Acta Crystallographica Section E
Structure Reports Online
ISSN 1600-5368

(4,4′-Bipyridyl-κN)tetrakis(nitrato-$\kappa^2 N,N'$)[4-(4-pyridyl)pyridinium-κN^1]-europium(III)

Xi-Rui Zeng,* Yin-Qiu Liu, Huang Lin and Ya-Ping Xu

College of Chemistry and Chemical Engineering, JiangXi Province Key Laboratory of Coordination Chemistry, JingGangShan University, 343009 Ji'an, JiangXi, People's Republic of China
Correspondence e-mail: zengxirui@jgsu.ed.cn

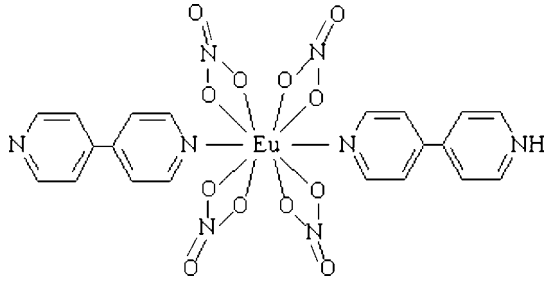
Received 30 April 2007; accepted 10 May 2007

Key indicators: single-crystal X-ray study; T = 293 K; mean σ(C–C) = 0.004 Å; R factor = 0.018; wR factor = 0.049; data-to-parameter ratio = 11.6.

In the title complex, $[Eu(NO_3)_4(C_{10}H_9N_2)(C_{10}H_8N_2)]$, each Eu^{III} ion is ten-coordinated by an N atom from a 4,4′-bipyridine molecule, an N atom from a 4′-(4-pyridyl)-pyridinium cation and eight O atoms from four different nitrate ions. A C_2 axis passes through the Eu^{III} ion. Adjacent molecules are connected by strong and weak hydrogen bonds to construct a three-dimensional network.

Related literature

For related literature, see: Adachi *et al.* (2000); Cotton *et al.* (2003); Sabbatini *et al.* (1993); Shaheen *et al.* (1999).



Experimental

Crystal data

$[Eu(NO_3)_4(C_{10}H_9N_2)(C_{10}H_8N_2)]$
M_r = 713.38
Monoclinic, $C2/c$
a = 20.136 (5) Å
b = 7.8079 (14) Å
c = 18.310 (3) Å
β = 118.834 (2)°
V = 2521.8 (9) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 2.57 mm^{-1}
T = 293 (2) K
0.28 × 0.26 × 0.21 mm

Data collection

Bruker APEXII area-detector diffractometer
Absorption correction: multi-scan (*SADABS*; Bruker, 2004)
T_{min} = 0.533, T_{max} = 0.619
(expected range = 0.503–0.583)
7437 measured reflections
2211 independent reflections
2153 reflections with $I > 2\sigma(I)$
R_{int} = 0.051

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.018
$wR(F^2)$ = 0.049
S = 1.02
2211 reflections
191 parameters
1 restraint
H atoms treated by a mixture of independent and constrained refinement
$\Delta\rho_{max}$ = 0.50 e Å^{-3}
$\Delta\rho_{min}$ = −0.56 e Å^{-3}

Table 1
Selected bond lengths (Å).

Eu1—O6	2.4620 (18)	Eu1—N3	2.626 (2)
Eu1—O3	2.4900 (19)	Eu1—N2	2.917 (2)
Eu1—O4	2.5159 (18)	Eu1—N1	2.960 (2)
Eu1—O1	2.563 (2)		

Data collection: *APEX2* (Bruker, 2004); cell refinement: *APEX2*; data reduction: *SAINT* (Bruker, 2000); program(s) used to solve structure: *SHELXS97* (Sheldrick, 1997); program(s) used to refine structure: *SHELXL97* (Sheldrick, 1997); molecular graphics: *SHELXL97*; software used to prepare material for publication: *SHELXL97*.

The authors are grateful for the support of this work by the Natural Science Foundation of Jiangxi Province (grant Nos. 0520036 and 0620029).

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: HG2235).

References

Adachi, C., Baldo, M. A. & Forrest, S. R. (2000). *J. Appl. Phys.* **87**, 8049–8055.
Bruker (2000). *SAINT*. Bruker AXS Inc., Madison, Wisconsin, USA.
Bruker (2004). *APEX2* (Version 1.22) and *SADABS* (Version 1.22). Bruker AXS Inc., Madison, Wisconsin, USA.
Cotton, S. A., Noy, O. E., Liesener, F. & Raithby, P. R. (2003). *Inorg. Chim. Acta*, **344**, 37–42.
Sabbatini, N., Guardigli, M. & Lehn, J. M. (1993). *Coord. Chem. Rev.* **123**, 201–228.
Shaheen, S. E., Jabbour, G. E., Kippelen, B., Peyghambarian, N., Anderson, J. D., Marder, S. R., Armstrong, N. R., Bellmann, E. & Grubbs, R. H. (1999). *Appl. Phys. Lett.* **74**, 3212–3214.
Sheldrick, G. M. (1997). *SHELXS97* and *SHELXL97*. University of Göttingen, Germany.

 doi:10.1107/S1600536807022982

supplementary materials

Acta Cryst. (2007). E**63**, m1929 [**doi:10.1107/S1600536807022982**]

(4,4'-Bipyridyl-κN)tetrakis(nitrato-$\kappa^2 N,N'$)[4-(4-pyridyl)pyridinium-κN^1]europium(III)

X.-R. Zeng, Y.-Q. Liu, H. Lin and Y.-P. Xu

Comment

Rare earth complexes with luminescent properties feature long emission life but narrow emission bands. Complexes of different rare earth metals yield each of the three basic colors (Eu^{3+} for red, Tb^{3+} for green and Eu^{2+} for blue) and represent potential candidates for the preparation of new generational display and other luminescent instruments (Shaheen *et al.*, 1999; Adachi *et al.*,2000). Past research shows it is important to select ligands which can match the central metal ions in energy and thus lead to 'antenna effect' (Sabbatini *et al.*,1993). Complexes of Eu^{III} ion with 4,4'-bipyridine or its dioxide derivative as a bidentate ligand have been reported (Cotton *et al.*,2003), but to our knowledge, complexes of Eu^{III} with 4,4'-bipyridyl as monodentate ligand have not been reported. In this paper we report the crystal structure of the title complex. As shown in Fig. 1, in this complex every Eu^{III} ion is ten coordinate defined by two N atoms from two different monodentate 4,4'-bipyridine molecules and eight O atoms from four different bidentate nitrate anions. The Eu—N bond length is 2.626 (2) Å. The Eu—O bond lengths range from 2.4620 (17) to 2.5160 (17) Å. The C_2 symmetry element existing in the crystal structure goes through the Eu^{III}ions. One hydrogen ion is distributed between the two non-coordinated N atoms of the 4,4'-bipyridine ligands in 50% occupation ratio and takes part in forming an N—H···N strong intermolecular hydrogen bond to give a zigzag array. As depicted in Fig. 2, the zigzag strings are found to extend by forming strong hydrogen bonds described above along the *a* axis, in the packing structure of the crystal. Weak hydrogen bonds between nitrate O atoms and H atoms of pyridine rings connect different strings in adjacent molecules to form a three-dimensional network.

Experimental

A mixture of 4,4'-bipyridine (0.25 g) and $Eu(NO_3)_3$ (0.28 g) in the molar ratio of 2:1 was added to methanol (20 ml). The mixture was heated at 350 K for 5 h under reflux with stirring. The resulting solution was then filtered. Single crystals suitable for X-ray diffraction analysis formed after a week by slow evaporation of the solvent.

Refinement

The H atoms were positioned geometrically and treated as riding on their parent atoms, with C—H = 0.93 Å (pyridine ring) and 0.96 Å(methyl), and N—H = 0.86 Å (amine group), and with $U_{iso}(H) = 1.2U_{eq}(C)$. H11 and H11A were defined as first and second disordered parts in a 50% occupation ratio and fully refined.

Figures

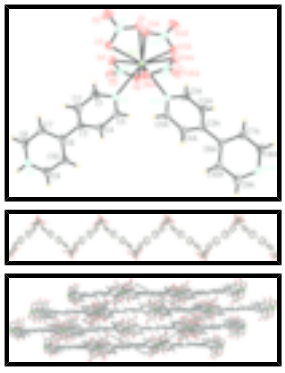


Fig. 1. The asymmetric unit of (I), showing 35% probability displacement ellipsoids.
Fig. 2. The one dimensional zigzag string of the title complex extending along the *a* axis.

(4,4'-Bipyridyl-κ*N*)[4'-(4-pyridyl)pyridinium-κ*N*$^{1'}$]tetrakis(nitrato- κ^2*N*,*N*')europium(III)

Crystal data

$[Eu(NO_3)_4(C_{10}H_9N_2)(C_{10}H_8N_2)]$	$Z = 4$
$M_r = 713.38$	$F_{000} = 1408$
Monoclinic, *C*2/*c*	$D_x = 1.879$ Mg m^{-3}
Hall symbol: -C 2yc	Mo *K*α radiation λ = 0.71073 Å
a = 20.136 (5) Å	θ = 2.1–28.4º
b = 7.8079 (14) Å	μ = 2.57 mm^{-1}
c = 18.310 (3) Å	*T* = 293 (2) K
β = 118.834 (2)º	Block, yellow
V = 2521.8 (9) Å^3	0.28 × 0.26 × 0.21 mm

Data collection

Bruker APEXII area-detector diffractometer	2211 independent reflections
Radiation source: fine-focus sealed tube	2153 reflections with $I > 2\sigma(I)$
Monochromator: graphite	$R_{int} = 0.051$
T = 293(2) K	$\theta_{max} = 25.2$º
φ and ω scans	$\theta_{min} = 2.3$º
Absorption correction: multi-scan (SADABS; Bruker, 2004)	*h* = −23→24
$T_{min} = 0.533$, $T_{max} = 0.619$	*k* = −9→9
7437 measured reflections	*l* = −21→21

Refinement

Refinement on F^2	Secondary atom site location: difference Fourier map
Least-squares matrix: full	Hydrogen site location: inferred from neighbouring sites
$R[F^2 > 2\sigma(F^2)] = 0.018$	H atoms treated by a mixture of

	independent and constrained refinement
$wR(F^2) = 0.049$	$w = 1/[\sigma^2(F_o^2) + (0.031P)^2 + 0.9897P]$ where $P = (F_o^2 + 2F_c^2)/3$
$S = 1.02$	$(\Delta/\sigma)_{max} < 0.001$
2211 reflections	$\Delta\rho_{max} = 0.50$ e Å^{-3}
191 parameters	$\Delta\rho_{min} = -0.56$ e Å^{-3}
1 restraint	Extinction correction: none
Primary atom site location: structure-invariant direct methods	

Special details

Geometry. All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

Refinement. Refinement of F^2 against ALL reflections. The weighted *R*-factor *wR* and goodness of fit *S* are based on F^2, conventional *R*-factors *R* are based on *F*, with *F* set to zero for negative F^2. The threshold expression of $F^2 > \sigma(F^2)$ is used only for calculating *R*-factors(gt) *etc*. and is not relevant to the choice of reflections for refinement. *R*-factors based on F^2 are statistically about twice as large as those based on *F*, and *R*- factors based on ALL data will be even larger.

Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2)

	x	*y*	*z*	U_{iso}*/U_{eq}	Occ. (<1)
H11	0.243 (7)	1.222 (16)	0.018 (7)	0.13 (5)*	0.50 (10)
Eu1	0.0000	0.338536 (17)	0.2500	0.03085 (8)	
O4	0.00208 (11)	0.3047 (3)	0.11446 (11)	0.0480 (4)	
O3	0.12196 (11)	0.2141 (3)	0.27142 (11)	0.0468 (4)	
O6	−0.09200 (10)	0.4418 (2)	0.11018 (11)	0.0478 (4)	
N2	−0.05805 (13)	0.3852 (3)	0.07139 (12)	0.0427 (5)	
N1	0.12672 (12)	0.0900 (3)	0.31810 (12)	0.0407 (5)	
O1	0.07166 (11)	0.0719 (3)	0.33171 (13)	0.0554 (5)	
O2	0.18155 (12)	−0.0037 (3)	0.34727 (12)	0.0622 (5)	
O5	−0.08280 (14)	0.4120 (3)	−0.00236 (11)	0.0702 (6)	
N3	0.06444 (12)	0.6021 (3)	0.22022 (12)	0.0399 (4)	
C3	0.12606 (15)	0.8304 (3)	0.15042 (14)	0.0340 (5)	
C4	0.05361 (16)	0.8533 (3)	0.13925 (16)	0.0396 (6)	
H4	0.0244	0.9459	0.1087	0.048*	
C2	0.16818 (15)	0.6951 (3)	0.19990 (15)	0.0412 (5)	
H2	0.2178	0.6777	0.2108	0.049*	
C5	0.02512 (15)	0.7364 (3)	0.17410 (15)	0.0411 (5)	
H5	−0.0241	0.7521	0.1649	0.049*	
C1	0.13539 (14)	0.5861 (4)	0.23286 (15)	0.0437 (6)	
H1	0.1645	0.4959	0.2660	0.052*	
C6	0.15731 (13)	0.9448 (3)	0.10950 (13)	0.0347 (5)	
C7	0.20534 (15)	0.8784 (4)	0.08172 (15)	0.0399 (5)	
H7	0.2178	0.7627	0.0882	0.048*	

C10	0.13999 (17)	1.1166 (4)	0.09719 (19)	0.0509 (7)
H10	0.1071	1.1645	0.1138	0.061*
N4	0.21769 (15)	1.1517 (3)	0.03422 (15)	0.0461 (6)
C8	0.23413 (14)	0.9869 (4)	0.04437 (15)	0.0444 (6)
H8	0.2661	0.9424	0.0257	0.053*
C9	0.17182 (18)	1.2178 (4)	0.05995 (19)	0.0571 (7)
H9	0.1608	1.3343	0.0529	0.068*

Atomic displacement parameters (Å^2)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Eu1	0.03323 (11)	0.02896 (11)	0.04004 (11)	0.000	0.02536 (8)	0.000
O4	0.0522 (12)	0.0524 (11)	0.0503 (9)	0.0116 (9)	0.0333 (9)	0.0021 (8)
O3	0.0481 (10)	0.0443 (10)	0.0590 (10)	0.0099 (9)	0.0345 (8)	0.0132 (9)
O6	0.0424 (10)	0.0494 (11)	0.0557 (9)	0.0070 (8)	0.0268 (8)	−0.0007 (8)
N2	0.0485 (13)	0.0384 (11)	0.0410 (10)	−0.0004 (10)	0.0214 (10)	−0.0026 (9)
N1	0.0442 (12)	0.0352 (12)	0.0429 (10)	0.0027 (9)	0.0210 (9)	−0.0010 (9)
O1	0.0572 (12)	0.0441 (11)	0.0790 (12)	0.0028 (9)	0.0442 (10)	0.0143 (10)
O2	0.0588 (12)	0.0558 (13)	0.0664 (11)	0.0266 (10)	0.0258 (9)	0.0138 (10)
O5	0.0959 (17)	0.0657 (15)	0.0396 (10)	0.0070 (13)	0.0253 (10)	0.0010 (10)
N3	0.0473 (13)	0.0380 (11)	0.0475 (10)	−0.0024 (9)	0.0332 (9)	0.0034 (9)
C3	0.0401 (13)	0.0324 (13)	0.0387 (11)	−0.0038 (8)	0.0262 (10)	−0.0016 (8)
C4	0.0447 (15)	0.0358 (13)	0.0524 (13)	0.0048 (9)	0.0346 (12)	0.0064 (10)
C2	0.0358 (13)	0.0450 (14)	0.0475 (12)	0.0003 (10)	0.0238 (11)	0.0091 (11)
C5	0.0466 (14)	0.0350 (13)	0.0578 (13)	0.0022 (11)	0.0382 (12)	0.0027 (11)
C1	0.0404 (14)	0.0450 (16)	0.0480 (12)	0.0022 (11)	0.0230 (11)	0.0140 (11)
C6	0.0349 (11)	0.0372 (12)	0.0390 (10)	−0.0024 (9)	0.0234 (9)	0.0022 (9)
C7	0.0405 (13)	0.0396 (12)	0.0486 (12)	0.0024 (10)	0.0286 (11)	0.0041 (10)
C10	0.0651 (19)	0.0383 (13)	0.0764 (18)	0.0059 (13)	0.0558 (16)	0.0090 (13)
N4	0.0494 (14)	0.0488 (15)	0.0536 (12)	−0.0056 (9)	0.0356 (11)	0.0093 (9)
C8	0.0412 (13)	0.0527 (16)	0.0513 (12)	−0.0010 (11)	0.0318 (11)	0.0043 (11)
C9	0.073 (2)	0.0411 (15)	0.0819 (18)	0.0055 (14)	0.0567 (17)	0.0146 (15)

Geometric parameters (Å, °)

Eu1—O6^{i}	2.4620 (18)	C3—C4	1.383 (4)
Eu1—O6	2.4620 (18)	C3—C2	1.384 (3)
Eu1—O3	2.4900 (19)	C3—C6	1.487 (3)
Eu1—O3^{i}	2.4900 (19)	C4—C5	1.386 (3)
Eu1—O4^{i}	2.5159 (18)	C4—H4	0.9300
Eu1—O4	2.5160 (18)	C2—C1	1.381 (4)
Eu1—O1^{i}	2.563 (2)	C2—H2	0.9300
Eu1—O1	2.563 (2)	C5—H5	0.9300
Eu1—N3	2.626 (2)	C1—H1	0.9300
Eu1—N3^{i}	2.626 (2)	C6—C10	1.377 (4)
Eu1—N2^{i}	2.917 (2)	C6—C7	1.392 (3)
Eu1—N1^{i}	2.960 (2)	C7—C8	1.380 (4)

O4—N2	1.250 (3)	C7—H7	0.9300
O3—N1	1.265 (3)	C10—C9	1.386 (4)
O6—N2	1.279 (3)	C10—H10	0.9300
N2—O5	1.211 (3)	N4—C8	1.319 (4)
N1—O2	1.213 (3)	N4—C9	1.327 (4)
N1—O1	1.256 (3)	N4—H11	0.89 (2)
N3—C1	1.338 (3)	C8—H8	0.9300
N3—C5	1.340 (4)	C9—H9	0.9300
O6^{i}—Eu1—O6	141.76 (9)	O6—Eu1—N1^{i}	73.34 (6)
O6^{i}—Eu1—O3	76.92 (6)	O3—Eu1—N1^{i}	113.25 (7)
O6—Eu1—O3	118.81 (6)	O3^{i}—Eu1—N1^{i}	24.97 (6)
O6^{i}—Eu1—O3^{i}	118.81 (6)	O4^{i}—Eu1—N1^{i}	85.74 (6)
O6—Eu1—O3^{i}	76.92 (6)	O4—Eu1—N1^{i}	86.37 (6)
O3—Eu1—O3^{i}	134.06 (10)	O1^{i}—Eu1—N1^{i}	24.99 (6)
O6^{i}—Eu1—O4^{i}	51.01 (6)	O1—Eu1—N1^{i}	80.89 (6)
O6—Eu1—O4^{i}	134.26 (7)	N3—Eu1—N1^{i}	146.93 (6)
O3—Eu1—O4^{i}	106.74 (6)	N3^{i}—Eu1—N1^{i}	100.91 (7)
O3^{i}—Eu1—O4^{i}	68.29 (6)	N2^{i}—Eu1—N1^{i}	110.62 (6)
O6^{i}—Eu1—O4	134.26 (7)	N2—O4—Eu1	95.61 (13)
O6—Eu1—O4	51.01 (6)	N1—O3—Eu1	98.80 (14)
O3—Eu1—O4	68.29 (6)	N2—O6—Eu1	97.39 (14)
O3^{i}—Eu1—O4	106.74 (6)	O5—N2—O4	122.9 (2)
O4^{i}—Eu1—O4	167.96 (9)	O5—N2—O6	121.1 (2)
O6^{i}—Eu1—O1^{i}	143.35 (6)	O4—N2—O6	115.97 (19)
O6—Eu1—O1^{i}	74.31 (7)	O2—N1—O1	123.2 (2)
O3—Eu1—O1^{i}	90.56 (6)	O2—N1—O3	121.1 (2)
O3^{i}—Eu1—O1^{i}	49.94 (6)	O1—N1—O3	115.7 (2)
O4^{i}—Eu1—O1^{i}	102.59 (6)	N1—O1—Eu1	95.47 (13)
O4—Eu1—O1^{i}	67.15 (7)	C1—N3—C5	116.0 (2)
O6^{i}—Eu1—O1	74.31 (7)	C1—N3—Eu1	118.97 (17)
O6—Eu1—O1	143.35 (6)	C5—N3—Eu1	122.90 (16)
O3—Eu1—O1	49.94 (6)	C4—C3—C2	117.7 (2)
O3^{i}—Eu1—O1	90.56 (6)	C4—C3—C6	121.4 (2)
O4^{i}—Eu1—O1	67.14 (7)	C2—C3—C6	120.9 (2)
O4—Eu1—O1	102.60 (6)	C3—C4—C5	119.2 (2)
O1^{i}—Eu1—O1	71.41 (10)	C3—C4—H4	120.4
O6^{i}—Eu1—N3	76.11 (6)	C5—C4—H4	120.4
O6—Eu1—N3	74.15 (7)	C1—C2—C3	119.0 (2)
O3—Eu1—N3	77.88 (7)	C1—C2—H2	120.5
O3^{i}—Eu1—N3	145.24 (7)	C3—C2—H2	120.5
O4^{i}—Eu1—N3	122.13 (6)	N3—C5—C4	123.7 (2)
O4—Eu1—N3	68.44 (7)	N3—C5—H5	118.1
O1^{i}—Eu1—N3	135.27 (6)	C4—C5—H5	118.1

O1—Eu1—N3	124.20 (7)	N3—C1—C2	124.2 (2)
O6^{i}—Eu1—N3^{i}	74.15 (7)	N3—C1—H1	117.9
O6—Eu1—N3^{i}	76.11 (6)	C2—C1—H1	117.9
O3—Eu1—N3^{i}	145.24 (7)	C10—C6—C7	117.9 (2)
O3^{i}—Eu1—N3^{i}	77.88 (7)	C10—C6—C3	122.2 (2)
O4^{i}—Eu1—N3^{i}	68.44 (7)	C7—C6—C3	119.9 (2)
O4—Eu1—N3^{i}	122.13 (6)	C8—C7—C6	119.0 (3)
O1^{i}—Eu1—N3^{i}	124.20 (6)	C8—C7—H7	120.5
O1—Eu1—N3^{i}	135.27 (6)	C6—C7—H7	120.5
N3—Eu1—N3^{i}	76.83 (9)	C6—C10—C9	119.7 (3)
O6^{i}—Eu1—N2^{i}	25.77 (6)	C6—C10—H10	120.2
O6—Eu1—N2^{i}	144.95 (6)	C9—C10—H10	120.2
O3—Eu1—N2^{i}	92.34 (6)	C8—N4—C9	120.0 (2)
O3^{i}—Eu1—N2^{i}	93.26 (6)	C8—N4—H11	120 (10)
O4^{i}—Eu1—N2^{i}	25.24 (6)	C9—N4—H11	119 (10)
O4—Eu1—N2^{i}	158.55 (7)	N4—C8—C7	122.1 (2)
O1^{i}—Eu1—N2^{i}	124.35 (7)	N4—C8—H8	118.9
O1—Eu1—N2^{i}	68.82 (7)	C7—C8—H8	118.9
N3—Eu1—N2^{i}	99.43 (6)	N4—C9—C10	121.3 (3)
N3^{i}—Eu1—N2^{i}	68.91 (6)	N4—C9—H9	119.4
O6^{i}—Eu1—N1^{i}	135.74 (6)	C10—C9—H9	119.4
O6^{i}—Eu1—O4—N2	−127.84 (16)	N3—Eu1—O1—N1	−23.62 (17)
O6—Eu1—O4—N2	0.63 (14)	N3^{i}—Eu1—O1—N1	−130.75 (14)
O3—Eu1—O4—N2	−171.12 (17)	N2^{i}—Eu1—O1—N1	−110.70 (15)
O3^{i}—Eu1—O4—N2	57.44 (17)	N1^{i}—Eu1—O1—N1	132.90 (14)
O4^{i}—Eu1—O4—N2	121.24 (16)	O6^{i}—Eu1—N3—C1	73.72 (18)
O1^{i}—Eu1—O4—N2	88.55 (16)	O6—Eu1—N3—C1	−130.59 (19)
O1—Eu1—O4—N2	151.89 (15)	O3—Eu1—N3—C1	−5.60 (17)
N3—Eu1—O4—N2	−86.04 (16)	O3^{i}—Eu1—N3—C1	−165.32 (15)
N3^{i}—Eu1—O4—N2	−28.55 (19)	O4^{i}—Eu1—N3—C1	96.69 (18)
N2^{i}—Eu1—O4—N2	−144.4 (2)	O4—Eu1—N3—C1	−76.82 (18)
N1^{i}—Eu1—O4—N2	72.07 (16)	O1^{i}—Eu1—N3—C1	−83.9 (2)
O6^{i}—Eu1—O3—N1	78.56 (15)	O1—Eu1—N3—C1	14.0 (2)
O6—Eu1—O3—N1	−139.02 (14)	N3^{i}—Eu1—N3—C1	150.4 (2)
O3^{i}—Eu1—O3—N1	−39.07 (13)	N2^{i}—Eu1—N3—C1	84.77 (18)
O4^{i}—Eu1—O3—N1	36.66 (16)	N1^{i}—Eu1—N3—C1	−119.82 (18)
O4—Eu1—O3—N1	−131.72 (16)	O6^{i}—Eu1—N3—C5	−123.43 (19)
O1^{i}—Eu1—O3—N1	−66.67 (15)	O6—Eu1—N3—C5	32.26 (18)
O1—Eu1—O3—N1	−1.81 (13)	O3—Eu1—N3—C5	157.24 (19)
N3—Eu1—O3—N1	156.89 (16)	O3^{i}—Eu1—N3—C5	−2.5 (2)
N3^{i}—Eu1—O3—N1	112.80 (16)	O4^{i}—Eu1—N3—C5	−100.46 (19)

N2^{i}—Eu1—O3—N1	57.74 (15)	O4—Eu1—N3—C5	86.02 (18)
N1^{i}—Eu1—O3—N1	−55.91 (18)	O1^{i}—Eu1—N3—C5	78.9 (2)
O6^{i}—Eu1—O6—N2	114.43 (15)	O1—Eu1—N3—C5	176.88 (17)
O3—Eu1—O6—N2	8.13 (17)	N3^{i}—Eu1—N3—C5	−46.80 (16)
O3^{i}—Eu1—O6—N2	−125.26 (15)	N2^{i}—Eu1—N3—C5	−112.38 (18)
O4^{i}—Eu1—O6—N2	−166.10 (13)	N1^{i}—Eu1—N3—C5	43.0 (2)
O4—Eu1—O6—N2	−0.62 (14)	C2—C3—C4—C5	−3.2 (4)
O1^{i}—Eu1—O6—N2	−73.66 (15)	C6—C3—C4—C5	175.7 (2)
O1—Eu1—O6—N2	−52.45 (19)	C4—C3—C2—C1	2.5 (4)
N3—Eu1—O6—N2	74.22 (15)	C6—C3—C2—C1	−176.3 (2)
N3^{i}—Eu1—O6—N2	154.21 (16)	C1—N3—C5—C4	1.0 (4)
N2^{i}—Eu1—O6—N2	158.00 (15)	Eu1—N3—C5—C4	−162.3 (2)
N1^{i}—Eu1—O6—N2	−99.67 (15)	C3—C4—C5—N3	1.4 (4)
Eu1—O4—N2—O5	177.7 (2)	C5—N3—C1—C2	−1.8 (4)
Eu1—O4—N2—O6	−1.0 (2)	Eu1—N3—C1—C2	162.2 (2)
Eu1—O6—N2—O5	−177.7 (2)	C3—C2—C1—N3	0.0 (4)
Eu1—O6—N2—O4	1.1 (2)	C4—C3—C6—C10	34.9 (4)
Eu1—O3—N1—O2	−176.7 (2)	C2—C3—C6—C10	−146.3 (3)
Eu1—O3—N1—O1	3.1 (2)	C4—C3—C6—C7	−144.6 (2)
O2—N1—O1—Eu1	176.8 (2)	C2—C3—C6—C7	34.2 (3)
O3—N1—O1—Eu1	−3.0 (2)	C10—C6—C7—C8	0.8 (4)
O6^{i}—Eu1—O1—N1	−84.12 (15)	C3—C6—C7—C8	−179.6 (2)
O6—Eu1—O1—N1	87.49 (17)	C7—C6—C10—C9	−1.6 (4)
O3—Eu1—O1—N1	1.81 (13)	C3—C6—C10—C9	178.9 (3)
O3^{i}—Eu1—O1—N1	156.02 (14)	C9—N4—C8—C7	−0.3 (4)
O4^{i}—Eu1—O1—N1	−137.91 (16)	C6—C7—C8—N4	0.1 (4)
O4—Eu1—O1—N1	48.72 (15)	C8—N4—C9—C10	−0.4 (5)
O1^{i}—Eu1—O1—N1	109.05 (16)	C6—C10—C9—N4	1.4 (5)

Symmetry codes: (i) −*x*, *y*, −*z*+1/2.

Hydrogen-bond geometry (Å, °)

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
N4—H11···N4^{ii}	0.89 (6)	1.80 (6)	2.682 (4)	169 (6)

Symmetry codes: (ii) −*x*+1/2, −*y*+5/2, −*z*.

Fig. 1

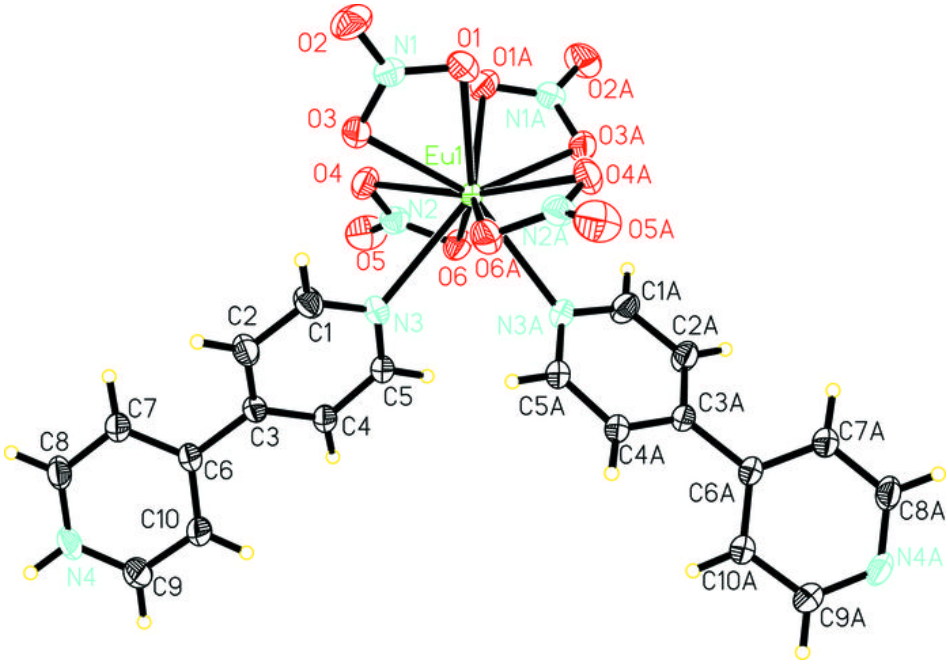

O2
N1
O1
O1A
O2A
O3
N1A
O3A
Eu1
O4
O4A
N2
N2A
O5A
O5
O6
O6A
C1A
C2
C1
N3
N3A
C2A
C5
C5A
C3A
C7
C3
C4
C4A
C7A
C8
C6
C6A
C8A
C10
N4A
N4
C10A
C9
C9A

Fig. 2

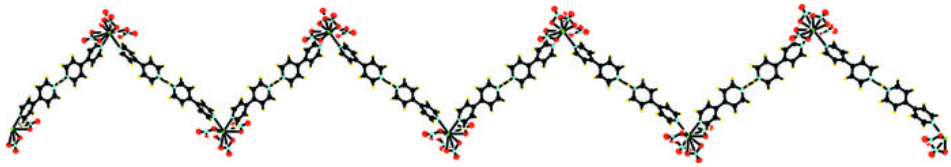


Fig. 3