Electronic Supplementary Material (ESI) for DALTON TRANSACTIONS.

A Photoluminescent Thermometer made from a Thermoresponsive Tetranuclear Gold Complex and Phosphor N630

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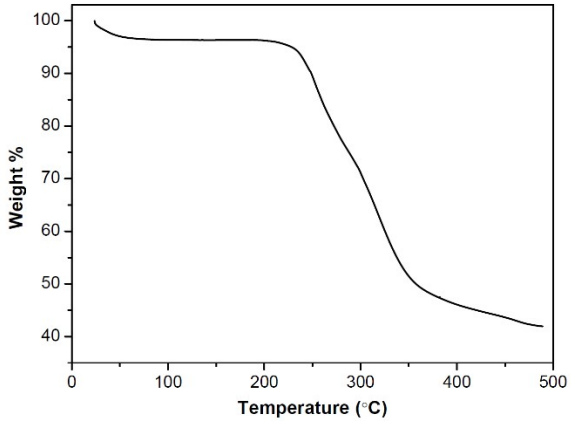

Fig. s1. TGA curve of **1**·EtOH from room temperature to 500 °C.

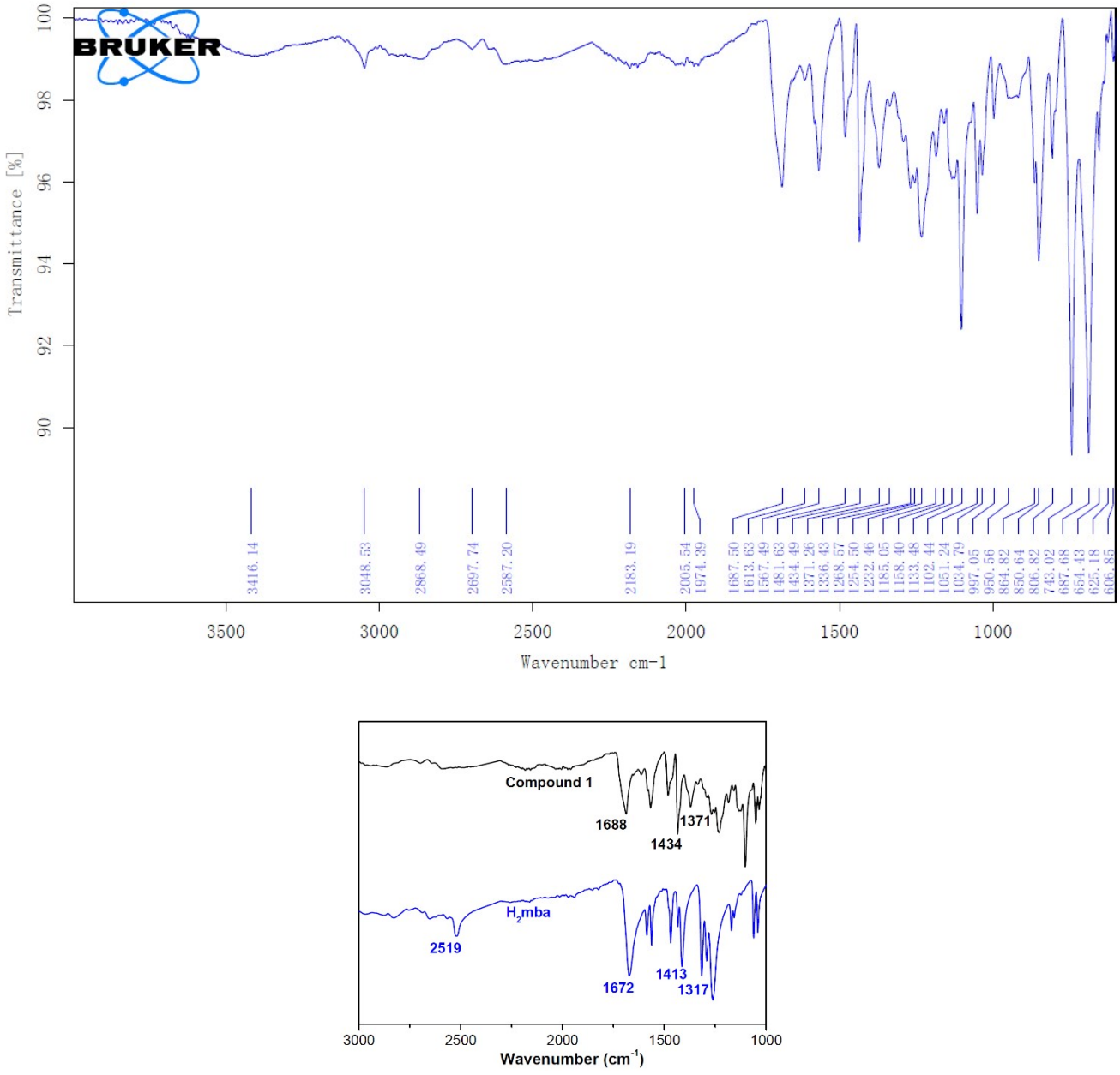

Fig. s2. IR spectra of compound **1** (upper) and H_2mba (lower).

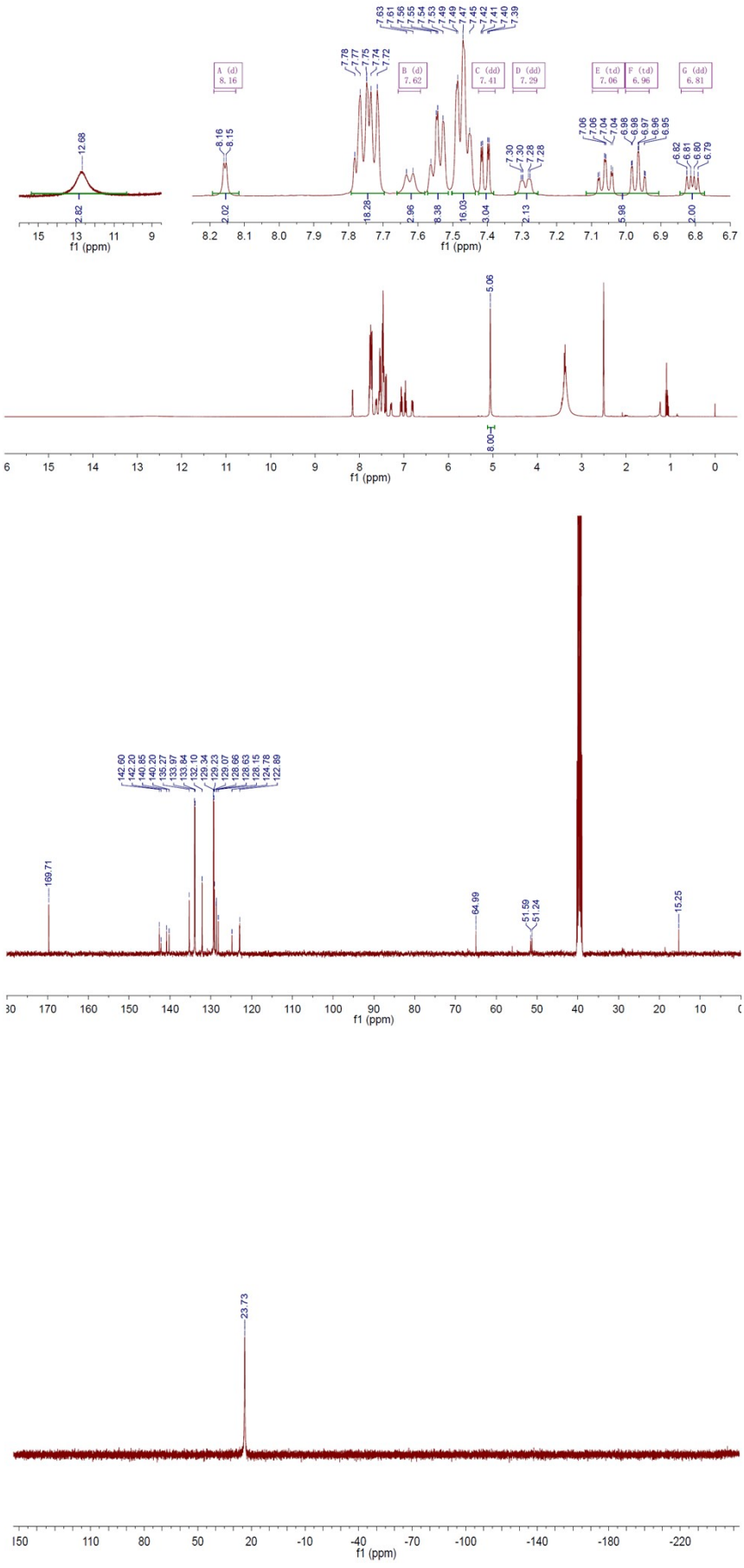

Fig. s3. ^{1}H, ^{13}C and ^{31}P NMR spectra of **1** in DMSO-d_6.

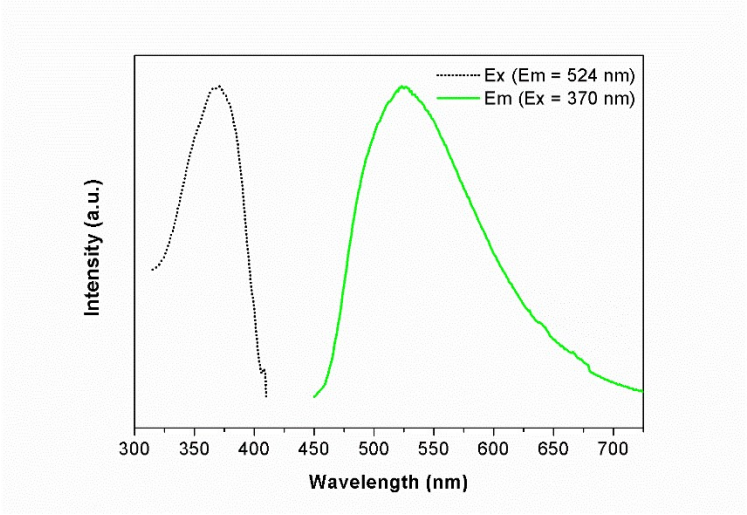

Fig. s4. Solid-state excitation (black) and emission (green) spectra of **1**·EtOH at room temperature.

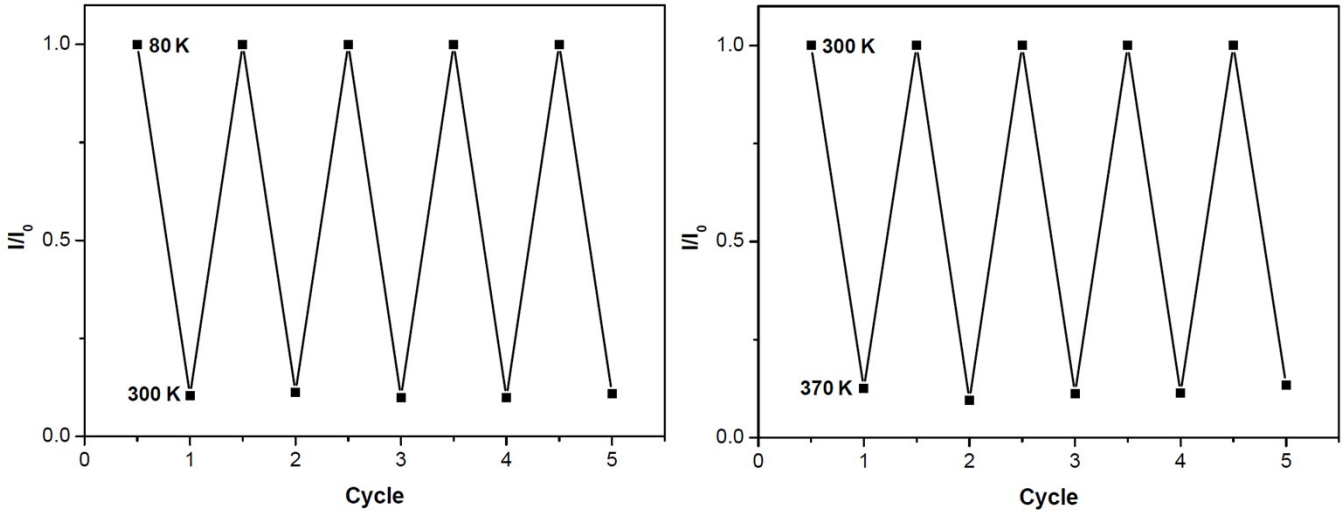

Fig. s5. PL intensity of **1** over five cycles between 80 and300 K (left) and between 300 and 370 K (right). The excitation wavelength was 370 nm.

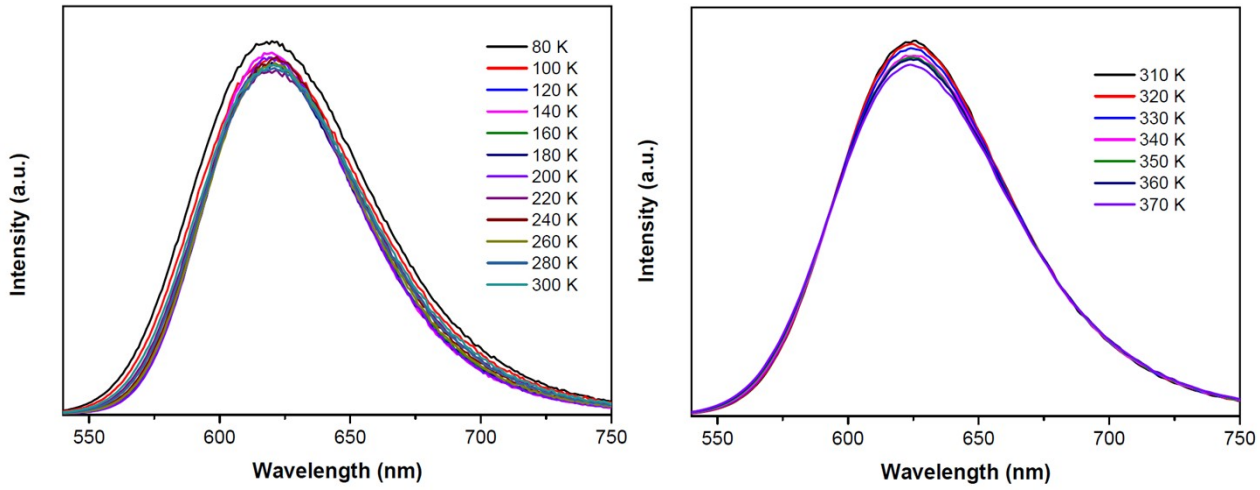

Fig. s6. Emission spectra of N630 at 80-300 K (left) and at 300-370 K (right) at an excitation wavelength of 370 nm.

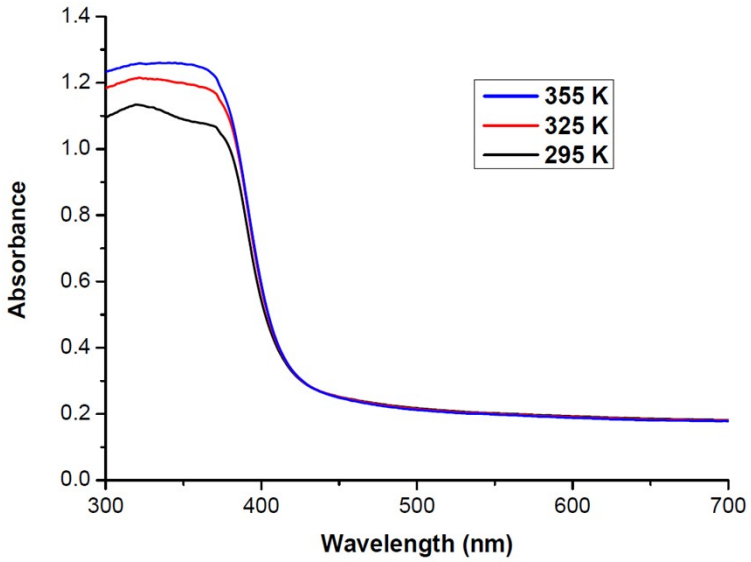

Fig. s7. Solid-state UV-Vis spectra of compound **1** at 295, 325 and 355 K

Table s1. Selected crystallographic data and refinement parameters for **1**·EtOH at different temperatures.

Temperature	**110 K**	**140 K**	**180 K**	**220 K**	**260 K**	**300 K**
Empirical formula	C85H77Au4ClN4O7P4S3					
Formula weight	2309.88					
Crystal system	triclinic					
Space group	$P\bar{1}$					
a/ Å	11.2814(9)	11.2999(9)	11.3296(10)	11.3392(6)	11.3501(6)	11.3650(7)
b/ Å	16.5641(14)	16.5823(13)	16.6117(14)	16.6308(9)	16.6508(9)	16.6659(9)
c/ Å	23.6076(19)	23.6305(19)	23.632(2)	23.7027(13)	23.7568(13)	23.8298(13)
α/°	81.379(3)	81.265(3)	81.126(4)	80.931(2)	80.641(2)	80.294(2)
β/°	89.680(4)	89.613(4)	89.448(4)	89.323(2)	89.174(3)	89.011(2)
γ/°	73.274(3)	73.337(3)	73.432(4)	73.566(2)	73.746(2)	73.898(2)
V/ Å^3	4173.8(6)	4189.5(6)	4209.3(6)	4231.1(4)	4250.6(4)	4272.3(4)
Z	2	2	2	2	2	2
ρ_{calc}/ g.cm^3	1.838	1.831	1.822	1.813	1.805	1.796
μ/mm^{-1}	10.307	10.269	10.221	10.168	10.121	10.070
F(000)	2224	2224	2224	2224	2224	2224
R_1[a]	0.0324	0.0324	0.0367	0.0383	0.0442	0.0594
wR_2[b]	0.0825	0.0818	0.0926	0.1027	0.1273	0.1932
GOF[c]	1.057	1.040	1.046	1.057	1.065	1.085

[a]$R_1 = \Sigma||F_o|-|F_c||/\Sigma|F_o|$, [b]$wR_2 = \{\Sigma w(F_o^2 - F_c^2)^2/\Sigma w(F_o^2)^2\}^{1/2}$. [c]$GOF = \{\Sigma w((F_o^2 - F_c^2)^2)/(n-p)\}^{1/2}$, where n = number of reflection and p = total number of parameters refined.

Table s2. Selected Bond Lengths (Å) and Angels (°) of **1**·EtOH at different temperatures.

Temperature	**110 K**	**140 K**	**180 K**	**220 K**	**260 K**	**300 K**
Au2–Au3	3.0710(4)	3.0788(3)	3.0862(4)	3.0987(4)	3.1106(5)	3.1287(7)
Au2-Cl1	2.2994(11)	2.2982(12)	2.2965(13)	2.2974(14)	2.2943(17)	2.292(2)
Au1–P1	2.2602(11)	2.2589(12)	2.2567(14)	2.2581(14)	2.2580(17)	2.261(3)
Au2–P2	2.2320(11)	2.2313(11)	2.2329(13)	2.2335(13)	2.2324(16)	2.235(2)
Au3–P3	2.2607(12)	2.2592(13)	2.2587(15)	2.2573(16)	2.255(2)	2.252(3)
Au4–P4	2.2547(13)	2.2553(13)	2.2513(15)	2.2519(16)	2.251(2)	2.251(3)
Au1–S1	2.3102(11)	2.3097(12)	2.3092(13)	2.3092(14)	2.3089(17)	2.304(3)
Au3–S2	2.3119(13)	2.3109(14)	2.3091(17)	2.3061(19)	2.308(2)	2.309(4)
Au4–S3	2.2952(12)	2.2953(13)	2.2933(15)	2.2893(17)	2.290(2)	2.290(3)
P1–Au1–S1	174.35(4)	174.43(4)	174.49(5)	174.53(5)	174.64(6)	174.77(9)
P2–Au2–Cl1	177.44(4)	177.35(4)	177.19(5)	177.05(5)	177.01(6)	176.82(9)
P2–Au2–Au3	98.12(3)	98.27(3)	98.42(3)	98.85(4)	99.22(4)	99.70(6)
Cl1–Au2–Au3	84.37(3)	84.33(3)	84.35(4)	84.08(4)	83.76(5)	83.48(7)
P3–Au3–S2	174.68(5)	174.73(5)	174.81(6)	174.98(7)	175.03(8)	174.90(13)
P3–Au3–Au2	102.28(3)	102.40(3)	102.30(4)	102.45(4)	102.63(5)	102.80(7)
S2–Au3–Au2	82.92(4)	82.77(4)	82.77(5)	82.50(5)	82.28(7)	82.22(10)
P4–Au4–S3	174.25(4)	174.40(5)	174.56(6)	174.72(6)	174.99(8)	175.34(11)