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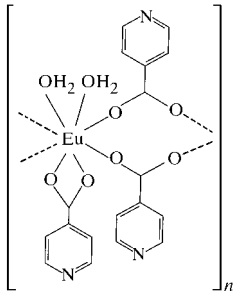
The title complex, $[Eu(C_6H_4O_2)_3(H_2O)_2]$, has a double carboxylate-bridged infinite-chain structure, with one chelating carboxylate group on each Eu ion centre, which also binds to two water molecules to yield an eight-coordinate square-antiprismatic geometry, with Eu—O bond lengths in the range 2.338 (3)–2.594 (3) Å. The pyridine N atoms of the isonicotinate groups do not coordinate to the Eu ions; instead, they direct the formation of Eu^{III} coordination polymers *via* hydrogen bonding with coordinated water molecules.

Comment

There has been considerable interest in rare earth isonicotinates (Moore *et al.*, 1972; Chupakhina *et al.*, 1963; Xu *et al.*, 1997; Ye & Qin, 1991). In this paper, we report that *catena*-poly[[[diaqua(isonicotinato-*O*,*O*′)europium(III)]-di-μ-isonicotinato-*O*:*O*′] dihydrate], (I), has a one-dimensional chain structure instead of the dimers reported for the Sm^{III} and La^{III} isonicotinates (Moore *et al.*, 1972).



(I)

In the title compound, the isonicotinates are coordinated to the Eu^{III} ions solely through the carboxylate O atoms, leaving the pyridine N atoms uncoordinated, and two isonicotinates act as bridging ligands between all adjacent Eu ions, thus forming a one-dimensional structure. In other words, the complex has a double carboxylate-bridged infinite chain, with one chelating carboxylate group on each Eu ion centre. The chelating carboxyl groups of isonicotinate have two Eu—O distances of 2.594 (3) and 2.445 (3) Å. A prominent feature is that the distances of the bridging isonicotinates have two shorter Eu—O distances: $O1^{ii}$ is 2.403 (3) Å from Eu1 and O2 is 2.338 (3) Å from Eu1, which represents a weak interaction between the metal ion and the C atom of the carboxylate group (see Table 1 for symmetry code).

The coordination sphere of each Eu ion is completed by two water molecules to yield an eight-coordinate square-antiprismatic geometry. The Eu1—O*W*1 and Eu1—O*W*2 bond lengths are 2.449 (3) and 2.444 (3) Å, respectively. The presence of water molecules permits hydrogen bonding to the N and O atoms of adjacent chain units, whose relevant geometric parameters are quoted in Table 2. This hydrogen bonding occurs between different chain units, so that the bulk structure is bound together by these hydrogen bonds into a three-dimensional network.

Experimental

Isonicotinic acid (0.1 g) and $Eu(CF_3COO)_3$ (0.1 g) were mixed with ethanol (1 ml) and water (0.1 ml) in a heavy-walled Pyrex tube. The Pyrex tube was sealed under vacuum (while frozen with liquid nitrogen). The tube was kept in oven at the temperature 350 K for 24 h, after which time, colourless prismatic crystals were obtained.

Crystal data

$[Eu(C_6H_4O_2)_3(H_2O)_2]$	D_x = 1.903 Mg m^{-3}
M_r = 554.30	Mo $K\alpha$ radiation
Monoclinic, $P2_1/c$	Cell parameters from 25 reflections
a = 9.4860 (19) Å	θ = 2.63–6.87°
b = 18.974 (4) Å	μ = 3.295 mm^{-1}
c = 10.759 (2) Å	T = 293 (2) K
β = 92.48 (3)°	Prism, colourless
V = 1934.7 (7) Å^3	0.32 × 0.26 × 0.24 mm
Z = 4	

Data collection

CAD-4 diffractometer	R_{int} = 0.017
ω–2θ scans	θ_{max} = 24.97°
Absorption correction: empirical from ψ scan (North *et al.*, 1968)	$h = 0 \rightarrow 11$
T_{min} = 0.348, T_{max} = 0.452	$k = 0 \rightarrow 22$
3615 measured reflections	$l = -12 \rightarrow 12$
3402 independent reflections	3 standard reflections every 97 reflections
3060 reflections with $I > 2\sigma(I)$	intensity decay: none

Refinement

Refinement on F^2	$w = 1/[\sigma^2(F_o^2) + (0.0460P)^2 + 1.4090P]$ where $P = (F_o^2 + 2F_c^2)/3$
$R[F^2 > 2\sigma(F^2)]$ = 0.025	$(\Delta/\sigma)_{max}$ = 0.002
$wR(F^2)$ = 0.070	$\Delta\rho_{max}$ = 0.729 e Å^{-3}
S = 1.091	$\Delta\rho_{min}$ = −2.005 e Å^{-3}
3402 reflections	
271 parameters	
H-atom parameters constrained	

Table 1
Selected geometric parameters (Å).

Eu1—O2	2.338 (3)	Eu1—O2*W*	2.445 (3)
Eu1—O6^{i}	2.359 (3)	Eu1—O1*W*	2.450 (3)
Eu1—O5	2.370 (3)	Eu1—O4	2.453 (2)
Eu1—O1^{ii}	2.403 (3)	Eu1—O3	2.594 (3)

Symmetry codes: (i) $1-x, 1-y, 1-z$; (ii) $2-x, 1-y, 1-z$.

Table 2
Hydrogen-bonding geometry (Å, °).

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
O1*W*—H1···O3^{i}	0.95 (7)	1.84 (7)	2.784 (4)	165 (8)
O1*W*—H2···N3^{ii}	0.97 (1)	1.84 (7)	2.799 (5)	166 (6)
O2*W*—H3···O4^{iii}	0.88 (6)	1.88 (5)	2.752 (4)	165 (3)
O2*W*—H4···N1^{iv}	0.86 (3)	1.96 (7)	2.800 (4)	161 (9)

Symmetry codes: (i) $1-x, 1-y, 1-z$; (ii) $x, \frac{1}{2}-y, z-\frac{1}{2}$; (iii) $2-x, 1-y, 1-z$; (iv) $x, y, z-1$.

The deepest difference electron-density hole was 1.07 Å from the Eu1 atom.

Data collection: *CAD*-4 *Software* (Enraf–Nonius, 1989); cell refinement: *CAD*-4 *Software*; program(s) used to solve structure: *SHELXS*97 (Sheldrick, 1990); program(s) used to refine structure: *SHELXTL* (Sheldrick, 1997); software used to prepare material for publication: *SHELXTL*.

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