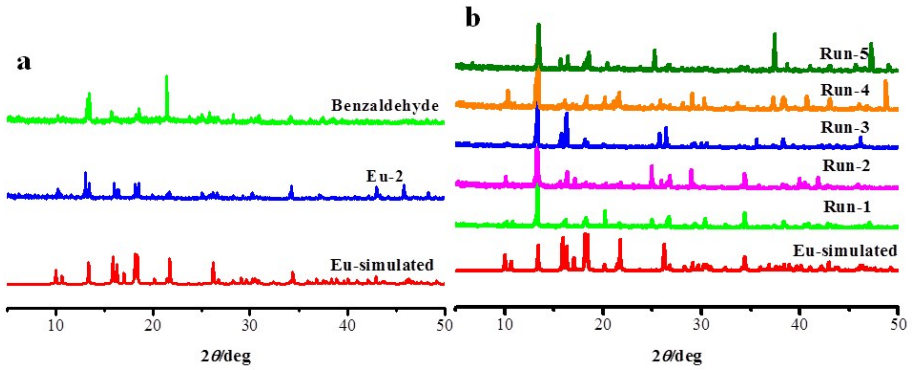

Fig. S4 (a)The PXRD patterns of **1** soaked in beazaldehyde. (b)The PXRD patterns of **2** after five luminescent recycling compared with the simulated one.

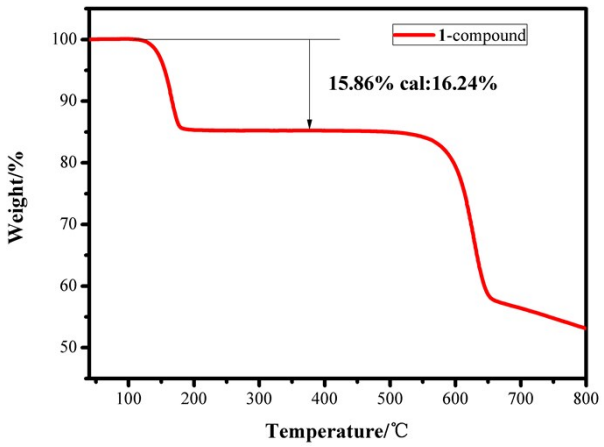

Fig. S5 Thermogravimetric analyses curve of **1**, the weight loss of 15.86% is close to the calculated value (16.24%).

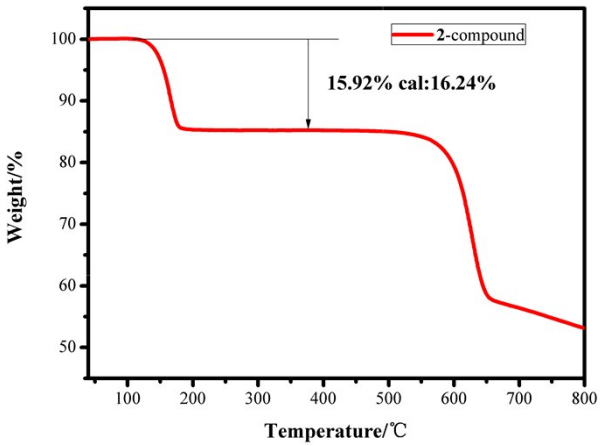

Fig. S6 Thermogravimetric analyses curve of **2**, the weight loss of 15.92% is close to the calculated value (16.24%).

Luminescent Properties.

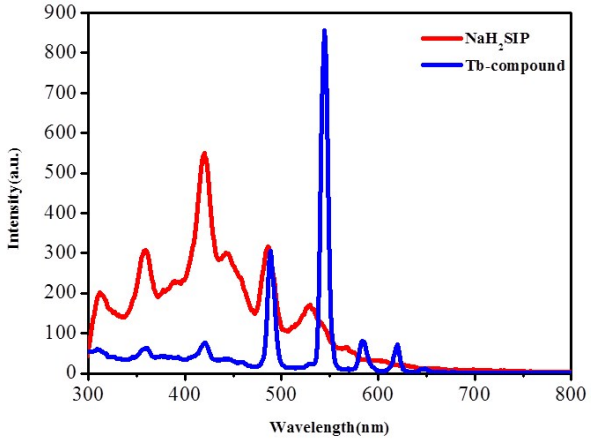

Fig. S7 The solid state luminescence spectra of NaH_2SIP and compound **1**. (λ=260 nm)

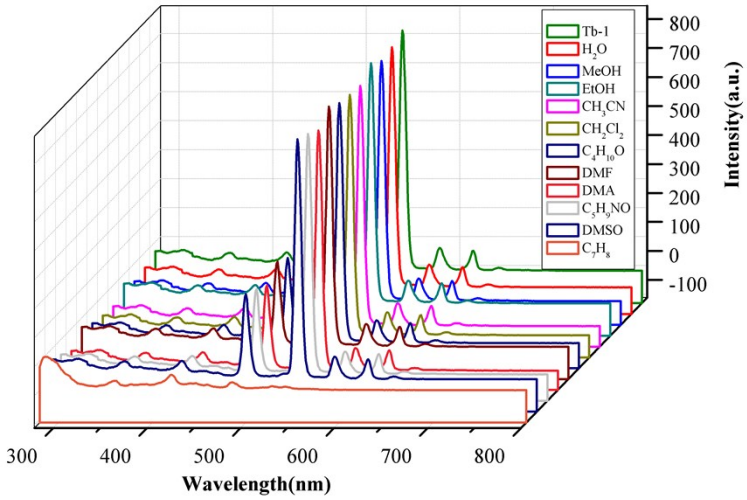

Fig. S8 Emission spectra of compound **1** in different solvents when excited at 260nm.

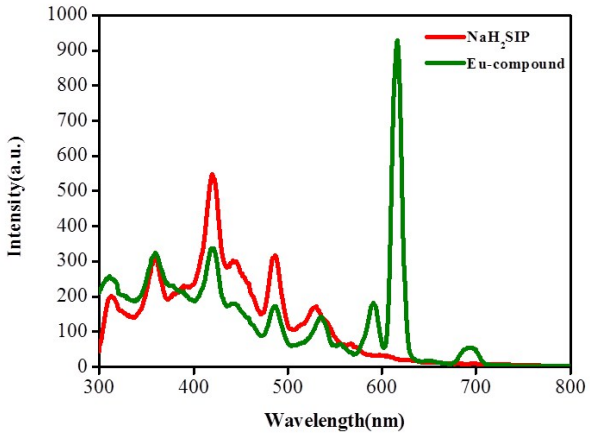

Fig. S9 The solid state luminescence spectra of NaH_2SIP and compound **2**. (λ=260 nm)

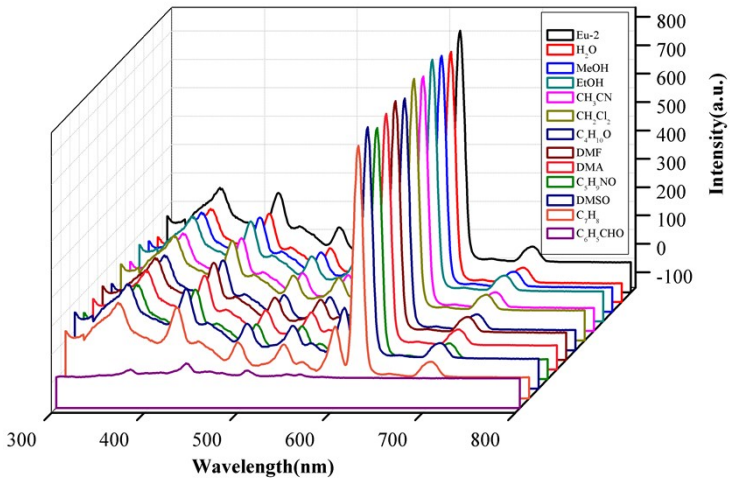

Fig. S10 Emission spectra of compound **2** in different solvents when excited at 260nm.

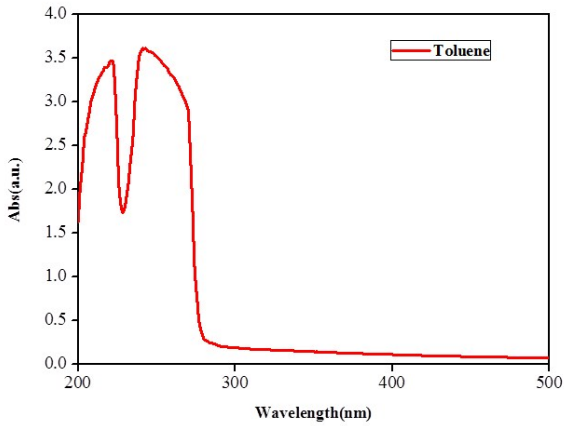

Fig. S11 The UV–vis spectra of toluene in ethanol.

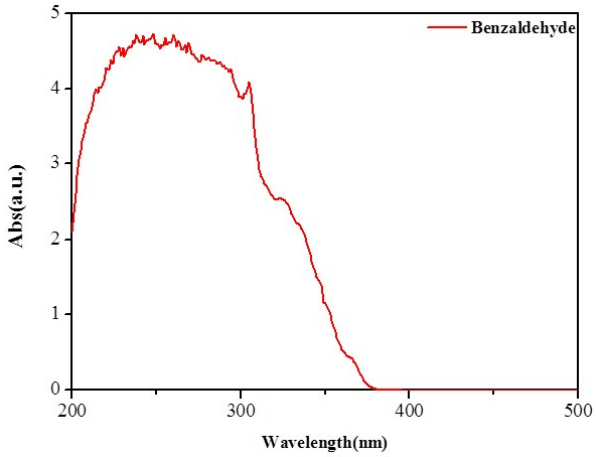

Fig. S12 The UV–vis spectra of benzaldehyde in ethanol.

	Sample	after five recycling
Tb^{3+} (ppm)	0	1.270
Eu^{3+} (ppm)	0	4.770

Table S2 The ICP results of compounds **1** and **2** after five luminescent recycling.

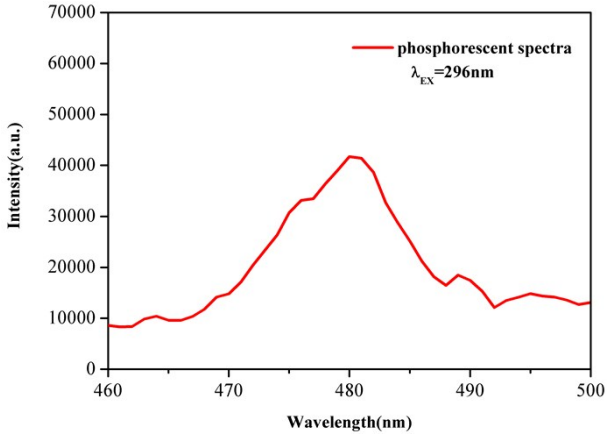

Fig. S13 The phosphorescence spectrum of Gd-MOF at 77 K.

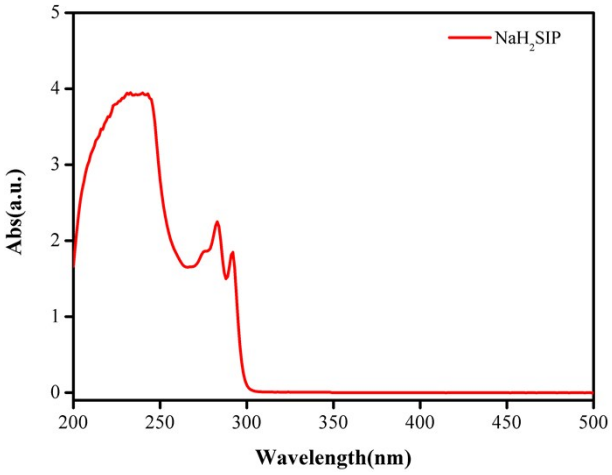

Fig. S14 The UV–vis spectra of NaH_2SIP in ethanol.

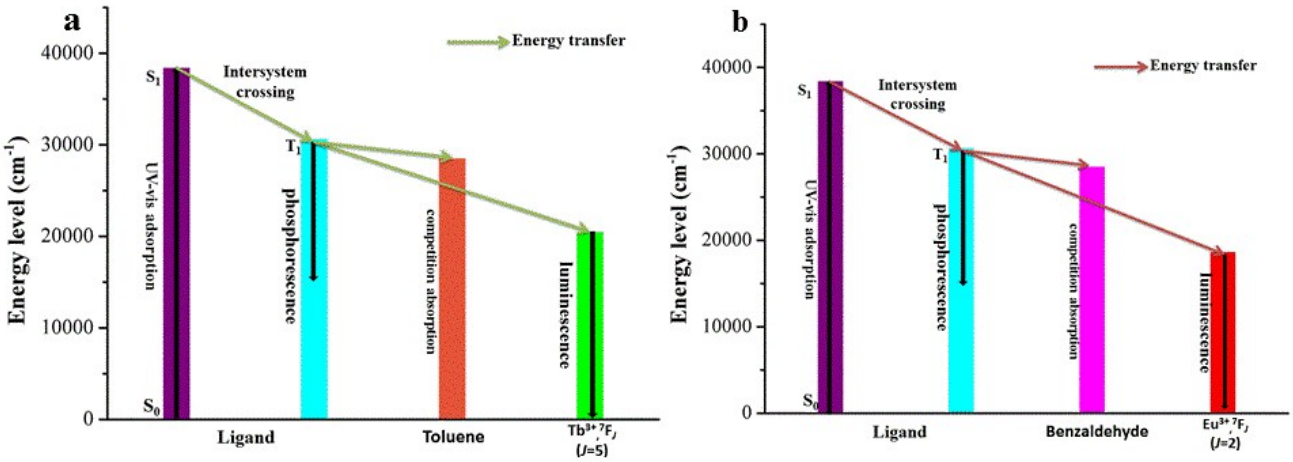

Fig. S15 Simplified schematic diagram of the ligand–metal energy transfer (S_0 is the ground state of the ligand; S_1 and T_1 are the singlet state and triplet state of the ligand, respectively) and the energy transfer between the lowest excited states $^5D_4$ of the Tb^{3+} ion centers **(a)** and Eu^{3+} ion centers **(b)**.

References

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