Electronic Supplementary Material (ESI) for Dalton Transactions

Series of Edge-sharing Bi-triangle Ln_4 Clusters with a μ_4-NO_3^- Bridge: Syntheses, Structures, Luminescence, and the SMM Behavior for the Dy_4 Analogue

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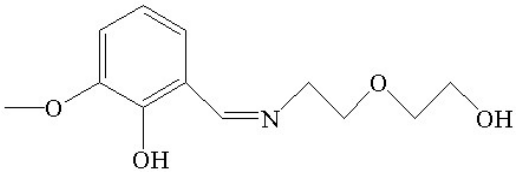

Scheme S1. Representation of the 2-{[2-(2-hydroxy-ethoxy)-ethylimino]-methyl}-6-methoxyphenol ligand.

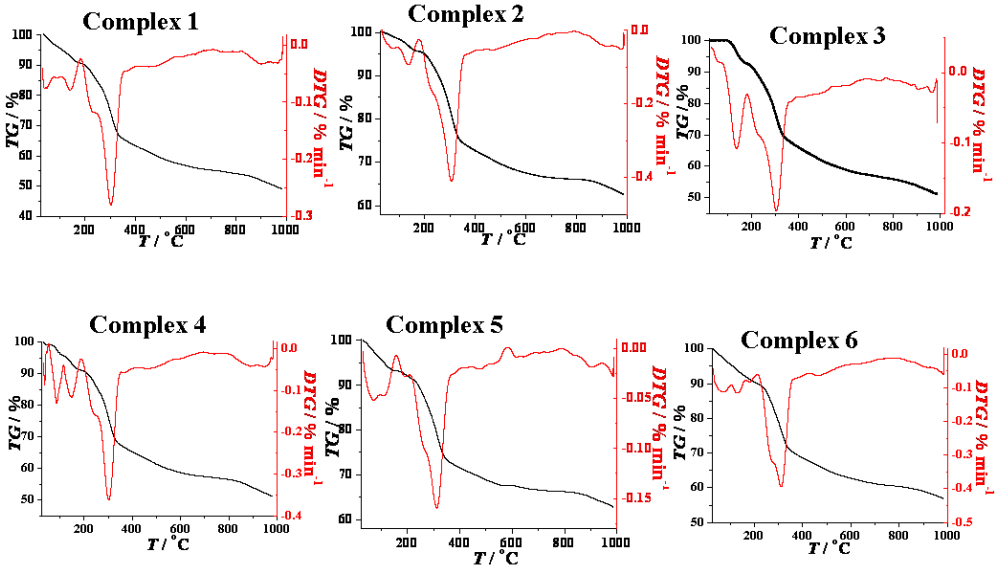

Fig. S1 TG-DTG curves of complexes **1**–**6**.

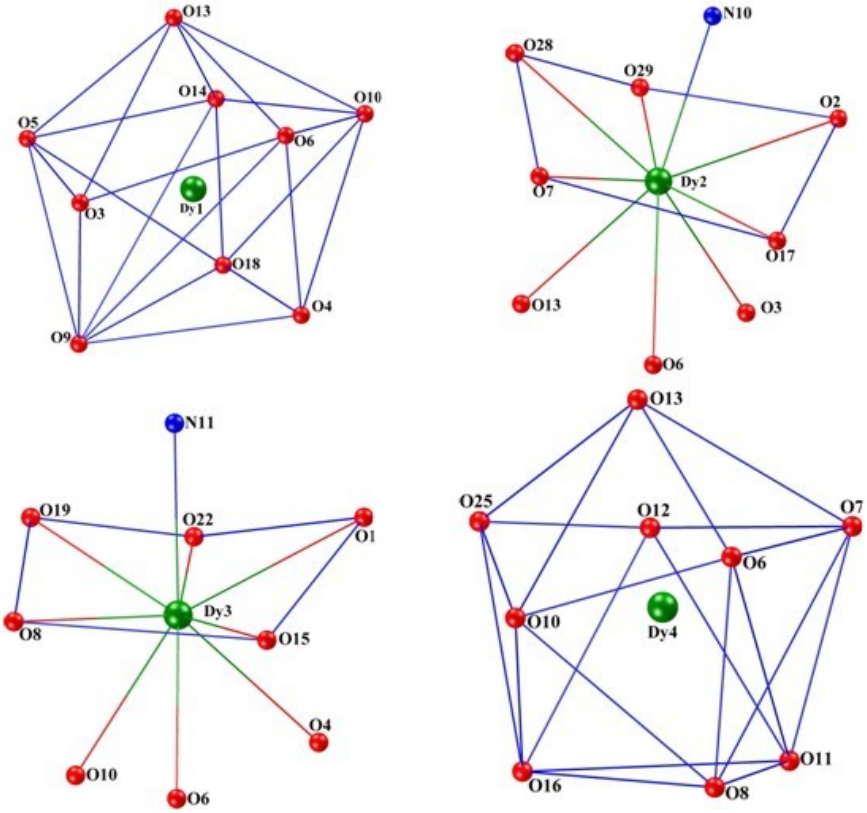

Fig S2. coordination environment of the dysprosium(III) ion Dy1, Dy2, Dy3, and Dy4.

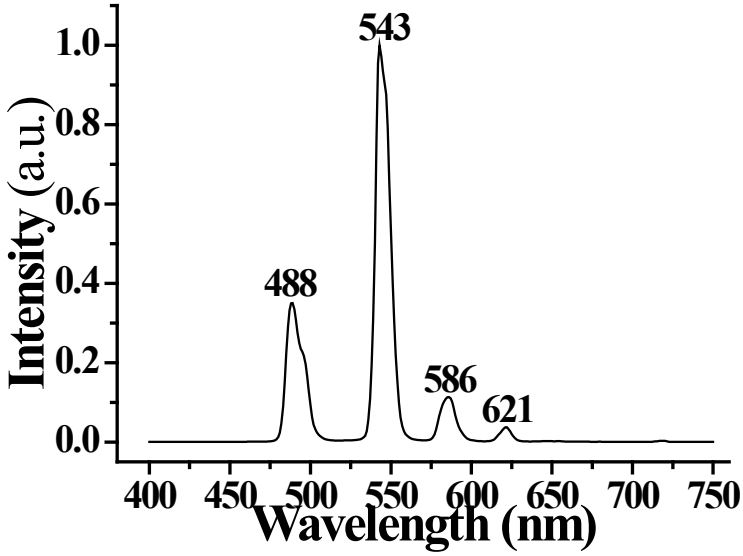

Fig S3. Emission spectra of **2** (excited at 362 nm) in the solid state at 77 K.

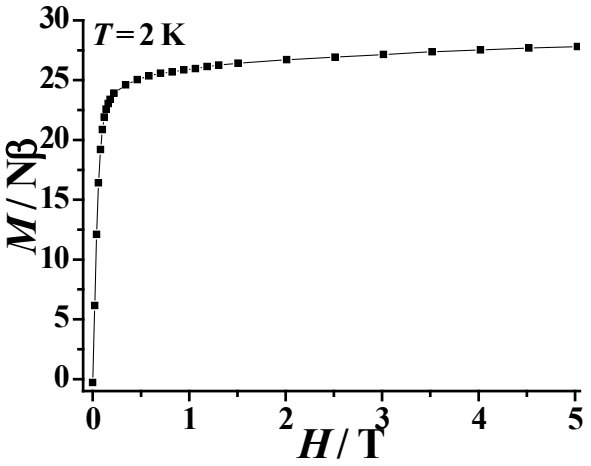

Fig. S4 *M* versus *H* curve of **1** at 2 K.

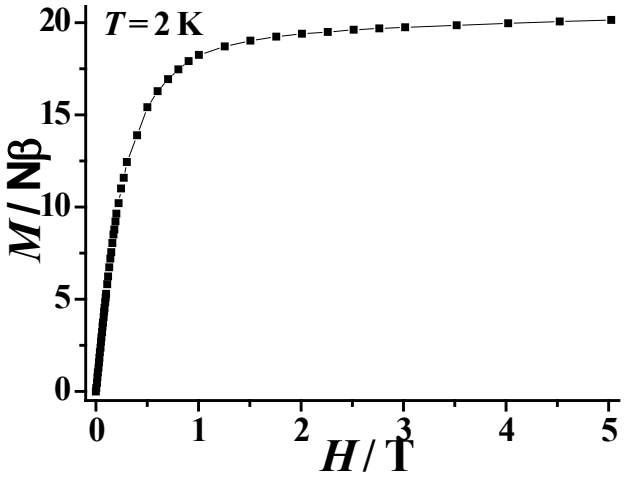

Fig. S5 *M* versus *H* curve of **3** at 2 K.

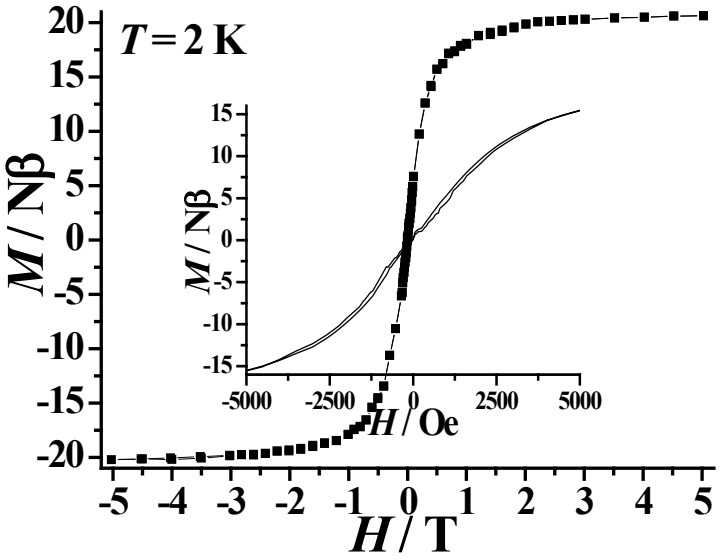

Fig. S6 Magnetic hysteresis loop of **3** recorded at 2 K (Inset: the enlarged picture of hysteresis loop).

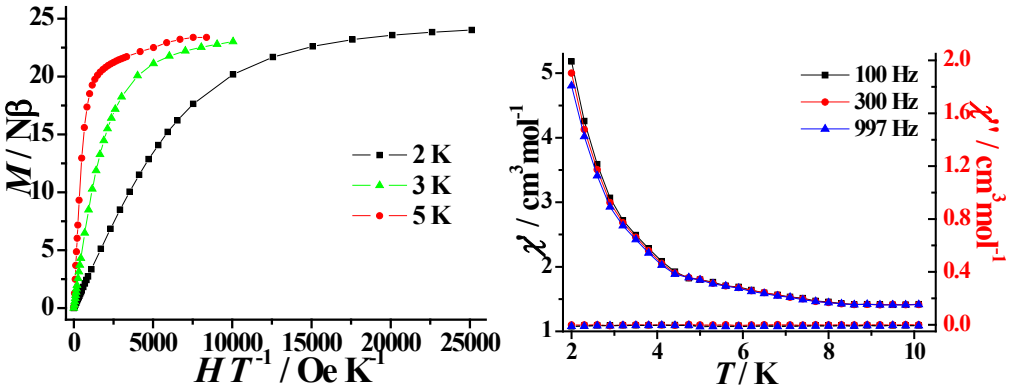

Fig. S7 The plot of the reduced magnetization *vs.* *H*/T for **2** in the field range 0–5 T and temperature range 2–5 K (left), temperature dependent in-phase and out-of-phase ac susceptibility for **2** in the absence of a dc field (H_{ac} = 2.5 Oe, right).

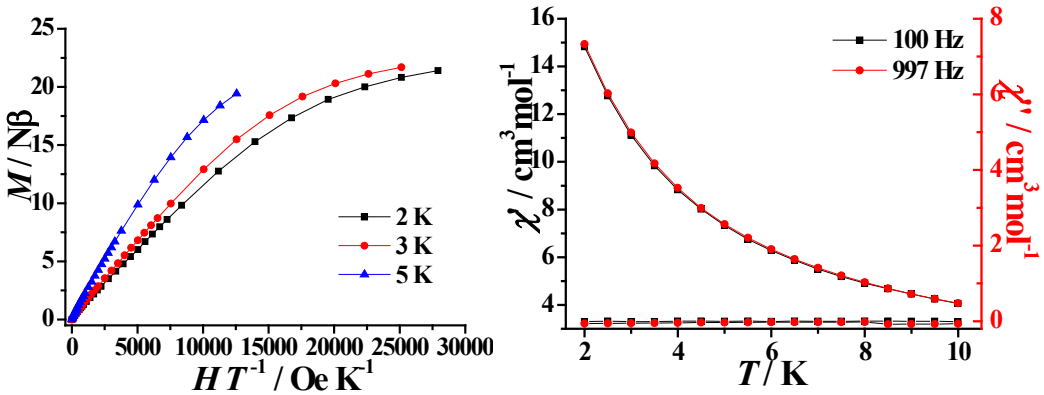

Fig. S8 The plot of the reduced magnetization *vs.* *H*/*T* for **4** in the field range 0–5 T and temperature range 2–5 K, temperature dependent in-phase and out-of-phase ac susceptibility for **4** in the absence of a dc field (H_{ac} = 2.5 Oe, right).

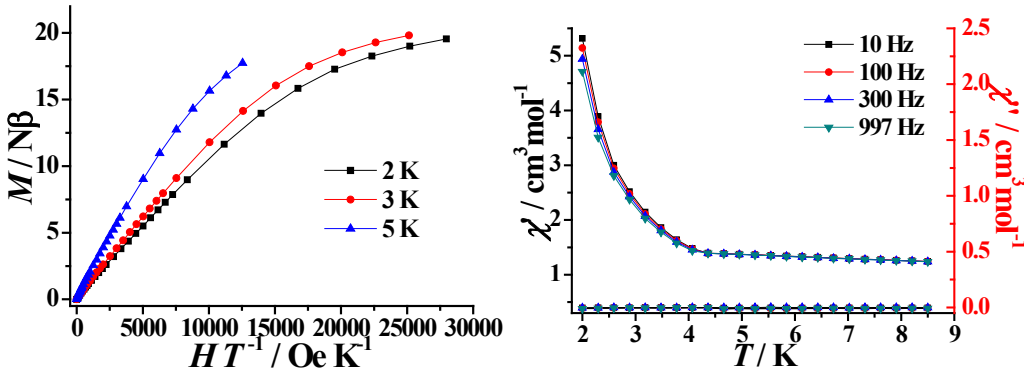

Fig. S9 The plot of the reduced magnetization *vs.* *H*/*T* for **5** in the field range 0–5 T and temperature range 2–5 K (left), Temperature dependent in-phase and out-of-phase ac susceptibility for **5** in the absence of a dc field. (H_{ac} = 2.5 Oe, right).

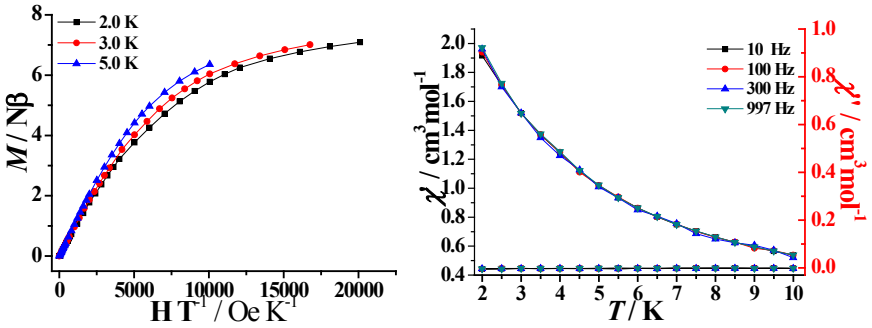

Fig. S10 The plot of the reduced magnetization *vs*. *H*/*T* for **6** in the field range 0–5 T and temperature range 2–5 K (left), Temperature dependent in-phase and out-of-phase ac susceptibility for **6** in the absence of a dc field. (H_{ac} = 2.5 Oe, right).

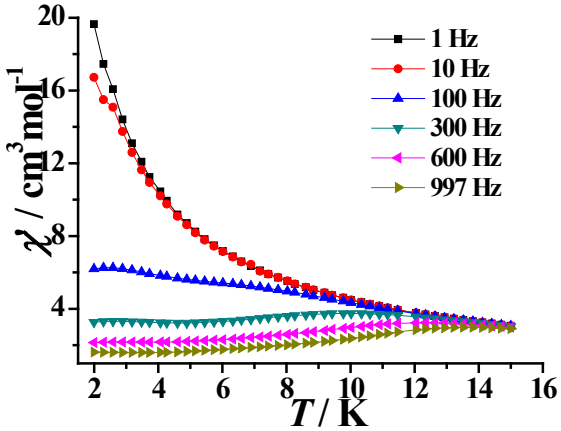

Fig. S11 Temperature dependent in-phase ac susceptibility for **3** in the absence of a dc field. (H_{ac} = 2.5 Oe)

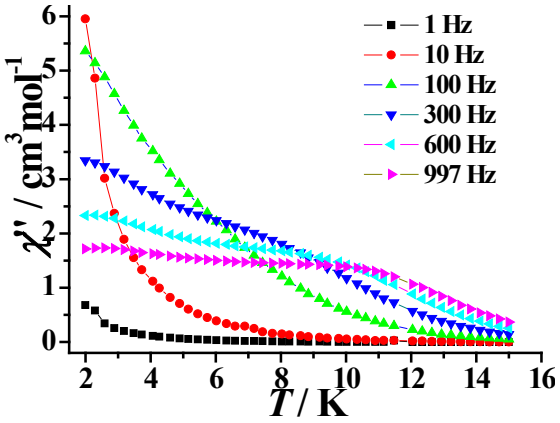

Fig. S12 Temperature dependent out-of-phase ac susceptibility in the absence of a dc field. (H_{ac} = 2.5 Oe)

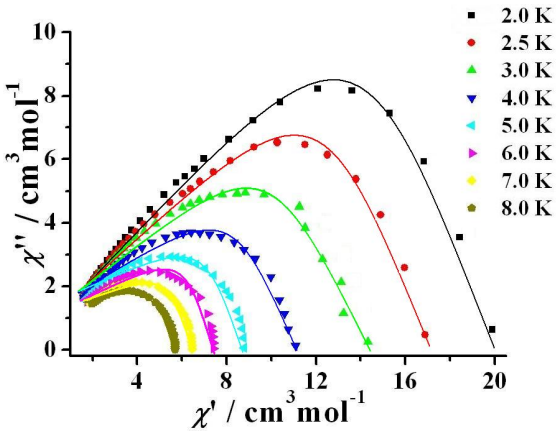

Figure S13. Cole-Cole diagram of **3** at 2.0–8.0 K with zero dc field; the solid lines are the best fits to the experimental data, obtained with the generalized Debye model.

To examine the process of magnetization relaxation, ac magnetic susceptibilities were employed to construct a Cole–Cole plot. The results are shown in Fig. S12, in which the solid lines represent the least-square fits of the theoretical curve based on Eqs. (1) and (2).

$$\chi'(\nu_{ac}) = \chi_{\infty} + \frac{(\chi_{o} - \chi_{\infty})[1 + (2\pi\nu_{ac}\tau)^{1-\alpha}\sin(\alpha\pi/2)]}{1 + 2(2\pi\nu_{ac}\tau)^{1-\alpha}\sin(\alpha\pi/2) + (2\pi\nu_{ac}\tau)^{2(1-\alpha)}} \quad (1)$$

$$\chi''(\nu_{ac}) = \frac{(\chi_{o} - \chi_{\infty})(2\pi\nu_{ac}\tau)^{1-\alpha}\cos(\alpha\pi/2)}{1 + 2(2\pi\nu_{ac}\tau)^{1-\alpha}\sin(\alpha\pi/2) + (2\pi\nu_{ac}\tau)^{2(1-\alpha)}} \quad (2)$$

Where χ_{∞} is the adiabatic susceptibility, χ_{o} is the isothermal susceptibility, and τ is the magnetization relaxation time. The parameter α is an indicator of the distribution of relaxation time. An analysis of the Cole–Cole plots at different temperatures show a parameters ranging from 0.18 to 0.32. Because these values are deviated from zero, the magnetization relaxation seem more likely to involve a distribution of relaxation processes.

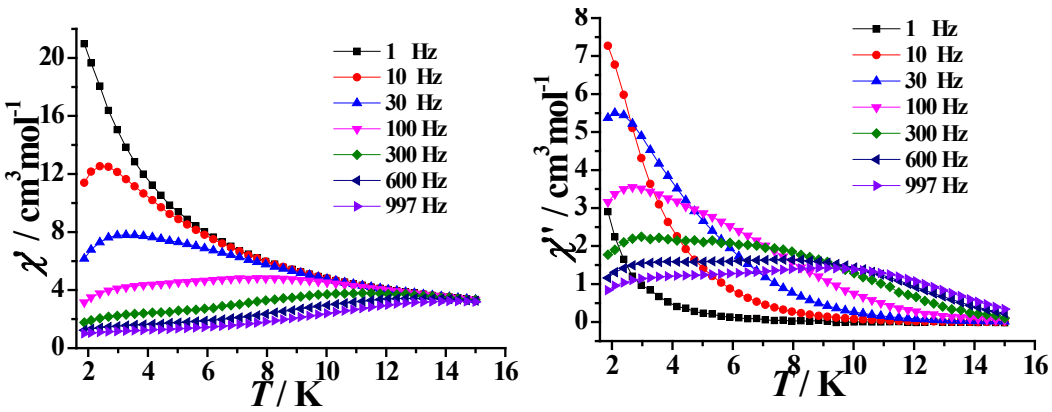

Fig. S14 Temperature dependent in-phase (left) and out-of-phase ac susceptibility in the 1000 Oe dc field. (H_{ac} = 2.5 Oe)

Table S1. Bond Length and Bond Angle Parameters for Complexes **1**−**6**.

Ln	Gd (**1**)	Tb (**2**)	Dy (**3**)	Ho (**4**)	Er (**5**)	Yb(**6**)
Ln1-O3	2.390(6)	2.371(3)	2.362(3)	2.346(2)	2.335(2)	2.3122(7)
Ln1-O4	2.268(6)	2.254(3)	2.242(4)	2.251(2)	2.240(2)	2.2071(8)
Ln1-O5	2.474(6)	2.458(3)	2.451(4)	2.448(2)	2.440(2)	2.4089(9)
Ln1-O6	2.599(6)	2.590(3)	2.586(3)	2.592(2)	2.591(2)	2.5474(7)
Ln1-O9	2.501(5)	2.495(3)	2.493(4)	2.487(2)	2.479(2)	2.4480(8)
Ln1-O10	2.430(5)	2.407(3)	2.405(4)	2.391(2)	2.384(2)	2.3537(8)
Ln1-O13	2.367(5)	2.352(3)	2.334(4)	2.342(2)	2.339(2)	2.2954(8)
Ln1-O14	2.580(6)	2.583(3)	2.579(4)	2.590(2)	2.596(2)	2.5785(9)
Ln1-O18	2.453(6)	2.427(3)	2.414(4)	2.411(2)	2.399(2)	2.3701(9)
Ln2-O2	2.385(6)	2.371(3)	2.360(4)	2.361(2)	2.353(2)	2.3095(8)
Ln2-O3	2.350(5)	2.334(3)	2.322(4)	2.334(2)	2.332(2)	2.2896(8)
Ln2-O6	2.547(6)	2.527(3)	2.519(3)	2.508(2)	2.494(2)	2.4647(7)
Ln2-O7	2.315(5)	2.313(3)	2.306(4)	2.305(2)	2.301(2)	2.2671(8)
Ln2-O13	2.374(6)	2.366(3)	2.354(4)	2.351(2)	2.350(2)	2.3175(7)
Ln2-O17	2.438(6)	2.426(3)	2.419(4)	2.413(2)	2.410(2)	2.3753(9)
Ln2-O28	2.476(6)	2.468(4)	2.448(4)	2.447(3)	2.443(3)	2.3989(11)
Ln2-O29	2.493(6)	2.479(4)	2.476(4)	2.484(3)	2.482(3)	2.4431(10)
Ln2-N10	2.506(8)	2.479(4)	2.475(4)	2.474(3)	2.476(3)	2.4397(11)
Ln3-O1	2.454(5)	2.441(3)	2.434(4)	2.440(2)	2.438(2)	2.4055(8)
Ln3-O4	2.319(5)	2.300(3)	2.289(4)	2.290(2)	2.289(2)	2.2404(8)
Ln3-O6	2.560(6)	2.536(3)	2.514(3)	2.500(2)	2.489(2)	2.4593(7)
Ln3-O8	2.366(5)	2.331(3)	2.319(4)	2.329(2)	2.320(2)	2.2809(8)
Ln3-O10	2.364(6)	2.354(3)	2.347(4)	2.349(2)	2.347(2)	2.3010(7)
Ln3-O15	2.405(6)	2.405(3)	2.401(3)	2.393(2)	2.388(2)	2.3641(7)
Ln3-O19	2.517(8)	2.521(4)	2.517(4)	2.519(2)	2.517(2)	2.4892(9)
Ln3-O22	2.469(8)	2.467(4)	2.461(4)	2.443(3)	2.429(3)	2.4082(9)
Ln3-N11	2.485(6)	2.459(4)	2.450(4)	2.452(3)	2.449(3)	2.4059(9)
Ln4-O6	2.544(5)	2.535(3)	2.526(4)	2.530(2)	2.528(2)	2.4877(8)
Ln4-O7	2.277(6)	2.261(3)	2.247(4)	2.242(2)	2.234(2)	2.2037(8)
Ln4-O8	2.395(6)	2.379(3)	2.374(4)	2.363(2)	2.348(2)	2.3101(7)
Ln4-O10	2.386(5)	2.364(3)	2.345(4)	2.352(2)	2.349(2)	2.3024(8)
Ln4-O11	2.531(5)	2.537(3)	2.525(4)	2.536(2)	2.533(2)	2.5045(8)
Ln4-O12	2.472(6)	2.453(4)	2.443(4)	2.433(2)	2.425(3)	2.3875(9)
Ln4-O13	2.448(5)	2.442(3)	2.434(4)	2.426(2)	2.422(2)	2.3753(7)
Ln4-O16	2.502(7)	2.485(4)	2.475(4)	2.473(2)	2.477(2)	2.4439(9)
Ln4-O25	2.563(6)	2.539(4)	2.540(4)	2.544(3)	2.543(3)	2.5127(9)
O3-Ln1-O4	94.4(2)	94.7(1)	94.7(1)	94.22(1)	93.88(1)	94.64(3)
O3-Ln1-O5	79.3(2)	79.4(1)	79.5(1)	79.81(1)	80.10(1)	79.99(3)
O3-Ln1-O6	68.7(2)	68.4(1)	68.5(1)	68.58(1)	68.47(1)	68.50(2)
O3-Ln1-O9	64.7(2)	65.1(1)	65.2(1)	65.78(1)	66.06(1)	66.32(3)
O3-Ln1-O10	129.2(2)	129.0(1)	129.1(1)	128.8(1)	128.86(1)	129.23(3)
O3-Ln1-O13	75.5(2)	75.6(1)	75.4(1)	75.7(1)	75.84(1)	75.43(3)

O3-Ln1-O14	143.0(2)	143.0(1)	142.7(1)	142.4(1)	142.5(1)	142.38(3)
O3-Ln1-O18	140.8(2)	141.7(1)	141.7(1)	142.0(1)	142.1(1)	142.58(3)
O4-Ln1-O5	149.1(2)	149.1(1)	148.8(1)	148.66(1)	148.41(1)	148.46(3)
O4-Ln1-O6	69.1(2)	69.3(1)	69.0(1)	68.75(1)	68.69(1)	68.75(3)
O4-Ln1-O9	77.5(2)	77.5(1)	77.5(1)	77.22(1)	77.17(1)	77.35(3)
O4-Ln1-O10	75.1(2)	74.8(1)	74.9(1)	74.76(1)	74.87(1)	74.33(3)
O4-Ln1-O13	130.0(2)	130.6(1)	130.7(1)	130.26(1)	130.5(1)	130.53(3)
O4-Ln1-O14	122.5(2)	122.3(1)	122.5(1)	123.23(1)	123.5(1)	122.90(3)
O4-Ln1-O18	84.1(2)	83.4(1)	83.7(1)	83.99(1)	84.07(1)	83.28(3)
O5-Ln1-O6	133.1(2)	133.0(1)	133.5(1)	133.90(1)	134.15(1)	134.36(3)
O5-Ln1-O9	72.5(2)	72.5(1)	72.3(1)	72.26(1)	72.03(1)	72.02(3)
O5-Ln1-O10	131.8(2)	132.1(1)	132.0(1)	132.37(1)	132.4(1)	132.48(3)
O5-Ln1-O13	78.1(2)	77.7(1)	77.8(1)	78.40(1)	78.42(1)	78.52(3)
O5-Ln1-O14	67.0(2)	67.15(1)	67.0(1)	66.78(1)	66.70(1)	66.78(3)
O5-Ln1-O18	82.3(2)	83.0(1)	82.5(1)	82.38(1)	82.20(1)	82.67(3)
O6-Ln1-O9	119.0(2)	119.0(1)	119.1(1)	119.51(1)	119.77(1)	119.73(3)
O6-Ln1-O10	61.0(2)	61.1(1)	61.2(1)	60.75(1)	60.90(1)	61.25(2)
O6-Ln1-O13	61.6(2)	62.1(1)	62.4(1)	62.17(1)	62.42(1)	62.47(3)
O6-Ln1-O14	125.1(2)	124.8(1)	124.8(1)	124.27(1)	124.2(1)	124.20(3)
O6-Ln1-O18	143.0(2)	142.3(1)	142.3(1)	142.03(1)	142.0(1)	141.32(3)
O9-Ln1-O10	150.0(2)	149.7(1)	149.6(1)	149.12(1)	149.0(1)	148.48(3)
O9-Ln1-O13	133.7(2)	133.9(1)	133.8(1)	134.66(1)	134.77(1)	134.75(3)
O9-Ln1-O14	115.9(2)	116.1(1)	116.1(1)	116.16(1)	116.0(1)	115.99(3)
O9-Ln1-O18	76.9(2)	77.3(1)	77.17(1)	76.89(1)	76.6(1)	76.86(3)
O10-Ln1-O13	74.8(2)	75.0(1)	75.3(1)	74.95(1)	75.2(1)	75.70(3)
O10-Dy1-O14	70.4(1)	70.58(1)	70.6(2)	70.5(1)	70.4(1)	70.20(3)
O10-Ln1-O18	88.4(2)	87.6(1)	87.5(1)	87.5(1)	87.3(1)	86.31(3)
O13-Ln1-O14	82.6(2)	81.8(1)	81.7(1)	81.1(1)	80.7(1)	80.94(3)
O13-Ln1-O18	133.4(2)	132.8(1)	132.8(1)	132.6(1)	132.4(1)	132.62(3)
O14-Ln1-O18	50.8(2)	51.0(1)	51.1(1)	51.5(1)	51.7(1)	51.69(3)
O2-Ln2-O3	83.0(2)	83.4(1)	84.1(1)	84.48(1)	84.72(1)	85.41(3)
O2-Ln2-O6	53.7(2)	54.0 (1)	54.2(1)	54.61(1)	54.75(1)	55.21(3)
O2-Ln2-O7	81.2(2)	81.8(1)	81.8(1)	81.67(1)	81.81(1)	82.20(3)
O2-Ln2-O13	115.9(2)	116.9(1)	117.3(1)	118.0(1)	118.6(1)	118.72(3)
O2-Ln2-O17	76.7(2)	76.9(1)	76.7(1)	76.63(1)	76.70(1)	76.89(3)
O2-Ln2-O28	144.6(2)	143.9(1)	144.4(1)	144.0(1)	143.9(1)	143.86(3)
O2-Ln2-O29	147.9(2)	147.8(1)	147.1(1)	147.0(1)	146.7(1)	146.74(3)
O2-Ln2-N10	71.5(2)	71.3(1)	71.5(1)	71.26(1)	71.25(1)	71.54(3)
O3-Ln2-O6	70.2(2)	70.1(1)	70.3(1)	70.25(1)	70.22(1)	70.33(3)
O3-Ln2-O7	137.0(2)	137.1(1)	137.1(1)	137.2(1)	137.19(1)	136.97(3)
O3-Ln2-O13	76.1(2)	76.1(1)	75.8(1)	75.7(1)	75.69(1)	75.44(3)
O3-Ln2-O17	142.0(2)	142.7(1)	143.2(1)	143.3(1)	143.7(1)	144.21(3)
O3-Ln2-O28	86.4(2)	87.2(1)	86.4(1)	86.2(1)	85.75(1)	84.05(3)
O3-Ln2-O29	129.0(2)	128.7(1)	128.7(1)	128.51(1)	128.6(1)	127.72(3)

O3-Ln2-N10	74.8(2)	75.1(1)	75.1(1)	74.96(1)	74.95(1)	75.53(3)
O6-Ln2-O7	68.2(2)	68.7(1)	68.6(1)	68.71(1)	68.81(1)	68.76(3)
O6-Ln2-O13	62.3(2)	62.9(1)	63.2(1)	63.39(1)	63.83(1)	63.52(3)
O6-Ln2-O17	118.6(2)	119.0(1)	119.0(1)	119.4(1)	119.5(1)	120.14(3)
O6-Ln2-O28	149.5(2)	150.5(1)	149.7(1)	149.7(1)	149.3(1)	147.70(3)
O6-Ln2-O29	132.5(2)	132.0(1)	132.2(1)	131.6(1)	131.6(1)	132.20(3)
O6-Ln2-N10	116.8(2)	116.8(1)	116.9(1)	116.8(1)	116.8(1)	117.45(3)
O4-Ln3-O19	75.6(2)	75.4(1)	75.3(1)	75.6(1)	75.7(1)	74.97(3)
O7-Ln2-O13	70.5(2)	70.9(1)	71.0(1)	70.9(1)	70.84(1)	71.41(3)
O7-Ln2-O17	126.0(2)	126.2(1)	126.1(1)	126.4(1)	126.5(1)	127.22(3)
O7-Ln2-O28	75.0(2)	75.0(1)	74.8(1)	74.5(1)	74.2(1)	74.73(3)
O7-Ln2-O29	135.8(2)	135.4(1)	135.9(1)	135.9(1)	136.1(1)	136.66(3)
O7-Ln2-N10	141.8(2)	141.2(1)	141.0(1)	141.0(1)	140.6(1)	140.34(3)
O13-Ln2-O17	93.9(2)	94.2(1)	93.2(1)	93.1(1)	92.4(1)	91.74(3)
O13-Ln2-O28	79.7(2)	78.6(1)	78.8(1)	78.1(1)	77.7(1)	78.17(3)
O13-Ln2-O29	148.8(2)	148.7(1)	148.3(1)	148.1(1)	147.9(1)	148.10(3)
O13-Ln2-N10	91.9(2)	90.5(1)	91.3(1)	90.9(1)	91.2(1)	92.15(3)
O17-Ln2-O28	74.8(2)	74.7(1)	74.0(1)	74.1(1)	73.8(1)	73.25(3)
O17-Ln2-O29	68.5(2)	68.8(1)	69.2(1)	69.3(1)	69.7(1)	69.45(3)
O17-Ln2-N10	51.2(2)	51.2(1)	51.3(1)	51.9(1)	52.3(1)	52.50(3)
O28-Ln2-O29	72.6(2)	72.6(1)	72.9(1)	72.7(1)	72.6(1)	72.36(4)
O28-Ln2-N10	110.5(2)	111.1(1)	110.7(1)	111.4(1)	111.5(1)	110.22(3)
O29-Ln2-N10	69.5(2)	69.7(1)	69.8(1)	69.9(1)	70.1(1)	70.23(3)
O1-Ln3-O4	115.1(2)	115.6(1)	115.8(1)	116.3(1)	116.5(1)	116.75(3)
O1-Ln3-O6	140.1(2)	140.6(1)	140.9(1)	141.2(1)	141.7(1)	142.30(3)
O1-Ln3-O8	142.2(2)	141.8(1)	141.9(1)	141.7(1)	141.4(1)	141.42(3)
O1-Ln3-O10	74.3(2)	74.9(1)	74.8(1)	74.9(1)	75.0(1)	75.25(3)
O1-Ln3-O15	111.2(2)	113.5(1)	113.6.3(1)	113.8(1)	114.1(1)	112.96(3)
O1-Ln3-O19	72.9(2)	72.3(1)	71.9(1)	71.8(1)	71.7(1)	71.76(3)
O1-Ln3-O22	68.2(2)	68.6(1)	68.7(1)	68.6(1)	68.7(1)	68.55(3)
O1-Ln3-N11	69.1(2)	69.6(1)	69.7(1)	69.9(1)	69.9(1)	69.93(3)
O4-Ln3-O6	137.0(2)	137.2(1)	137.8(1)	137.3(1)	137.0(1)	136.96(3)
O4-Ln3-O8	75.5(2)	75.0(1)	75.1(1)	74.9(1)	74.7(1)	74.76(3)
O4-Ln3-O10	83.7(2)	84.7(1)	85.0(1)	85.41(1)	85.8(1)	85.90(3)
O4-Ln3-O15	126.2(2)	126.5(1)	126.7(1)	126.8(1)	126.9(1)	127.24(3)
O4-Ln3-O22	84.2(2)	85.2(1)	85.0(1)	85.0(1)	85.1(1)	83.95(3)
O4-Ln3-N11	135.9(2)	136.8(1)	136.2(1)	137.4(1)	137.6(1)	137.71(3)
O6-Ln3-O8	69.1(2)	69.0(1)	69.0(1)	68.95(1)	68.8(1)	68.99(3)
O6-Ln3-O10	62.4(2)	62.6(1)	62.9(1)	62.70(1)	62.95(1)	63.32(3)
O6-Ln3-O15	53.6(2)	53.7(1)	53.8(1)	54.66(1)	54.88(1)	54.92(2)
O6-Ln3-O19	133.5(2)	130.8(1)	130.7(2)	129.8(1)	129.4(1)	130.21(3)
O6-Ln3-O22	145.1(2)	146.9(1)	146.0(1)	147.0(1)	147.0(1)	145.71(3)
O6-Ln3-N11	119.9(2)	120.6(1)	120.6(1)	121.7(1)	122.03(1)	122.30(3)
O8-Ln3-O10	76.8(2)	76.8(1)	76.2(1)	76.5(1)	76.36(1)	75.92(3)

O8-Ln3-O15	79.7(2)	79.6(1)	79.5(1)	80.2(1)	80.31(1)	80.97(3)
O8-Ln3-O19	78.4(2)	76.0(1)	76.5(1)	74.7(1)	74.18(1)	73.95(3)
O8-Ln3-O22	128.0(2)	126.9(1)	126.5(1)	126.5(1)	126.3(1)	126.29(3)
O8-Ln3-N11	75.8(2)	75.9(1)	75.9(1)	76.42(1)	76.84(1)	77.34(3)
O10-Ln3-O15	116.0(2)	116.3(1)	116.5(1)	117.3(1)	117.8(1)	118.21(3)
O10-Ln3-O19	78.8(2)	76.8(1)	76.3(1)	76.16(1)	75.78(1)	76.43(3)
O10-Ln3-O22	90.1(2)	91.0(1)	91.7(1)	90.73(1)	90.43(1)	89.12(3)
O10-Ln3-N11	148.6(2)	148.2(1)	147.1(1)	147.71(1)	147.62(1)	147.44(3)
O15-Ln3-O19	149.7(2)	148.8(1)	148.5(1)	147.78(1)	147.3(1)	146.86(3)
O15-Ln3-O22	147.2(2)	147.1(1)	147.6(1)	146.6(1)	146.7(1)	147.00(3)
O15-Ln3-N11	73.6(2)	74.3(1)	74.1(1)	74.7(1)	74.75(1)	74.99(3)
O19-Ln3-O22	49.7(3)	51.0(1)	50.3(1)	51.8(1)	52.1(1)	52.36(3)
O19-Ln3-N11	80.9(2)	81.0(1)	80.3(1)	79.94(1)	79.69(1)	78.60(3)
O22-Ln3-N11	94.8(2)	92.4(1)	92.4(1)	91.32(1)	90.94(1)	91.95(3)
O6-Ln4-O7	68.8(2)	69.3(1)	69.2(1)	69.21(1)	69.18(1)	69.28(3)
O6-Ln4-O8	69.0(2)	68.32(1)	68.8(1)	67.93(1)	67.72(1)	68.04(3)
O6-Ln4-O10	62.4(2)	62.5(1)	62.2(1)	62.18(1)	62.30(1)	62.85(3)
O6-Ln4-O11	116.2(2)	116.1(1)	116.3(1)	116.60(1)	116.7(1)	117.04(2)
O6-Ln4-O12	143.7(2)	143.4(1)	143.3(1)	144.75(1)	145.1(1)	144.69(3)
O6-Ln4-O13	61.4(2)	61.8(1)	62.0(1)	62.06(1)	62.3(1)	62.38(2)
O6-Ln4-O16	128.7(2)	127.3(1)	127.6(1)	126.93(1)	127.1(1)	128.04(3)
O6-Ln4-O25	127.7(2)	127.9(1)	127.7(1)	127.43(1)	127.4(1)	127.48(3)
O7-Ln4-O8	96.0(2)	96.1(1)	96.2(1)	95.22(1)	95.0(1)	95.79(3)
O7-Ln4-O10	130.2(2)	130.7(1)	131.1(1)	130.41(1)	130.5(1)	131.19(3)
O7-Ln4-O11	75.8(2)	75.4(1)	75.5(1)	75.28(1)	75.2(1)	75.06(3)
O7-Ln4-O12	85.0(2)	84.2(1)	84.9(1)	85.49(1)	85.8(1)	84.97(3)
O7-Ln4-O13	74.8(2)	74.9(1)	74.8(13)	75.28(1)	75.4(1)	74.98(3)
O7-Ln4-O16	148.6(2)	148.6(1)	148.3(2)	148.04(1)	147.8(1)	147.58(3)
O7-Ln4-O25	125.5(2)	125.5(1)	125.9(1)	126.80(1)	127.1(1)	126.64(3)
O8-Ln4-O10	75.8(2)	75.7(1)	75.6(1)	75.83(1)	75.8(1)	75.33(3)
O8-Ln4-O11	64.1(2)	64.6(1)	64.8(1)	65.07(1)	65.4(1)	66.02(3)
O8-Ln4-O12	141.1(2)	141.9(1)	141.6(1)	141.16(1)	141.1(1)	140.91(3)
O8-Ln4-O13	129.5(2)	129.3(1)	129.4(1)	129.25(1)	129.3(1)	129.67(3)
O8-Ln4-O16	72.6(2)	71.7(1)	71.9(2)	71.68(1)	71.8(1)	72.11(3)
O8-Ln4-O25	138.0(2)	137.9(1)	137.5(1)	137.6(1)	137.6(1)	137.21(3)
O10-Ln4-O11	135.0(2)	135.3(1)	135.1(1)	135.6(1)	135.8(1)	135.80(3)
O10-Ln4-O12	131.3(2)	131.3(1)	130.7(1)	131.2(1)	131.0(1)	131.45(3)
O10-Ln4-O13	74.1(2)	74.2(1)	74.6(1)	74.11(1)	74.3(1)	75.15(3)
O10-Ln4-O16	76.4(2)	75.6(1)	75.5(2)	75.79(1)	75.9(1)	75.97(3)
O10-Ln4-O25	80.7(2)	80.4(1)	79.7(1)	79.68(1)	79.4(1)	79.42(3)
O11-Ln4-O12	78.8(2)	78.9(1)	78.5(1)	77.76(1)	77.4(1)	76.63(3)
O11-Ln4-O13	148.7(2)	148.4(1)	148.3(1)	148.34(1)	148.2(1)	147.46(3)
O11-Ln4-O16	72.9(2)	73.3(1)	72.9(2)	72.77(1)	72.6(1)	72.54(3)
O11-Ln4-O25	116.1(2)	116.1(1)	116.1(1)	115.96(1)	115.9(1)	115.48(3)

O12-Ln4-O13	88.4(2)	87.7(1)	88.1(1)	88.58(1)	88.6(1)	88.39(3)
O12-Ln4-O16	86.5(2)	88.3(1)	87.2(2)	87.41(1)	86.9(1)	86.49(3)
O12-Ln4-O25	50.7(2)	51.0(1)	51.1(1)	51.57(1)	51.6(1)	52.06(3)
O13-Ln4-O16	135.2(2)	135.4(1)	135.6(2)	135.7(1)	135.7(1)	135.98(3)
O13-Ln4-O25	74.2(2)	74.2(1)	74.2(1)	74.09(1)	73.9(1)	74.01(3)
O16-Ln4-O25	68.3(2)	69.1(1)	68.8(2)	69.07(1)	69.0(1)	68.56(3)

Table S2 Main magnetic data extracted from the static properties of the tetranuclear compounds **1–6.**

	1	**2**	**3**	**4**	**5**	**6**
Ground state term of Ln^{III} ion	$^8S_{7/2}$	$^7F_6$	$^6H_{15/2}$	$^5I_8$	$^4I_{15/2}$	$^2F_{7/2}$
S	7/2	6/2	5/2	4/2	3/2	1/2
g	2	3/2	4/3	5/4	6/5	8/7
C (cm^3Kmol^{-1}) for each Ln^{III} ion	7.88	11.82	14.17	14.07	11.50	2.57
$\chi_m T$ (cm^3Kmol^{-1}) expected value or 4 non-interacting Ln_4 at rt	31.50	47.28	56.68	56.28	46.00	10.28
$\chi_m T$ (cm^3Kmol^{-1}) experimental value for Ln_4 at rt	31.55	47.65	55.43	52.76	45.25	9.90
$\chi_m T$ (cm^3Kmol^{-1}) experimental value for Ln_4 at 2.0 K	25.60	18.89	32.60	27.92	18.06	3.93