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Poly[(μ_3-4-carboxypyridine-3-carboxylato-κ^3N:O^3:O^4)(triphenylphosphine-κP)-silver(I)]

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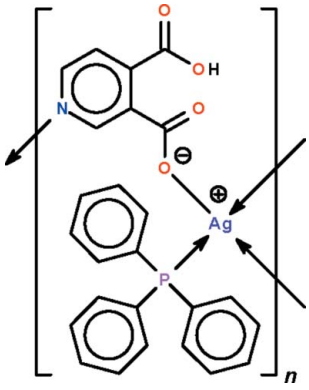
Key indicators: single-crystal X-ray study; T = 100 K; mean σ(C–C) = 0.003 Å; R factor = 0.020; wR factor = 0.055; data-to-parameter ratio = 16.9.

In the title 1:1 silver(I) 4-carboxypyridine-3-carboxylate adduct with triphenylphosphine, $[Ag(C_7H_4NO_4)(C_{18}H_{15}P)]_n$, the carboxylate anion bridges the phosphine-coordinated Ag atoms through its N and O atoms, generating a coordination polymer forming layers in the *bc* plane. The Ag atom exists in a distorted tetrahedral geometry. The H atom of the carboxylate is midway between two O atoms of the two carboxyl groups, thus forming a strong intramolecular hydrogen bond.

Related literature

For the synthesis of the silver reactant used in the synthesis, see: Hanna & Ng (1999); Ng & Othman (1997). For a related structure, see: Drew *et al.* (1971).



Experimental

Crystal data

$[Ag(C_7H_4NO_4)(C_{18}H_{15}P)]$
M_r = 536.25
Monoclinic, $P2_1/c$
a = 14.2472 (7) Å
b = 10.2431 (5) Å
c = 16.3146 (8) Å
β = 115.206 (1)°
V = 2154.18 (18) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 1.04 mm^{-1}
T = 100 K
0.35 × 0.30 × 0.15 mm

Data collection

Bruker SMART APEX diffractometer
Absorption correction: multi-scan (*SADABS*; Sheldrick, 1996)
T_{min} = 0.712, T_{max} = 0.859
13432 measured reflections
4942 independent reflections
4587 reflections with $I > 2\sigma(I)$
R_{int} = 0.019

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.020
$wR(F^2)$ = 0.055
S = 1.05
4942 reflections
293 parameters
H atoms treated by a mixture of independent and constrained refinement
$\Delta\rho_{max}$ = 0.43 e Å^{-3}
$\Delta\rho_{min}$ = −0.48 e Å^{-3}

Data collection: *APEX2* (Bruker, 2009); cell refinement: *SAINT* (Bruker, 2009); data reduction: *SAINT*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *X-SEED* (Barbour, 2001); software used to prepare material for publication: *publCIF* (Westrip, 2010).

We thank Shahid Beheshti University and the University of Malaya for supporting this study.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: BT5322).

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supporting information

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Omid Sadeghi, Mostafa M. Amini and Seik Weng Ng

S1. Comment

We have used bis(silver acetate·2triphenylphosphine) monohydrate sesquiethanol (Hanna & Ng, 1999; Ng & Othman, 1997) as a template in the synthesis of triphenylphosphine adducts of other silver carboxylates; the silver carboxylates themselves cannot be synthesized directly by the reaction of a silver salt with the carboxylate anion as the reaction invariably leads to the formation of some insoluble gray material.

The crystal structure of the silver(II) derivative of the monobasic 3-carboxypyridyl-4-carboxylate anion was reported a long time ago (Drew *et al.*, 1971); the silver atom is *N*,*O*-chelated by two anions in an approximate square-planar enviroment.

The silver(I) 3-carboxypyridyl-4-carboxylate–triphenylphosphine adduct (Scheme I) exists as a polymeric compound (Fig. 1) in which the anion bridges adjacent silver atoms through one carboxyl group and the pyridyl N atom (Fig. 2). The diffraction measurements are of a sufficiently high quality for the acid H atom to be refined; the refinement places this atom mid-way between the O atoms of the two carboxyl O atoms, at a distance of 1.20 (4) Å. The O···H···O interaction is an intramolecular hydrogen bond. The pyridyl ring and the carboxyl –CO_2 unit that is engaged in Ag coordination enclose a dihedral angle of 14.3 (2) ° whereas the free carboxyl group encloses a dihedral angle of 15.2 (3) ° with the pyridyl ring; such minimal twist probably locks the acid H atom in its place.

S2. Experimental

Silver acetate (1 mmol, 0.17 g) and triphenylphosphine (2 mmol, 0.53 g) were heated in ethanol (50 ml) until the reactants dissolved completely. Gray insoluble material was removed by filtration and the solvent removed to yield bis(silver acetate·2triphenylphosphine) monohydrate sesquiethanol (Hanna & Ng, 1999; Ng & Othman, 1997).

The adduct (0.5 mmol, 0.69 g) and 3,4-pyridinedicarboxylic acid (1 mmol, 0.17 g) were placed in a convection tube; the tube was filled with a 1:1 methanol/ethanol mixture and kept at 333 K. Colorless crystals were collected after 3 days (m.p. > 550 K).

S3. Refinement

Hydrogen atoms bonded to C were placed in calculated positions (C–H 0.95 Å) and were included in the refinement in the riding model approximation, with U(H) set to 1.2U_{eq}(C). The carboxylic H-atom was freely refined.

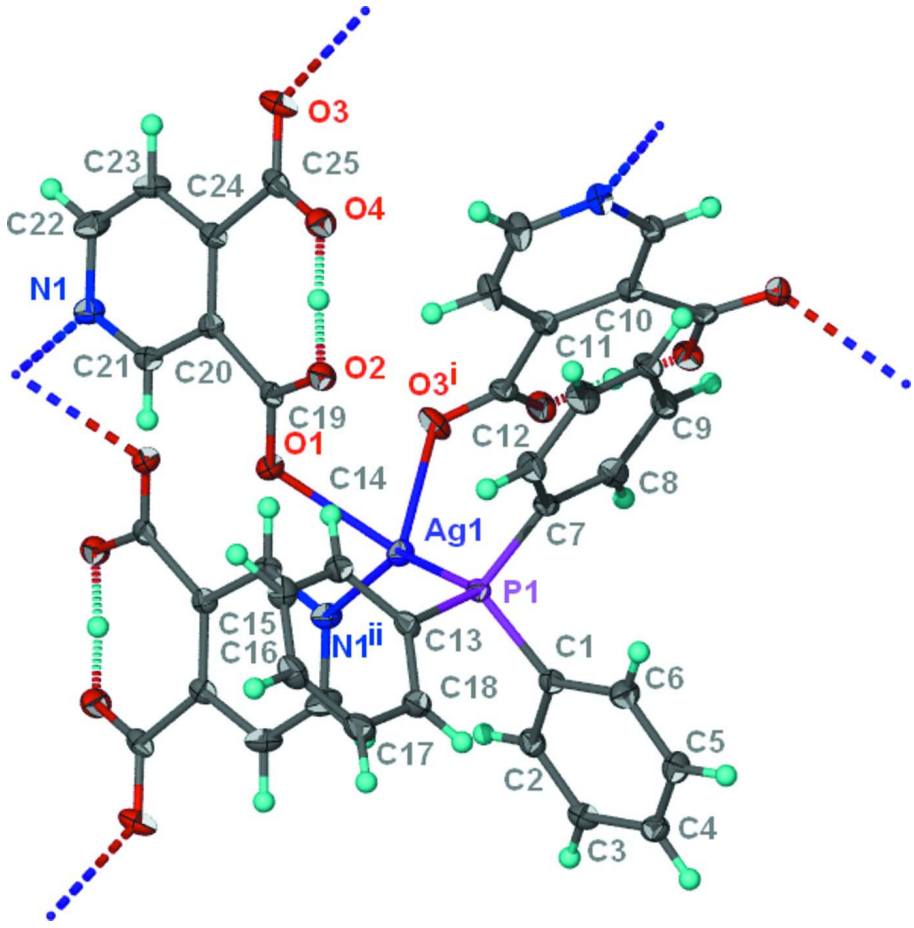

Figure 1

Anisotropic displacement ellipsoid plot (Barbour, 2001) of a portion of the title polymer; ellipsoids are drawn at the 70% probability level and H atoms are of arbitrary radius. Symmetry transformations are given in Table 1.: *i* = 1 - *x*, 1 - *y*, 1 - *z*; *ii* = 3/2 - *x*, *y* - 1/2, 3/2 - *z*.

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Crystal data

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Monoclinic, $P2_1/c$
Hall symbol: -P 2ybc
a = 14.2472 (7) Å
b = 10.2431 (5) Å
c = 16.3146 (8) Å
β = 115.206 (1)°
V = 2154.18 (18) Å^3
Z = 4
$F(000)$ = 1080
D_x = 1.653 Mg m^{-3}
Mo $K\alpha$ radiation, λ = 0.71073 Å
Cell parameters from 9293 reflections
θ = 2.4–28.3°
μ = 1.04 mm^{-1}
T = 100 K
Block, colorless
0.35 × 0.30 × 0.15 mm

Data collection

Bruker SMART APEX diffractometer
Radiation source: fine-focus sealed tube
Graphite monochromator
ω scans

Absorption correction: multi-scan (*SADABS*; Sheldrick, 1996)
T_{min} = 0.712, T_{max} = 0.859
13432 measured reflections
4942 independent reflections
4587 reflections with $I > 2\sigma(I)$

R_{int} = 0.019
θ_{max} = 27.5°, θ_{min} = 1.6°
h = −18→18
k = −10→13
l = −21→20

Refinement

Refinement on F^2
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.020
$wR(F^2)$ = 0.055
S = 1.05
4942 reflections
293 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 atoms treated by a mixture of independent and constrained refinement
$w = 1/[\sigma^2(F_o^2) + (0.0292P)^2 + 1.0816P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.001
$\Delta\rho_{max}$ = 0.43 e Å^{-3}
$\Delta\rho_{min}$ = −0.48 e Å^{-3}

Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²)

	x	y	z	U_{iso}*/U_{eq}
Ag1	0.618798 (9)	0.207715 (12)	0.474714 (8)	0.01345 (5)
P1	0.76750 (3)	0.10818 (4)	0.47440 (3)	0.01115 (8)
O1	0.62846 (9)	0.44669 (12)	0.47885 (7)	0.0165 (2)
O2	0.69543 (9)	0.48204 (12)	0.38079 (8)	0.0166 (2)
O3	0.53857 (9)	0.75596 (13)	0.16600 (8)	0.0193 (2)
O4	0.66107 (9)	0.61847 (12)	0.25149 (8)	0.0178 (2)
H4	0.679 (3)	0.554 (4)	0.318 (2)	0.095 (12)*
N1	0.46880 (10)	0.77905 (13)	0.43864 (10)	0.0148 (3)
C1	0.78294 (12)	−0.06194 (15)	0.50936 (10)	0.0127 (3)
C2	0.73968 (12)	−0.10399 (16)	0.56721 (11)	0.0146 (3)
H2	0.6994	−0.0453	0.5842	0.018*
C3	0.75513 (13)	−0.23085 (17)	0.60006 (11)	0.0160 (3)
H3	0.7260	−0.2587	0.6398	0.019*
C4	0.81319 (13)	−0.31702 (16)	0.57480 (11)	0.0158 (3)
H4A	0.8246	−0.4036	0.5979	0.019*
C5	0.85461 (14)	−0.27720 (17)	0.51589 (12)	0.0175 (3)
H5	0.8930	−0.3372	0.4977	0.021*
C6	0.84020 (13)	−0.14963 (17)	0.48331 (11)	0.0166 (3)
H6	0.8693	−0.1223	0.4434	0.020*
C7	0.77577 (12)	0.10772 (15)	0.36598 (10)	0.0122 (3)
C8	0.69787 (12)	0.04132 (16)	0.29445 (11)	0.0159 (3)
H8	0.6462	−0.0053	0.3047	0.019*
C9	0.69546 (13)	0.04295 (17)	0.20850 (11)	0.0176 (3)
H9	0.6430	−0.0036	0.1604	0.021*
C10	0.76977 (13)	0.11260 (17)	0.19307 (11)	0.0189 (3)
H10	0.7670	0.1157	0.1339	0.023*
C11	0.84788 (14)	0.17757 (18)	0.26345 (12)	0.0211 (4)

H11	0.8992	0.2241	0.2527	0.025*
C12	0.85148 (13)	0.17507 (17)	0.35027 (11)	0.0173 (3)
H12	0.9055	0.2193	0.3986	0.021*
C13	0.88689 (12)	0.18607 (16)	0.55374 (11)	0.0132 (3)
C14	0.89652 (13)	0.32173 (17)	0.54761 (11)	0.0155 (3)
H14	0.8419	0.3704	0.5029	0.019*
C15	0.98636 (13)	0.38491 (17)	0.60728 (11)	0.0185 (3)
H15	0.9934	0.4765	0.6024	0.022*
C16	1.06569 (13)	0.31447 (18)	0.67385 (12)	0.0191 (3)
H16	1.1267	0.3578	0.7145	0.023*
C17	1.05556 (13)	0.18084 (18)	0.68081 (11)	0.0186 (3)
H17	1.1096	0.1328	0.7266	0.022*
C18	0.96635 (12)	0.11650 (17)	0.62095 (11)	0.0158 (3)
H18	0.9598	0.0249	0.6261	0.019*
C19	0.63603 (11)	0.51340 (15)	0.41887 (10)	0.0127 (3)
C20	0.57237 (11)	0.63798 (15)	0.39057 (10)	0.0119 (3)
C21	0.52976 (12)	0.67522 (16)	0.44994 (11)	0.0130 (3)
H21	0.5453	0.6228	0.5022	0.016*
C22	0.44636 (13)	0.85140 (18)	0.36360 (12)	0.0191 (3)
H22	0.4028	0.9256	0.3536	0.023*
C23	0.48410 (13)	0.82197 (17)	0.30104 (12)	0.0177 (3)
H23	0.4657	0.8755	0.2489	0.021*
C24	0.54897 (12)	0.71481 (15)	0.31276 (11)	0.0124 (3)
C25	0.58450 (12)	0.69438 (16)	0.23706 (11)	0.0140 (3)

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Ag1	0.01300 (7)	0.01372 (7)	0.01545 (7)	0.00322 (4)	0.00782 (5)	0.00133 (4)
P1	0.01137 (17)	0.01234 (19)	0.01010 (18)	0.00181 (14)	0.00492 (15)	0.00062 (14)
O1	0.0218 (6)	0.0127 (6)	0.0151 (6)	0.0016 (4)	0.0081 (5)	0.0017 (4)
O2	0.0175 (5)	0.0186 (6)	0.0147 (5)	0.0052 (5)	0.0077 (5)	0.0007 (5)
O3	0.0168 (6)	0.0290 (7)	0.0106 (5)	−0.0030 (5)	0.0043 (5)	0.0032 (5)
O4	0.0212 (6)	0.0192 (6)	0.0168 (6)	0.0025 (5)	0.0118 (5)	0.0012 (5)
N1	0.0136 (6)	0.0163 (7)	0.0156 (7)	0.0025 (5)	0.0074 (5)	0.0031 (5)
C1	0.0123 (7)	0.0135 (7)	0.0110 (7)	0.0007 (6)	0.0037 (6)	0.0004 (6)
C2	0.0143 (7)	0.0170 (8)	0.0134 (7)	0.0018 (6)	0.0067 (6)	−0.0013 (6)
C3	0.0154 (7)	0.0197 (8)	0.0124 (7)	−0.0016 (6)	0.0056 (6)	0.0011 (6)
C4	0.0160 (7)	0.0136 (8)	0.0139 (7)	−0.0004 (6)	0.0026 (6)	0.0007 (6)
C5	0.0184 (8)	0.0162 (8)	0.0188 (8)	0.0035 (6)	0.0088 (7)	−0.0010 (6)
C6	0.0182 (8)	0.0166 (8)	0.0175 (8)	0.0024 (6)	0.0101 (7)	0.0019 (6)
C7	0.0133 (7)	0.0138 (8)	0.0103 (7)	0.0041 (6)	0.0057 (6)	0.0021 (6)
C8	0.0131 (7)	0.0181 (8)	0.0155 (8)	0.0009 (6)	0.0053 (6)	0.0005 (6)
C9	0.0172 (7)	0.0191 (8)	0.0123 (7)	0.0038 (6)	0.0023 (6)	−0.0025 (6)
C10	0.0262 (8)	0.0205 (9)	0.0119 (7)	0.0066 (7)	0.0097 (7)	0.0016 (6)
C11	0.0255 (9)	0.0229 (9)	0.0202 (9)	−0.0037 (7)	0.0148 (7)	−0.0001 (7)
C12	0.0178 (8)	0.0188 (8)	0.0153 (8)	−0.0036 (6)	0.0070 (6)	−0.0026 (6)
C13	0.0127 (7)	0.0176 (8)	0.0101 (7)	0.0018 (6)	0.0056 (6)	−0.0011 (6)

C14	0.0152 (7)	0.0158 (8)	0.0141 (7)	0.0027 (6)	0.0047 (6)	0.0004 (6)
C15	0.0186 (8)	0.0180 (8)	0.0188 (8)	−0.0004 (6)	0.0078 (7)	−0.0018 (7)
C16	0.0158 (8)	0.0246 (9)	0.0146 (8)	−0.0008 (7)	0.0041 (6)	−0.0043 (7)
C17	0.0161 (8)	0.0245 (9)	0.0128 (8)	0.0057 (7)	0.0037 (6)	0.0006 (6)
C18	0.0161 (7)	0.0177 (8)	0.0139 (7)	0.0044 (6)	0.0066 (6)	0.0011 (6)
C19	0.0109 (7)	0.0133 (8)	0.0098 (7)	−0.0009 (6)	0.0007 (6)	−0.0026 (6)
C20	0.0092 (6)	0.0132 (7)	0.0114 (7)	−0.0010 (6)	0.0027 (6)	−0.0005 (6)
C21	0.0117 (7)	0.0143 (7)	0.0119 (7)	−0.0008 (6)	0.0041 (6)	0.0016 (6)
C22	0.0178 (8)	0.0194 (9)	0.0227 (8)	0.0071 (7)	0.0113 (7)	0.0076 (7)
C23	0.0161 (8)	0.0213 (9)	0.0165 (8)	0.0038 (6)	0.0078 (6)	0.0083 (7)
C24	0.0098 (7)	0.0156 (8)	0.0108 (7)	−0.0023 (6)	0.0035 (6)	−0.0005 (6)
C25	0.0133 (7)	0.0179 (8)	0.0110 (7)	−0.0063 (6)	0.0054 (6)	−0.0031 (6)

Geometric parameters (Å, º)

Ag1—P1	2.3531 (4)	C8—C9	1.388 (2)
Ag1—O1	2.451 (1)	C8—H8	0.9500
Ag1—O3^{i}	2.481 (1)	C9—C10	1.386 (2)
Ag1—N1^{ii}	2.253 (1)	C9—H9	0.9500
P1—C1	1.8175 (16)	C10—C11	1.383 (3)
P1—C7	1.8222 (15)	C10—H10	0.9500
P1—C13	1.8248 (17)	C11—C12	1.396 (2)
O1—C19	1.2353 (19)	C11—H11	0.9500
O2—C19	1.2858 (18)	C12—H12	0.9500
O3—C25	1.235 (2)	C13—C18	1.391 (2)
O3—Ag1^{iii}	2.4814 (12)	C13—C14	1.404 (2)
O4—C25	1.277 (2)	C14—C15	1.394 (2)
O4—H4	1.20 (4)	C14—H14	0.9500
N1—C21	1.335 (2)	C15—C16	1.390 (2)
N1—C22	1.348 (2)	C15—H15	0.9500
N1—Ag1^{ii}	2.2531 (13)	C16—C17	1.386 (2)
C1—C6	1.396 (2)	C16—H16	0.9500
C1—C2	1.397 (2)	C17—C18	1.395 (2)
C2—C3	1.387 (2)	C17—H17	0.9500
C2—H2	0.9500	C18—H18	0.9500
C3—C4	1.387 (2)	C19—C20	1.519 (2)
C3—H3	0.9500	C20—C21	1.397 (2)
C4—C5	1.386 (2)	C20—C24	1.408 (2)
C4—H4A	0.9500	C21—H21	0.9500
C5—C6	1.392 (2)	C22—C23	1.374 (2)
C5—H5	0.9500	C22—H22	0.9500
C6—H6	0.9500	C23—C24	1.395 (2)
C7—C12	1.393 (2)	C23—H23	0.9500
C7—C8	1.398 (2)	C24—C25	1.536 (2)
P1—Ag1—O1	113.12 (3)	C9—C10—H10	119.9
P1—Ag1—O3^{i}	122.95 (3)	C10—C11—C12	120.18 (16)
P1—Ag1—N1^{ii}	140.10 (4)	C10—C11—H11	119.9

O1—Ag1—O3^{i}	81.06 (4)	C12—C11—H11	119.9
O1—Ag1—N1^{ii}	87.84 (4)	C7—C12—C11	119.94 (16)
O3^{i}—Ag1—N1^{ii}	92.57 (4)	C7—C12—H12	120.0
C1—P1—C7	104.65 (7)	C11—C12—H12	120.0
C1—P1—C13	104.18 (7)	C18—C13—C14	119.46 (15)
C7—P1—C13	105.28 (7)	C18—C13—P1	122.35 (13)
C1—P1—Ag1	113.79 (5)	C14—C13—P1	118.16 (12)
C7—P1—Ag1	115.70 (5)	C15—C14—C13	119.88 (15)
C13—P1—Ag1	112.16 (5)	C15—C14—H14	120.1
C19—O1—Ag1	123.60 (10)	C13—C14—H14	120.1
C25—O3—Ag1^{iii}	132.51 (11)	C16—C15—C14	120.26 (16)
C25—O4—H4	110.1 (17)	C16—C15—H15	119.9
C21—N1—C22	116.87 (14)	C14—C15—H15	119.9
C21—N1—Ag1^{ii}	117.57 (10)	C17—C16—C15	119.88 (16)
C22—N1—Ag1^{ii}	123.80 (11)	C17—C16—H16	120.1
C6—C1—C2	119.38 (15)	C15—C16—H16	120.1
C6—C1—P1	121.99 (12)	C16—C17—C18	120.31 (16)
C2—C1—P1	118.58 (12)	C16—C17—H17	119.8
C3—C2—C1	120.45 (14)	C18—C17—H17	119.8
C3—C2—H2	119.8	C13—C18—C17	120.19 (16)
C1—C2—H2	119.8	C13—C18—H18	119.9
C2—C3—C4	119.87 (15)	C17—C18—H18	119.9
C2—C3—H3	120.1	O1—C19—O2	122.82 (15)
C4—C3—H3	120.1	O1—C19—C20	117.60 (13)
C5—C4—C3	120.17 (16)	O2—C19—C20	119.58 (14)
C5—C4—H4A	119.9	C21—C20—C24	117.80 (14)
C3—C4—H4A	119.9	C21—C20—C19	113.46 (13)
C4—C5—C6	120.25 (15)	C24—C20—C19	128.70 (14)
C4—C5—H5	119.9	N1—C21—C20	124.81 (14)
C6—C5—H5	119.9	N1—C21—H21	117.6
C5—C6—C1	119.86 (15)	C20—C21—H21	117.6
C5—C6—H6	120.1	N1—C22—C23	122.51 (15)
C1—C6—H6	120.1	N1—C22—H22	118.7
C12—C7—C8	119.29 (14)	C23—C22—H22	118.7
C12—C7—P1	123.54 (12)	C22—C23—C24	121.11 (15)
C8—C7—P1	117.08 (11)	C22—C23—H23	119.4
C9—C8—C7	120.46 (15)	C24—C23—H23	119.4
C9—C8—H8	119.8	C23—C24—C20	116.89 (14)
C7—C8—H8	119.8	C23—C24—C25	115.03 (14)
C10—C9—C8	119.84 (15)	C20—C24—C25	128.06 (14)
C10—C9—H9	120.1	O3—C25—O4	123.62 (15)
C8—C9—H9	120.1	O3—C25—C24	117.47 (14)
C11—C10—C9	120.26 (15)	O4—C25—C24	118.88 (14)
C11—C10—H10	119.9		

N1^{ii}—Ag1—P1—C1	43.84 (8)	C1—P1—C13—C18	1.57 (15)
O1—Ag1—P1—C1	160.37 (6)	C7—P1—C13—C18	−108.28 (14)
O3^{i}—Ag1—P1—C1	−105.31 (7)	Ag1—P1—C13—C18	125.08 (12)

N1^{ii}—Ag1—P1—C7	165.10 (8)	C1—P1—C13—C14	−176.52 (12)
O1—Ag1—P1—C7	−78.37 (7)	C7—P1—C13—C14	73.64 (14)
O3^{i}—Ag1—P1—C7	15.96 (7)	Ag1—P1—C13—C14	−53.00 (13)
N1^{ii}—Ag1—P1—C13	−74.11 (8)	C18—C13—C14—C15	1.6 (2)
O1—Ag1—P1—C13	42.42 (6)	P1—C13—C14—C15	179.71 (12)
O3^{i}—Ag1—P1—C13	136.75 (7)	C13—C14—C15—C16	−1.1 (2)
N1^{ii}—Ag1—O1—C19	−153.23 (12)	C14—C15—C16—C17	0.1 (3)
P1—Ag1—O1—C19	61.82 (12)	C15—C16—C17—C18	0.4 (3)
O3^{i}—Ag1—O1—C19	−60.29 (12)	C14—C13—C18—C17	−1.0 (2)
C7—P1—C1—C6	28.81 (15)	P1—C13—C18—C17	−179.09 (12)
C13—P1—C1—C6	−81.49 (14)	C16—C17—C18—C13	0.1 (2)
Ag1—P1—C1—C6	156.05 (12)	Ag1—O1—C19—O2	−41.8 (2)
C7—P1—C1—C2	−153.99 (12)	Ag1—O1—C19—C20	138.75 (11)
C13—P1—C1—C2	95.70 (13)	O1—C19—C20—C21	12.9 (2)
Ag1—P1—C1—C2	−26.75 (14)	O2—C19—C20—C21	−166.63 (14)
C6—C1—C2—C3	1.3 (2)	O1—C19—C20—C24	−164.64 (15)
P1—C1—C2—C3	−175.96 (12)	O2—C19—C20—C24	15.9 (2)
C1—C2—C3—C4	−0.5 (2)	C22—N1—C21—C20	0.8 (2)
C2—C3—C4—C5	−0.9 (2)	Ag1^{ii}—N1—C21—C20	166.32 (12)
C3—C4—C5—C6	1.5 (3)	C24—C20—C21—N1	−0.4 (2)
C4—C5—C6—C1	−0.7 (3)	C19—C20—C21—N1	−178.22 (14)
C2—C1—C6—C5	−0.7 (2)	C21—N1—C22—C23	−0.4 (3)
P1—C1—C6—C5	176.45 (13)	Ag1^{ii}—N1—C22—C23	−164.87 (13)
C1—P1—C7—C12	−119.18 (14)	N1—C22—C23—C24	−0.5 (3)
C13—P1—C7—C12	−9.67 (16)	C22—C23—C24—C20	0.9 (2)
Ag1—P1—C7—C12	114.76 (13)	C22—C23—C24—C25	179.83 (15)
C1—P1—C7—C8	64.36 (13)	C21—C20—C24—C23	−0.4 (2)
C13—P1—C7—C8	173.86 (12)	C19—C20—C24—C23	176.96 (15)
Ag1—P1—C7—C8	−61.70 (13)	C21—C20—C24—C25	−179.24 (14)
C12—C7—C8—C9	−0.4 (2)	C19—C20—C24—C25	−1.8 (3)
P1—C7—C8—C9	176.25 (12)	Ag1^{iii}—O3—C25—O4	93.68 (18)
C7—C8—C9—C10	−1.0 (2)	Ag1^{iii}—O3—C25—C24	−88.43 (17)
C8—C9—C10—C11	1.7 (3)	C23—C24—C25—O3	−13.6 (2)
C9—C10—C11—C12	−1.0 (3)	C20—C24—C25—O3	165.22 (15)
C8—C7—C12—C11	1.1 (2)	C23—C24—C25—O4	164.40 (15)
P1—C7—C12—C11	−175.27 (13)	C20—C24—C25—O4	−16.8 (2)
C10—C11—C12—C7	−0.5 (3)		

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

Hydrogen-bond geometry (Å, º)

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
O4—H4···O2	1.20 (4)	1.20 (4)	2.401 (2)	176 (4)