Supporting Information

Enhancement of luminescence properties of high-nuclearity Cd-Ln (Ln = Eu and Nd) nanoclusters by the introduction of more energy transfer donors

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Contents

1. General Procedures

All reactions were performed under dry oxygen-free dinitrogen atmospheres using standard Schlenk techniques. Metal salts and other solvents were purchased from Aldrich and used directly without further purification. The Schiff-base ligand H_2L weas prepared according to well-established procedures.[1] Physical measurements: NMR: VARIAN UNITY-plus. 600 spectrometer (^1H, 600 MHz) at 298 K; Powder XRD: SMART APE II DUO; IR: FTIR-650 spectrometer; Melting points were obtained in sealed glass capillaries under dinitrogen and are uncorrected. Conductivity measurements were carried out with a DDS-11 conductivity bridge for 10^{-3} M solutions in CH_3CN. Elemental analyses (C, H, N) were carried out on a EA1112 elemental analyses. Transmission electron microscopy (TEM) images were recorded on a JEOL JEM-1200EX transmission electron microscope. Field emission scanning electron microscopy (FESEM) images were recorded on a Nova NanoSEM 200 scanning electron microscope. Absorption spectra were obtained on a UV-3600 spectrophotometer, excitation and emission spectra on a QuantaMaster PTI fluorimeter.

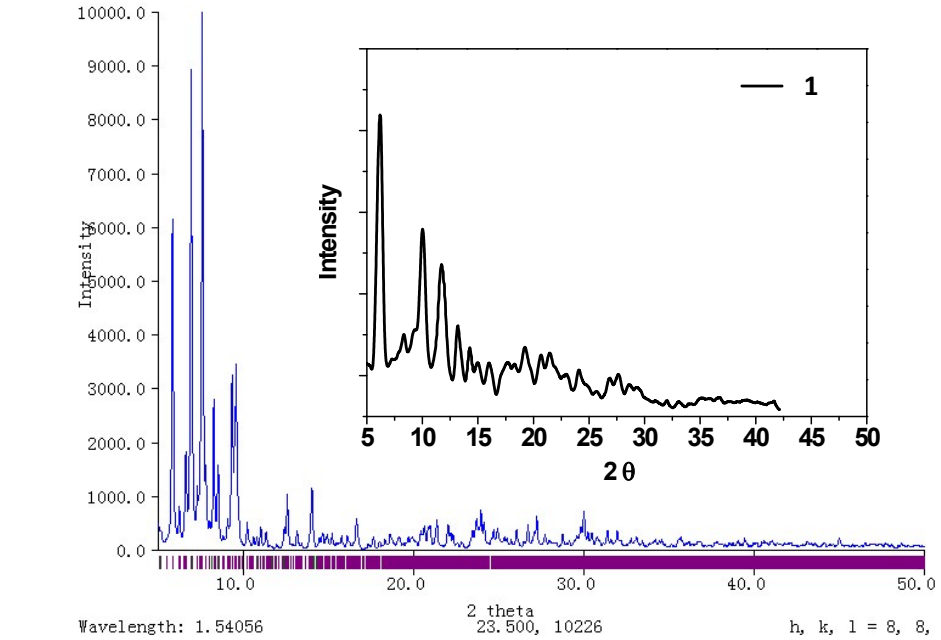
Ref. (1) F. Lam, J.-X. Xu, K.-S. Chan, *J. Org. Chem.* **1996**, *61*, 8414-8418.

2. Synthesis of 1 and 2

$[Eu_8Cd_{24}L_{12}(1,4\text{-BDC})_4(OAc)_{38}(OH)_2]$ (**1**). $Cd(OAc)_2{\cdot}2H_2O$ (0.60 mmol, 0.1595 g), $Eu(OAc)_3{\cdot}4H_2O$ (0.20 mmol, 0.0835 g) and H_2L (0.30 mmol, 0.1155 g) were dissolved in 30 mL MeOH at room temperature, and 0.60 mmol Et_3N in 10 ml MeOH were then added. The resulting solution was stirred and heated under reflux for 20 mins. Then 0.0249 g (0.15 mmol) 1,4-BDC (1,4-benzenedicarboxylate) and a solution of NaOH in H_2O (0.06 mol/L, 5 ml) were added. The solution was stirred and heated under reflux for 30 mins. It was allowed to cool and was then filtered. Diethyl ether was allowed to diffuse slowly into the filtrate at room temperature and pale yellow crystals were obtained after two weeks. The crystals were filtered off and washed with MeOH (5 ml). Yield (based on $Eu(OAc)_3{\cdot}4H_2O$): 0.1133 g (37 %). m. p. > 205 ^oC (dec.). Elemental analysis: Found: C, 38.69; H, 4.11; N, 2.61 %. Calc. for $[Eu_8Cd_{24}L_{12}(1,4\text{-BDC})_4(OAc)_{38}(OH)_2](MeOH)_{16}(H_2O)_{12}$: C, 38.31; H, 4.31; N, 2.76 %. IR (cm^{-1}): 3401 (s), 2900 (s), 2850 (s), 1630 (s), 1577 (s), 1438 (s), 1411 (s), 1297 (m), 1212 (s), 1080 (m), 1012 (w), 961 (w), 839 (w), 766 (s), 673 (m).

$[Nd_8Cd_{24}L_{12}(1,4\text{-BDC})_4(OAc)_{38}(OH)_2]$ (**2**). The procedure was the same as that for **1** using $Nd(OAc)_3{\cdot}4H_2O$ (0.20 mmol, 0.0787 g). Pale yellow single crystals of **2** were formed after two weeks. Yield (based on $Nd(OAc)_3{\cdot}4H_2O$): 0.0699 g (23 %). m. p. > 208 ^oC (dec.). Elemental analysis: Found: C, 37.95; H, 4.50; N, 2.63 %. Calc. for $[Nd_8Cd_{24}L_{12}(1,4\text{-BDC})_4(OAc)_{38}(OH)_2](MeOH)_{15}(H_2O)_{12}$: C, 38.47; H, 4.37; N, 2.78 %. IR (cm^{-1}): 3411 (m), 2934 (m), 2848 (m), 1636 (s), 1575 (s), 1450 (s), 1403 (s), 1301 (s), 1232 (s), 1205 (s), 1096 (w), 1013 (w), 963 (m), 870 (m), 842 (m), 784 (m), 675 (m), 618 (w). ^1H NMR (600 MHz, $CDCl_3$): δ(ppm) -14.250, -11.013, -10.254, -7.173, -5.758, -5.363, -4.241, -3.728, -2.843, -2.446, -1.860, -1.475, -0.913, -0.587, -0.392, 0.553, 1.225, 3.252, 3.559, 3.919, 5.311, 5.726, 6.341, 6.571, 6.749, 7.226, 7.902, 8.078, 8.267, 9.287, 9.900, 9.993, 11.004, 11.879, 12.036, 14.188, 16.569.

3. Powder XRD patterns of 1 and 2



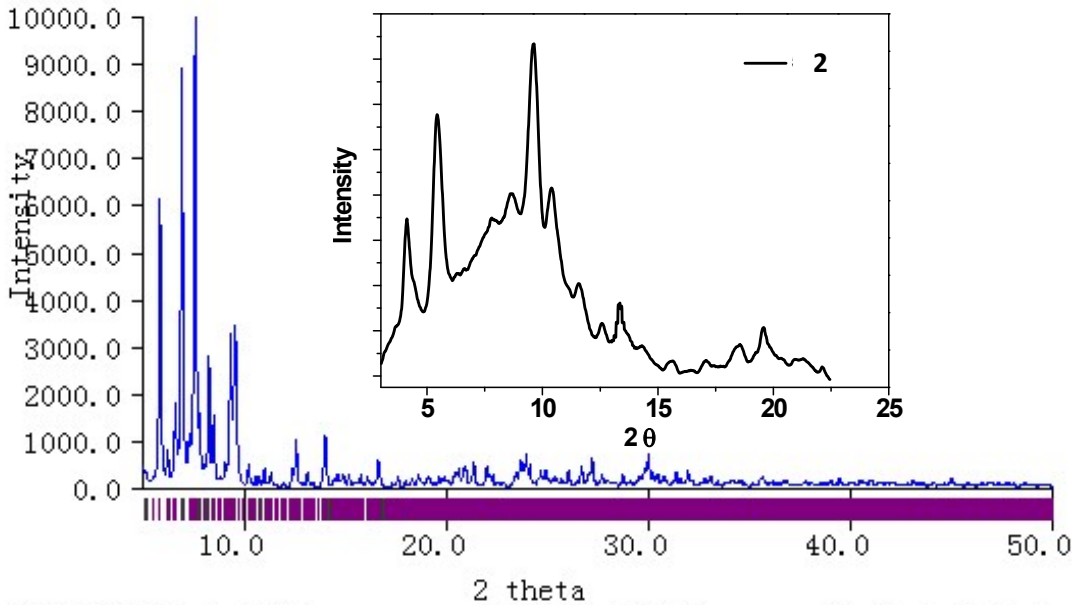
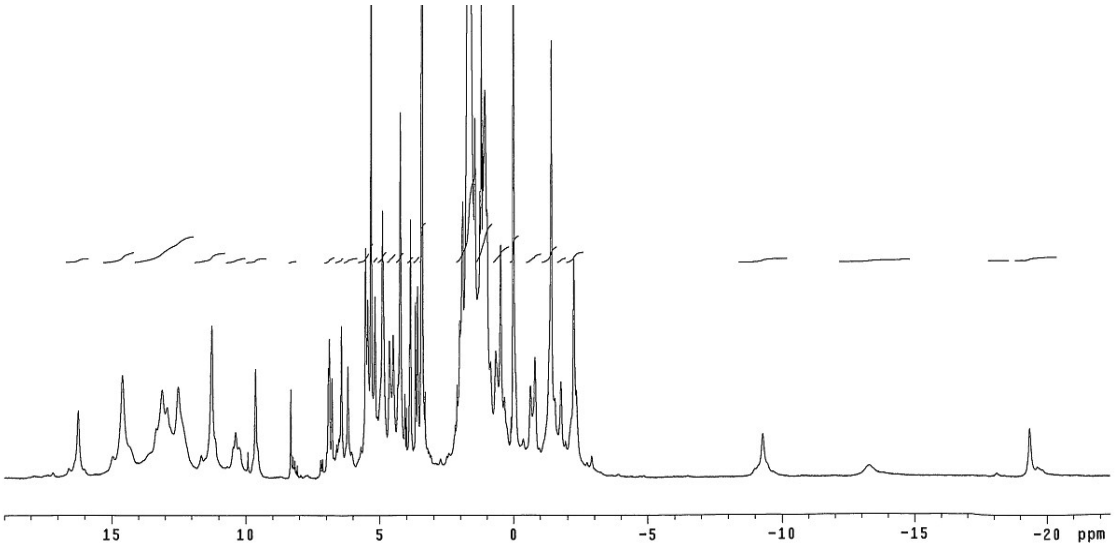
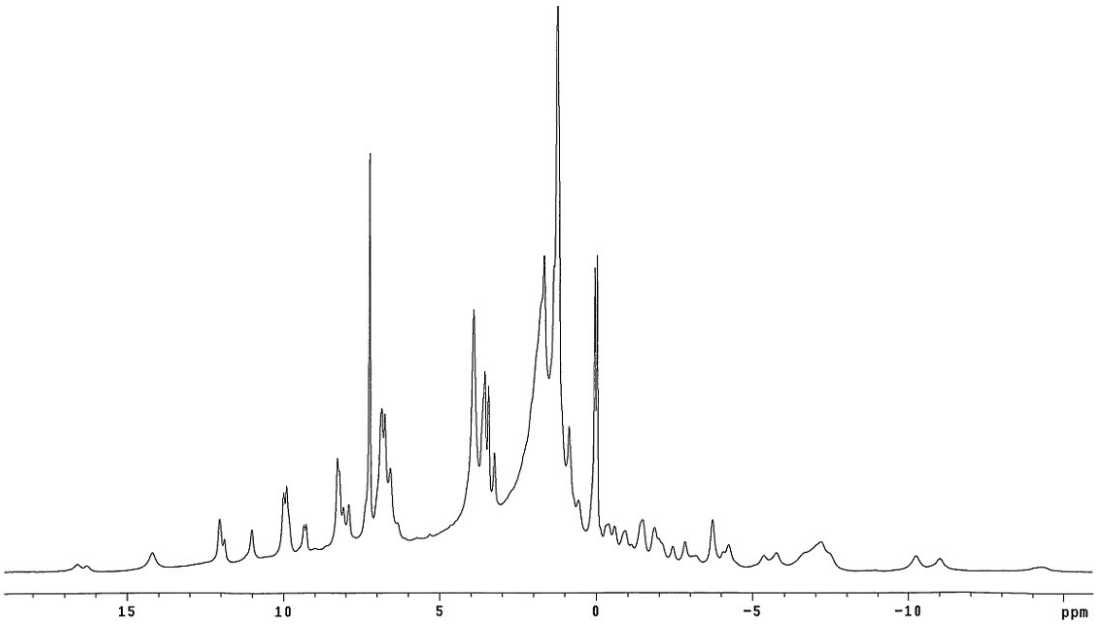


Figure S1. Powder XRD patterns of **1** and **2**.

4. ^{1}H NMR spectrum of 1 and 2



(a)



(b)

Figure S2. ^{1}H NMR spectrum of **1** (a) and **2** (b) in CD_2Cl_2.

5. Excitation spectrum of 2 and the UV-Vis spectrum of $[Nd_8Cd_{24}L_{12}(OAc)_{48}]$

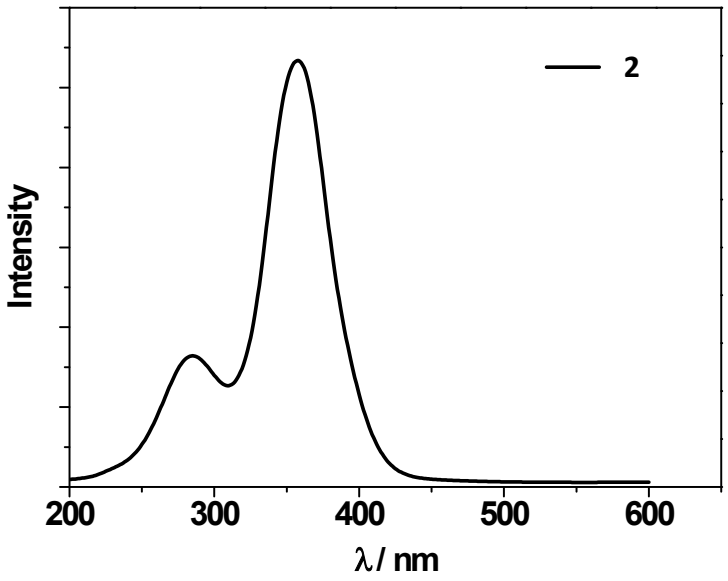


Figure S3. Excitation spectrum of **2** in CH_3OH.

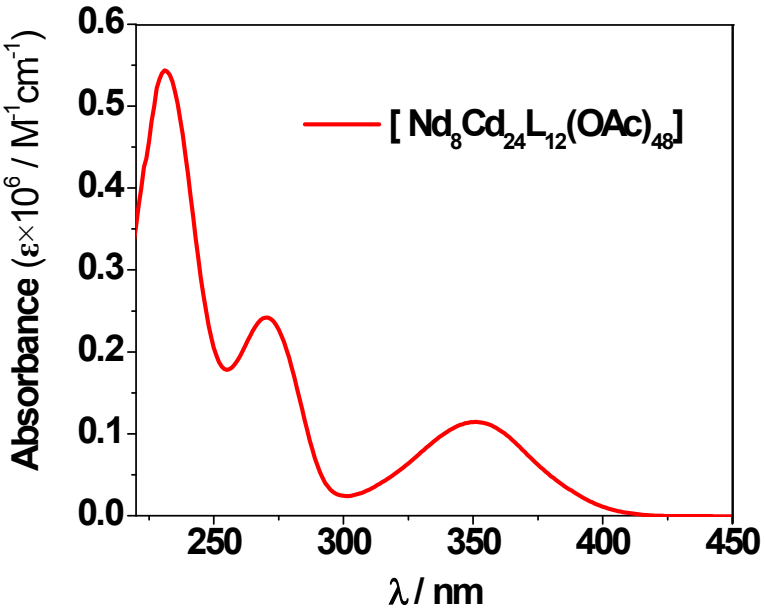


Figure S4. The UV-Vis spectrum of $[Nd_8Cd_{24}L_{12}(OAc)_{48}]$.

6. The thermogravimetric analysis of 1

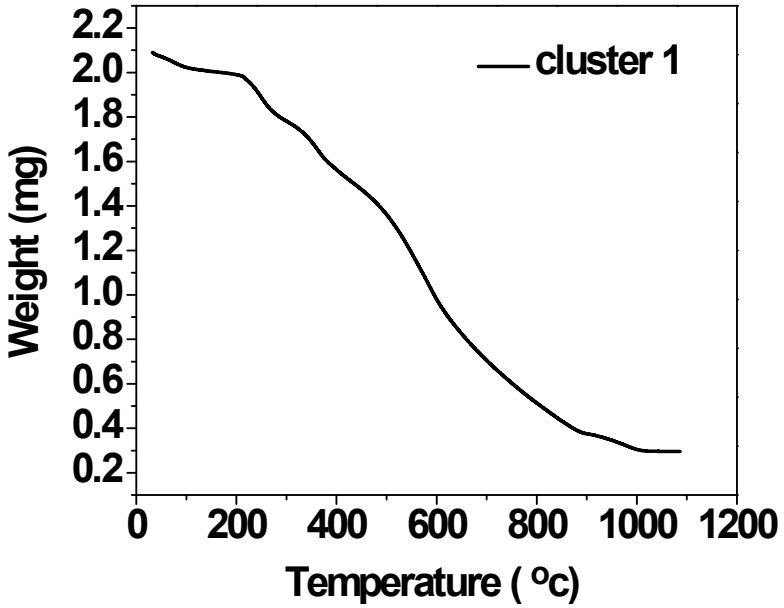


Figure S5. The thermogravimetric analysis of **1**.

7. X-Ray Crystallography

Data were collected on a Smart APEX CCD diffractometer with graphite monochromated Mo-Kα radiation (λ = 0.71073 Å) at 190 K. The data set was corrected for absorption based on multiple scans and reduced using standard methods. Data reduction was performed using DENZO-SMN.[1] The structures were solved by direct methods and refined anisotropically using full-matrix least-squares methods with the SHELX 97 program package.[2] Coordinates of the non-hydrogen atoms were refined anisotropically, while hydrogen atoms were included in the calculation isotropically but not refined. Neutral atom scattering factors were taken from Cromer and Waber.[3]

For the crystal structure of **1**, some uncoordinated solvent molecules such as CH_3OH and H_2O molecules were found to be badly disordered. Attempts to model the disorder were unsatisfactory. The contributions to the scattering factors due to these solvent molecules were removed by use of the utility SQUEEZE (Sluis and Spek, 1990) in PLATON98 (Spek, 1998). Crystallographic data for **1** and **2** are presented in Table S1 and selected bond lengths are given in Tables S2 and S3. (CCDC reference numbers 1031253 and 1507887). See http://www.rsc.org/suppdata/cc/ for crystallographic data in CIF format).

Ref. (1) DENZO-SMN. (**1997**). Z. Otwinowski, W. Minor, *Methods in Enzymology*, 276: *Macromolecular Crystallography, Part A*, 307 – 326, C. W. J. Carter, M. I. Simon, R. M. Sweet, Editors, Academic Press.

(2) G. H. Sheldrick, SHELX 97, *A software package for the solution and refinement of X-ray data*; University of Göttingen: Göttingen, Germany, **1997**.

(3) D. T. Cromer, J. T. Waber, *International Tables for X-Ray Crystallography*, Kynoch Press, Birmingham, vol. 4, **1974**, Table 2.2A.

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

	1	**2**
Formula	$C_{372}H_{446}Cd_{24}N_{24}O_{142}Eu_8$	$C_{389}H_{512}Cd_{24}N_{24}O_{174}Nd_8$
Fw	11438.81	12151.75
Crystal system	Tetragonal	Tetragonal
Space group	P-4n2	P-4n2
a [Å]	42.723(6)	42.795(6)
b [Å]	42.723(6)	42.795(6)
c [Å]	37.856(8)	37.864(8)
α [deg]	90.00	90.00
β [deg]	90.00	90.00
γ [deg]	90.00	90.00
V / [Å^3]	69097(20)	69344(20)
d / [g/cm^3]	1.100	1.164
Z	4	4
T [K]	190(1)	190(1)
F(000)	22552	24136
μ, mm^{-1}	1.489	1.366
θ rang, deg	3.01-25.00	3.01-25.00
reflns meads	57809	337714
reflns used	57809	56490
params	2566	2899
R1[a], wR2[a] [$I > 2\sigma(I)$]	0.0916, 0.2165	0.1094, 0.2595
R1, wR2 (all data)	0.1553, 0.2587	0.2006, 0.3325
Quality of fit	0.908	1.076

[a] $R1 = \Sigma||F_o| - |F_c||\Sigma|F_o|$. $wR2 = [\Sigma w[(F_o^2 - F_c^2)^2]/\Sigma|[w(F_o^2)^2]]^{1/2}$. $w=1/[\sigma^2(F_o^2)+(0.075P)^2]$, where $P = [\max(F_o^2,0)+2F_c^2]/3$.

Table S2. Selected Bond Lengths (Å) and Angles (°) for **1**.

Eu(1)-O(2)	2.310(13)	O(28)-Eu(1)-O(60)	76.9(5)
Eu(1)-O(28)	2.322(16)	O(30)-Eu(1)-O(60)	87.5(5)
Eu(1)-O(30)	2.334(16)	O(6)-Eu(1)-O(60)	71.7(5)
Eu(1)-O(6)	2.340(15)	O(61)-Eu(1)-O(60)	78.1(5)
Eu(1)-O(61)	2.367(16)	O(2)-Eu(1)-N(3)	72.8(6)
Eu(1)-O(60)	2.376(16)	O(28)-Eu(1)-N(3)	76.9(6)
Eu(1)-N(3)	2.58(2)	O(30)-Eu(1)-N(3)	142.3(6)
Eu(1)-O(1)	2.587(15)	O(6)-Eu(1)-N(3)	67.2(6)
Eu(2)-O(39)	2.299(18)	O(61)-Eu(1)-N(3)	139.5(6)
Eu(2)-O(68)	2.301(16)	O(60)-Eu(1)-N(3)	112.4(5)
Eu(2)-O(10)	2.318(14)	O(2)-Eu(1)-O(1)	63.0(5)
Eu(2)-O(7)	2.331(14)	O(28)-Eu(1)-O(1)	141.8(5)
Eu(2)-O(34)	2.414(14)	O(30)-Eu(1)-O(1)	108.8(5)
Eu(2)-O(38)	2.416(15)	O(6)-Eu(1)-O(1)	77.3(5)
Eu(2)-N(4)	2.545(18)	O(61)-Eu(1)-O(1)	71.8(5)
Eu(2)-O(9)	2.603(16)	O(60)-Eu(1)-O(1)	139.6(5)
Cd(1)-O(29)	2.235(17)	N(3)-Eu(1)-O(1)	77.1(6)
Cd(1)-O(2)	2.238(15)	O(39)-Eu(2)-O(68)	76.3(6)
Cd(1)-N(1)	2.288(18)	O(39)-Eu(2)-O(10)	78.0(6)
Cd(1)-O(27)	2.329(14)	O(68)-Eu(2)-O(10)	82.6(5)
Cd(1)-O(31)	2.352(16)	O(39)-Eu(2)-O(7)	147.8(6)
Cd(1)-O(33)	2.371(16)	O(68)-Eu(2)-O(7)	118.1(6)
Cd(2)-O(3)	2.215(16)	O(10)-Eu(2)-O(7)	129.9(5)
Cd(2)-O(35)	2.234(19)	O(39)-Eu(2)-O(34)	87.0(6)
Cd(2)-O(37)	2.268(17)	O(68)-Eu(2)-O(34)	78.3(5)
Cd(2)-O(32)	2.301(18)	O(10)-Eu(2)-O(34)	158.1(5)
Cd(2)-O(31)	2.368(16)	O(7)-Eu(2)-O(34)	69.8(5)
Cd(2)-O(4)	2.39(2)	O(39)-Eu(2)-O(38)	73.2(6)
Cd(3)-O(3)	2.160(17)	O(68)-Eu(2)-O(38)	142.3(5)
Cd(3)-N(2)	2.22(2)	O(10)-Eu(2)-O(38)	111.8(5)
Cd(3)-O(7)	2.260(15)	O(7)-Eu(2)-O(38)	80.3(5)
Cd(3)-O(37)	2.268(17)	O(34)-Eu(2)-O(38)	78.3(5)
Cd(3)-O(34)	2.291(15)	O(39)-Eu(2)-N(4)	143.0(6)
Cd(3)-O(8)	2.520(14)	O(68)-Eu(2)-N(4)	77.7(6)
Cd(3)-O(33)	2.616(15)	O(10)-Eu(2)-N(4)	72.9(5)
Cd(4)-O(40)	2.253(17)	O(7)-Eu(2)-N(4)	68.8(6)
Cd(4)-O(10)	2.254(14)	O(34)-Eu(2)-N(4)	112.9(5)
Cd(4)-O(67)	2.287(14)	O(38)-Eu(2)-N(4)	139.2(6)
Cd(4)-O(43)	2.310(15)	O(39)-Eu(2)-O(9)	109.2(6)
Cd(4)-N(5)	2.35(2)	O(68)-Eu(2)-O(9)	141.6(5)
Cd(4)-O(41)	2.361(14)	O(10)-Eu(2)-O(9)	62.6(5)
O(2)-Eu(1)-O(28)	82.8(5)	O(7)-Eu(2)-O(9)	78.0(5)
O(2)-Eu(1)-O(30)	77.2(5)	O(34)-Eu(2)-O(9)	138.6(5)
O(28)-Eu(1)-O(30)	77.3(6)	O(38)-Eu(2)-O(9)	71.0(5)
O(2)-Eu(1)-O(6)	128.5(5)	N(4)-Eu(2)-O(9)	76.9(5)
O(28)-Eu(1)-O(6)	116.7(5)	O(29)-Cd(1)-O(2)	108.2(5)
O(30)-Eu(1)-O(6)	150.1(5)	O(29)-Cd(1)-N(1)	172.6(6)
O(2)-Eu(1)-O(61)	113.3(5)	O(2)-Cd(1)-N(1)	78.2(6)
O(28)-Eu(1)-O(61)	142.3(6)	O(29)-Cd(1)-O(27)	93.8(6)
O(30)-Eu(1)-O(61)	73.9(6)	O(2)-Cd(1)-O(27)	96.5(5)
O(6)-Eu(1)-O(61)	80.9(6)	N(1)-Cd(1)-O(27)	89.2(6)
O(2)-Eu(1)-O(60)	156.8(5)	O(29)-Cd(1)-O(31)	84.1(6)

O(2)-Cd(1)-O(31)	85.0(5)	N(2)-Cd(3)-O(34)	106.7(6)
N(1)-Cd(1)-O(31)	92.8(6)	O(7)-Cd(3)-O(34)	73.2(5)
O(27)-Cd(1)-O(31)	177.7(6)	O(37)-Cd(3)-O(34)	89.1(6)
O(29)-Cd(1)-O(33)	87.7(6)	O(3)-Cd(3)-O(8)	82.2(6)
O(2)-Cd(1)-O(33)	161.0(5)	N(2)-Cd(3)-O(8)	90.4(6)
N(1)-Cd(1)-O(33)	85.4(6)	O(7)-Cd(3)-O(8)	66.3(5)
O(27)-Cd(1)-O(33)	92.6(5)	O(37)-Cd(3)-O(8)	84.8(5)
O(31)-Cd(1)-O(33)	86.5(5)	O(34)-Cd(3)-O(8)	137.6(5)
O(3)-Cd(2)-O(35)	104.7(7)	O(3)-Cd(3)-O(33)	86.4(6)
O(3)-Cd(2)-O(37)	74.5(6)	N(2)-Cd(3)-O(33)	102.9(6)
O(35)-Cd(2)-O(37)	113.6(7)	O(7)-Cd(3)-O(33)	123.3(5)
O(3)-Cd(2)-O(32)	147.1(7)	O(37)-Cd(3)-O(33)	78.5(5)
O(35)-Cd(2)-O(32)	96.8(7)	O(34)-Cd(3)-O(33)	50.3(5)
O(37)-Cd(2)-O(32)	119.0(7)	O(8)-Cd(3)-O(33)	161.7(5)
O(3)-Cd(2)-O(31)	95.3(6)	O(40)-Cd(4)-O(10)	108.6(6)
O(35)-Cd(2)-O(31)	151.5(6)	O(40)-Cd(4)-O(67)	94.1(6)
O(37)-Cd(2)-O(31)	91.0(6)	O(10)-Cd(4)-O(67)	94.6(5)
O(32)-Cd(2)-O(31)	57.0(6)	O(40)-Cd(4)-O(43)	89.3(6)
O(3)-Cd(2)-O(4)	69.0(6)	O(10)-Cd(4)-O(43)	160.0(5)
O(35)-Cd(2)-O(4)	80.9(8)	O(67)-Cd(4)-O(43)	92.8(5)
O(37)-Cd(2)-O(4)	143.2(6)	O(40)-Cd(4)-N(5)	172.4(7)
O(32)-Cd(2)-O(4)	90.6(7)	O(10)-Cd(4)-N(5)	78.0(6)
O(31)-Cd(2)-O(4)	87.7(6)	O(67)-Cd(4)-N(5)	89.0(6)
O(3)-Cd(3)-N(2)	85.4(7)	O(43)-Cd(4)-N(5)	83.6(6)
O(3)-Cd(3)-O(7)	148.4(6)	O(40)-Cd(4)-O(41)	84.3(6)
N(2)-Cd(3)-O(7)	96.8(6)	O(10)-Cd(4)-O(41)	84.0(5)
O(3)-Cd(3)-O(37)	75.6(6)	O(67)-Cd(4)-O(41)	177.5(5)
N(2)-Cd(3)-O(37)	160.8(7)	O(43)-Cd(4)-O(41)	89.1(5)
O(7)-Cd(3)-O(37)	98.2(6)	N(5)-Cd(4)-O(41)	92.8(6)

Table S3. Selected Bond Lengths (Å) and Angles (°) for **2**.

Nd(1)-O(28)	2.313(15)	O(28)-Nd(1)-O(60)	76.8(5)
Nd(1)-O(2)	2.315(13)	O(2)-Nd(1)-O(60)	157.7(5)
Nd(1)-O(30)	2.333(16)	O(30)-Nd(1)-O(60)	87.8(5)
Nd(1)-O(6)	2.352(16)	O(6)-Nd(1)-O(60)	71.1(5)
Nd(1)-O(61)	2.361(16)	O(61)-Nd(1)-O(60)	77.6(5)
Nd(1)-O(60)	2.384(16)	O(28)-Nd(1)-O(1)	141.6(5)
Nd(1)-O(1)	2.590(16)	O(2)-Nd(1)-O(1)	62.0(5)
Nd(1)-N(3)	2.592(19)	O(30)-Nd(1)-O(1)	108.5(5)
Nd(2)-O(68)	2.291(16)	O(6)-Nd(1)-O(1)	78.1(5)
Nd(2)-O(39)	2.324(18)	O(61)-Nd(1)-O(1)	72.8(5)
Nd(2)-O(10)	2.329(14)	O(60)-Nd(1)-O(1)	140.0(5)
Nd(2)-O(7)	2.352(14)	O(28)-Nd(1)-N(3)	77.5(6)
Nd(2)-O(34)	2.399(14)	O(2)-Nd(1)-N(3)	72.7(5)
Nd(2)-O(38)	2.427(16)	O(30)-Nd(1)-N(3)	142.9(6)
Nd(2)-N(4)	2.551(19)	O(6)-Nd(1)-N(3)	66.9(6)
Nd(2)-O(9)	2.579(14)	O(61)-Nd(1)-N(3)	139.8(6)
Cd(1)-O(29)	2.247(16)	O(60)-Nd(1)-N(3)	111.8(5)
Cd(1)-O(2)	2.274(15)	O(1)-Nd(1)-N(3)	77.2(6)
Cd(1)-N(1)	2.285(18)	O(68)-Nd(2)-O(39)	76.1(6)
Cd(1)-O(27)	2.344(14)	O(68)-Nd(2)-O(10)	82.2(5)
Cd(1)-O(31)	2.359(15)	O(39)-Nd(2)-O(10)	78.2(5)
Cd(1)-O(33)	2.401(15)	O(68)-Nd(2)-O(7)	118.3(5)
Cd(2)-O(3)	2.202(17)	O(39)-Nd(2)-O(7)	148.1(6)
Cd(2)-O(35)	2.23(2)	O(10)-Nd(2)-O(7)	129.5(5)
Cd(2)-O(37)	2.243(16)	O(68)-Nd(2)-O(34)	79.5(5)
Cd(2)-O(32)	2.294(18)	O(39)-Nd(2)-O(34)	86.7(5)
Cd(2)-O(31)	2.368(16)	O(10)-Nd(2)-O(34)	158.5(5)
Cd(2)-O(4)	2.45(2)	O(7)-Nd(2)-O(34)	70.0(5)
Cd(2)-O(36)	2.65(3)	O(68)-Nd(2)-O(38)	142.3(5)
Cd(3)-O(3)	2.182(18)	O(39)-Nd(2)-O(38)	73.1(6)
Cd(3)-N(2)	2.23(2)	O(10)-Nd(2)-O(38)	111.6(5)
Cd(3)-O(37)	2.273(17)	O(7)-Nd(2)-O(38)	80.7(5)
Cd(3)-O(7)	2.281(15)	O(34)-Nd(2)-O(38)	77.6(5)
Cd(3)-O(34)	2.287(14)	O(68)-Nd(2)-N(4)	77.8(5)
Cd(3)-O(8)	2.544(14)	O(39)-Nd(2)-N(4)	143.0(6)
Cd(3)-O(33)	2.601(14)	O(10)-Nd(2)-N(4)	72.8(5)
Cd(4)-O(40)	2.225(16)	O(7)-Nd(2)-N(4)	68.4(5)
Cd(4)-O(10)	2.257(14)	O(34)-Nd(2)-N(4)	113.6(5)
Cd(4)-O(67)	2.276(14)	O(38)-Nd(2)-N(4)	139.2(5)
Cd(4)-O(43)	2.298(14)	O(68)-Nd(2)-O(9)	141.1(5)
Cd(4)-O(41)	2.330(15)	O(39)-Nd(2)-O(9)	110.4(5)
Cd(4)-N(5)	2.37(2)	O(10)-Nd(2)-O(9)	62.9(5)
O(28)-Nd(1)-O(2)	83.1(5)	O(7)-Nd(2)-O(9)	77.1(5)
O(28)-Nd(1)-O(30)	76.9(5)	O(34)-Nd(2)-O(9)	137.8(5)
O(2)-Nd(1)-O(30)	78.1(5)	O(38)-Nd(2)-O(9)	71.6(5)
O(28)-Nd(1)-O(6)	116.9(5)	N(4)-Nd(2)-O(9)	75.9(5)
O(2)-Nd(1)-O(6)	128.0(5)	O(29)-Cd(1)-O(2)	108.3(5)
O(30)-Nd(1)-O(6)	149.8(5)	O(29)-Cd(1)-N(1)	173.3(6)
O(28)-Nd(1)-O(61)	141.1(5)	O(2)-Cd(1)-N(1)	77.4(6)
O(2)-Nd(1)-O(61)	113.8(5)	O(29)-Cd(1)-O(27)	93.0(6)
O(30)-Nd(1)-O(61)	73.3(6)	O(2)-Cd(1)-O(27)	96.5(5)
O(6)-Nd(1)-O(61)	81.1(6)	N(1)-Cd(1)-O(27)	89.7(6)

O(29)-Cd(1)-O(31)	84.8(6)	O(3)-Cd(3)-O(7)	148.6(6)
O(2)-Cd(1)-O(31)	84.7(5)	N(2)-Cd(3)-O(7)	96.5(6)
N(1)-Cd(1)-O(31)	92.5(6)	O(37)-Cd(3)-O(7)	99.0(6)
O(27)-Cd(1)-O(31)	177.7(5)	O(3)-Cd(3)-O(34)	136.0(6)
O(29)-Cd(1)-O(33)	87.7(5)	N(2)-Cd(3)-O(34)	108.2(6)
O(2)-Cd(1)-O(33)	160.8(5)	O(37)-Cd(3)-O(34)	88.9(5)
N(1)-Cd(1)-O(33)	86.0(6)	O(7)-Cd(3)-O(34)	73.2(5)
O(27)-Cd(1)-O(33)	92.9(5)	O(3)-Cd(3)-O(8)	82.7(6)
O(31)-Cd(1)-O(33)	86.5(5)	N(2)-Cd(3)-O(8)	89.9(7)
O(3)-Cd(2)-O(35)	104.6(8)	O(37)-Cd(3)-O(8)	84.5(5)
O(3)-Cd(2)-O(37)	74.9(7)	O(7)-Cd(3)-O(8)	66.1(5)
O(35)-Cd(2)-O(37)	113.3(7)	O(34)-Cd(3)-O(8)	137.0(5)
O(3)-Cd(2)-O(32)	146.3(7)	O(3)-Cd(3)-O(33)	86.1(6)
O(35)-Cd(2)-O(32)	97.8(7)	N(2)-Cd(3)-O(33)	103.6(6)
O(37)-Cd(2)-O(32)	118.6(7)	O(37)-Cd(3)-O(33)	78.5(5)
O(3)-Cd(2)-O(31)	95.1(6)	O(7)-Cd(3)-O(33)	123.3(5)
O(35)-Cd(2)-O(31)	151.6(7)	O(34)-Cd(3)-O(33)	50.2(5)
O(37)-Cd(2)-O(31)	91.3(6)	O(8)-Cd(3)-O(33)	161.6(5)
O(32)-Cd(2)-O(31)	56.2(5)	O(40)-Cd(4)-O(10)	108.7(6)
O(3)-Cd(2)-O(4)	68.1(7)	O(40)-Cd(4)-O(67)	94.3(5)
O(35)-Cd(2)-O(4)	80.6(8)	O(10)-Cd(4)-O(67)	94.8(5)
O(37)-Cd(2)-O(4)	142.8(7)	O(40)-Cd(4)-O(43)	89.1(6)
O(32)-Cd(2)-O(4)	91.6(7)	O(10)-Cd(4)-O(43)	159.9(5)
O(31)-Cd(2)-O(4)	88.1(6)	O(67)-Cd(4)-O(43)	93.0(5)
O(3)-Cd(2)-O(36)	132.2(7)	O(40)-Cd(4)-O(41)	83.9(6)
O(35)-Cd(2)-O(36)	52.0(8)	O(10)-Cd(4)-O(41)	83.9(5)
O(37)-Cd(2)-O(36)	79.0(7)	O(67)-Cd(4)-O(41)	177.2(5)
O(32)-Cd(2)-O(36)	81.5(7)	O(43)-Cd(4)-O(41)	89.1(5)
O(31)-Cd(2)-O(36)	125.1(7)	O(40)-Cd(4)-N(5)	172.3(6)
O(4)-Cd(2)-O(36)	130.0(7)	O(10)-Cd(4)-N(5)	78.0(6)
O(3)-Cd(3)-N(2)	85.3(7)	O(67)-Cd(4)-N(5)	88.6(6)
O(3)-Cd(3)-O(37)	74.7(6)	O(43)-Cd(4)-N(5)	83.7(6)
N(2)-Cd(3)-O(37)	159.7(7)	O(41)-Cd(4)-N(5)	93.5(6)