

**catena-Poly[[ (1,10-phenanthroline- $\kappa^2N,N'$ )lead(II)]-di- $\mu$ -nitrate- $\kappa^3O,O':O''$ ;  $\kappa^3O:O',O''$ -(1,10-phenanthroline- $\kappa^2N,N'$ )lead(II)]-bis( $\mu$ -2,2,2-trichloroacetato- $\kappa^2O:O'$ )**

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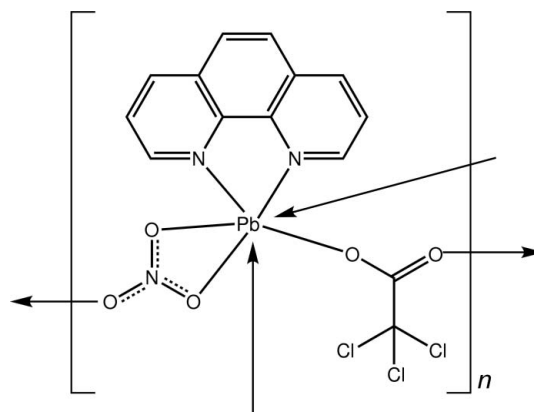
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Key indicators: single-crystal X-ray study;  $T = 100$  K; mean  $\sigma(C-C) = 0.004$  Å;  $R$  factor = 0.017;  $wR$  factor = 0.038; data-to-parameter ratio = 16.6.

In the title  $Pb^{II}$  complex,  $[Pb_2(C_2Cl_3O_2)_2(NO_3)_2(C_{12}H_8N_2)_2]_n$ , the 1,10-phenanthroline ligand is chelating, the nitrate anion chelates one  $Pb^{II}$  ion and simultaneously bridges a neighbouring  $Pb^{II}$  ion *via* the third O atom, and the trichloroacetate anion is bidentate, bridging two  $Pb^{II}$  ions. The coordination geometry is based on a pentagonal–bipyramidal geometry defined by an  $N_2O_5$  donor set with no obvious stereochemical role for the lead-bound lone pair of electrons. The coordination polymer has a zigzag topology along [010] and comprises alternating eight-membered  $\{PbONO\}_2$  and  $\{PbOCO\}_2$  rings.

## Related literature

On the stereochemical activity of lone pairs of electrons in  $Pb^{II}$  structures, see: Davidovich *et al.* (2009). For recent structural studies of mixed-ligand  $Pb^{II}$  compounds, see: Shahverdizadeh *et al.* (2008, 2011*a,b*). For specialized crystallization techniques, see: Harrowfield *et al.* (1996).



## Experimental

### Crystal data

$[Pb_2(C_2Cl_3O_2)_2(NO_3)_2(C_{12}H_8N_2)_2]$   
 $M_r = 1223.54$   
 Triclinic,  $P\bar{1}$   
 $a = 8.8852$  (3) Å  
 $b = 9.7465$  (3) Å  
 $c = 11.1570$  (3) Å  
 $\alpha = 109.427$  (3)°  
 $\beta = 99.019$  (3)°

$\gamma = 106.199$  (3)°  
 $V = 841.13$  (4) Å<sup>3</sup>  
 $Z = 1$   
 Mo  $K\alpha$  radiation  
 $\mu = 10.54$  mm<sup>-1</sup>  
 $T = 100$  K  
 0.20 × 0.15 × 0.10 mm

### Data collection

Agilent SuperNova Dual diffractometer with an Atlas detector  
 Absorption correction: multi-scan (*CrysAlis PRO*; Agilent, 2010)  
 $T_{min} = 0.227$ ,  $T_{max} = 0.419$

12671 measured reflections  
 3899 independent reflections  
 3740 reflections with  $I > 2\sigma(I)$   
 $R_{int} = 0.029$

### Refinement

$R[F^2 > 2\sigma(F^2)] = 0.017$   
 $wR(F^2) = 0.038$   
 $S = 0.99$   
 3899 reflections

235 parameters  
 H-atom parameters constrained  
 $\Delta\rho_{max} = 0.84$  e Å<sup>-3</sup>  
 $\Delta\rho_{min} = -0.97$  e Å<sup>-3</sup>

**Table 1**

Selected bond lengths (Å).

Pb—O1	2.410 (2)	Pb—O5 <sup>ii</sup>	2.807 (2)
Pb—O2 <sup>i</sup>	2.821 (2)	Pb—N1	2.576 (2)
Pb—O3	2.591 (2)	Pb—N2	2.515 (2)
Pb—O4	2.844 (2)		

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

Data collection: *CrysAlis PRO* (Agilent, 2010); cell refinement: *CrysAlis PRO*; data reduction: *CrysAlis PRO*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *X-SEED* (Barbour, 2001) and *DIAMOND* (Brandenburg, 2006); software used to prepare material for publication: *publCIF* (Westrip, 2010).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: HG5168).

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## supplementary materials

*Acta Cryst.* (2012). E68, m237–m238 [doi:10.1107/S1600536812003595]

***catena*-Poly[[[(1,10-phenanthroline- $\kappa^2$ N,N')lead(II)]-di- $\mu$ -nitrate- $\kappa^3$ O,O':O''; $\kappa^3$ O:O',O''-[(1,10-phenanthroline- $\kappa^2$ N,N')lead(II)]-bis( $\mu$ -2,2,2-trichloroacetato- $\kappa^2$ O:O')]**

**Gholam Hossein Shahverdizadeh, Seik Weng Ng, Edward R. T. Tiekink and Babak Mirtamizdoust**

### Comment

The coordination chemistry of Pb<sup>II</sup> with N- and O-donor ligands has been investigated in the past decade and frequently discussed in regard of the stereochemical activity of the lone pair of electrons (Davidovich *et al.*, 2009). In connection with recent structural studies (Shahverdizadeh *et al.*, 2008, 2011a, 2011b), herein we report the crystal and molecular structure of the mixed ligand Pb<sup>II</sup> complex containing nitrate, trichloroacetate and 1,10-phenanthroline, (I).

A view of the asymmetric unit is shown in Fig. 1. This comprises a Pb<sup>II</sup> atom, a chelating 1,10-phenanthroline molecule, a nitrate anion and a trichloroacetate anion. The nitrate anion chelates one Pb<sup>II</sup> atom and at the same time bridges a second Pb<sup>II</sup> atom *via* the third O atom. The trichloroacetate anion is bidentate, bridging two Pb<sup>II</sup> atoms. Both bridges are non-symmetric, Table 1. The resulting coordination geometry, Fig. 2, is based on a distorted pentagonal bipyramid with no obvious role for the lead-bound lone pair of electrons.

The resulting polymeric chain along [010] has a zigzag topology with the backbone being defined by alternating eight-membered {PbONO}<sub>2</sub> and {PbOCO}<sub>2</sub> rings, Fig. 3.

### Experimental

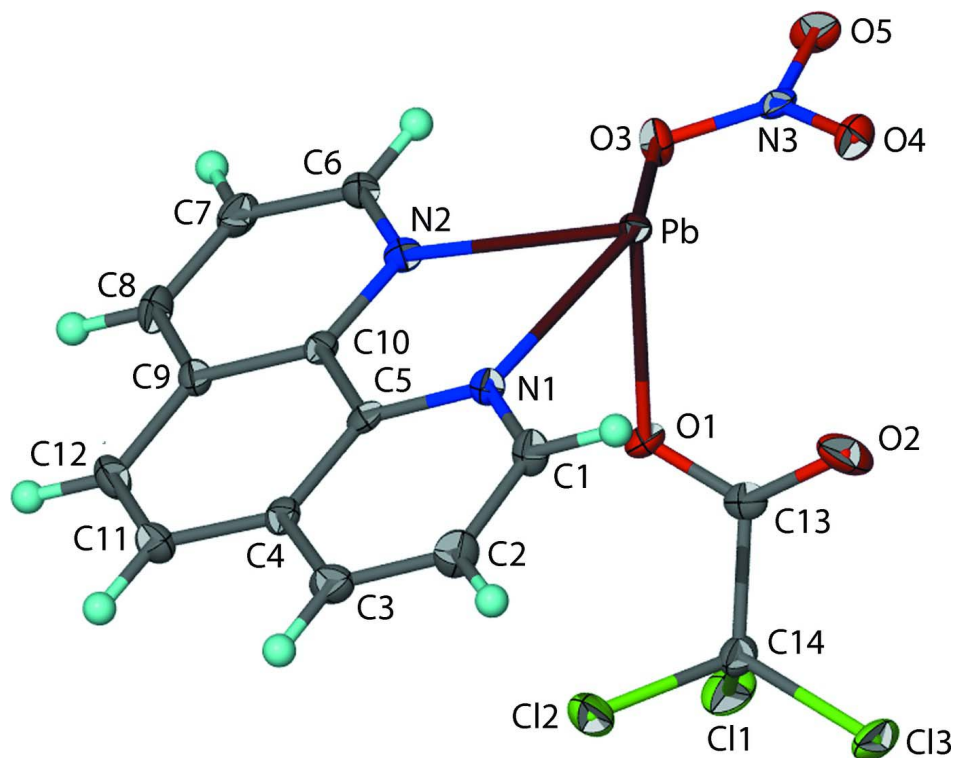
1,10-Phenanthroline (1 mmol) was placed in one arm of a branched tube (Harrowfield *et al.*, 1996) and a mixture of lead(II) nitrate (1 mmol) and trichloroacetic acid (1 mmol) in the other. Methanol was then added to fill both arms, the tube sealed and the ligand-containing arm immersed in a bath at 333 K, while the other was left at ambient temperature. After two weeks, crystals had deposited in the arm held at ambient temperature. They were filtered off, washed with acetone and ether, and air-dried. Yield: 65%. *M.pt.* = 491 K.

### Refinement

Carbon-bound H-atoms were placed in calculated positions [C—H 0.95 Å, *U*<sub>iso</sub>(H) 1.2*U*<sub>eq</sub>(C)] and were included in the refinement in the riding model approximation.

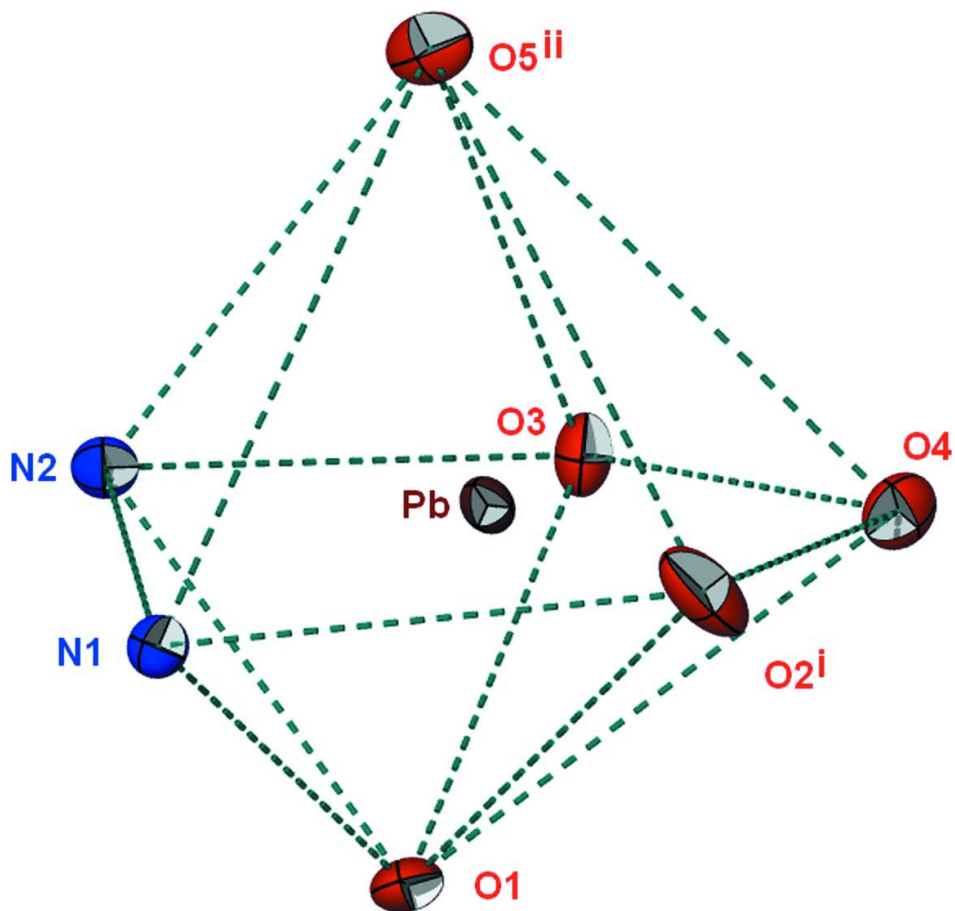
### Computing details

Data collection: *CrysAlis PRO* (Agilent, 2010); cell refinement: *CrysAlis PRO* (Agilent, 2010); data reduction: *CrysAlis PRO* (Agilent, 2010); program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *X-SEED* (Barbour, 2001) and *DIAMOND* (Brandenburg, 2006); software used to prepare material for publication: *publCIF* (Westrip, 2010).



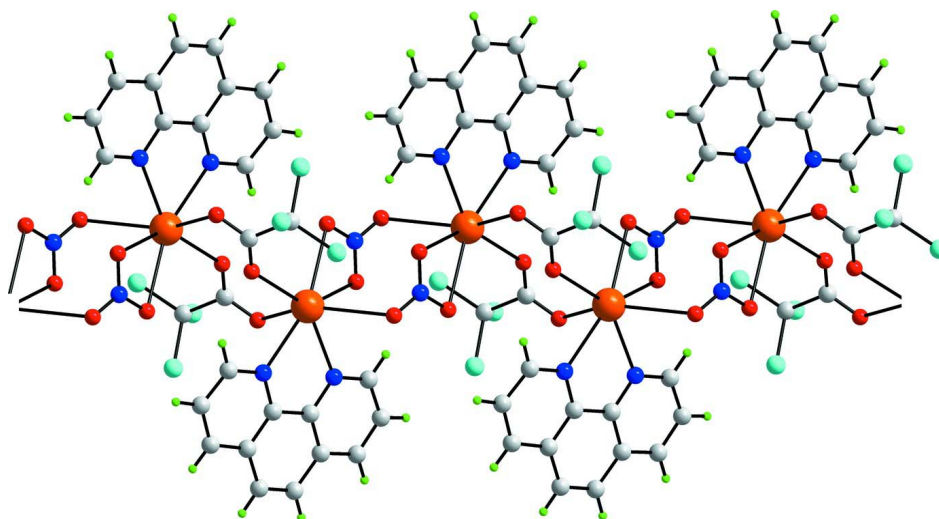
**Figure 1**

The asymmetric unit of (I) showing the atom-labelling scheme and displacement ellipsoids at the 70% probability level.



**Figure 2**

A view of the distorted pentagonal bipyramidal coordination geometry for the lead atom in (I).



**Figure 3**

A view of the zigzag polymeric chain along [010] in (I).

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*Crystal data*

[Pb<sub>2</sub>(C<sub>2</sub>Cl<sub>3</sub>O<sub>2</sub>)<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub>(C<sub>12</sub>H<sub>8</sub>N<sub>2</sub>)<sub>2</sub>]

$M_r = 1223.54$

Triclinic,  $P\bar{1}$

Hall symbol: -P 1

$a = 8.8852$  (3) Å

$b = 9.7465$  (3) Å

$c = 11.1570$  (3) Å

$\alpha = 109.427$  (3)°

$\beta = 99.019$  (3)°

$\gamma = 106.199$  (3)°

$V = 841.13$  (4) Å<sup>3</sup>

$Z = 1$

$F(000) = 572$

$D_x = 2.415$  Mg m<sup>-3</sup>

Mo  $K\alpha$  radiation,  $\lambda = 0.71073$  Å

Cell parameters from 9962 reflections

$\theta = 2.4$ – $27.5$ °

$\mu = 10.54$  mm<sup>-1</sup>

$T = 100$  K

Prism, colourless

$0.20 \times 0.15 \times 0.10$  mm

*Data collection*

Agilent SuperNova Dual

diffractometer with an Atlas detector

Radiation source: SuperNova (Mo) X-ray

Source

Mirror monochromator

Detector resolution: 10.4041 pixels mm<sup>-1</sup>

$\omega$  scan

Absorption correction: multi-scan

(*CrysAlis PRO*; Agilent, 2010)

$T_{\min} = 0.227$ ,  $T_{\max} = 0.419$

12671 measured reflections

3899 independent reflections

3740 reflections with  $I > 2\sigma(I)$

$R_{\text{int}} = 0.029$

$\theta_{\max} = 27.6$ °,  $\theta_{\min} = 2.4$ °

$h = -11 \rightarrow 11$

$k = -12 \rightarrow 12$

$l = -14 \rightarrow 14$

*Refinement*

Refinement on  $F^2$

Least-squares matrix: full

$R[F^2 > 2\sigma(F^2)] = 0.017$

$wR(F^2) = 0.038$

$S = 0.99$

3899 reflections

235 parameters

0 restraints

Primary atom site location: structure-invariant

direct methods

Secondary atom site location: difference Fourier map

Hydrogen site location: inferred from neighbouring sites

H-atom parameters constrained

$w = 1/[\sigma^2(F_o^2) + (0.0188P)^2]$

where  $P = (F_o^2 + 2F_c^2)/3$

$(\Delta/\sigma)_{\max} = 0.001$

$\Delta\rho_{\max} = 0.84$  e Å<sup>-3</sup>

$\Delta\rho_{\min} = -0.97$  e Å<sup>-3</sup>

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å<sup>2</sup>)*

	<i>x</i>	<i>y</i>	<i>z</i>	$U_{\text{iso}}^*/U_{\text{eq}}$
Pb	0.526354 (11)	0.321866 (10)	0.619700 (8)	0.00914 (4)
Cl1	1.10668 (9)	0.71315 (9)	0.63924 (7)	0.02148 (16)
Cl2	0.92529 (9)	0.85568 (8)	0.80608 (7)	0.01891 (15)
Cl3	0.89253 (10)	0.85230 (9)	0.54481 (7)	0.02467 (17)
O1	0.7927 (2)	0.5079 (2)	0.66123 (18)	0.0146 (4)
O2	0.6722 (3)	0.5436 (2)	0.4883 (2)	0.0231 (5)
O3	0.6734 (2)	0.1262 (2)	0.54516 (18)	0.0148 (4)
O4	0.5454 (2)	0.1386 (2)	0.36793 (18)	0.0157 (4)
O5	0.6385 (3)	-0.0491 (2)	0.35098 (19)	0.0167 (4)
N1	0.5609 (3)	0.5650 (3)	0.8223 (2)	0.0112 (5)
N2	0.6794 (3)	0.3366 (3)	0.8360 (2)	0.0115 (5)

N3	0.6188 (3)	0.0712 (3)	0.4200 (2)	0.0115 (5)
C1	0.5074 (3)	0.6760 (3)	0.8136 (3)	0.0131 (6)
H1	0.4390	0.6586	0.7314	0.016*
C2	0.5473 (4)	0.8182 (3)	0.9205 (3)	0.0163 (6)
H2	0.5091	0.8964	0.9098	0.020*
C3	0.6421 (4)	0.8433 (3)	1.0406 (3)	0.0152 (6)
H3	0.6673	0.9378	1.1147	0.018*
C4	0.7023 (3)	0.7275 (3)	1.0538 (3)	0.0115 (5)
C5	0.6586 (3)	0.5890 (3)	0.9403 (3)	0.0111 (5)
C6	0.7343 (3)	0.2258 (3)	0.8442 (3)	0.0120 (5)
H6	0.7036	0.1326	0.7676	0.014*
C7	0.8356 (4)	0.2399 (3)	0.9606 (3)	0.0154 (6)
H7	0.8731	0.1580	0.9619	0.018*
C8	0.8803 (3)	0.3727 (3)	1.0725 (3)	0.0150 (6)
H8	0.9508	0.3849	1.1517	0.018*
C9	0.8205 (3)	0.4908 (3)	1.0688 (3)	0.0113 (5)
C10	0.7198 (3)	0.4687 (3)	0.9475 (2)	0.0098 (5)
C11	0.8037 (4)	0.7453 (3)	1.1749 (3)	0.0151 (6)
H11	0.8318	0.8382	1.2512	0.018*
C12	0.8606 (3)	0.6330 (3)	1.1830 (3)	0.0147 (6)
H12	0.9277	0.6478	1.2648	0.018*
C13	0.7796 (3)	0.5824 (3)	0.5894 (3)	0.0123 (6)
C14	0.9201 (3)	0.7446 (3)	0.6404 (3)	0.0142 (6)

Atomic displacement parameters ( $\text{\AA}^2$ )

	$U^{11}$	$U^{22}$	$U^{33}$	$U^{12}$	$U^{13}$	$U^{23}$
Pb	0.01030 (6)	0.00697 (6)	0.00857 (6)	0.00233 (4)	0.00028 (4)	0.00284 (4)
Cl1	0.0130 (3)	0.0269 (4)	0.0277 (4)	0.0043 (3)	0.0084 (3)	0.0157 (3)
Cl2	0.0239 (4)	0.0124 (3)	0.0149 (3)	0.0045 (3)	0.0009 (3)	0.0024 (3)
Cl3	0.0247 (4)	0.0209 (4)	0.0244 (4)	-0.0022 (3)	-0.0044 (3)	0.0178 (3)
O1	0.0157 (10)	0.0124 (10)	0.0149 (10)	0.0008 (8)	0.0043 (8)	0.0080 (8)
O2	0.0218 (12)	0.0128 (10)	0.0234 (11)	0.0013 (9)	-0.0097 (10)	0.0048 (9)
O3	0.0179 (11)	0.0173 (10)	0.0092 (9)	0.0073 (9)	0.0027 (8)	0.0047 (8)
O4	0.0187 (11)	0.0162 (10)	0.0154 (10)	0.0073 (9)	0.0038 (9)	0.0096 (8)
O5	0.0240 (11)	0.0096 (10)	0.0192 (10)	0.0078 (9)	0.0125 (9)	0.0043 (8)
N1	0.0115 (11)	0.0115 (11)	0.0106 (11)	0.0035 (9)	0.0022 (9)	0.0051 (9)
N2	0.0137 (12)	0.0088 (11)	0.0123 (11)	0.0039 (9)	0.0031 (10)	0.0046 (9)
N3	0.0120 (12)	0.0096 (11)	0.0135 (12)	0.0014 (9)	0.0063 (10)	0.0061 (9)
C1	0.0163 (14)	0.0149 (14)	0.0111 (13)	0.0092 (12)	0.0054 (11)	0.0053 (11)
C2	0.0230 (16)	0.0137 (14)	0.0165 (14)	0.0109 (12)	0.0077 (13)	0.0065 (11)
C3	0.0193 (15)	0.0109 (13)	0.0146 (14)	0.0046 (12)	0.0073 (12)	0.0033 (11)
C4	0.0130 (14)	0.0123 (13)	0.0107 (13)	0.0041 (11)	0.0055 (11)	0.0055 (10)
C5	0.0105 (13)	0.0116 (13)	0.0122 (13)	0.0013 (11)	0.0053 (11)	0.0069 (10)
C6	0.0144 (14)	0.0098 (13)	0.0111 (13)	0.0039 (11)	0.0027 (11)	0.0040 (10)
C7	0.0193 (15)	0.0144 (14)	0.0171 (14)	0.0081 (12)	0.0051 (12)	0.0101 (11)
C8	0.0170 (15)	0.0187 (15)	0.0131 (14)	0.0077 (12)	0.0035 (12)	0.0100 (11)
C9	0.0107 (13)	0.0125 (13)	0.0095 (13)	0.0025 (11)	0.0017 (11)	0.0047 (10)
C10	0.0096 (13)	0.0101 (13)	0.0101 (12)	0.0026 (10)	0.0041 (11)	0.0046 (10)
C11	0.0187 (15)	0.0121 (14)	0.0107 (13)	0.0036 (12)	0.0042 (12)	0.0015 (11)

C12	0.0125 (14)	0.0172 (14)	0.0095 (13)	0.0028 (11)	0.0003 (11)	0.0028 (11)
C13	0.0119 (14)	0.0110 (13)	0.0143 (14)	0.0045 (11)	0.0061 (12)	0.0038 (11)
C14	0.0124 (14)	0.0161 (14)	0.0145 (14)	0.0033 (11)	0.0018 (11)	0.0091 (11)

*Geometric parameters (Å, °)*

Pb—O1	2.410 (2)	C1—H1	0.9500
Pb—O2 <sup>i</sup>	2.821 (2)	C2—C3	1.371 (4)
Pb—O3	2.591 (2)	C2—H2	0.9500
Pb—O4	2.844 (2)	C3—C4	1.415 (4)
Pb—O5 <sup>ii</sup>	2.807 (2)	C3—H3	0.9500
Pb—N1	2.576 (2)	C4—C5	1.412 (4)
Pb—N2	2.515 (2)	C4—C11	1.429 (4)
C11—C14	1.770 (3)	C5—C10	1.442 (4)
C12—C14	1.790 (3)	C6—C7	1.401 (4)
C13—C14	1.762 (3)	C6—H6	0.9500
O1—C13	1.260 (3)	C7—C8	1.369 (4)
O2—C13	1.226 (3)	C7—H7	0.9500
O3—N3	1.272 (3)	C8—C9	1.405 (4)
O4—N3	1.252 (3)	C8—H8	0.9500
O5—N3	1.247 (3)	C9—C10	1.413 (4)
N1—C1	1.322 (3)	C9—C12	1.442 (4)
N1—C5	1.366 (3)	C11—C12	1.350 (4)
N2—C6	1.326 (3)	C11—H11	0.9500
N2—C10	1.368 (3)	C12—H12	0.9500
C1—C2	1.401 (4)	C13—C14	1.568 (4)
O1—Pb—N2	77.20 (7)	C2—C3—C4	119.6 (2)
O1—Pb—N1	73.51 (7)	C2—C3—H3	120.2
N2—Pb—N1	65.43 (7)	C4—C3—H3	120.2
O1—Pb—O3	82.13 (6)	C5—C4—C3	117.2 (2)
N2—Pb—O3	77.41 (6)	C5—C4—C11	119.6 (2)
N1—Pb—O3	138.96 (6)	C3—C4—C11	123.2 (2)
O1—Pb—O5 <sup>ii</sup>	143.59 (6)	N1—C5—C4	122.1 (2)
N2—Pb—O5 <sup>ii</sup>	72.82 (7)	N1—C5—C10	118.4 (2)
N1—Pb—O5 <sup>ii</sup>	110.82 (6)	C4—C5—C10	119.5 (2)
O3—Pb—O5 <sup>ii</sup>	71.66 (6)	N2—C6—C7	123.0 (2)
O1—Pb—O2 <sup>i</sup>	100.42 (6)	N2—C6—H6	118.5
N2—Pb—O2 <sup>i</sup>	142.33 (6)	C7—C6—H6	118.5
N1—Pb—O2 <sup>i</sup>	77.74 (6)	C8—C7—C6	119.4 (3)
O3—Pb—O2 <sup>i</sup>	140.08 (6)	C8—C7—H7	120.3
O5 <sup>ii</sup> —Pb—O2 <sup>i</sup>	115.93 (6)	C6—C7—H7	120.3
O1—Pb—O4	90.38 (6)	C7—C8—C9	119.2 (2)
N2—Pb—O4	124.31 (6)	C7—C8—H8	120.4
N1—Pb—O4	159.41 (7)	C9—C8—H8	120.4
O3—Pb—O4	46.99 (5)	C8—C9—C10	118.1 (2)
O5 <sup>ii</sup> —Pb—O4	89.76 (5)	C8—C9—C12	122.3 (2)
O2 <sup>i</sup> —Pb—O4	93.09 (6)	C10—C9—C12	119.6 (2)
C13—O1—Pb	107.77 (17)	N2—C10—C9	121.8 (2)
N3—O3—Pb	101.84 (14)	N2—C10—C5	118.8 (2)



N3—O4—Pb	90.19 (14)	C9—C10—C5	119.3 (2)
C1—N1—C5	118.9 (2)	C12—C11—C4	121.5 (2)
C1—N1—Pb	123.02 (17)	C12—C11—H11	119.3
C5—N1—Pb	117.39 (16)	C4—C11—H11	119.3
C6—N2—C10	118.3 (2)	C11—C12—C9	120.6 (3)
C6—N2—Pb	122.22 (17)	C11—C12—H12	119.7
C10—N2—Pb	119.21 (16)	C9—C12—H12	119.7
O5—N3—O4	121.0 (2)	O2—C13—O1	128.1 (3)
O5—N3—O3	119.6 (2)	O2—C13—C14	118.2 (2)
O4—N3—O3	119.4 (2)	O1—C13—C14	113.8 (2)
N1—C1—C2	122.7 (2)	C13—C14—C13	113.04 (19)
N1—C1—H1	118.6	C13—C14—C11	108.31 (18)
C2—C1—H1	118.6	C13—C14—C11	109.62 (15)
C3—C2—C1	119.3 (3)	C13—C14—C12	108.31 (19)
C3—C2—H2	120.4	C13—C14—C12	107.89 (15)
C1—C2—H2	120.4	C11—C14—C12	109.62 (14)
N2—Pb—O1—C13	-162.22 (17)	C5—N1—C1—C2	0.3 (4)
N1—Pb—O1—C13	-94.40 (17)	Pb—N1—C1—C2	-170.2 (2)
O3—Pb—O1—C13	118.98 (17)	N1—C1—C2—C3	-1.8 (5)
O5 <sup>ii</sup> —Pb—O1—C13	162.70 (14)	C1—C2—C3—C4	2.0 (4)
O2 <sup>i</sup> —Pb—O1—C13	-20.64 (17)	C2—C3—C4—C5	-0.8 (4)
O4—Pb—O1—C13	72.57 (17)	C2—C3—C4—C11	179.0 (3)
O1—Pb—O3—N3	-105.10 (16)	C1—N1—C5—C4	1.0 (4)
N2—Pb—O3—N3	176.34 (16)	Pb—N1—C5—C4	172.0 (2)
N1—Pb—O3—N3	-158.57 (14)	C1—N1—C5—C10	-178.3 (2)
O5 <sup>ii</sup> —Pb—O3—N3	100.50 (16)	Pb—N1—C5—C10	-7.3 (3)
O2 <sup>i</sup> —Pb—O3—N3	-8.3 (2)	C3—C4—C5—N1	-0.7 (4)
O4—Pb—O3—N3	-7.15 (13)	C11—C4—C5—N1	179.4 (3)
O1—Pb—O4—N3	85.95 (15)	C3—C4—C5—C10	178.5 (2)
N2—Pb—O4—N3	11.24 (17)	C11—C4—C5—C10	-1.3 (4)
N1—Pb—O4—N3	123.84 (19)	C10—N2—C6—C7	-2.0 (4)
O3—Pb—O4—N3	7.11 (13)	Pb—N2—C6—C7	172.4 (2)
O5 <sup>ii</sup> —Pb—O4—N3	-57.64 (15)	N2—C6—C7—C8	0.6 (4)
O2 <sup>i</sup> —Pb—O4—N3	-173.59 (15)	C6—C7—C8—C9	1.3 (4)
O1—Pb—N1—C1	94.8 (2)	C7—C8—C9—C10	-1.8 (4)
N2—Pb—N1—C1	177.9 (2)	C7—C8—C9—C12	179.2 (3)
O3—Pb—N1—C1	150.9 (2)	C6—N2—C10—C9	1.5 (4)
O5 <sup>ii</sup> —Pb—N1—C1	-123.5 (2)	Pb—N2—C10—C9	-173.1 (2)
O2 <sup>i</sup> —Pb—N1—C1	-10.2 (2)	C6—N2—C10—C5	-179.0 (2)
O4—Pb—N1—C1	54.9 (3)	Pb—N2—C10—C5	6.4 (3)
O1—Pb—N1—C5	-75.88 (19)	C8—C9—C10—N2	0.4 (4)
N2—Pb—N1—C5	7.30 (18)	C12—C9—C10—N2	179.4 (2)
O3—Pb—N1—C5	-19.8 (2)	C8—C9—C10—C5	-179.1 (2)
O5 <sup>ii</sup> —Pb—N1—C5	65.9 (2)	C12—C9—C10—C5	-0.1 (4)
O2 <sup>i</sup> —Pb—N1—C5	179.2 (2)	N1—C5—C10—N2	0.7 (4)
O4—Pb—N1—C5	-115.7 (2)	C4—C5—C10—N2	-178.6 (2)
O1—Pb—N2—C6	-103.8 (2)	N1—C5—C10—C9	-179.7 (2)
N1—Pb—N2—C6	178.6 (2)	C4—C5—C10—C9	1.0 (4)

O3—Pb—N2—C6	-19.2 (2)	C5—C4—C11—C12	0.7 (4)
O5 <sup>ii</sup> —Pb—N2—C6	55.2 (2)	C3—C4—C11—C12	-179.1 (3)
O2 <sup>i</sup> —Pb—N2—C6	165.63 (18)	C4—C11—C12—C9	0.1 (4)
O4—Pb—N2—C6	-22.3 (2)	C8—C9—C12—C11	178.5 (3)
O1—Pb—N2—C10	70.51 (19)	C10—C9—C12—C11	-0.4 (4)
N1—Pb—N2—C10	-7.01 (18)	Pb—O1—C13—O2	-21.3 (3)
O3—Pb—N2—C10	155.2 (2)	Pb—O1—C13—C14	158.09 (17)
O5 <sup>ii</sup> —Pb—N2—C10	-130.4 (2)	O2—C13—C14—C13	3.3 (3)
O2 <sup>i</sup> —Pb—N2—C10	-20.0 (3)	O1—C13—C14—C13	-176.12 (19)
O4—Pb—N2—C10	152.07 (17)	O2—C13—C14—C11	-118.3 (2)
Pb—O4—N3—O5	167.5 (2)	O1—C13—C14—C11	62.2 (3)
Pb—O4—N3—O3	-12.2 (2)	O2—C13—C14—C12	122.8 (2)
Pb—O3—N3—O5	-165.96 (19)	O1—C13—C14—C12	-56.6 (3)
Pb—O3—N3—O4	13.7 (3)		

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