

# Poly[( $\mu_4$ -pyridine-2,3-dicarboxylato)-lead(II)]

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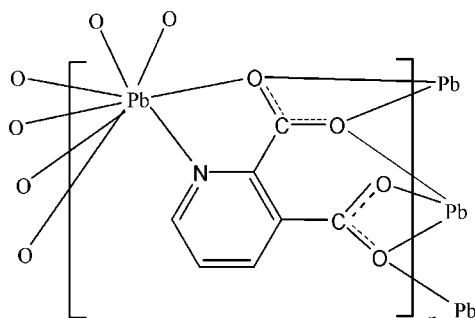
Received 16 December 2010; accepted 5 January 2011

 Key indicators: single-crystal X-ray study;  $T = 297$  K; mean  $\sigma(\text{C}-\text{C}) = 0.016$  Å;  $R$  factor = 0.073;  $wR$  factor = 0.204; data-to-parameter ratio = 12.6.

In the title coordination polymer,  $[\text{Pb}(\text{C}_7\text{H}_3\text{NO}_4)]_n$ , the  $\text{Pb}^{\text{II}}$  ion is eight-coordinated in a distorted square-antiprismatic geometry formed by one pyridine N atom and seven carboxylate O atoms from four pyridine-2,3-dicarboxylate (pda) anions. In the pda anion, the dihedral angles between the pyridine ring and carboxylate groups are  $19.5$  (6) and  $73.3$  (6)°. The carboxylate groups of the pda anions bridge the Pb ions, forming a two-dimensional coordination polymer parallel to (100). Weak intermolecular C—H...O hydrogen bonding is present in the crystal structure.

## Related literature

For the coordination modes of the pyridine-2,3-dicarboxylate anion, see: Aghabozorg *et al.* (2007); Baruah *et al.* (2007); Li *et al.* (2006). For the biological activity of pyridine-2,3-dicarboxylic acid, see: Xiang *et al.* (2006); Yang *et al.* (2006); Zhang *et al.* (2008). For the inert lone-pair effect, see: Liat *et al.* (1998). For longer Pb—O bonds, see: Mao *et al.* (2006); Yang *et al.* (2010).



## Experimental

### Crystal data

$[\text{Pb}(\text{C}_7\text{H}_3\text{NO}_4)]$	$V = 751.84$ (11) Å <sup>3</sup>
$M_r = 372.30$	$Z = 4$
Monoclinic, $P2_1/c$	Mo $K\alpha$ radiation
$a = 11.6943$ (9) Å	$\mu = 22.42$ mm <sup>-1</sup>
$b = 4.5392$ (4) Å	$T = 297$ K
$c = 14.1636$ (12) Å	$0.54 \times 0.23 \times 0.04$ mm
$\beta = 90.046$ (2)°	

### Data collection

Bruker SMART CCD area-detector diffractometer	4013 measured reflections
Absorption correction: multi-scan (SADABS; Bruker, 2001)	1484 independent reflections
$T_{\text{min}} = 0.659$ , $T_{\text{max}} = 1.000$	1336 reflections with $I > 2\sigma(I)$
	$R_{\text{int}} = 0.125$

### Refinement

$R[F^2 > 2\sigma(F^2)] = 0.073$	118 parameters
$wR(F^2) = 0.204$	H-atom parameters constrained
$S = 1.13$	$\Delta\rho_{\text{max}} = 4.56$ e Å <sup>-3</sup>
1484 reflections	$\Delta\rho_{\text{min}} = -5.06$ e Å <sup>-3</sup>

**Table 1**

Selected bond lengths (Å).

Pb—N	2.651 (7)	Pb—O2 <sup>i</sup>	2.566 (9)
Pb—O1 <sup>i</sup>	2.816 (7)	Pb—O3 <sup>iii</sup>	2.397 (9)
Pb—O1 <sup>iii</sup>	2.911 (6)	Pb—O3 <sup>ii</sup>	2.754 (9)
Pb—O2	2.592 (7)	Pb—O4 <sup>ii</sup>	2.845 (7)

 Symmetry codes: (i)  $-x + 1, y - \frac{1}{2}, -z + \frac{3}{2}$ ; (ii)  $x, -y + \frac{1}{2}, z + \frac{1}{2}$ ; (iii)  $x, -y - \frac{1}{2}, z + \frac{1}{2}$ .

**Table 2**

Hydrogen-bond geometry (Å, °).

$D-H\cdots A$	$D-H$	$H\cdots A$	$D\cdots A$	$D-H\cdots A$
$\text{C5}-\text{H5A}\cdots\text{O3}^{\text{iii}}$	0.93	2.57	3.164 (13)	122

 Symmetry code: (iii)  $x, -y - \frac{1}{2}, z + \frac{1}{2}$ .

Data collection: *SMART* (Bruker, 2000); cell refinement: *SAINT* (Bruker, 1999); data reduction: *SAINT*; program(s) used to solve structure: *SHELXTL* (Sheldrick, 2008); program(s) used to refine structure: *SHELXTL*; molecular graphics: *PLATON* (Spek, 2009); software used to prepare material for publication: *PLATON*.

This work was supported financially by Yuanpei University, Taiwan.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: XU5124).

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## supporting information

*Acta Cryst.* (2011). E67, m163–m164 [doi:10.1107/S1600536811000419]

**Poly[( $\mu_4$ -pyridine-2,3-dicarboxylato)lead(II)]****Shie Fu Lush and Fwu Ming Shen****S1. Comment**

The pyridine-2,3-dicarboxylic acid (pdaH<sub>2</sub>) is a typical chelated-form ligand. Its biological importance has been described in several literatures (Xiang *et al.*, 2006; Yang *et al.*, 2006; Zhang *et al.*, 2008). Pda shows diverse coordination modes, such as monodentate (Baruah *et al.*, 2007),  $\mu_2$ -bridging (Aghabozorg *et al.*, 2007),  $\mu_3$ -bridging (Li *et al.*, 2006). Here we describe the title compound in which the pda is a  $\mu_4$ -bridging ligand (Fig. 1).

The structure of a coordination polymer [Pb(C<sub>7</sub>H<sub>3</sub>NO<sub>4</sub>)<sub>n</sub>], the lead ion is eight-coordinated with a distorted square-antiprismatic geometry formed by one O-monodentate pda<sup>2-</sup> ligand, one N,O-bidentate pda<sup>2-</sup> ligand, one O,O'-bidentate pda<sup>2-</sup> ligand and one O,O',O''-tridentate pda<sup>2-</sup> ligand (Table 1). According to "inert-pair effect", the coordination number of Pb<sup>II</sup> is variable, and the lengths of bonds to Pb<sup>II</sup> vary in a wide range (Liat *et al.*, 1998). Longer distance is observed between Pb and O1 (2.911 (6) Å); some long Pb—O weak bonds have also been reported in reported lead complexes (Mao *et al.*, 2006; Yang *et al.*, 2010). The carboxylate group of pda<sup>2-</sup>ligand bridges four Pb<sup>II</sup> ion forming a 2-D framework is constructed.

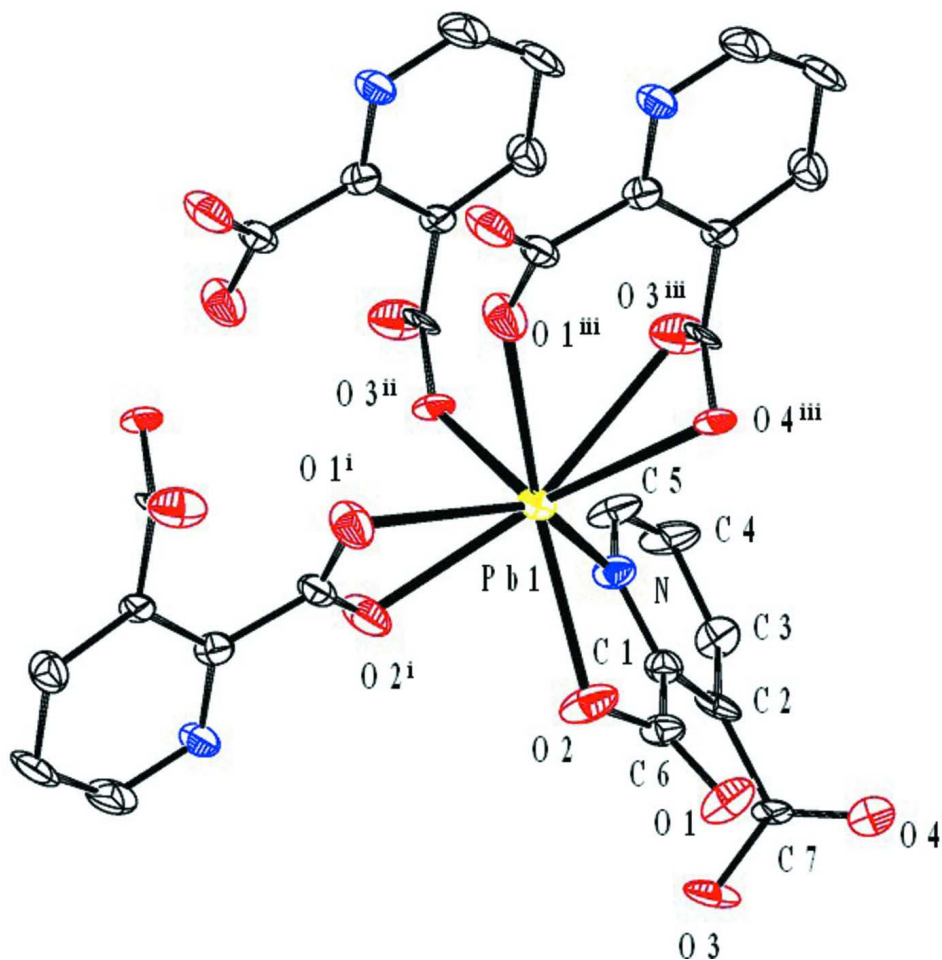
There are no classic intermolecular hydrogen-bonding in the title compound, but intermolecular C—H $\cdots$ O weak interaction (Table 2) and ring $\cdots$ metal interaction help to stabilize the crystal structure, the Cg3 (Pb/O1—O2—C6) $\cdots$ Pb interaction is 3.877 Å (symmetry code: 1 - x, -1/2 + y, 3/2 - z).

**S2. Experimental**

An aqueous solution (5 ml) containing Pb(NO<sub>3</sub>)<sub>2</sub> (0.164 g, 0.50 mmol) and 1,2-bis(4-pyridyl)ethane (0.0934 g, 0.50 mmol) was added to an aqueous solution (5 ml) of pyridine-2,3-dicarboxylic acid (0.0838 g, 0.50 mmol), and the mixture was stirred for 30 minutes and then filtered. The solution was placed in a 23 ml Teflon-lined reactor, heated at 423 K for 3 days, then cooled slowly to room temperature. The colorless transparent single crystals of the title compound were obtained in 45.67% yield (based on Pb).

**S3. Refinement**

H atoms were positioned geometrically with C—H = 0.93 (aromatic), and were refined using a riding model with  $U_{\text{iso}}(\text{H}) = 1.2U_{\text{eq}}(\text{C})$ .



**Figure 1**

View of the title compound with the atom numbering scheme. Displacement ellipsoids for non-H atoms are drawn at the 50% probability level. H atoms have been omitted for clarity. [Symmetry codes: (i)  $-x + 1, y - 1/2, -z + 3/2$ ; (ii)  $x, -y - 1/2, z + 1/2$ ; (iii)  $x, -y + 1/2$ ].

**Poly[( $\mu_4$ -pyridine-2,3-dicarboxylato)lead(II)]**

*Crystal data*

[Pb(C<sub>7</sub>H<sub>3</sub>NO<sub>4</sub>)]

$M_r = 372.30$

Monoclinic,  $P2_1/c$

Hall symbol:  $-P\ 2_1/c$

$a = 11.6943\ (9)\ \text{\AA}$

$b = 4.5392\ (4)\ \text{\AA}$

$c = 14.1636\ (12)\ \text{\AA}$

$\beta = 90.046\ (2)^\circ$

$V = 751.84\ (11)\ \text{\AA}^3$

$Z = 4$

$F(000) = 664$

$D_x = 3.289\ \text{Mg m}^{-3}$

Mo  $K\alpha$  radiation,  $\lambda = 0.71073\ \text{\AA}$

Cell parameters from 2856 reflections

$\theta = 2.3\text{--}26.0^\circ$

$\mu = 22.42\ \text{mm}^{-1}$

$T = 297\ \text{K}$

Parallelepiped, colorless

$0.54 \times 0.23 \times 0.04\ \text{mm}$

*Data collection*

Bruker SMART CCD area-detector  
diffractometer  
Radiation source: fine-focus sealed tube  
Graphite monochromator  
Detector resolution: 9 pixels mm<sup>-1</sup>  
 $\omega$  scan  
Absorption correction: multi-scan  
(*SADABS*; Bruker, 2001)  
 $T_{\min} = 0.659$ ,  $T_{\max} = 1.000$

4013 measured reflections  
1484 independent reflections  
1336 reflections with  $I > 2\sigma(I)$   
 $R_{\text{int}} = 0.125$   
 $\theta_{\max} = 26.0^\circ$ ,  $\theta_{\min} = 1.7^\circ$   
 $h = -14 \rightarrow 10$   
 $k = -5 \rightarrow 5$   
 $l = -17 \rightarrow 17$

*Refinement*

Refinement on  $F^2$   
Least-squares matrix: full  
 $R[F^2 > 2\sigma(F^2)] = 0.073$   
 $wR(F^2) = 0.204$   
 $S = 1.13$   
1484 reflections  
118 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  
 $w = 1/[\sigma^2(F_o^2) + (0.1477P)^2]$   
where  $P = (F_o^2 + 2F_c^2)/3$   
 $(\Delta/\sigma)_{\max} = 0.001$   
 $\Delta\rho_{\max} = 4.56 \text{ e } \text{\AA}^{-3}$   
 $\Delta\rho_{\min} = -5.06 \text{ e } \text{\AA}^{-3}$

*Special details*

**Experimental.** Elemental analysis: calculated for C<sub>7</sub>H<sub>3</sub>NO<sub>4</sub>Pb: (Mr=372.29) C, 22.56; H, 0.81; N, 3.76%. Found: C, 22.47; H, 0.89; N, 3.85%. IR data (cm<sup>-1</sup>): 3429(s), 1602(s), 1579(s), 1551(s), 1459(w), 1385(s), 1276(w), 1236(w), 1105(m), 871(m), 825(m), 779(m), 711(s), 700(m), 660(m), 603(w), 534(w), 443(w).

**Geometry.** Bond distances, angles *etc.* have been calculated using the rounded fractional coordinates. All su's are estimated from the variances of the (full) variance-covariance matrix. The cell e.s.d.'s are taken into account in the estimation of distances, angles and torsion angles

**Refinement.** Refinement on  $F^2$  for ALL reflections except those flagged by the user for potential systematic errors. Weighted  $R$ -factors  $wR$  and all goodnesses 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 observed criterion of  $F^2 > \sigma(F^2)$  is used only for calculating  $-R$ -factor-obs *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 ( $\text{\AA}^2$ )*

	$x$	$y$	$z$	$U_{\text{iso}}^*/U_{\text{eq}}$
Pb	0.60762 (4)	0.01636 (10)	0.85892 (3)	0.0213 (3)
O1	0.6007 (6)	0.3400 (19)	0.5591 (4)	0.035 (2)
O2	0.5381 (7)	0.120 (2)	0.6883 (5)	0.037 (3)
O3	0.6905 (9)	-0.061 (2)	0.4106 (6)	0.032 (3)
O4	0.8222 (6)	0.2863 (17)	0.4294 (4)	0.038 (2)
N	0.7437 (6)	-0.1315 (19)	0.7170 (5)	0.024 (2)
C1	0.7208 (12)	-0.0178 (18)	0.6321 (9)	0.021 (4)
C2	0.7951 (11)	-0.058 (3)	0.5526 (9)	0.021 (3)
C3	0.8932 (8)	-0.216 (2)	0.5715 (6)	0.027 (3)
C4	0.9192 (9)	-0.325 (3)	0.6603 (7)	0.038 (4)
C5	0.8383 (9)	-0.288 (3)	0.7300 (6)	0.036 (3)
C6	0.6141 (8)	0.163 (3)	0.6231 (6)	0.023 (3)
C7	0.7687 (9)	0.068 (2)	0.4580 (7)	0.019 (3)

H3A	0.94410	-0.25180	0.52240	0.0320*
H4A	0.98820	-0.41980	0.67230	0.0450*
H5A	0.85060	-0.37490	0.78850	0.0430*

*Atomic displacement parameters (Å<sup>2</sup>)*

	$U^{11}$	$U^{22}$	$U^{33}$	$U^{12}$	$U^{13}$	$U^{23}$
Pb	0.0207 (5)	0.0242 (5)	0.0189 (5)	-0.0031 (1)	-0.0051 (3)	-0.0016 (1)
O1	0.035 (4)	0.045 (5)	0.026 (3)	0.015 (4)	0.007 (3)	0.012 (3)
O2	0.027 (4)	0.061 (6)	0.024 (3)	0.017 (5)	0.001 (3)	0.013 (4)
O3	0.039 (5)	0.031 (4)	0.027 (4)	0.006 (4)	-0.022 (4)	-0.013 (4)
O4	0.044 (4)	0.041 (5)	0.030 (3)	-0.007 (4)	-0.010 (3)	0.009 (3)
N	0.018 (4)	0.032 (5)	0.021 (3)	0.004 (3)	-0.003 (3)	0.004 (3)
C1	0.018 (7)	0.028 (6)	0.017 (6)	-0.002 (3)	0.000 (5)	-0.001 (3)
C2	0.006 (5)	0.037 (5)	0.021 (5)	0.002 (4)	-0.004 (4)	-0.010 (5)
C3	0.023 (5)	0.032 (6)	0.026 (4)	0.006 (4)	0.003 (4)	0.003 (4)
C4	0.029 (6)	0.054 (8)	0.031 (5)	0.018 (6)	-0.013 (4)	0.010 (5)
C5	0.041 (6)	0.046 (7)	0.021 (4)	0.009 (5)	-0.009 (4)	0.011 (4)
C6	0.018 (5)	0.031 (5)	0.021 (4)	0.006 (4)	-0.005 (3)	0.002 (4)
C7	0.008 (5)	0.030 (5)	0.019 (4)	0.006 (4)	-0.007 (4)	0.004 (4)

*Geometric parameters (Å, °)*

Pb—N	2.651 (7)	N—C1	1.336 (14)
Pb—O1 <sup>i</sup>	2.816 (7)	N—C5	1.327 (14)
Pb—O1 <sup>ii</sup>	2.911 (6)	C1—C2	1.435 (18)
Pb—O2	2.592 (7)	C1—C6	1.499 (17)
Pb—O2 <sup>i</sup>	2.566 (9)	C2—C3	1.379 (16)
Pb—O3 <sup>iii</sup>	2.397 (9)	C2—C7	1.489 (16)
Pb—O3 <sup>ii</sup>	2.754 (9)	C3—C4	1.385 (14)
Pb—O4 <sup>ii</sup>	2.845 (7)	C4—C5	1.378 (14)
O1—C6	1.221 (13)	C3—H3A	0.9300
O2—C6	1.297 (12)	C4—H4A	0.9300
O3—C7	1.276 (14)	C5—H5A	0.9300
O4—C7	1.240 (12)		
O2—Pb—N	61.8 (2)	Pb <sup>v</sup> —O1—C6	150.1 (7)
O1 <sup>i</sup> —Pb—O2	99.5 (2)	Pb <sup>iv</sup> —O1—Pb <sup>v</sup>	111.3 (2)
O2—Pb—O2 <sup>i</sup>	71.1 (3)	Pb—O2—C6	118.5 (6)
O2—Pb—O3 <sup>iii</sup>	124.6 (3)	Pb—O2—Pb <sup>iv</sup>	125.3 (3)
O1 <sup>ii</sup> —Pb—O2	149.2 (2)	Pb <sup>iv</sup> —O2—C6	99.5 (7)
O2—Pb—O3 <sup>ii</sup>	101.2 (3)	Pb <sup>vi</sup> —O3—C7	147.7 (8)
O2—Pb—O4 <sup>ii</sup>	123.1 (2)	Pb <sup>v</sup> —O3—C7	88.8 (6)
O2—Pb—C7 <sup>ii</sup>	121.1 (3)	Pb <sup>vi</sup> —O3—Pb <sup>v</sup>	123.4 (4)
O1 <sup>i</sup> —Pb—N	139.5 (2)	Pb <sup>v</sup> —O4—C7	85.5 (6)
O2 <sup>i</sup> —Pb—N	91.4 (2)	Pb—N—C1	117.7 (7)
O3 <sup>iii</sup> —Pb—N	76.7 (3)	Pb—N—C5	122.1 (6)
O1 <sup>ii</sup> —Pb—N	144.3 (2)	C1—N—C5	119.9 (9)

O3 <sup>ii</sup> —Pb—N	102.6 (3)	N—C1—C2	122.4 (11)
O4 <sup>ii</sup> —Pb—N	79.4 (2)	N—C1—C6	117.0 (10)
N—Pb—C7 <sup>ii</sup>	97.8 (3)	C2—C1—C6	120.5 (10)
O1 <sup>i</sup> —Pb—O2 <sup>i</sup>	48.2 (2)	C1—C2—C3	114.7 (11)
O1 <sup>i</sup> —Pb—O3 <sup>iii</sup>	88.8 (3)	C1—C2—C7	122.2 (11)
O1 <sup>i</sup> —Pb—O1 <sup>ii</sup>	68.73 (19)	C3—C2—C7	123.1 (10)
O1 <sup>i</sup> —Pb—O3 <sup>ii</sup>	116.7 (3)	C2—C3—C4	123.0 (10)
O1 <sup>i</sup> —Pb—O4 <sup>ii</sup>	135.08 (17)	C3—C4—C5	117.2 (10)
O1 <sup>i</sup> —Pb—C7 <sup>ii</sup>	121.8 (2)	N—C5—C4	122.6 (9)
O2 <sup>i</sup> —Pb—O3 <sup>iii</sup>	75.1 (3)	O1—C6—O2	122.7 (10)
O1 <sup>ii</sup> —Pb—O2 <sup>i</sup>	113.1 (2)	O1—C6—C1	122.0 (9)
O2 <sup>i</sup> —Pb—O3 <sup>ii</sup>	158.7 (3)	O2—C6—C1	115.3 (10)
O2 <sup>i</sup> —Pb—O4 <sup>ii</sup>	153.8 (2)	O3—C7—O4	123.8 (9)
O2 <sup>i</sup> —Pb—C7 <sup>ii</sup>	167.3 (2)	O3—C7—C2	116.4 (9)
O1 <sup>ii</sup> —Pb—O3 <sup>iii</sup>	84.7 (3)	Pb <sup>v</sup> —C7—O3	66.1 (6)
O3 <sup>iii</sup> —Pb—O3 <sup>ii</sup>	123.4 (3)	O4—C7—C2	119.8 (9)
O3 <sup>iii</sup> —Pb—O4 <sup>ii</sup>	78.9 (3)	Pb <sup>v</sup> —C7—O4	70.3 (5)
O3 <sup>iii</sup> —Pb—C7 <sup>ii</sup>	98.4 (3)	Pb <sup>v</sup> —C7—C2	142.1 (7)
O1 <sup>ii</sup> —Pb—O3 <sup>ii</sup>	63.3 (2)	C2—C3—H3A	119.00
O1 <sup>ii</sup> —Pb—O4 <sup>ii</sup>	67.22 (18)	C4—C3—H3A	118.00
O1 <sup>ii</sup> —Pb—C7 <sup>ii</sup>	54.8 (2)	C3—C4—H4A	121.00
O3 <sup>ii</sup> —Pb—O4 <sup>ii</sup>	46.7 (3)	C5—C4—H4A	121.00
O3 <sup>ii</sup> —Pb—C7 <sup>ii</sup>	25.1 (3)	N—C5—H5A	119.00
O4 <sup>ii</sup> —Pb—C7 <sup>ii</sup>	24.2 (2)	C4—C5—H5A	119.00
Pb <sup>iv</sup> —O1—C6	89.5 (6)		
N—Pb—O2—C6	-27.3 (8)	O2—Pb—O4 <sup>ii</sup> —C7 <sup>ii</sup>	93.1 (6)
N—Pb—O2—Pb <sup>iv</sup>	-155.1 (5)	N—Pb—O4 <sup>ii</sup> —C7 <sup>ii</sup>	138.9 (6)
O1 <sup>i</sup> —Pb—O2—C6	-169.0 (9)	O2—Pb—C7 <sup>ii</sup> —O3 <sup>ii</sup>	41.3 (7)
O1 <sup>i</sup> —Pb—O2—Pb <sup>iv</sup>	63.2 (4)	O2—Pb—C7 <sup>ii</sup> —O4 <sup>ii</sup>	-102.4 (5)
O2 <sup>i</sup> —Pb—O2—C6	-129.5 (9)	O2—Pb—C7 <sup>ii</sup> —C2 <sup>ii</sup>	144.2 (11)
O2 <sup>i</sup> —Pb—O2—Pb <sup>iv</sup>	102.7 (4)	N—Pb—C7 <sup>ii</sup> —O3 <sup>ii</sup>	102.9 (6)
O3 <sup>iii</sup> —Pb—O2—C6	-73.9 (10)	N—Pb—C7 <sup>ii</sup> —O4 <sup>ii</sup>	-40.7 (6)
O3 <sup>iii</sup> —Pb—O2—Pb <sup>iv</sup>	158.3 (4)	N—Pb—C7 <sup>ii</sup> —C2 <sup>ii</sup>	-154.2 (12)
O1 <sup>ii</sup> —Pb—O2—C6	126.9 (9)	Pb <sup>v</sup> —O1—C6—O2	-131.7 (11)
O1 <sup>ii</sup> —Pb—O2—Pb <sup>iv</sup>	-0.9 (7)	Pb <sup>iv</sup> —O1—C6—C1	-175.5 (10)
O3 <sup>ii</sup> —Pb—O2—C6	71.1 (9)	Pb <sup>iv</sup> —O1—C6—O2	3.8 (11)
O3 <sup>ii</sup> —Pb—O2—Pb <sup>iv</sup>	-56.7 (4)	Pb <sup>v</sup> —O1—C6—C1	49.0 (19)
O4 <sup>ii</sup> —Pb—O2—C6	25.9 (10)	Pb <sup>iv</sup> —O2—C6—C1	175.1 (8)
O4 <sup>ii</sup> —Pb—O2—Pb <sup>iv</sup>	-101.9 (4)	Pb—O2—C6—C1	36.0 (13)
C7 <sup>ii</sup> —Pb—O2—C6	54.5 (10)	Pb—O2—C6—O1	-143.4 (9)
C7 <sup>ii</sup> —Pb—O2—Pb <sup>iv</sup>	-73.3 (5)	Pb <sup>iv</sup> —O2—C6—O1	-4.2 (12)
O2—Pb—N—C1	15.4 (7)	Pb <sup>vi</sup> —O3—C7—O4	136.7 (11)
O2—Pb—N—C5	-171.4 (9)	Pb <sup>v</sup> —O3—C7—O4	-42.2 (10)
O1 <sup>i</sup> —Pb—N—C1	85.5 (8)	Pb <sup>vi</sup> —O3—C7—C2	-43.1 (19)
O1 <sup>i</sup> —Pb—N—C5	-101.3 (8)	Pb <sup>v</sup> —O3—C7—C2	138.0 (9)
O2 <sup>i</sup> —Pb—N—C1	83.0 (7)	Pb <sup>vi</sup> —O3—C7—Pb <sup>v</sup>	178.9 (15)
O2 <sup>i</sup> —Pb—N—C5	-103.8 (9)	Pb <sup>v</sup> —O4—C7—O3	40.7 (10)

O3 <sup>iii</sup> —Pb—N—C1	157.4 (8)	Pb <sup>v</sup> —O4—C7—C2	-139.5 (9)
O3 <sup>iii</sup> —Pb—N—C5	-29.4 (9)	C5—N—C1—C2	0.1 (16)
O1 <sup>ii</sup> —Pb—N—C1	-142.1 (7)	Pb—N—C1—C2	173.5 (8)
O1 <sup>ii</sup> —Pb—N—C5	31.1 (10)	Pb—N—C1—C6	-5.1 (12)
O3 <sup>ii</sup> —Pb—N—C1	-80.8 (7)	C1—N—C5—C4	4.1 (17)
O3 <sup>ii</sup> —Pb—N—C5	92.4 (9)	C5—N—C1—C6	-178.5 (10)
O4 <sup>ii</sup> —Pb—N—C1	-121.6 (7)	Pb—N—C5—C4	-169.0 (9)
O4 <sup>ii</sup> —Pb—N—C5	51.6 (8)	C6—C1—C2—C3	176.8 (10)
C7 <sup>ii</sup> —Pb—N—C1	-105.8 (7)	N—C1—C2—C3	-1.7 (16)
C7 <sup>ii</sup> —Pb—N—C5	67.4 (9)	N—C1—C2—C7	179.7 (10)
O2—Pb—O1 <sup>i</sup> —C6 <sup>i</sup>	51.7 (7)	C6—C1—C2—C7	-1.9 (17)
O2—Pb—O1 <sup>i</sup> —Pb <sup>vii</sup>	-150.3 (3)	N—C1—C6—O1	159.4 (10)
N—Pb—O1 <sup>i</sup> —C6 <sup>i</sup>	-5.4 (8)	N—C1—C6—O2	-20.0 (15)
N—Pb—O1 <sup>i</sup> —Pb <sup>vii</sup>	152.5 (3)	C2—C1—C6—O1	-19.2 (17)
O2—Pb—O2 <sup>i</sup> —Pb <sup>i</sup>	14.6 (4)	C2—C1—C6—O2	161.5 (10)
O2—Pb—O2 <sup>i</sup> —C6 <sup>i</sup>	-120.6 (7)	C1—C2—C3—C4	-0.7 (17)
N—Pb—O2 <sup>i</sup> —Pb <sup>i</sup>	-44.8 (4)	C7—C2—C3—C4	177.9 (11)
N—Pb—O2 <sup>i</sup> —C6 <sup>i</sup>	179.9 (7)	C1—C2—C7—O3	-74.7 (15)
O2—Pb—O3 <sup>iii</sup> —C7 <sup>iii</sup>	136.3 (13)	C1—C2—C7—O4	105.5 (13)
N—Pb—O3 <sup>iii</sup> —C7 <sup>iii</sup>	95.1 (14)	C1—C2—C7—Pb <sup>v</sup>	10 (2)
O2—Pb—O1 <sup>ii</sup> —Pb <sup>vii</sup>	72.2 (6)	C3—C2—C7—O3	106.7 (13)
O2—Pb—O1 <sup>ii</sup> —C6 <sup>ii</sup>	-59.0 (14)	C3—C2—C7—O4	-73.0 (15)
N—Pb—O1 <sup>ii</sup> —Pb <sup>vii</sup>	-149.1 (3)	C3—C2—C7—Pb <sup>v</sup>	-168.9 (8)
N—Pb—O1 <sup>ii</sup> —C6 <sup>ii</sup>	79.8 (14)	C2—C3—C4—C5	4.5 (18)
O2—Pb—O3 <sup>ii</sup> —C7 <sup>ii</sup>	-144.8 (6)	C3—C4—C5—N	-6.3 (18)
N—Pb—O3 <sup>ii</sup> —C7 <sup>ii</sup>	-81.6 (6)		

Symmetry codes: (i)  $-x+1, y-1/2, -z+3/2$ ; (ii)  $x, -y+1/2, z+1/2$ ; (iii)  $x, -y-1/2, z+1/2$ ; (iv)  $-x+1, y+1/2, -z+3/2$ ; (v)  $x, -y+1/2, z-1/2$ ; (vi)  $x, -y-1/2, z-1/2$ ; (vii)  $-x+1, -y, -z+2$ .

Hydrogen-bond geometry ( $\text{\AA}, ^\circ$ )

$D-H\cdots A$	$D-H$	$H\cdots A$	$D\cdots A$	$D-H\cdots A$
C5—H5A $\cdots$ O3 <sup>iii</sup>	0.93	2.57	3.164 (13)	122

Symmetry code: (iii)  $x, -y-1/2, z+1/2$ .