

Tuning white light emission in dinuclear phenoxo bridged Dy^{III} complexes
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Supporting Information

Synthesis of ligands.

General Method. To a suspension of paraformaldehyde (60 mmol) and the corresponding phenol (60 mmol) in methanol (100 mL) 2-(aminomethyl)pyridine was added (30 mmol) and the mixture was refluxed for 48 h ($H_2L^{CH_3}$) or 96 h (H_2L^{Cl} , $H_2L^{CH_3O}$). A first portion of the product was filtered and the solution was rotary evaporated. Treatment of the residue with acetonitrile precipitate a second portion of the product. The combined solids were recrystallized from boiling acetonitrile ($H_2L^{CH_3}$) or ethanol (H_2L^{Cl} , $H_2L^{CH_3O}$) to give the pure ligands in yields ranging from 40 to 70 %.

$H_2(L^{CH_3})$. 1H NMR $CDCl_3$ $\delta(J\ Hz)$: 8.6 (1H, d(4.9), H_{α} -Py), 7.7 (1H, t(7.7)), 7.27 (1H, t(6.3)), 7.1 (1H, d(7.7)) pyridyl protons; 6.98 (2H, dd(8.7; 2.8)), 6.87 (2H, d(2.8)), 6.81 (2H, d(2.8)) phenyl protons, 3.89 (2H, s, CH_2 -Py), 3.78 (4H, s, CH_2 -Ph), 2.25 (6H, s, CH_3 -Ph). FTIR (atr): 1596, 1570, 1500, 1433, 1284, 1262, 1216, 1005, 865, 824 cm^{-1} .

$H_2(L^{Cl})$. 1H NMR $CDCl_3$ $\delta(J\ Hz)$: 8.68 (1H, d(4.6), H_{α} -Py), 7.78 (1H, t(7.6)), 7.35 (1H, t(6.2)), 7.2 (1H, d(8.3)) pyridyl protons; 7.16 (2H, dd(8.6; 2)), 7.07 (2H, d(2)), 6.92 (2H, d(8.6)) phenyl protons, 4.03 (2H, s, CH_2 -Py), 3.95 (4H, s, CH_2 -Ph). FTIR (atr): 1598, 1578, 1482, 1461, 1369, 1353, 1277, 1253, 1090, 967, 815, 752 cm^{-1} .

$H_2(L^{CH_3O})$. 1H NMR $CDCl_3$ $\delta(J\ Hz)$: 8.68 (1H, d(4.9), H_{α} -Py), 7.75 (1H, t(7.6)), 7.32 (1H, t(6.3)), 7.2 (1H, d(7.7)) pyridyl protons; 6.67 (2H, d(2.8)), 6.77 (2H, dd(8.7; 2.8)), 6.9 (2H, d(8.7)), phenyl protons, 3.98 (2H, s, CH_2 -Py), 3.91 (4H, s, CH_2 -Ph), 3.76 (6H, s, CH_3O -Ph). FTIR (atr) 1595, 1569, 1495, 1468, 1449, 1432, 1367, 1309, 1254, 1222, 1150, 1038, 823, 762 cm^{-1} .

Synthesis of Yttrium Complexes. To a solution of the appropriate ligand (0.5 mmol) in 20 mL MeOH containing 1 mmol of MeONa, a solution of 383 mg $Y(NO_3)_3 \cdot (H_2O)_6$ (1 mmol) in 5 mL MeOH was added with stirring at ambient temperature. After three to five days the corresponding solid products deposited, in yields ranging from 60 to 80%.

$Y_2(L^{CH_3})_2(MeOH)_2(NO_3)_2$ (V). Elemental analysis: Exp.(Calcd.) for $C_{46}H_{52}N_6O_{12}Y_2$: C: 51.8(52.18); H: 4.9(4.95); N: 7.9(7.94) %.

1H NMR DMSO-d⁶ $\delta(J\ Hz)$: 8.62 (1H, d(5.1), H_{α} -Py), 7.74 (1H, t(7.6)), 7.28 (1H, t(6.3)), 7.19 (1H, d(7.8)) pyridyl protons; 6.72 (2H, s(br)), 6.69 (2H, d(7.9)), 6.18 (2H, d(7.9)) phenyl protons, 3.73 (2H, s, CH_2 -Py), 3.37 (4H, s, CH_2 -Ph), 2.09 (6H, s, CH_3 -Ph), 4.1 (1H, q(5.2), HO- CH_3), 3.17 (3H, d(5.2), CH_3 -OH). FTIR (atr): 1607, 1570, 1490, 1442, 1381, 1280, 1248, 1217, 1157, 1126, 1083, 1026, 1011, 832, 816, 791, 766, 744 cm^{-1} .

Y₂(L^{Cl})₂(MeOH)₂(NO₃)₂·2MeOH (VI). Elemental analysis: Exp.(Calcd.) for C₄₄H₄₈N₆O₁₄Cl₄Y₂: C: 49.3(49.73); H: 4.6(4.55); N: 8.1(7.91) %.

¹H NMR DMSO-d⁶ (δ (J Hz)): 8.54 (1H, d(5.3), H_o-Py), 7.57 (1H, t(7.6)), 7.12 (1H, t(6.4)), 6.97 (1H, d(7.7)) pyridyl protons; 6.9 (2H, s(br, *unresolved*)), 6.78 (2H, d(8.5)), 6.12 (2H, d(8.5)) phenyl protons, 3.79 (2H, s, CH₂-Py), 4.11 (2 H, q(5.2), HO-CH₃), 3.18 (6 H, d(5.2), CH₃-OH). The signal for the CH₂-Ph protons is displaced and therefore superimposed by that of the water present in DMSO. FTIR (atr): 1603, 1594, 1475, 1440, 1416, 1393, 1369, 1330, 1307, 1262, 1190, 1154, 1119, 1092, 1040, 10009, 815, 786, 755, 673 cm⁻¹.

Y₂(L^{CH₃O})₂(MeOH)₂(NO₃)₂ (VII). Elemental analysis: Exp.(Calcd.) for C₄₆H₅₂N₆O₁₆Y₂: C: 49.1(49.2); H: 4.6(4.67); N: 7.4(7.49) %.

¹H NMR DMSO-d⁶ (δ (J Hz)): 8.60 (1H, d(5.3), H_o-Py), 7.70 (1H, t((7.7)), 7.25 (1H, t(6.3)), 7.16 (1H, d(7.7)) pyridyl protons; 6.56 (2H, d(3.0)), 6.49 (2H, dd(8.5; 3.0)), 6.16 (2H, d(8.5)), phenyl protons, 3.75 (2H, s, CH₂-Py), 3.39 (4H, s, CH₂-Ph), 3.58 (6H, s, CH₃O-Ph), 4.10 (1H, q(5.2), HO-CH₃), 3.17 (3H, d(5.2), CH₃-OH). FTIR (atr) 1607, 1570, 1488, 1442, 1423, 1379, 1301, 1261, 1237, 1212, 1150, 1087, 1039, 853, 813, 796, 765, 753 cm⁻¹.

Diffuse reflectance spectra. The diffuse reflectance spectra (DRS) at room temperature in the range of 200 – 2500 nm (2500 – 250 cm⁻¹) of the Dy^{III} complexes are shown in Figure S2a, while those corresponding to Y^{III} are shown in Figure S2b. For Dy^{III} complexes the spectra above 360 nm show a number of sharp peaks corresponding to several transitions between the ⁶H_{15/2} ground state and the excited states of the 4f⁹ configuration of Dy^{III}. The more prominent bands have been assigned following previous reported data,^{S1} being each one centered approximately at 364 nm (⁶H_{15/2} → ⁴I_{11/2}), 389 nm (⁶H_{15/2} → ⁴K_{17/2}, ⁴M_{19/2,21/2}, ⁴I_{13/2}, ⁴F_{7/2}), 424 nm (⁶H_{15/2} → ⁴G_{11/2}), 456 nm (⁶H_{15/2} → ⁴I_{15/2}), 476 nm (⁶H_{15/2} → ⁴F_{9/2}), 747 nm (⁶H_{15/2} → ⁶F_{1/2}), 761 nm (⁶H_{15/2} → ⁶F_{3/2}), 795 nm (⁶H_{15/2} → ⁶F_{5/2}), 894 nm (⁶H_{15/2} → ⁶F_{7/2}), 1084 nm (⁶H_{15/2} → ⁶H_{7/2}, ⁶F_{9/2}), 1260 nm (⁶H_{15/2} → ⁶H_{9/2}) and 1317 nm (⁶H_{15/2} → ⁶F_{11/2}). In addition, all spectra also display bands due to the absorptions of the ligand at 1140–1200, 1670–2070 nm and 2170–2500 nm regions. All these bands are observed in the DRS spectra of all Y^{III} complexes (Fig. S2b), indicating that all Dy^{III} complexes, as well as the Y^{III} complexes present the same intraligand processes.

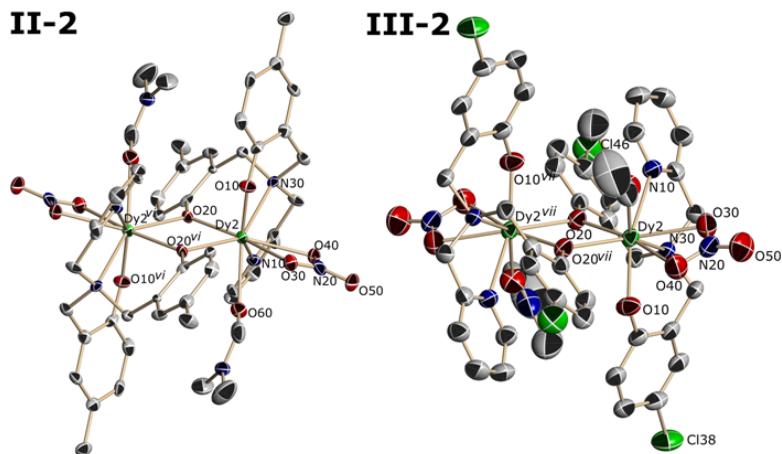


Figure S1. Molecular structure diagram for **II-2** and **III-2**. Atoms at 50% level of probability. Hydrogen atoms, except those involved in intramolecular hydrogen bonds, have been omitted for clarity.

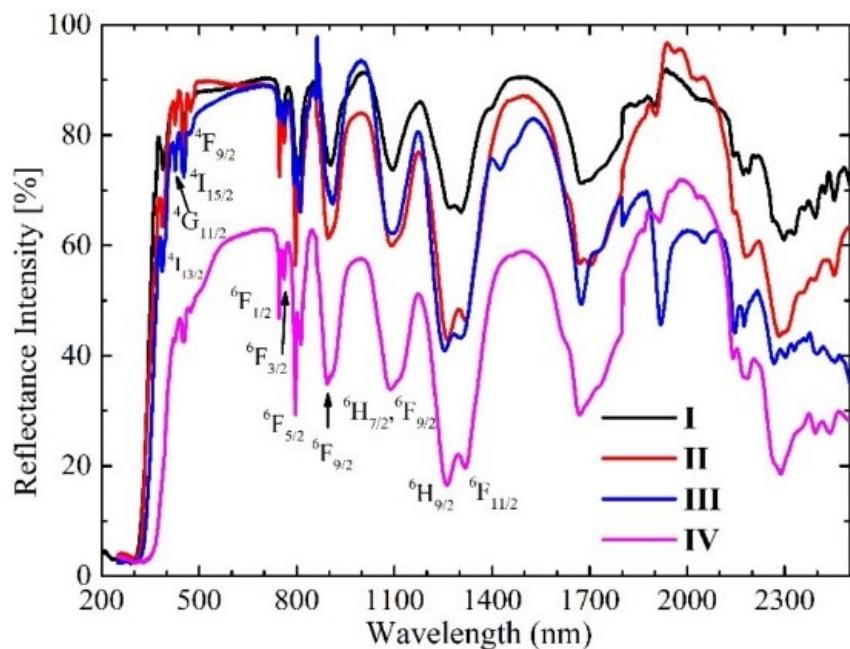


Figure S2a: Diffuse reflectance spectra (DRS) of Dy^{III} complexes, taken at room temperature.

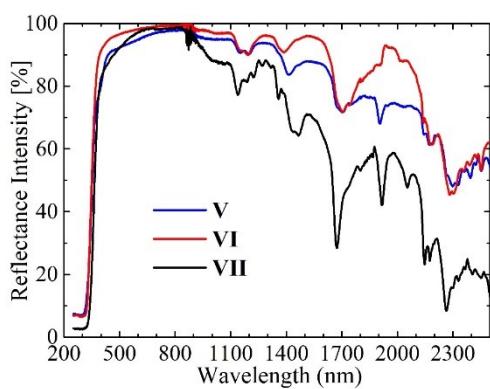


Figure S2b: Diffuse reflectance spectra (DRS) of Y^{III} complexes, taken at room temperature.

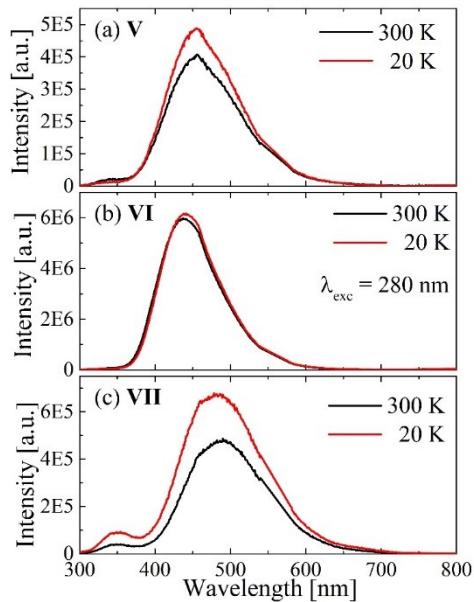


Figure S3: Photoluminescence spectra of Y^{III} complexes at 300K and 20K. Excitation wavelength: 280 nm.

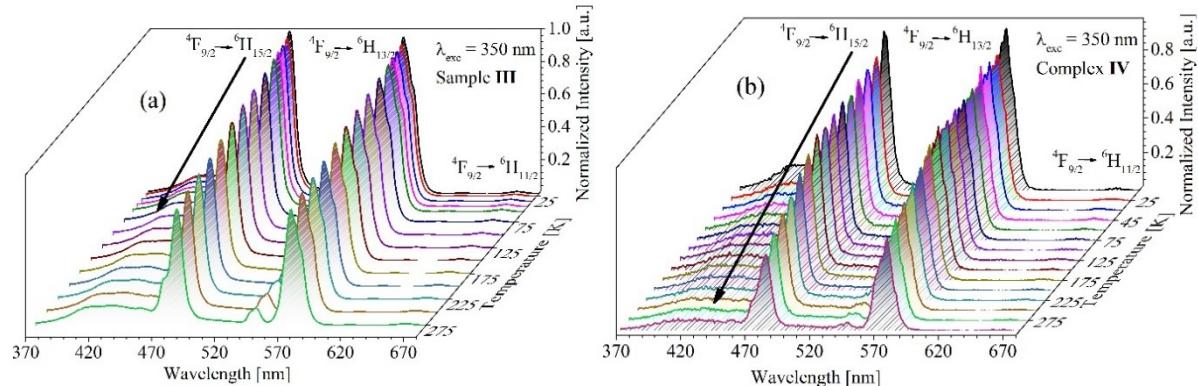


Figure S4 : Dy^{III} emission spectra under excitation at 325 nm as a function of the temperature. (a) for **III** and (b) for **IV**. The arrows indicate the temperature variation from 20 to 300 K.

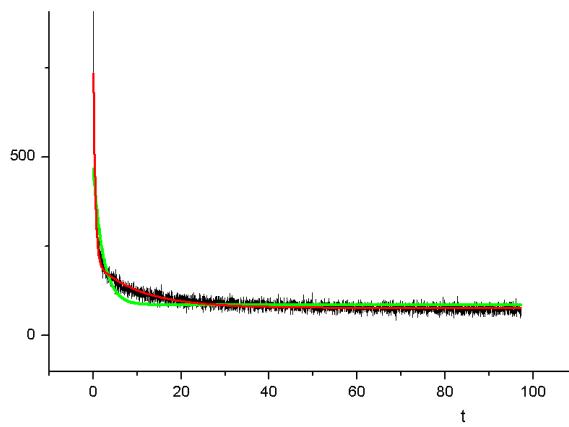


Figure S5. Luminescence decay profiles for complexes **I** excited at 340 nm and monitored at 575 nm, at 16K. Red line: fit of the experimental data with a two components function. Green line: fit of the experimental data with a one component function.

Table S1. Crystal data and structure refinement details for $[\text{Dy}_2(\text{L}^{\text{CH}_3})_2(\text{NO}_3)_2(\text{MeOH})_2]$ (**I**), $[\text{Dy}_2(\text{L}^{\text{CH}_3})_2(\text{NO}_3)_2(\text{DMF})_2] \cdot 2\text{DMF}$ (**II**), $[\text{Dy}_2(\text{L}^{\text{Cl}})_2(\text{NO}_3)_2(\text{DMF})_2] \cdot 2\text{DMF}$ (**III**).

	I	II	III
FW/uma	1205.94	1434.24	1515.90
Crystal System	Monoclinic	Triclinic	Triclinic
Temperature	293	100	293
Space Group	P2 ₁ /c	P $\overline{1}$	P $\overline{1}$
a (Å)	10.3951 (9)	11.1605 (9)	11.3354 (7)
b (Å)	14.6680 (12)	15.6425 (12)	15.6984 (10)
c (Å)	15.4118 (13)	16.9536 (12)	17.1069 (11)
α (°)	90	89.877 (6)	89.358 (1)
β (°)	93.255 (1)	88.992 (5)	88.643 (1)
γ (°)	90	80.059 (6)	80.748 (1)
V (Å³)	2346.1 (3)	2914.8 (4)	3003.6 (3)
Z(Z')	4(2)	2(2)	2(2)
d (g cm⁻³)	1.707	1.634	1.676
μ (mm⁻¹)	3.23	2.62	2.72
F (000)	1196	1444.0	1508
θ range	1.9–26.0°	2.1–26.0°	1.8–26.0°
hkl range	-12 ≤ <i>h</i> ≤ 12 -17 ≤ <i>k</i> ≤ 17 -18 ≤ <i>l</i> ≤ 18	-13 ≤ <i>h</i> ≤ 13 -19 ≤ <i>k</i> ≤ 19 -20 ≤ <i>l</i> ≤ 20	-13 ≤ <i>h</i> ≤ 13 -19 ≤ <i>k</i> ≤ 19 -21 ≤ <i>l</i> ≤ 21
N_{tot}, N_{uniqu} (R_{int}), N_{obs}	18093, 4605(0.029), 3832	22722, 11442(0.100), 7163	20501, 11662(0.020), 9587
Ref. Parameters	305	752	747
GOF	1.07	0.98	1.03
R1, wR2 (obs)	0.032, 0.083	0.056, 0.113	0.036, 0.098
Max. and min Δρ e Å⁻³	1.36, -0.51	1.06, -1.29	1.15, -0.61

Table S2. Selected bond and interatomic distances(Å) and angles(°) for [Dy₂(L^{CH₃})₂(NO₃)₂(MeOH)₂] (**I**), [Dy₂(L^{CH₃})₂(NO₃)₂(DMF)₂]DMF (**I**), [Dy₂(L^{C₁})₂(NO₃)₂(DMF)₂]DMF (**III**).

I			
Dy1—O1	2.233(3)	O2—Dy1 ⁱ	2.308(3)
Dy1—O2 ⁱ	2.308(3)	Dy1—O4	2.468(3)
Dy1—O2	2.311(3)	Dy1—N3	2.508(3)
Dy1—O16	2.425(3)	Dy1—N1	2.601(3)
Dy1—O3	2.456(3)	Dy1···Dy1 ⁱ	3.7280(4)
O1—Dy1—O2 ⁱ	80.00(10)	O3—Dy1—O4	51.74(11)
O1—Dy1—O2	83.86(10)	O1—Dy1—N3	75.26(10)
O2 ⁱ —Dy1—O2	72.38(11)	O2 ⁱ —Dy1—N3	142.92(10)
O1—Dy1—O6	154.04(11)	O2—Dy1—N3	77.84(10)
O2 ⁱ —Dy1—O6	80.14(11)	O6—Dy1—N3	112.59(12)
O6		O1—Dy1—N1	128.24(11)
O2—Dy1—O6	74.30(11)	O3—Dy1—N3	134.53(10)
O1—Dy1—O3	114.29(11)	O4—Dy1—N3	93.25(11)
O2 ⁱ —Dy1—O3	80.98(10)	O1—Dy1—N1	128.24(11)
O3		O2 ⁱ —Dy1—N1	148.70(11)
O2—Dy1—O3	144.68(10)	O2—Dy1—N1	118.61(11)
O6—Dy1—O3	78.71(12)	O16—Dy1—N1	75.74(11)
O1—Dy1—O4	75.66(11)	O2 ⁱ —Dy1—N1	75.03(12)
O2 ⁱ —Dy1—O4	106.94(11)	O3—Dy1—N1	
O4		O4—Dy1—N1	73.20(12)
O2—Dy1—O4	159.19(11)	O6—Dy1—N1	66.49(11)
O6—Dy1—O4	126.45(12)	N3—Dy1—N1	
II			
II-1		II-2	
Dy1—O1	2.153(5)	Dy2—O10	2.150(5)
Dy1—O2	2.296(5)	Dy2—O20	2.301(5)
Dy1—O2 ⁱ	2.337(5)	Dy2—O20 ⁱⁱ	2.335(5)
Dy1—O6	2.387(5)	Dy2—O60	2.394(6)
Dy1—O3	2.452(5)	Dy2—O40	2.465(5)
Dy1—N1	2.510(6)	Dy2—N10	2.527(6)
Dy1—N3	2.583(6)	Dy2—N30	2.551(6)
Dy1—O4	2.615(5)	Dy2—O30	2.575(5)
Dy1···Dy1 ⁱ	3.7731(8)	Dy2···Dy2 ⁱⁱ	3.7719(8)
O1—Dy1—O2	102.15(19)	O10—Dy2—O20 ⁱⁱ	85.52(19)
O1—Dy1—O2 ⁱ	84.96(18)	O20—Dy2—O20 ⁱⁱ	71.10(19)
O2—Dy1—O2 ⁱ	70.97(19)	O10—Dy2—O60	140.00(19)
O1—Dy1—O6	137.98(18)	O20—Dy2—O60	106.76(18)
O2—Dy1—O6	106.44(17)	O20 ⁱⁱ —Dy2—O60	75.75(18)
O2 ⁱ —Dy1—O6	76.20(18)	O10—Dy2—O40	98.62(19)
O3		O20—Dy2—O40	142.15(17)
O1—Dy1—O3	93.27(19)	O20 ⁱⁱ —Dy2—O40	143.30(18)
O2—Dy1—O3	143.13(18)	O60—Dy2—O40	78.14(18)
O2 ⁱ —Dy1—O3	144.47(18)	O10—Dy2—N10	122.99(19)
O6—Dy1—O3	81.90(18)	O20—Dy2—N10	142.6(2)
O1—Dy1—N1	142.04(19)	O20 ⁱⁱ —Dy2—N10	71.90(19)
O2—Dy1—N1	72.70(19)	O60—Dy2—N10	122.99(19)
O2 ⁱ —Dy1—N1	125.53(18)	O40—Dy2—N10	75.31(19)
N1		O40—Dy2—N30	73.37(18)
O6—Dy1—N1	76.85(19)	O10—Dy2—N30	74.81(19)
O3—Dy1—N1	74.59(18)	O20—Dy2—N30	77.95(18)
O1—Dy1—N3	74.29(19)	O20 ⁱⁱ —Dy2—N30	139.68(19)
O2—Dy1—N3	77.48(18)	O60—Dy2—N30	139.34(19)
O2 ⁱ —Dy1—N3	137.35(19)	N10—Dy2—N30	
N3		O40—Dy2—N30	75.44(19)
O6—Dy1—N3	141.63(19)	N10—Dy2—N30	67.8(2)
O3—Dy1—N3	74.82(19)		

N1—Dy1—N3	67.85(19)	O10—Dy2—O30	76.18(19)
O1—Dy1—O4	75.23(18)	O20—Dy2—O30	167.05(17)
O2—Dy1—O4	166.06(17)	O20 ⁱⁱ —Dy2—O30	96.18(17)
O2 ⁱ —Dy1—	95.11(17)	O60—Dy2—O30	71.22(18)
O4			
O6—Dy1—O4	69.58(17)	O40—Dy2—O30	50.68(17)
O3—Dy1—O4	50.63(17)	N10—Dy2—O30	118.76(19)
N1—Dy1—O4	117.92(18)	N30—Dy2—O30	112.22(18)
N3—Dy1—O4	114.23(17)	O10—Dy2—O20	99.81(19)
Dy1—O2—	109.03(19)	Dy2—O20—Dy2 ⁱⁱ	108.90(19)
Dy1 ⁱ			

III			
III-1		III-2	
Dy1—O1	2.174(3)	Dy2—O10	2.168(3)
Dy1—O2	2.302(3)	Dy2—O20	2.312(3)
Dy1—O2 ⁱⁱ	2.356(3)	Dy2—O20 ⁱⁱⁱ	2.348(3)
Dy1—O6	2.385(3)	Dy2—O60	2.391(3)
Dy1—O4	2.439(3)	Dy2—O30	2.454(3)
Dy1—N1	2.529(4)	Dy2—N10	2.520(4)
Dy1—N3	2.582(4)	Dy2—O40	2.551(4)
Dy1—O3	2.602(4)	Dy2—N30	2.554(4)
Dy1 ⁱⁱⁱ —Dy1 ⁱⁱ	3.7986(4)	Dy2 ⁱⁱⁱ —Dy2 ⁱⁱ	3.8014(4)
O1—Dy1—O2	101.37(12)	O10—Dy2—	84.13(11)
		O20 ⁱⁱⁱ	
O1—Dy1—	83.58(11)	O20—Dy2—	70.70(11)
O2 ⁱⁱ		O20 ⁱⁱⁱ	
O2—Dy1—	70.73(11)	O10—Dy2—O60	139.69(13)
O2 ⁱⁱ			
O1—Dy1—O6	138.42(12)	O20—Dy2—O60	107.06(12)
O2—Dy1—O6	105.68(11)	O20 ⁱⁱⁱ —Dy2—	74.96(12)
		O60	
O2 ⁱⁱ —Dy1—	76.42(12)	O10—Dy2—O30	101.75(13)
O6			
O1—Dy1—O4	93.18(12)	O20—Dy2—O30	141.81(11)
O2—Dy1—O4	143.76(11)	O20 ⁱⁱⁱ —Dy2—	143.50(11)
		O30	
O2 ⁱⁱ —Dy1—	144.54(11)	O60—Dy2—O30	77.94(13)
O4			
O6—Dy1—O4	83.27(12)	O10—Dy2—N10	141.94(12)
O1—Dy1—N1	142.00(12)	O20—Dy2—N10	72.45(11)
O2—Dy1—N1	73.48(11)	O20 ⁱⁱⁱ —Dy2—	123.74(11)
		N10	
O2 ⁱⁱ —Dy1—	126.73(11)	O60—Dy2—N10	77.08(12)
N1			
O6—Dy1—N1	76.86(12)	O30—Dy2—N10	71.99(12)
O4—Dy1—N1	74.68(12)	O10—Dy2—O40	76.57(14)
O1—Dy1—N3	74.02(11)	O20—Dy2—O40	167.31(11)
O2—Dy1—N3	77.10(11)	O20 ⁱⁱⁱ —Dy2—	97.28(12)
		O40	
O2 ⁱⁱ —Dy1—	135.96(11)	O60—Dy2—O40	72.48(14)
N3			
O6—Dy1—N3	142.56(12)	O30—Dy2—O40	50.87(12)
O4—Dy1—N3	75.32(12)	N10—Dy2—O40	119.04(12)
N1—Dy1—N3	68.11(11)	O10—Dy2—N30	74.59(11)
O1—Dy1—O3	75.26(12)	O20—Dy2—N30	78.17(11)
O2—Dy1—O3	165.72(11)	O20 ⁱⁱⁱ —Dy2—	139.34(11)
		N30	
O2 ⁱⁱ —Dy1—	95.03(11)	O60—Dy2—N30	140.81(12)
O3			
O6—Dy1—O3	70.73(12)	O30—Dy2—N30	75.76(12)
O4—Dy1—O3	50.45(11)	N10—Dy2—N30	67.45(11)
N1—Dy1—O3	117.85(12)	O40—Dy2—N30	110.48(13)
N3—Dy1—O3	114.45(11)	O10—Dy2—O20	97.62(13)
Dy1—O2—	109.27(11)	Dy2—O20—	109.30(11)
Dy1 ⁱⁱ		Dy2 ⁱⁱⁱ	

Symmetry codes: *i*: -x, -y, -z+2; *ii*: -x, -y+1, -z+1; *iii*: -x+1, -y+1, -z+1.

Table S3. Hydrogen bond geometry (\AA , $^\circ$) for $[\text{Dy}_2(\text{L}^{\text{CH}_3})_2(\text{NO}_3)_2(\text{MeOH})_2]$ (**I**).

$D-\text{H}\cdots A$	$D-\text{H}$	$\text{H}\cdots A$	$D\cdots A$	$D-\text{H}\cdots A$
O6—H1M \cdots O1 ^v	0.85	1.83	2.680(4)	175

Symmetry code: v: -x, -y, -z+2.

Table S4 Luminescent lifetimes of **I-IV** complexes at different temperatures.

T(K)	I			II		
	τ_1 (μs)	τ_2 (μs)	τ_{AV} (μs)	τ_1 (μs)	τ_2 (μs)	τ_{AV} (μs)
16	0.40(7)	10.6(2)	8.9(7)	0.24(2)	9.4(3)	7.6(5)
50	0.23(7)	8.0(9)	7(2)	0.33(3)	11.0(4)	9.6(4)
100	0.23(6)	7.8(4)	7(1)	0.26(2)	10.4(3)	8.4(7)
150	0.20(2)	7.8(2)	7(3)	0.27(2)	10.6(3)	8.6(5)
200	0.22(5)	8.0(2)	7(1)	0.31(3)	10.9(3)	8.8(6)
250	0.29(6)	8.1(4)	6.8(9)	0.33(2)	11.3(7)	9.0(4)
300	0.27(7)	8.9(5)	7.5(7)	0.33(2)	11.0(3)	8.8(4)
T(K)	III			IV		
	τ_1 (μs)	τ_2 (μs)	τ_{AV} (μs)	τ_1 (μs)	τ_2 (μs)	τ_{AV} (μs)
16	0.19(2)	9.8(4)	8.3(6)	0.72(1)	8.6(7)	8.1(4)
50	0.28(2)	11.0(3)	9.1(4)	0.77(1)	8.1(7)	8.1(4)
100	0.26(2)	10.2(3)	8.4(4)	0.44(3)	13.3(8)	8.3(4)
150	0.30(2)	11.1(3)	9.2(5)	0.31(2)	10.8(2)	8.7(5)
200	0.36(2)	11.4(3)	9.3(3)	0.26(3)	10.2(3)	8.3(2)
250	0.33(2)	11.7(4)	9.6(7)	0.28(2)	10.8(9)	8.8(6)
300	0.30(2)	11.1(3)	9.1(3)	0.22(2)	9.7(3)	8.0(3)

Table S5: Relative amplitudes (in %) of the fitted decay curves of the **I-IV** complexes at different temperatures.

T(K)	I		II		III		IV	
	A1	A2	A1	A2	A1	A2	A1	A2
16	16.4	83.6	20.2	79.8	15.9	84.1	12.7	87.3
50	16.1	83.9	19.3	80.7	17.6	82.4	13.5	86.5
100	15.1	84.9	17.6	82.4	17.9	82.1	22.3	77.7
150	14.6	85.4	19.8	80.2	18.3	82.7	19.5	80.5
200	14.8	85.2	20.4	79.6	19.0	81.0	18.8	81.2
250	15.8	84.2	20.6	79.3	18.1	81.9	18.9	81.1
300	15.8	84.2	20.7	79.3	18.1	81.9	17.8	82.2

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References

- S1. Gruber, J. B.; Zandi, B.; Valiev, U. V.; Rakhimov, S. A. Energy Levels of Dy³⁺(4f 9) in Orthoaluminate Crystals. *J. Appl. Phys.* **2003**, *94* (2), 1030–1034 DOI: 10.1063/1.1581351