Supporting Information for

Two Novel Dy_8 and Dy_{11} Clusters with cubane $[Dy_4(\mu_3\text{-}OH)_4]^{8+}$ units Exhibiting Slow Magnetic Relaxation Behaviour

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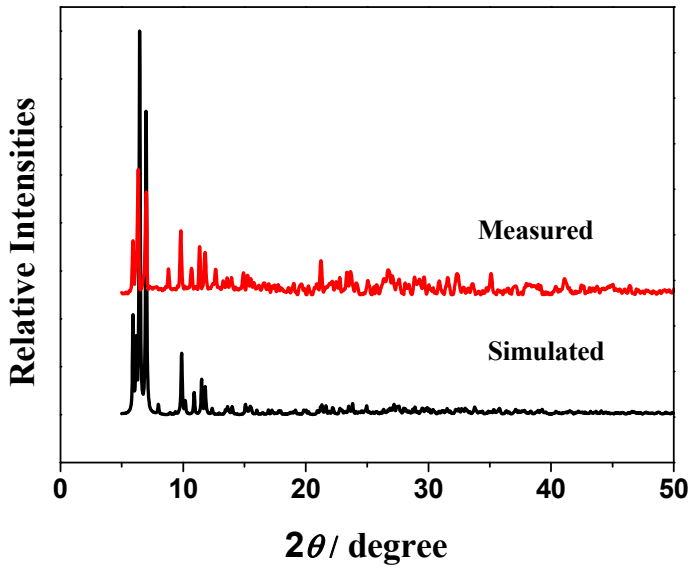

Fig. S1 XRD patterns of **1**

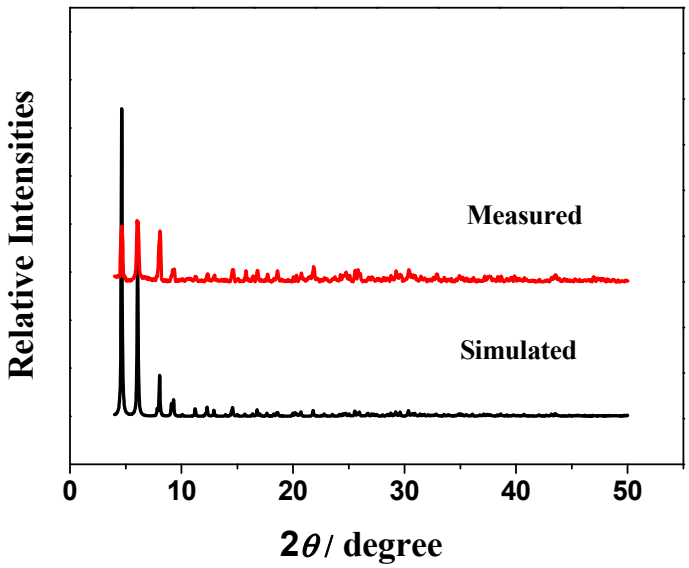

Fig. S2 XRD patterns of **2**

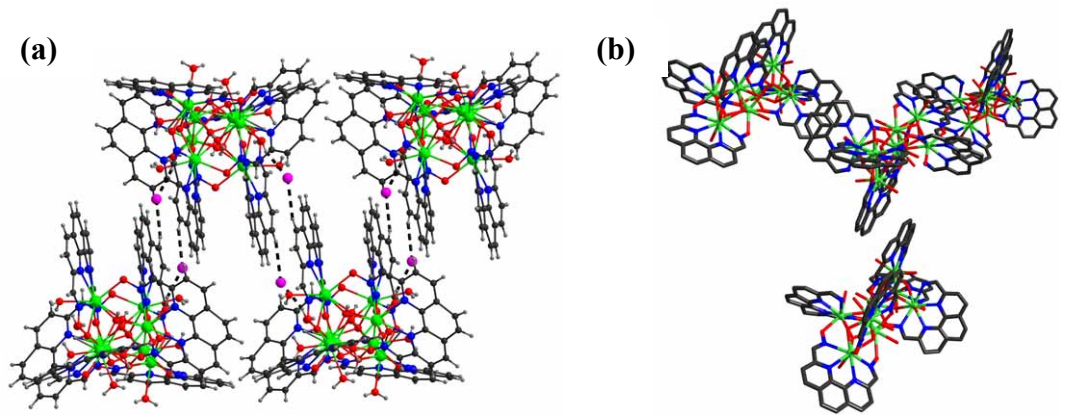

Fig. S3 (a) the hydrogen bonds between octadnuclear units in **1** (b) The off-set π-π interaction in the distance of 3.57(8) Å between phendox^{2-} groups from the neighboring octadnuclear units. Color legend: carbon (black), dysprosium (green), chloride (purple), nitrogen (blue), oxygen (red). Symmetry codes: a) -x+1,y,-z+3/2 for **1**.

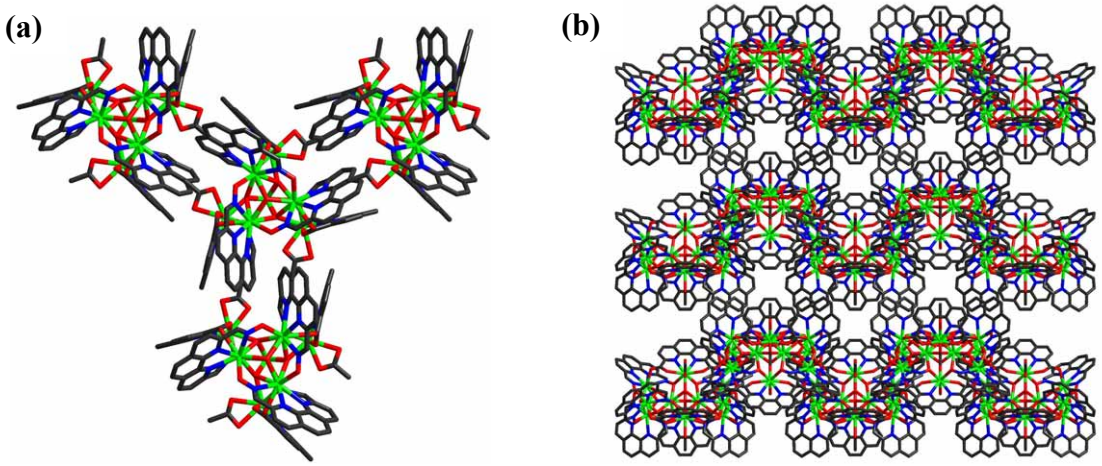

Fig. S4 (a) The off-set π-π interaction in the distance of 3.45(8) Å between phendox^{2-} groups from the neighboring hendecanuclear units. (b) The supramolecular network of **2** viewed along the *a* or *b*-axis, the H_2O and H atoms on the phendox^{2-} are omitted for clarity. Color legend: carbon (black), dysprosium (green), nitrogen (blue), oxygen (red). Symmetry codes: a) x, x-y+1, -z+3/2; b) -x+y, -x+1, z; c) -y+1, -x+1, -z+3/2; d) -y+1, x-y+1, z ; e) –x+y+1, -x+1,-z+3/2 for **2**.

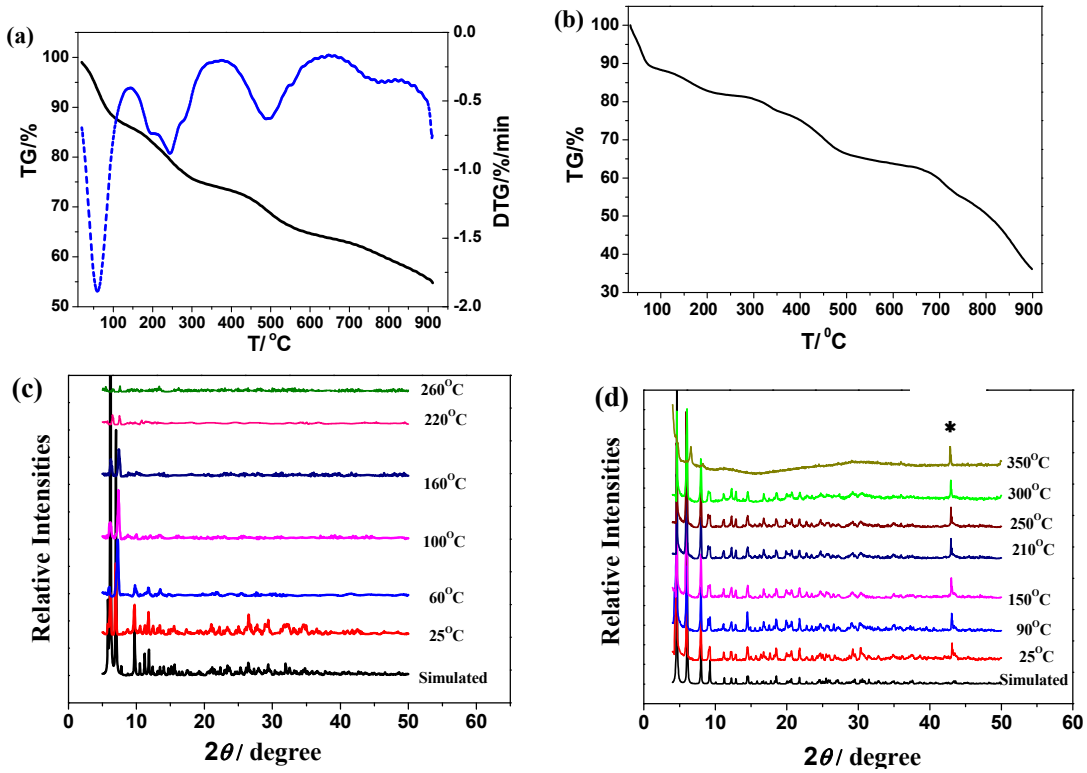

Fig. S5 TG curve of **1**(a) and **2**(b) under N_2. Variable-temperature X-ray powder diffraction (VTXRPD) of **1**(c) and **2**(d) under N_2 at standard atmospheric pressure. (* marks the diffraction peak of back ground).

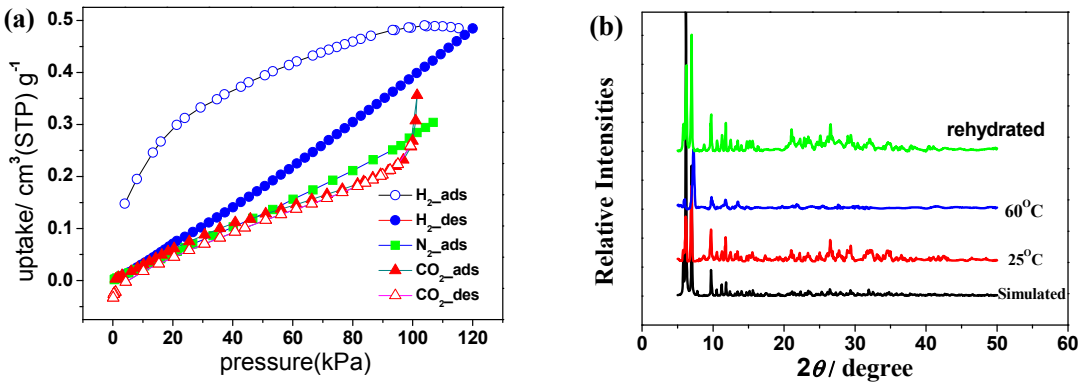

Fig. S6 (a) Adsorption isotherms of CO_2 (▲) at 195 K, N_2 (■) at 77 K and H_2 (●) at 77 K for the dehydrated **1**.(b) Variable-temperature X-ray powder diffraction (VTXRPD) of **1** at 60℃(blue) and **1** was rehydrared at damp atmosphere after heating at 60℃ in high vacuum for 6 h (green).

Table S1. Selected bond lengths (Å) and angles (°) for **1**.

Dy(1)-O(2)	2.280(8)	Dy(3)-O(3)	2.307(8)
Dy(1)-O(9)	2.339(8)	Dy(3)-O(8)	2.336(9)
Dy(1)-O(1)	2.399(8)	Dy(3)-O(1)	2.363(8)
Dy(1)-O(1w)	2.415(8)	Dy(3)-O(3w)	2.403(11)
Dy(1)-O(3)	2.434(8)	Dy(3)-O(4)	2.456(7)
Dy(1)-N(1)	2.518(11)	Dy(3)-N(10)	2.458(12)
Dy(1)-N(2)	2.538(11)	Dy(3)-N(9)	2.572(12)
Dy(1)-N(4)	2.542(11)	Dy(3)-N(12)	2.591(16)
Dy(1)-N(3)	2.548(11)	Dy(3)-N(11)	2.648(12)
Dy(2)-O(4)	2.288(8)	Dy(4)-O(4)	2.326(7)
Dy(2)-O(6)	2.346(8)	Dy(4)-O(2)	2.362(8)
Dy(2)-O(1)	2.347(7)	Dy(4)-O(5*a*)	2.373(7)
Dy(2)-O(2)	2.418(7)	Dy(4)-O(10)	2.373(12)
Dy(2)-O(2w)	2.426(8)	Dy(4)-O(7)	2.391(8)
Dy(2)-N(5)	2.540(11)	Dy(4)-O(5)	2.393(8)
Dy(2)-N(6)	2.552(10)	Dy(4)-O(3)	2.440(8)
Dy(2)-N(8)	2.627(10)	Dy(4)-O(4w)	2.486(9)
Dy(2)-N(7)	2.633(9)		
O(2)-Dy(1)-O(9)	142.5(3)	O(4)-Dy(2)-O(6)	140.3(3)
O(2)-Dy(1)-O(1)	70.0(2)	O(4)-Dy(2)-O(1)	69.4(3)
O(9)-Dy(1)-O(1)	76.3(3)	O(6)-Dy(2)-O(1)	74.7(3)
O(2)-Dy(1)-O(1w)	77.3(3)	O(4)-Dy(2)-O(2)	71.1(3)
O(9)-Dy(1)-O(1w)	139.9(3)	O(6)-Dy(2)-O(2)	80.8(3)
O(1)-Dy(1)-O(1w)	133.5(3)	O(1)-Dy(2)-O(2)	68.6(3)
O(2)-Dy(1)-O(3)	72.0(3)	O(4)-Dy(2)-O(2w)	76.1(3)
O(9)-Dy(1)-O(3)	80.8(3)	O(6)-Dy(2)-O(2w)	143.4(3)
O(1)-Dy(1)-O(3)	68.4(3)	O(1)-Dy(2)-O(2w)	133.7(3)
O(1w)-Dy(1)-O(3)	130.4(3)	O(2)-Dy(2)-O(2w)	127.1(3)
O(2)-Dy(1)-N(1)	137.2(3)	O(4)-Dy(2)-N(5)	139.8(3)
O(9)-Dy(1)-N(1)	73.8(3)	O(6)-Dy(2)-N(5)	74.4(3)
O(1)-Dy(1)-N(1)	149.9(3)	O(1)-Dy(2)-N(5)	149.0(3)
O(1w)-Dy(1)-N(1)	74.3(3)	O(2)-Dy(2)-N(5)	106.5(3)
O(3)-Dy(1)-N(1)	104.0(4)	O(2w)-Dy(2)-N(5)	74.8(3)
O(2)-Dy(1)-N(2)	135.5(3)	O(4)-Dy(2)-N(6)	132.3(3)
O(9)-Dy(1)-N(2)	71.5(3)	O(6)-Dy(2)-N(6)	75.1(3)
O(1)-Dy(1)-N(2)	109.8(3)	O(1)-Dy(2)-N(6)	108.9(3)
O(1w)-Dy(1)-N(2)	72.6(3)	O(2)-Dy(2)-N(6)	155.4(3)
O(3)-Dy(1)-N(2)	151.5(3)	O(2w)-Dy(2)-N(6)	73.3(3)
N(1)-Dy(1)-N(2)	62.6(4)	N(5)-Dy(2)-N(6)	62.3(3)
O(2)-Dy(1)-N(4)	78.9(3)	O(4)-Dy(2)-N(8)	74.4(3)
O(9)-Dy(1)-N(4)	101.8(3)	O(6)-Dy(2)-N(8)	105.8(3)
O(1)-Dy(1)-N(4)	65.3(3)	O(1)-Dy(2)-N(8)	66.1(3)
O(1W)-Dy(1)-N(4)	76.9(3)	O(2)-Dy(2)-N(8)	130.1(3)
O(3)-Dy(1)-N(4)	131.3(3)	O(2w)-Dy(2)-N(8)	75.7(3)
N(1)-Dy(1)-N(4)	123.7(4)	N(5)-Dy(2)-N(8)	123.1(4)
N(2)-Dy(1)-N(4)	63.0(3)	N(6)-Dy(2)-N(8)	63.1(4)
O(2)-Dy(1)-N(3)	78.1(3)	O(4)-Dy(2)-N(7)	83.7(3)
O(9)-Dy(1)-N(3)	112.9(4)	O(6)-Dy(2)-N(7)	107.5(3)
O(1)-Dy(1)-N(3)	129.1(3)	O(1)-Dy(2)-N(7)	129.3(3)
O(1w)-Dy(1)-N(3)	71.9(3)	O(2)-Dy(2)-N(7)	62.2(3)
O(3)-Dy(1)-N(3)	64.4(3)	O(2w)-Dy(2)-N(7)	74.1(3)
N(1)-Dy(1)-N(3)	63.0(4)	N(5)-Dy(2)-N(7)	62.1(3)
N(2)-Dy(1)-N(3)	120.7(3)	N(6)-Dy(2)-N(7)	120.8(3)
N(4)-Dy(1)-N(3)	144.5(3)	N(8)-Dy(2)-N(7)	146.2(3)
O(3)-Dy(3)-O(8)	140.2(3)	O(4)-Dy(4)-O(2)	71.4(3)

O(3)-Dy(3)-O(1)	71.2(3)	O(4)-Dy(4)-O(5*a*)	157.3(3)
O(8)-Dy(3)-O(1)	76.2(3)	O(2)-Dy(4)-O(5*a*)	120.2(3)
O(3)-Dy(3)-O(3w)	77.7(3)	O(4)-Dy(4)-O(10)	79.3(4)
O(8)-Dy(3)-O(3w)	142.1(3)	O(2)-Dy(4)-O(10)	140.3(4)
O(1)-Dy(3)-O(3w)	132.5(4)	O(5*a*)-Dy(4)-O(10)	96.9(4)
O(3)-Dy(3)-O(4)	70.8(3)	O(4)-Dy(4)-O(7)	89.8(3)
O(8)-Dy(3)-O(4)	75.7(3)	O(2)-Dy(4)-O(7)	69.1(3)
O(1)-Dy(3)-O(4)	66.4(3)	O(5*a*)-Dy(4)-O(7)	78.0(3)
O(3w)-Dy(3)-O(4)	133.8(3)	O(10)-Dy(4)-O(7)	138.0(4)
O(3)-Dy(3)-N(10)	137.1(4)	O(4)-Dy(4)-O(5)	140.4(3)
O(8)-Dy(3)-N(10)	74.0(3)	O(2)-Dy(4)-O(5)	80.4(3)
O(1)-Dy(3)-N(10)	150.0(3)	O(5*a*)-Dy(4)-O(5)	62.1(4)
O(3w)-Dy(3)-N(10)	73.5(4)	O(10)-Dy(4)-O(5)	108.2(4)
O(4)-Dy(3)-N(10)	108.8(3)	O(7)-Dy(4)-O(5)	105.8(3)
O(3)-Dy(3)-N(9)	134.8(3)	O(4)-Dy(4)-O(3)	70.8(3)
O(8)-Dy(3)-N(9)	75.3(3)	O(2)-Dy(4)-O(3)	70.5(3)
O(1)-Dy(3)-N(9)	105.0(3)	O(5*a*)-Dy(4)-O(3)	130.2(3)
O(3w)-Dy(3)-N(9)	73.3(3)	O(10)-Dy(4)-O(3)	74.9(4)
O(4)-Dy(3)-N(9)	150.9(3)	O(7)-Dy(4)-O(3)	139.0(3)
N(10)-Dy(3)-N(9)	64.0(4)	O(5)-Dy(4)-O(3)	73.9(3)
O(3)-Dy(3)-N(12)	77.2(4)	O(4)-Dy(4)-O(4w)	75.0(3)
O(8)-Dy(3)-N(12)	109.4(4)	O(2)-Dy(4)-O(4w)	125.3(3)
O(1)-Dy(3)-N(12)	130.8(3)	O(5*a*)-Dy(4)-O(4w)	82.8(3)
O(3w)-Dy(3)-N(12)	72.7(4)	O(10)-Dy(4)-O(4w)	69.1(4)
O(4)-Dy(3)-N(12)	68.1(3)	O(7)-Dy(4)-O(4w)	68.9(3)
N(10)-Dy(3)-N(12)	64.4(4)	O(5)-Dy(4)-O(4w)	144.5(3)
N(9)-Dy(3)-N(12)	124.0(4)	O(3)-Dy(4)-O(4w)	133.9(3)
O(3)-Dy(3)-N(11)	78.0(3)	O(4)-Dy(3)-N(11)	127.8(3)
O(8)-Dy(3)-N(11)	107.8(4)	N(10)-Dy(3)-N(11)	122.4(4)
O(1)-Dy(3)-N(11)	64.4(3)	N(9)-Dy(3)-N(11)	61.5(4)
O(3w)-Dy(3)-N(11)	74.7(4)	N(12)-Dy(3)-N(11)	142.4(4)

Symmetry codes: *a*) -x+1, y, -z+3/2 for **1.**

Table S2. Selected bond lengths (Å) and angles (^{o}) for **2**.

Dy(1)-O(2)	2.328(4)	Dy(3)-O(3*a*)	2.252(8)
Dy(1)-O(1)	2.352(6)	Dy(3)-O(5)	2.423(6)
Dy(1)-O(4*a*)	2.389(7)	Dy(3)-O(5*c*)	2.423(6)
Dy(1)-O(6)	2.426(7)	Dy(3)-O(7*c*)	2.442(9)
Dy(1)-O(1*a*)	2.438(6)	Dy(3)-O(7)	2.442(9)
Dy(1)-N(2)	2.539(9)	Dy(3)-O(8)	2.489(13)
Dy(1)-N(3)	2.542(8)	Dy(3)-N(5*c*)	2.508(10)
Dy(1)-N(1)	2.562(8)	Dy(3)-N(5)	2.508(10)
Dy(1)-N(4)	2.586(8)	Dy(3)-O(9)	2.571(14)
Dy(2)-O(3*b*)	2.408(6)	Dy(2)-O(1)	2.412(6)
Dy(2)-O(3)	2.408(6)	Dy(2)-O(5*a*)	2.527(6)
Dy(2)-O(3*a*)	2.408(6)	Dy(2)-O(5)	2.527(6)
Dy(2)-O(1*a*)	2.412(6)	Dy(2)-O(5*b*)	2.527(6)
Dy(2)-O(1*b*)	2.412(6)		
O(2)-Dy(1)-O(1)	69.8(2)	O(3*a*)-Dy(3)-O(5)	67.5(2)
O(2)-Dy(1)-O(4*a*)	72.5(2)	O(3*a*)-Dy(3)-O(5*c*)	67.5(2)
O(1)-Dy(1)-O(4*a*)	139.8(2)	O(5)-Dy(3)-O(5*c*)	74.3(3)
O(2)-Dy(1)-O(6)	131.42(18)	O(3*a*)-Dy(3)-O(7*c*)	93.7(2)
O(1)-Dy(1)-O(6)	77.9(2)	O(5)-Dy(3)-O(7*c*)	144.8(3)
O(4*a*)-Dy(1)-O(6)	140.2(2)	O(5*c*)-Dy(3)-O(7*c*)	71.0(3)

O(2)-Dy(1)-O(1*a*)	68.3(2)	O(3*a*)-Dy(3)-O(7)	93.7(2)
O(1)-Dy(1)-O(1*a*)	71.6(3)	O(5)-Dy(3)-O(7)	71.0(3)
O(4*a*)-Dy(1)-O(1*a*)	82.1(2)	O(5*c*)-Dy(3)-O(7)	144.8(3)
O(6)-Dy(1)-O(1*a*)	133.1(2)	O(7*c*)-Dy(3)-O(7)	142.3(4)
O(2)-Dy(1)-N(2)	148.2(2)	O(3*a*)-Dy(3)-O(8)	69.2(4)
O(1)-Dy(1)-N(2)	137.6(2)	O(5)-Dy(3)-O(8)	121.2(3)
O(4*a*)-Dy(1)-N(2)	76.3(3)	O(5*c*)-Dy(3)-O(8)	121.2(3)
O(6)-Dy(1)-N(2)	78.1(3)	O(7*c*)-Dy(3)-O(8)	74.1(2)
O(1*a*)-Dy(1)-N(2)	101.6(2)	O(7)-Dy(3)-O(8)	74.1(2)
O(2)-Dy(1)-N(3)	66.1(3)	O(3*a*)-Dy(3)-N(5*c*)	144.6(3)
O(1)-Dy(1)-N(3)	81.7(2)	O(5)-Dy(3)-N(5*c*)	114.0(3)
O(4*a*)-Dy(1)-N(3)	95.6(2)	O(5*c*)-Dy(3)-N(5*c*)	78.7(3)
O(6)-Dy(1)-N(3)	74.3(3)	O(7*c*)-Dy(3)-N(5*c*)	64.5(4)
O(1*a*)-Dy(1)-N(3)	132.8(3)	O(7)-Dy(3)-N(5*c*)	120.9(4)
N(2)-Dy(1)-N(3)	123.8(3)	O(8)-Dy(3)-N(5*c*)	124.4(4)
O(2)-Dy(1)-N(1)	110.2(3)	O(3*a*)-Dy(3)-N(5)	144.6(3)
O(1)-Dy(1)-N(1)	138.2(3)	O(5)-Dy(3)-N(5)	78.7(3)
O(4*a*)-Dy(1)-N(1)	69.0(3)	O(5*c*)-Dy(3)-N(5)	114.0(3)
O(6)-Dy(1)-N(1)	72.3(2)	O(7*c*)-Dy(3)-N(5)	120.9(4)
O(1*a*)-Dy(1)-N(1)	149.4(2)	O(7)-Dy(3)-N(5)	64.5(4)
N(2)-Dy(1)-N(1)	62.7(3)	O(8)-Dy(3)-N(5)	124.4(4)
N(3)-Dy(1)-N(1)	62.6(3)	N(5*c*)-Dy(3)-N(5)	59.8(6)
O(2)-Dy(1)-N(4)	130.3(3)	O(3*a*)-Dy(3)-O(9)	120.3(4)
O(1)-Dy(1)-N(4)	78.5(2)	O(5)-Dy(3)-O(9)	142.82(16)
O(4*a*)-Dy(1)-N(4)	117.7(2)	O(5*c*)-Dy(3)-O(9)	142.82(16)
O(6)-Dy(1)-N(4)	74.0(2)	O(7*c*)-Dy(3)-O(9)	72.2(2)
O(1*a*)-Dy(1)-N(4)	65.7(2)	O(7)-Dy(3)-O(9)	72.2(2)
N(2)-Dy(1)-N(4)	61.5(3)	O(8)-Dy(3)-O(9)	51.1(4)
N(3)-Dy(1)-N(4)	145.4(3)	N(5*c*)-Dy(3)-O(9)	81.0(4)
N(1)-Dy(1)-N(4)	118.9(3)	N(5)-Dy(3)-O(9)	81.0(4)
O(3b)-Dy(2)-O(3)	71.2(2)	O(3b)-Dy(2)-O(5)	65.9(3)
O(3b)-Dy(2)-O(3*a*)	71.2(2)	O(3)-Dy(2)-O(5)	125.0(2)
O(3)-Dy(2)-O(3*a*)	71.2(2)	O(3*a*)-Dy(2)-O(5)	63.6(2)
O(3b)-Dy(2)-O(1*a*)	95.7(2)	O(1*a*)-Dy(2)-O(5)	75.9(2)
O(3)-Dy(2)-O(1*a*)	142.1(2)	O(1b)-Dy(2)-O(5)	139.3(2)
O(3*a*)-Dy(2)-O(1*a*)	139.4(2)	O(1)-Dy(2)-O(5)	76.4(2)
O(3b)-Dy(2)-O(1b)	139.4(2)	O(5*a*)-Dy(2)-O(5)	118.43(7)
O(3)-Dy(2)-O(1b)	95.7(2)	O(3b)-Dy(2)-O(5b)	125.0(2)
O(3*a*)-Dy(2)-O(1b)	142.1(2)	O(3)-Dy(2)-O(5b)	63.6(2)
O(1*a*)-Dy(2)-O(1b)	71.0(2)	O(3*a*)-Dy(2)-O(5b)	65.9(3)
O(3b)-Dy(2)-O(1)	142.1(2)	O(1*a*)-Dy(2)-O(5b)	139.3(2)
O(3)-Dy(2)-O(1)	139.4(2)	O(1b)-Dy(2)-O(5b)	76.4(2)
O(3*a*)-Dy(2)-O(1)	95.7(2)	O(1)-Dy(2)-O(5b)	75.9(2)
O(1*a*)-Dy(2)-O(1)	71.0(2)	O(5*a*)-Dy(2)-O(5b)	118.43(7)
O(1b)-Dy(2)-O(1)	71.0(2)	O(5)-Dy(2)-O(5b)	118.43(7)
O(3b)-Dy(2)-O(5*a*)	63.6(2)	O(1*a*)-Dy(2)-O(5*a*)	76.4(2)
O(3)-Dy(2)-O(5*a*)	65.9(3)	O(1b)-Dy(2)-O(5*a*)	75.9(2)
O(3*a*)-Dy(2)-O(5*a*)	125.0(2)	O(1)-Dy(2)-O(5*a*)	139.3(2)

Symmetry codes: *a*) -x+y+1, -x+1, z; b) -y+1, x-y, z; *c*) x, y, -z+3/2 for **2**.