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μ-Chlorido-bis[(dimethyl sulfoxide-κO)bis(triphenylphosphane-κP)silver(I)] nitrate

Yun-Hua Li* and Yong-Liang Shao

College of Chemistry and Chemical Engineering, Lanzhou University Lanzhou 730000, People's Republic of China. *Correspondence e-mail: liyunhua@lzu.edu.cn

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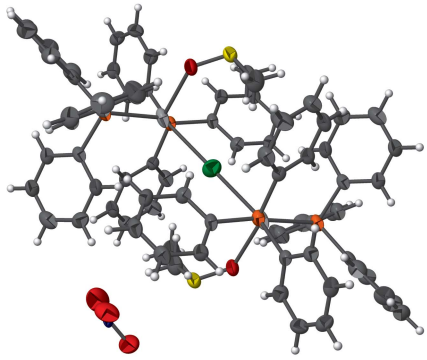
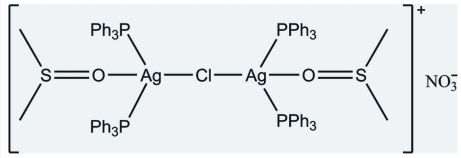
Structural data: full structural data are available from iucrdata.iucr.org

The asymmetric unit of the title salt, $[Ag_2Cl(C_2H_6OS)_2(C_{18}H_{15}P)_4]NO_3$, comprises one nitrate anion and one half of the binuclear complex cation, the other half being completed by inversion symmetry. The Ag^I atom has a distorted ($ClOP_2$) coordination sphere. Weak intermolecular C—H···O interactions between the cation and the O atoms of the nitrate counter-anion help to consolidate the crystal packing.

3D view



Chemical scheme



Structure description

The Ag^I atom in the complex cation is coordinated by two P atoms from triphenylphosphine ligands, the bridging Cl atom, and the O atom from the dimethyl sulfoxide ligand in a distorted tetrahedral environment [bond angle range 95.62 (11)–120.71 (4) °; Fig. 1]. The nitrate anion does not coordinate to the metal cation and is statistically disordered about a centre of inversion. The molecular configuration of the cation is stabilized by an intramolecular hydrogen bond between a phenyl CH group (C1) and the dimethyl sulfoxide O atom (O4). Other intermolecular C—H···O hydrogen-bonding interactions involving the phenyl and methyl H atoms of the cation and neighbouring anions (Table 1) lead to the formation of a three-dimensional network structure. The crystal structures of similar silver compounds were reported by Cassel (1979) and Bowmaker *et al.* (1993).

Synthesis and crystallization

Reaction of $AgNO_3$ (85 mg, 0.5 mmol) with PPh_3 (262 mg, 1 mmol) in chloroform/DMSO/ethanol/water (12 ml, *v/v/v/v* = 1:1:1:1) under ultrasonic treatment (160 W, 40 kHz, 373 K, 10 min) led to a colourless solution that was allowed to slowly evaporate

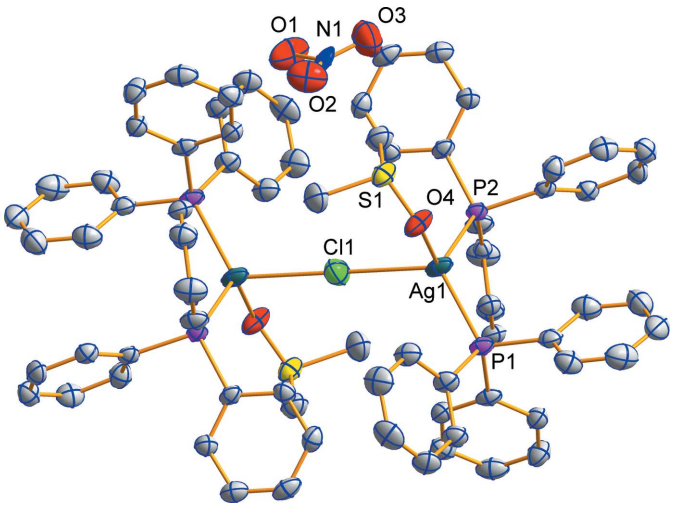


Figure 1
The molecular structures of the cation and anion in the title structure. Displacement ellipsoids are displayed at the 50% probability level. Non-labelled symmetry-related atoms are generated by symmetry code ($-x$, $-y$, $-z+1$). Only one orientation of the nitrate anion is shown.

at room temperature for two weeks to give colourless crystals of the title compound. Yield: *ca* 55% based on $AgNO_3$.

Refinement

Crystal data, data collection and structure refinement details are summarized in Table 2. The nitrate counter-anion (N1, O1, O2, O3) is disordered about an inversion centre and each of the atoms consequently has an occupancy of 0.5.

Acknowledgements

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Table 1
Hydrogen-bond geometry (Å, °).

D—H···A	D—H	H···A	D···A	D—H···A
C1—H1···O4	0.93	2.50	3.381 (8)	159
C4—H4···O2^{i}	0.93	2.45	3.14 (2)	131
C16—H16···O1^{ii}	0.93	2.24	3.00 (2)	138
C37—H37A···O3^{iii}	0.96	2.43	3.321 (16)	155
C38—H38A···O2^{iii}	0.96	2.26	3.095 (18)	145

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

Table 2
Experimental details.

Crystal data	
Chemical formula	$[Ag_2Cl(C_2H_6OS)_2(C_{18}H_{15}P)_4]NO_3$
M_r	1518.56
Crystal system, space group	Triclinic, $P\overline{1}$
Temperature (K)	173
a, b, c (Å)	12.440 (3), 13.070 (3), 13.579 (3)
α, β, γ (°)	93.489 (5), 117.157 (4), 115.354 (4)
V (Å^3)	1682.6 (7)
Z	1
Radiation type	Mo $K\alpha$
μ (mm^{-1})	0.83
Crystal size (mm)	0.3 × 0.15 × 0.12
Data collection	
Diffractometer	Agilent CCD Xcalibur
Absorption correction	Multi-scan (*CrysAlis PRO*; Agilent, 2014)
T_{min}, T_{max}	0.861, 0.905
No. of measured, independent and observed [$I > 2\sigma(I)$] reflections	8521, 5941, 5298
R_{int}	0.062
(sin $\theta/\lambda)_{max}$ (Å^{-1})	0.595
Refinement	
$R[F^2 > 2\sigma(F^2)]$, $wR(F^2)$, S	0.064, 0.153, 1.12
No. of reflections	5868
No. of parameters	430
No. of restraints	6
H-atom treatment	H-atom parameters constrained
$\Delta\rho_{max}$, $\Delta\rho_{min}$ (e Å^{-3})	2.39, −2.12

Computer programs: *CrysAlis PRO* (Agilent, 2014), *SHELXS97* (Sheldrick, 2008), *OLEX2* (Dolomanov *et al.*, 2009), *Mercury* (Macrae *et al.*, 2006), *publCIF* (Westrip, 2010).

full crystallographic data

IUCrData (2016). **1**, x160332 [doi:10.1107/S2414314616003321]

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Crystal data

$[Ag_2Cl(C_2H_6OS)_2(C_{18}H_{15}P)_4]NO_3$
M_r = 1518.56
Triclinic, $P\overline{1}$
a = 12.440 (3) Å
b = 13.070 (3) Å
c = 13.579 (3) Å
α = 93.489 (5)°
β = 117.157 (4)°
γ = 115.354 (4)°
V = 1682.6 (7) Å^3
Z = 1
$F(000)$ = 778
D_x = 1.499 Mg m^{-3}
Mo $K\alpha$ radiation, λ = 0.71073 Å
Cell parameters from 4355 reflections
θ = 2.3–28.4°
μ = 0.83 mm^{-1}
T = 173 K
Block, colourless
0.3 × 0.15 × 0.12 mm

Data collection

Agilent CCD Xcalibur diffractometer
Radiation source: sealed X-ray tube
Graphite monochromator
ω scans
Absorption correction: multi-scan (*CrysAlis PRO*; Agilent, 2014)
T_{min} = 0.861, T_{max} = 0.905
8521 measured reflections
5941 independent reflections
5298 reflections with $I > 2\sigma(I)$
R_{int} = 0.062
θ_{max} = 25.0°, θ_{min} = 1.8°
h = −14→14
k = −10→15
l = −16→13

Refinement

Refinement on F^2
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.064
$wR(F^2)$ = 0.153
S = 1.12
5868 reflections
430 parameters
6 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
$w = 1/[\sigma^2(F_o^2) + (0.0478P)^2 + 6.8934P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.004
$\Delta\rho_{max}$ = 2.39 e Å^{-3}
$\Delta\rho_{min}$ = −2.12 e Å^{-3}

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 (Å²)

	x	*y*	*z*	U_{iso}*/U_{eq}	Occ. (<1)
Ag1	0.04619 (4)	0.07560 (4)	0.71100 (4)	0.03575 (17)	
Cl1	0.0000	0.0000	0.5000	0.0484 (6)	
S1	−0.26857 (16)	−0.19692 (13)	0.61116 (14)	0.0371 (4)	
P1	0.03902 (14)	0.25182 (12)	0.76647 (13)	0.0288 (3)	
P2	0.23582 (14)	0.03943 (12)	0.82202 (12)	0.0251 (3)	
O4	−0.1809 (5)	−0.0643 (3)	0.6687 (4)	0.0434 (11)	
C1	−0.2383 (6)	0.1576 (5)	0.5935 (5)	0.0388 (14)	
H1	−0.2448	0.0841	0.5942	0.047*	
C2	−0.3545 (6)	0.1622 (6)	0.5162 (6)	0.0492 (17)	
H2	−0.4390	0.0920	0.4639	0.059*	
C3	−0.3452 (7)	0.2706 (6)	0.5167 (6)	0.0474 (17)	
H3	−0.4243	0.2733	0.4649	0.057*	
C4	−0.2228 (7)	0.3735 (6)	0.5912 (6)	0.0419 (15)	
H4	−0.2178	0.4466	0.5910	0.050*	
C5	−0.1055 (6)	0.3694 (5)	0.6674 (5)	0.0360 (14)	
H5	−0.0208	0.4402	0.7179	0.043*	
C6	−0.1124 (6)	0.2614 (5)	0.6697 (5)	0.0311 (12)	
C7	−0.0046 (7)	0.3372 (6)	0.9310 (6)	0.0418 (15)	
H7	−0.0751	0.3426	0.8695	0.050*	
C8	0.0251 (8)	0.3725 (6)	1.0423 (7)	0.0527 (18)	
H8	−0.0258	0.4005	1.0557	0.063*	
C9	0.1299 (8)	0.3659 (6)	1.1330 (6)	0.0483 (17)	
H9	0.1520	0.3915	1.2087	0.058*	
C10	0.2021 (8)	0.3221 (6)	1.1131 (6)	0.0500 (17)	
H10	0.2733	0.3177	1.1750	0.060*	
C11	0.1699 (7)	0.2845 (6)	1.0020 (6)	0.0434 (15)	
H11	0.2172	0.2519	0.9885	0.052*	
C12	0.0678 (6)	0.2942 (5)	0.9094 (5)	0.0326 (13)	
C13	0.2916 (6)	0.4746 (5)	0.8694 (5)	0.0322 (13)	
H13	0.2912	0.4803	0.9378	0.039*	
C14	0.4001 (6)	0.5616 (5)	0.8674 (5)	0.0393 (14)	
H14	0.4735	0.6262	0.9346	0.047*	
C15	0.4027 (7)	0.5555 (6)	0.7684 (6)	0.0423 (15)	
H15	0.4777	0.6157	0.7681	0.051*	
C16	0.2943 (7)	0.4603 (6)	0.6687 (6)	0.0402 (15)	

H16	0.2947	0.4559	0.6002	0.048*	
C17	0.1862 (6)	0.3723 (5)	0.6717 (5)	0.0331 (13)	
H17	0.1135	0.3070	0.6050	0.040*	
C18	0.1828 (5)	0.3786 (5)	0.7719 (5)	0.0271 (12)	
C19	0.1706 (6)	0.0051 (5)	0.9879 (5)	0.0352 (13)	
H19	0.0783	−0.0339	0.9242	0.042*	
C20	0.1975 (7)	0.0112 (5)	1.0988 (6)	0.0385 (14)	
H20	0.1235	−0.0256	1.1104	0.046*	
C21	0.3331 (7)	0.0716 (5)	1.1915 (5)	0.0353 (13)	
H21	0.3512	0.0756	1.2665	0.042*	
C22	0.4416 (6)	0.1257 (5)	1.1763 (5)	0.0352 (14)	
H22	0.5335	0.1680	1.2407	0.042*	
C23	0.4167 (6)	0.1187 (5)	1.0660 (5)	0.0283 (12)	
H23	0.4915	0.1555	1.0554	0.034*	
C24	0.2808 (5)	0.0571 (4)	0.9716 (4)	0.0241 (11)	
C25	0.4200 (6)	0.2558 (5)	0.8256 (5)	0.0308 (12)	
H25	0.3540	0.2763	0.8173	0.037*	
C26	0.5389 (6)	0.3362 (5)	0.8317 (5)	0.0373 (14)	
H26	0.5541	0.4117	0.8285	0.045*	
C27	0.6363 (7)	0.3075 (5)	0.8425 (5)	0.0391 (14)	
H27	0.7175	0.3628	0.8467	0.047*	
C28	0.6125 (7)	0.1958 (6)	0.8472 (6)	0.0439 (16)	
H28	0.6779	0.1753	0.8538	0.053*	
C29	0.4949 (6)	0.1148 (5)	0.8422 (6)	0.0379 (14)	
H29	0.4805	0.0396	0.8459	0.046*	
C30	0.3966 (6)	0.1437 (5)	0.8317 (4)	0.0256 (11)	
C31	0.2194 (6)	−0.1782 (5)	0.8462 (5)	0.0313 (12)	
H31	0.2412	−0.1516	0.9216	0.038*	
C32	0.1942 (7)	−0.2895 (5)	0.8046 (6)	0.0395 (14)	
H32	0.1992	−0.3379	0.8519	0.047*	
C33	0.1624 (6)	−0.3291 (5)	0.6954 (6)	0.0377 (14)	
H33	0.1449	−0.4048	0.6677	0.045*	
C34	0.1555 (6)	−0.2580 (5)	0.6247 (5)	0.0341 (13)	
H34	0.1343	−0.2854	0.5497	0.041*	
C35	0.1797 (6)	−0.1470 (5)	0.6648 (5)	0.0315 (12)	
H35	0.1741	−0.0993	0.6168	0.038*	
C36	0.2125 (5)	−0.1056 (4)	0.7768 (5)	0.0264 (11)	
C37	−0.3516 (8)	−0.2205 (7)	0.4597 (6)	0.0544 (19)	
H37A	−0.4095	−0.3048	0.4185	0.082*	
H37B	−0.2815	−0.1847	0.4404	0.082*	
H37C	−0.4091	−0.1851	0.4375	0.082*	
C38	−0.1502 (7)	−0.2429 (6)	0.6253 (6)	0.0446 (16)	
H38A	−0.2008	−0.3279	0.5897	0.067*	
H38B	−0.0821	−0.2220	0.7065	0.067*	
H38C	−0.1029	−0.2040	0.5873	0.067*	
N1	0.511 (4)	0.506 (6)	0.5173 (15)	0.035 (3)	0.50
O1	0.5480 (17)	0.4748 (12)	0.4527 (14)	0.070 (3)	0.50
O2	0.4006 (13)	0.5016 (13)	0.4696 (13)	0.063 (3)	0.50

O3	0.5750 (14)	0.5105 (11)	0.6173 (10)	0.082 (3)	0.50

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Ag1	0.0243 (2)	0.0216 (2)	0.0448 (3)	0.01288 (18)	0.0063 (2)	0.00570 (18)
Cl1	0.0594 (15)	0.0553 (14)	0.0419 (12)	0.0347 (12)	0.0295 (12)	0.0205 (11)
S1	0.0315 (8)	0.0279 (7)	0.0414 (9)	0.0084 (6)	0.0193 (7)	0.0046 (6)
P1	0.0220 (7)	0.0212 (7)	0.0362 (8)	0.0121 (6)	0.0098 (6)	0.0078 (6)
P2	0.0242 (7)	0.0225 (7)	0.0265 (7)	0.0146 (6)	0.0099 (6)	0.0066 (5)
O4	0.042 (2)	0.025 (2)	0.057 (3)	0.0083 (19)	0.032 (2)	0.0002 (19)
C1	0.027 (3)	0.031 (3)	0.045 (4)	0.013 (3)	0.012 (3)	0.012 (3)
C2	0.023 (3)	0.045 (4)	0.051 (4)	0.010 (3)	0.007 (3)	0.013 (3)
C3	0.033 (3)	0.065 (5)	0.050 (4)	0.035 (3)	0.017 (3)	0.027 (4)
C4	0.046 (4)	0.043 (4)	0.048 (4)	0.033 (3)	0.023 (3)	0.018 (3)
C5	0.032 (3)	0.032 (3)	0.039 (3)	0.019 (3)	0.013 (3)	0.011 (3)
C6	0.025 (3)	0.032 (3)	0.038 (3)	0.020 (2)	0.014 (3)	0.011 (2)
C7	0.044 (4)	0.046 (4)	0.047 (4)	0.028 (3)	0.028 (3)	0.022 (3)
C8	0.070 (5)	0.055 (4)	0.070 (5)	0.042 (4)	0.052 (4)	0.032 (4)
C9	0.066 (5)	0.041 (4)	0.045 (4)	0.023 (3)	0.037 (4)	0.017 (3)
C10	0.049 (4)	0.057 (4)	0.040 (4)	0.027 (4)	0.020 (3)	0.023 (3)
C11	0.039 (4)	0.043 (4)	0.052 (4)	0.024 (3)	0.024 (3)	0.019 (3)
C12	0.030 (3)	0.020 (3)	0.038 (3)	0.010 (2)	0.015 (3)	0.010 (2)
C13	0.032 (3)	0.028 (3)	0.030 (3)	0.015 (2)	0.012 (3)	0.006 (2)
C14	0.034 (3)	0.030 (3)	0.039 (3)	0.009 (3)	0.016 (3)	0.003 (3)
C15	0.033 (3)	0.035 (3)	0.063 (4)	0.020 (3)	0.025 (3)	0.022 (3)
C16	0.054 (4)	0.043 (4)	0.043 (4)	0.033 (3)	0.032 (3)	0.020 (3)
C17	0.036 (3)	0.025 (3)	0.030 (3)	0.015 (3)	0.013 (3)	0.006 (2)
C18	0.022 (3)	0.022 (3)	0.039 (3)	0.015 (2)	0.014 (2)	0.010 (2)
C19	0.031 (3)	0.037 (3)	0.033 (3)	0.017 (3)	0.014 (3)	0.007 (3)
C20	0.038 (3)	0.038 (3)	0.048 (4)	0.018 (3)	0.029 (3)	0.017 (3)
C21	0.045 (4)	0.044 (3)	0.033 (3)	0.030 (3)	0.024 (3)	0.016 (3)
C22	0.032 (3)	0.035 (3)	0.026 (3)	0.019 (3)	0.006 (3)	0.005 (2)
C23	0.027 (3)	0.029 (3)	0.032 (3)	0.017 (2)	0.016 (2)	0.009 (2)
C24	0.025 (3)	0.022 (3)	0.027 (3)	0.016 (2)	0.012 (2)	0.007 (2)
C25	0.034 (3)	0.027 (3)	0.031 (3)	0.017 (2)	0.016 (3)	0.009 (2)
C26	0.042 (3)	0.024 (3)	0.040 (3)	0.017 (3)	0.018 (3)	0.010 (3)
C27	0.034 (3)	0.036 (3)	0.045 (4)	0.017 (3)	0.021 (3)	0.016 (3)
C28	0.038 (3)	0.046 (4)	0.064 (4)	0.028 (3)	0.032 (3)	0.026 (3)
C29	0.036 (3)	0.031 (3)	0.048 (4)	0.023 (3)	0.019 (3)	0.016 (3)
C30	0.027 (3)	0.029 (3)	0.021 (3)	0.017 (2)	0.011 (2)	0.008 (2)
C31	0.034 (3)	0.029 (3)	0.032 (3)	0.018 (3)	0.016 (3)	0.010 (2)
C32	0.045 (4)	0.031 (3)	0.049 (4)	0.023 (3)	0.025 (3)	0.016 (3)
C33	0.032 (3)	0.027 (3)	0.053 (4)	0.018 (3)	0.021 (3)	0.006 (3)
C34	0.032 (3)	0.033 (3)	0.032 (3)	0.017 (3)	0.015 (3)	0.003 (2)
C35	0.035 (3)	0.035 (3)	0.029 (3)	0.023 (3)	0.016 (3)	0.012 (2)
C36	0.022 (3)	0.022 (3)	0.030 (3)	0.013 (2)	0.009 (2)	0.004 (2)
C37	0.052 (4)	0.053 (4)	0.037 (4)	0.026 (4)	0.010 (3)	0.009 (3)

C38	0.043 (4)	0.037 (3)	0.046 (4)	0.023 (3)	0.017 (3)	0.010 (3)
N1	0.019 (10)	0.022 (10)	0.037 (9)	−0.002 (11)	0.010 (12)	−0.010 (16)
O1	0.087 (9)	0.061 (8)	0.107 (8)	0.044 (8)	0.078 (9)	0.026 (9)
O2	0.043 (6)	0.072 (9)	0.093 (9)	0.036 (6)	0.043 (6)	0.038 (9)
O3	0.073 (8)	0.080 (8)	0.051 (6)	0.026 (7)	0.015 (6)	0.019 (6)

Geometric parameters (Å, º)

Ag1—Cl1	2.6799 (8)	C17—H17	0.9300
Ag1—P1	2.4303 (15)	C17—C18	1.379 (8)
Ag1—P2	2.4200 (14)	C19—H19	0.9300
Ag1—O4	2.371 (4)	C19—C20	1.374 (9)
Cl1—Ag1^{i}	2.6799 (8)	C19—C24	1.374 (8)
S1—O4	1.497 (4)	C20—H20	0.9300
S1—C37	1.762 (7)	C20—C21	1.362 (9)
S1—C38	1.755 (7)	C21—H21	0.9300
P1—C6	1.804 (5)	C21—C22	1.349 (9)
P1—C12	1.808 (6)	C22—H22	0.9300
P1—C18	1.810 (6)	C22—C23	1.372 (8)
P2—C24	1.813 (5)	C23—H23	0.9300
P2—C30	1.811 (6)	C23—C24	1.371 (7)
P2—C36	1.811 (5)	C25—H25	0.9300
C1—H1	0.9300	C25—C26	1.358 (9)
C1—C2	1.376 (9)	C25—C30	1.381 (7)
C1—C6	1.377 (8)	C26—H26	0.9300
C2—H2	0.9300	C26—C27	1.365 (9)
C2—C3	1.370 (9)	C27—H27	0.9300
C3—H3	0.9300	C27—C28	1.371 (8)
C3—C4	1.351 (9)	C28—H28	0.9300
C4—H4	0.9300	C28—C29	1.357 (9)
C4—C5	1.378 (8)	C29—H29	0.9300
C5—H5	0.9300	C29—C30	1.379 (8)
C5—C6	1.381 (8)	C31—H31	0.9300
C7—H7	0.9300	C31—C32	1.372 (8)
C7—C8	1.376 (10)	C31—C36	1.379 (8)
C7—C12	1.365 (9)	C32—H32	0.9300
C8—H8	0.9300	C32—C33	1.348 (9)
C8—C9	1.365 (10)	C33—H33	0.9300
C9—H9	0.9300	C33—C34	1.375 (9)
C9—C10	1.361 (10)	C34—H34	0.9300
C10—H10	0.9300	C34—C35	1.368 (8)
C10—C11	1.367 (10)	C35—H35	0.9300
C11—H11	0.9300	C35—C36	1.384 (8)
C11—C12	1.382 (9)	C37—H37A	0.9600
C13—H13	0.9300	C37—H37B	0.9600
C13—C14	1.356 (9)	C37—H37C	0.9600
C13—C18	1.366 (8)	C38—H38A	0.9600
C14—H14	0.9300	C38—H38B	0.9600

C14—C15	1.357 (9)	C38—H38C	0.9600
C15—H15	0.9300	N1—O1	1.27 (4)
C15—C16	1.376 (9)	N1—O2	1.20 (4)
C16—H16	0.9300	N1—O3	1.20 (2)
C16—C17	1.366 (9)		

P1—Ag1—Cl1	120.71 (4)	C18—C17—H17	119.4
P2—Ag1—Cl1	97.42 (4)	C13—C18—P1	124.8 (5)
P2—Ag1—P1	125.89 (5)	C13—C18—C17	118.4 (5)
O4—Ag1—Cl1	96.95 (11)	C17—C18—P1	116.6 (4)
O4—Ag1—P1	95.62 (11)	C20—C19—H19	120.2
O4—Ag1—P2	117.80 (12)	C24—C19—H19	120.2
Ag1^{i}—Cl1—Ag1	180.0	C24—C19—C20	119.7 (6)
O4—S1—C37	106.2 (3)	C19—C20—H20	120.2
O4—S1—C38	105.7 (3)	C21—C20—C19	119.5 (6)
C38—S1—C37	97.4 (4)	C21—C20—H20	120.2
C6—P1—Ag1	118.66 (19)	C20—C21—H21	119.5
C6—P1—C12	104.4 (3)	C22—C21—C20	121.0 (6)
C6—P1—C18	103.3 (3)	C22—C21—H21	119.5
C12—P1—Ag1	117.58 (19)	C21—C22—H22	119.9
C12—P1—C18	103.6 (3)	C21—C22—C23	120.2 (5)
C18—P1—Ag1	107.40 (18)	C23—C22—H22	119.9
C24—P2—Ag1	111.65 (17)	C22—C23—H23	120.3
C30—P2—Ag1	112.26 (17)	C24—C23—C22	119.5 (5)
C30—P2—C24	105.6 (2)	C24—C23—H23	120.3
C36—P2—Ag1	119.52 (17)	C19—C24—P2	116.7 (4)
C36—P2—C24	102.2 (2)	C23—C24—P2	123.3 (4)
C36—P2—C30	104.3 (2)	C23—C24—C19	120.1 (5)
S1—O4—Ag1	130.5 (2)	C26—C25—H25	119.8
C2—C1—H1	119.9	C26—C25—C30	120.4 (5)
C2—C1—C6	120.2 (6)	C30—C25—H25	119.8
C6—C1—H1	119.9	C25—C26—H26	119.6
C1—C2—H2	120.1	C25—C26—C27	120.8 (5)
C3—C2—C1	119.8 (6)	C27—C26—H26	119.6
C3—C2—H2	120.1	C26—C27—H27	120.5
C2—C3—H3	119.5	C26—C27—C28	119.0 (6)
C4—C3—C2	121.0 (6)	C28—C27—H27	120.5
C4—C3—H3	119.5	C27—C28—H28	119.5
C3—C4—H4	120.3	C29—C28—C27	120.9 (6)
C3—C4—C5	119.5 (6)	C29—C28—H28	119.5
C5—C4—H4	120.3	C28—C29—H29	119.9
C4—C5—H5	119.6	C28—C29—C30	120.2 (6)
C4—C5—C6	120.7 (6)	C30—C29—H29	119.9
C6—C5—H5	119.6	C25—C30—P2	118.6 (4)
C1—C6—P1	118.9 (4)	C29—C30—P2	122.6 (4)
C1—C6—C5	118.9 (5)	C29—C30—C25	118.7 (5)
C5—C6—P1	122.2 (4)	C32—C31—H31	119.9
C8—C7—H7	119.4	C32—C31—C36	120.3 (6)

C12—C7—H7	119.4	C36—C31—H31	119.9
C12—C7—C8	121.1 (6)	C31—C32—H32	119.8
C7—C8—H8	120.2	C33—C32—C31	120.4 (6)
C9—C8—C7	119.5 (7)	C33—C32—H32	119.8
C9—C8—H8	120.2	C32—C33—H33	119.8
C8—C9—H9	119.9	C32—C33—C34	120.3 (5)
C10—C9—C8	120.3 (7)	C34—C33—H33	119.8
C10—C9—H9	119.9	C33—C34—H34	120.0
C9—C10—H10	120.0	C35—C34—C33	120.0 (6)
C9—C10—C11	120.0 (7)	C35—C34—H34	120.0
C11—C10—H10	120.0	C34—C35—H35	119.9
C10—C11—H11	119.6	C34—C35—C36	120.1 (5)
C10—C11—C12	120.8 (6)	C36—C35—H35	119.9
C12—C11—H11	119.6	C31—C36—P2	123.3 (4)
C7—C12—P1	123.4 (5)	C31—C36—C35	118.9 (5)
C7—C12—C11	118.3 (6)	C35—C36—P2	117.8 (4)
C11—C12—P1	118.2 (5)	S1—C37—H37A	109.5
C14—C13—H13	119.7	S1—C37—H37B	109.5
C14—C13—C18	120.7 (6)	S1—C37—H37C	109.5
C18—C13—H13	119.7	H37A—C37—H37B	109.5
C13—C14—H14	119.6	H37A—C37—H37C	109.5
C13—C14—C15	120.8 (6)	H37B—C37—H37C	109.5
C15—C14—H14	119.6	S1—C38—H38A	109.5
C14—C15—H15	120.1	S1—C38—H38B	109.5
C14—C15—C16	119.9 (6)	S1—C38—H38C	109.5
C16—C15—H15	120.1	H38A—C38—H38B	109.5
C15—C16—H16	120.5	H38A—C38—H38C	109.5
C17—C16—C15	119.0 (6)	H38B—C38—H38C	109.5
C17—C16—H16	120.5	O2—N1—O1	117.3 (15)
C16—C17—H17	119.4	O3—N1—O1	116 (3)
C16—C17—C18	121.2 (5)	O3—N1—O2	125 (3)

Ag1—P1—C6—C1	24.1 (6)	C12—P1—C6—C1	−109.1 (5)
Ag1—P1—C6—C5	−154.1 (5)	C12—P1—C6—C5	72.6 (6)
Ag1—P1—C12—C7	−141.1 (5)	C12—P1—C18—C13	6.2 (5)
Ag1—P1—C12—C11	40.0 (5)	C12—P1—C18—C17	−178.6 (4)
Ag1—P1—C18—C13	−118.9 (4)	C12—C7—C8—C9	0.9 (10)
Ag1—P1—C18—C17	56.3 (4)	C13—C14—C15—C16	0.1 (10)
Ag1—P2—C24—C19	45.1 (5)	C14—C13—C18—P1	175.2 (5)
Ag1—P2—C24—C23	−134.8 (4)	C14—C13—C18—C17	0.2 (8)
Ag1—P2—C30—C25	27.7 (5)	C14—C15—C16—C17	−0.8 (9)
Ag1—P2—C30—C29	−150.8 (4)	C15—C16—C17—C18	1.2 (9)
Ag1—P2—C36—C31	−119.3 (4)	C16—C17—C18—P1	−176.4 (5)
Ag1—P2—C36—C35	57.7 (5)	C16—C17—C18—C13	−0.9 (8)
Cl1—Ag1—P1—C6	51.4 (2)	C18—P1—C6—C1	142.8 (5)
Cl1—Ag1—P1—C12	178.7 (2)	C18—P1—C6—C5	−35.5 (6)
Cl1—Ag1—P1—C18	−65.0 (2)	C18—P1—C12—C7	100.6 (5)
Cl1—Ag1—P2—C24	−170.54 (18)	C18—P1—C12—C11	−78.3 (5)

Cl1—Ag1—P2—C30	71.10 (19)	C18—C13—C14—C15	0.2 (9)
Cl1—Ag1—P2—C36	−51.5 (2)	C19—C20—C21—C22	0.1 (9)
Cl1—Ag1—O4—S1	48.0 (4)	C20—C19—C24—P2	177.5 (4)
P1—Ag1—Cl1—Ag1^{i}	−155 (100)	C20—C19—C24—C23	−2.6 (8)
P1—Ag1—P2—C24	52.6 (2)	C20—C21—C22—C23	−1.3 (9)
P1—Ag1—P2—C30	−65.8 (2)	C21—C22—C23—C24	0.5 (8)
P1—Ag1—P2—C36	171.7 (2)	C22—C23—C24—P2	−178.7 (4)
P1—Ag1—O4—S1	169.9 (3)	C22—C23—C24—C19	1.4 (8)
P2—Ag1—Cl1—Ag1^{i}	65 (100)	C24—P2—C30—C25	−94.2 (5)
P2—Ag1—P1—C6	179.4 (2)	C24—P2—C30—C29	87.4 (5)
P2—Ag1—P1—C12	−53.3 (2)	C24—P2—C36—C31	4.6 (5)
P2—Ag1—P1—C18	62.9 (2)	C24—P2—C36—C35	−178.5 (4)
P2—Ag1—O4—S1	−54.2 (4)	C24—C19—C20—C21	1.8 (9)
O4—Ag1—Cl1—Ag1^{i}	−55 (100)	C25—C26—C27—C28	0.0 (10)
O4—Ag1—P1—C6	−50.1 (3)	C26—C25—C30—P2	−179.5 (4)
O4—Ag1—P1—C12	77.2 (2)	C26—C25—C30—C29	−1.0 (8)
O4—Ag1—P1—C18	−166.6 (2)	C26—C27—C28—C29	−0.6 (10)
O4—Ag1—P2—C24	−68.6 (2)	C27—C28—C29—C30	0.3 (10)
O4—Ag1—P2—C30	173.0 (2)	C28—C29—C30—P2	178.9 (5)
O4—Ag1—P2—C36	50.5 (3)	C28—C29—C30—C25	0.4 (9)
C1—C2—C3—C4	0.8 (12)	C30—P2—C24—C19	167.4 (4)
C2—C1—C6—P1	−178.0 (5)	C30—P2—C24—C23	−12.5 (5)
C2—C1—C6—C5	0.3 (10)	C30—P2—C36—C31	114.4 (5)
C2—C3—C4—C5	0.3 (11)	C30—P2—C36—C35	−68.7 (5)
C3—C4—C5—C6	−1.1 (10)	C30—C25—C26—C27	0.8 (9)
C4—C5—C6—P1	179.0 (5)	C31—C32—C33—C34	0.4 (9)
C4—C5—C6—C1	0.8 (10)	C32—C31—C36—P2	177.0 (5)
C6—P1—C12—C7	−7.2 (6)	C32—C31—C36—C35	0.1 (8)
C6—P1—C12—C11	173.8 (5)	C32—C33—C34—C35	−0.6 (9)
C6—P1—C18—C13	114.9 (5)	C33—C34—C35—C36	0.6 (9)
C6—P1—C18—C17	−69.9 (5)	C34—C35—C36—P2	−177.4 (4)
C6—C1—C2—C3	−1.1 (11)	C34—C35—C36—C31	−0.4 (8)
C7—C8—C9—C10	−1.6 (11)	C36—P2—C24—C19	−83.8 (5)
C8—C7—C12—P1	−177.5 (5)	C36—P2—C24—C23	96.3 (5)
C8—C7—C12—C11	1.4 (9)	C36—P2—C30—C25	158.5 (4)
C8—C9—C10—C11	0.0 (11)	C36—P2—C30—C29	−20.0 (5)
C9—C10—C11—C12	2.3 (10)	C36—C31—C32—C33	−0.1 (9)
C10—C11—C12—P1	176.0 (5)	C37—S1—O4—Ag1	−81.7 (4)
C10—C11—C12—C7	−3.0 (9)	C38—S1—O4—Ag1	21.0 (5)

Symmetry code: (i) $-x, -y, -z+1$.

Hydrogen-bond geometry (Å, º)

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
C1—H1···O4	0.93	2.50	3.381 (8)	159
C4—H4···O2^{ii}	0.93	2.45	3.14 (2)	131
C16—H16···O1^{iii}	0.93	2.24	3.00 (2)	138

C37—H37*A*···O3^{i}	0.96	2.43	3.321 (16)	155
C38—H38*A*···O2^{i}	0.96	2.26	3.095 (18)	145

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