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# Bis[$\mu$-bis(diphenylphosphino)methane-$\kappa^2P:P'$]bis[(chlorodifluoroacetato-$\kappa O$)-silver(I)](*Ag—Ag*)

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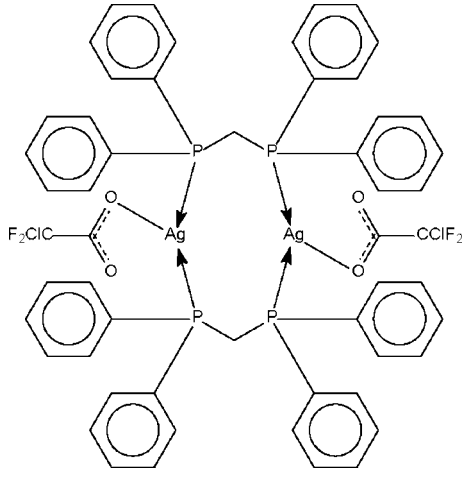
Key indicators: single-crystal X-ray study; $T$ = 100 K; mean $\sigma$(C–C) = 0.007 Å; disorder in main residue; $R$ factor = 0.046; $wR$ factor = 0.112; data-to-parameter ratio = 18.0.

The asymmetric unit of the title compound, $[Ag_2(C_2ClF_2O_2)_2(C_{25}H_{22}P_2)_2]$, consists of two half-molecules, each $Ag^I$ ion lying on a center of symmetry. In each complete molecule, two bis(diphenylphosphino)methane ligands bridge two $Ag^I$ ions, which are further coordinated by one chlorodifluoroacetate ligand, giving *T*-shaped geometries and short intramolecular Ag···Ag distances of 3.1078 (6) and 2.9950 (6) Å. In one molecule, the unique $-CF_2Cl$ group is rotationally disordered over two sites with approximate occupancies of 0.53 and 0.47 for the major and minor components, respectively.

## Related literature

The compound is isostructural with $[Ag(O_2CCF_3)(C_6H_5)_2PCH_2P(C_6H_5)_2]_2$, see: Effendy *et al.* (2005). The report also provides background literature on complexes of bis(diphenylphosphino)methane with univalent coinage metals.




## Experimental

### Crystal data

$[Ag_2(C_2ClF_2O_2)_2(C_{25}H_{22}P_2)_2]$
$M_r$ = 1243.41
Triclinic, $P\overline{1}$
$a$ = 10.8127 (3) Å
$b$ = 14.4911 (3) Å
$c$ = 17.2340 (3) Å
$\alpha$ = 83.040 (1)°
$\beta$ = 86.477 (1)°
$\gamma$ = 72.188 (1)°
$V$ = 2551.1 (1) Å$^3$
$Z$ = 2
Mo $K\alpha$ radiation
$\mu$ = 1.06 mm$^{-1}$
$T$ = 100 (2) K
0.30 × 0.20 × 0.15 mm

### Data collection

Bruker SMART APEX diffractometer
Absorption correction: multi-scan (*SADABS*; Sheldrick, 1996)
$T_{min}$ = 0.648, $T_{max}$ = 0.857
31942 measured reflections
11567 independent reflections
8338 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.066

### Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.045
$wR(F^2)$ = 0.112
$S$ = 1.01
11567 reflections
641 parameters
54 restraints
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.91 e Å$^{-3}$
$\Delta\rho_{min}$ = −1.05 e Å$^{-3}$

**Table 1**
Selected geometric parameters (Å, °).

| | | | |
|---|---|---|---|
| Ag1—O1 | 2.382 (3) | Ag2—O3 | 2.383 (3) |
| Ag1—P1 | 2.4194 (12) | Ag2—P3 | 2.430 (1) |
| Ag1—P2$^{i}$ | 2.419 (1) | Ag2—P4$^{ii}$ | 2.429 (1) |
| O1—Ag1—P1 | 100.92 (9) | O3—Ag2—P3 | 104.14 (8) |
| O1—Ag1—P2$^{i}$ | 103.78 (9) | O3—Ag2—P4$^{ii}$ | 101.43 (8) |
| P1—Ag1—P2$^{i}$ | 151.19 (4) | P3—Ag2—P4$^{ii}$ | 149.67 (4) |

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

Data collection: *APEX2* (Bruker, 2007); cell refinement: *SAINT* (Bruker, 2007); 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, 2008).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: LH2610).

## References

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Westrip, S. P. (2008). *publCIF*. In preparation.

# supporting information

*Acta Cryst.* (2008). E**64**, m717 [doi:10.1107/S1600536808011033]

# Bis[$\mu$-bis(diphenylphosphino)methane-$\kappa^2P:P'$]bis[(chlorodifluoroacetato-$\kappa O$)silver(I)](*Ag—Ag*)

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## S1. Comment

A recent report on complexes of bis(diphenylphosphino)methane with univalent coinage metals details the structure of the 1:1 adduct of the ligand with silver trifluoroacetate. The dinuclear molecule has the ligand binding to two carboxylate-bound silver atoms, who geometry is best described as being *T*-shaped (Effendy *et al.*, 2005). Replacing the trifluoroacetate ion by the chlorodifluoroacetate ion gives the isostructural title compound (I). There are two formula units in the unit cell (Figs. 1 and 2). One of the unique chlorodifluromethyl groups is ordered whereas the other is disordered.

## S2. Experimental

Silver chlorodifluoroacetate was prepared *in situ* from silver oxide (1.20 g, 5 mmol) and chlorodifluoroacetic acid (0.65 g, 5 mmol) in acetone (50 ml). The reactants were heated until the silver oxide dissolved completely. To the brown solution was added bis(diphenylphosphino)methane (3.84 g, 10 mmol) dissolved in acetone (50 ml). The mixture was heated for 30 min; the colorless filtered solution yielded prism-shaped crystals in 60% yield.

## S3. Refinement

Carbon-bound H-atoms were placed in calculated positions (C—H 0.95 to 0.99 Å) and were included in the refinement in the riding model approximation, with $U$(H) set to 1.2$U_{eq}$(C).

There is minor disorder in the chlorodifluoromethyl groups. For both the ordered and disordered groups, the C–Cl distances were restrained to within 0.01 Å of each other, as were the C–F distances. The Cl···F distances as well as the F···F distances were similarly restrained. The Cl1 atom is near the F1′ atom, the Cl1′ atom near the F1 atom and the F2 atom near the F2′ atom; for these pairs, the temperature factors were restrained to be the same. The ansiotropic temperature factors of the Cl1, F1 and F2 atoms were restrained to be nearly isotropic.

The largest peak and deepest holes area in the vicinity of the diordered chlorodifluoromethyl group.

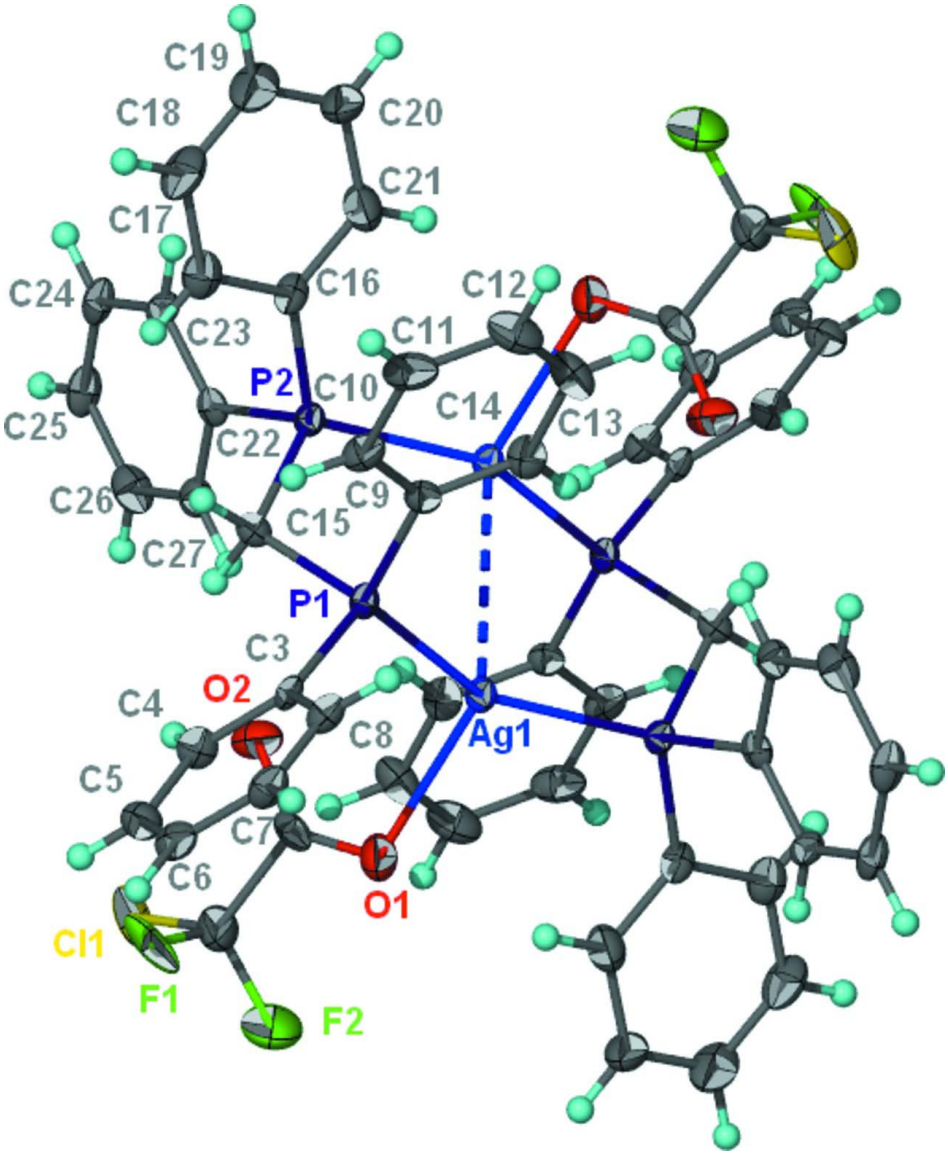


**Figure 1**

70% Probability thermal ellipsoid plot of one independent formula unit of (I). Hydrogen atoms are drawn as spheres of arbitrary radius. The disorder is not shown.

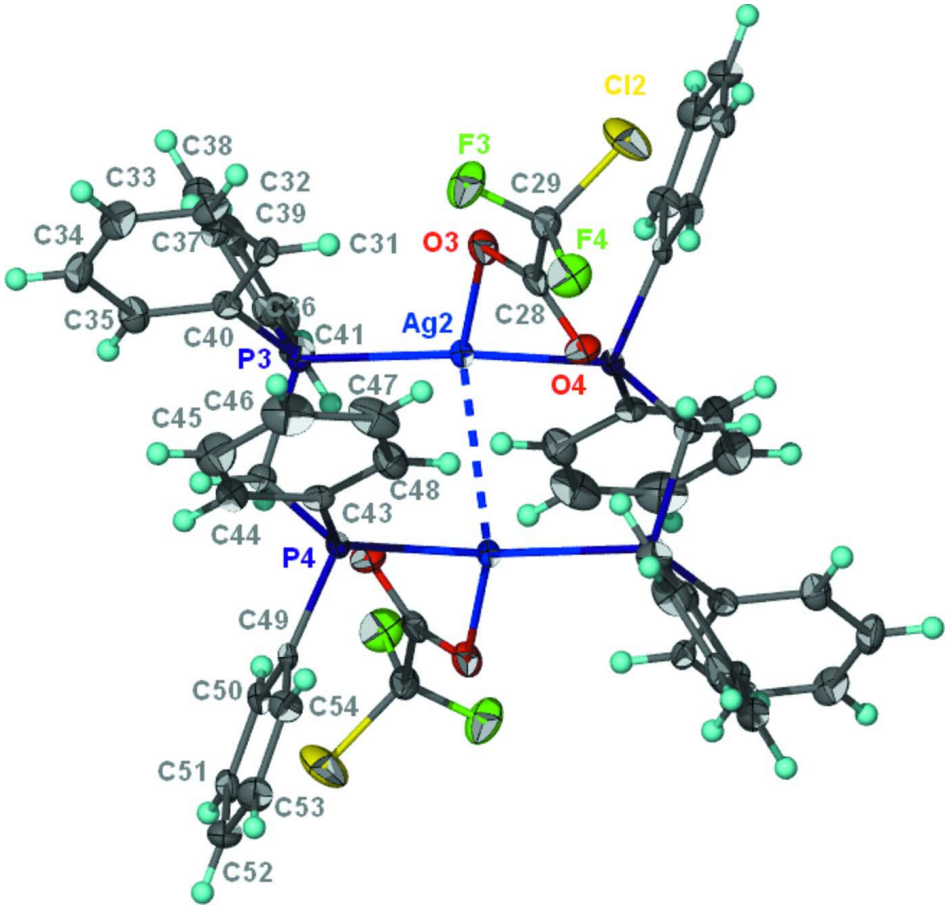


**Figure 2**

70% Probability thermal ellipsoid plot of the ither independent formula unit of (I). Hydrogen atoms are drawn as spheres of arbitrary radius.

**Bis[$\mu$-bis(diphenylphosphino)methane- $\kappa^2P$:$P'$]bis[(chlorodifluoroacetato- $\kappa O$)silver(I)](Ag—Ag)**

*Crystal data*

$[Ag_2(C_2ClF_2O_2)_2(C_{25}H_{22}P_2)_2]$
$M_r$ = 1243.41
Triclinic, $P\overline{1}$
Hall symbol: -P 1
$a$ = 10.8127 (3) Å
$b$ = 14.4911 (3) Å
$c$ = 17.2340 (3) Å
$\alpha$ = 83.040 (1)°
$\beta$ = 86.477 (1)°
$\gamma$ = 72.188 (1)°
$V$ = 2551.1 (1) Å$^3$
$Z$ = 2
$F$(000) = 1248
$D_x$ = 1.619 Mg m$^{-3}$
Mo $K\alpha$ radiation, $\lambda$ = 0.71073 Å
Cell parameters from 4611 reflections
$\theta$ = 2.3–25.1°
$\mu$ = 1.06 mm$^{-1}$
$T$ = 100 K
Block, colorless
0.30 × 0.20 × 0.15 mm

*Data collection*

Bruker SMART APEXII diffractometer
Radiation source: fine-focus sealed tube
Graphite monochromator
$\omega$ scans
Absorption correction: multi-scan (*SADABS*; Sheldrick, 1996)
$T_{min}$ = 0.648, $T_{max}$ = 0.857

31942 measured reflections
11567 independent reflections
8338 reflections with $I > 2\sigma(I)$
$R_{int} = 0.066$
$\theta_{max} = 27.5°$, $\theta_{min} = 1.2°$
$h = -14 \rightarrow 11$
$k = -18 \rightarrow 18$
$l = -22 \rightarrow 22$

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)] = 0.045$
$wR(F^2) = 0.112$
$S = 1.01$
11567 reflections
641 parameters
54 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
$w = 1/[\sigma^2(F_o^2) + (0.0475P)^2 + 0.1513P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} = 0.001$
$\Delta\rho_{max} = 0.91$ e Å$^{-3}$
$\Delta\rho_{min} = -1.05$ e Å$^{-3}$

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

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ | Occ. (<1) |
|---|---|---|---|---|---|
| Ag1 | 0.57141 (3) | 0.89080 (2) | 1.025045 (18) | 0.01359 (9) | |
| Ag2 | 0.44457 (3) | 0.57795 (2) | 0.435262 (17) | 0.01308 (9) | |
| P1 | 0.36794 (11) | 0.90512 (8) | 1.09660 (6) | 0.0128 (2) | |
| P2 | 0.21898 (11) | 1.08082 (8) | 0.99185 (6) | 0.0126 (2) | |
| P3 | 0.22156 (11) | 0.57580 (8) | 0.45928 (6) | 0.0123 (2) | |
| P4 | 0.33747 (11) | 0.49679 (8) | 0.61526 (6) | 0.0123 (2) | |
| Cl1 | 0.4662 (5) | 0.6779 (3) | 0.79374 (16) | 0.0304 (8) | 0.528 (4) |
| Cl1′ | 0.4581 (6) | 0.5832 (3) | 0.9291 (2) | 0.0379 (9) | 0.472 (4) |
| Cl2 | 0.57724 (14) | 0.91381 (9) | 0.36753 (7) | 0.0349 (3) | |
| F1 | 0.4587 (11) | 0.6087 (7) | 0.9329 (5) | 0.0379 (9) | 0.528 (4) |
| F2 | 0.6495 (6) | 0.5949 (9) | 0.8867 (7) | 0.057 (3) | 0.528 (4) |
| F1′ | 0.4795 (11) | 0.6915 (7) | 0.8078 (4) | 0.0304 (8) | 0.47 |
| F2′ | 0.6572 (6) | 0.6182 (9) | 0.8661 (8) | 0.057 (3) | 0.47 |
| F3 | 0.3672 (3) | 0.93038 (18) | 0.44623 (16) | 0.0303 (7) | |
| F4 | 0.5391 (3) | 0.89416 (18) | 0.51371 (14) | 0.0281 (7) | |
| O1 | 0.6050 (3) | 0.7406 (2) | 0.97176 (19) | 0.0252 (8) | |
| O2 | 0.4233 (3) | 0.8250 (2) | 0.90831 (18) | 0.0250 (8) | |
| O3 | 0.4269 (3) | 0.7468 (2) | 0.40995 (17) | 0.0194 (7) | |
| O4 | 0.5974 (3) | 0.7093 (2) | 0.48919 (17) | 0.0210 (7) | |
| C1 | 0.5177 (5) | 0.7528 (3) | 0.9251 (3) | 0.0177 (10) | |
| C2 | 0.5279 (4) | 0.6620 (3) | 0.8834 (2) | 0.0320 (13) | |
| C3 | 0.3471 (4) | 0.7884 (3) | 1.1364 (2) | 0.0134 (9) | |
| C4 | 0.3135 (5) | 0.7311 (3) | 1.0871 (2) | 0.0182 (10) | |
| H4 | 0.2984 | 0.7544 | 1.0335 | 0.022* | |
| C5 | 0.3020 (5) | 0.6412 (3) | 1.1149 (3) | 0.0203 (10) | |
| H5 | 0.2785 | 0.6030 | 1.0807 | 0.024* | |
| C6 | 0.3245 (4) | 0.6058 (3) | 1.1930 (3) | 0.0195 (10) | |
| H6 | 0.3159 | 0.5438 | 1.2125 | 0.023* | |
| C7 | 0.3599 (4) | 0.6621 (3) | 1.2422 (3) | 0.0192 (10) | |
| H7 | 0.3757 | 0.6381 | 1.2956 | 0.023* | |

| | | | | |
|---|---|---|---|---|
| C8 | 0.3725 (4) | 0.7528 (3) | 1.2146 (2) | 0.0176 (10) |
| H8 | 0.3981 | 0.7903 | 1.2486 | 0.021* |
| C9 | 0.3251 (4) | 0.9819 (3) | 1.1755 (2) | 0.0151 (9) |
| C10 | 0.2197 (5) | 0.9807 (3) | 1.2262 (2) | 0.0196 (10) |
| H10 | 0.1697 | 0.9385 | 1.2203 | 0.023* |
| C11 | 0.1883 (5) | 1.0417 (3) | 1.2856 (3) | 0.0247 (11) |
| H11 | 0.1177 | 1.0401 | 1.3208 | 0.030* |
| C12 | 0.2601 (5) | 1.1050 (3) | 1.2934 (3) | 0.0284 (12) |
| H12 | 0.2387 | 1.1464 | 1.3341 | 0.034* |
| C13 | 0.3617 (5) | 1.1072 (3) | 1.2422 (3) | 0.0250 (11) |
| H13 | 0.4094 | 1.1515 | 1.2467 | 0.030* |
| C14 | 0.3950 (5) | 1.0457 (3) | 1.1842 (3) | 0.0197 (10) |
| H14 | 0.4666 | 1.0470 | 1.1497 | 0.024* |
| C15 | 0.2313 (4) | 0.9546 (3) | 1.0303 (2) | 0.0147 (9) |
| H15A | 0.1496 | 0.9527 | 1.0588 | 0.018* |
| H15B | 0.2440 | 0.9141 | 0.9865 | 0.018* |
| C16 | 0.0933 (4) | 1.1592 (3) | 1.0494 (2) | 0.0161 (9) |
| C17 | −0.0165 (5) | 1.1347 (3) | 1.0790 (2) | 0.0213 (10) |
| H17 | −0.0218 | 1.0712 | 1.0751 | 0.026* |
| C18 | −0.1181 (5) | 1.2016 (4) | 1.1138 (3) | 0.0282 (12) |
| H18 | −0.1916 | 1.1837 | 1.1352 | 0.034* |
| C19 | −0.1112 (5) | 1.2954 (4) | 1.1172 (3) | 0.0331 (13) |
| H19 | −0.1813 | 1.3419 | 1.1402 | 0.040* |
| C20 | −0.0046 (5) | 1.3213 (4) | 1.0877 (3) | 0.0312 (13) |
| H20 | −0.0015 | 1.3857 | 1.0901 | 0.037* |
| C21 | 0.1000 (5) | 1.2531 (3) | 1.0541 (3) | 0.0257 (11) |
| H21 | 0.1749 | 1.2706 | 1.0347 | 0.031* |
| C22 | 0.1465 (4) | 1.0963 (3) | 0.8966 (2) | 0.0136 (9) |
| C23 | 0.0346 (4) | 1.1716 (3) | 0.8754 (2) | 0.0153 (9) |
| H23 | −0.0120 | 1.2131 | 0.9129 | 0.018* |
| C24 | −0.0092 (5) | 1.1862 (3) | 0.7991 (2) | 0.0192 (10) |
| H24 | −0.0854 | 1.2377 | 0.7847 | 0.023* |
| C25 | 0.0581 (5) | 1.1261 (3) | 0.7447 (2) | 0.0201 (10) |
| H25 | 0.0284 | 1.1363 | 0.6927 | 0.024* |
| C26 | 0.1690 (5) | 1.0508 (3) | 0.7656 (3) | 0.0228 (11) |
| H26 | 0.2148 | 1.0092 | 0.7279 | 0.027* |
| C27 | 0.2132 (5) | 1.0358 (3) | 0.8403 (2) | 0.0175 (10) |
| H27 | 0.2896 | 0.9841 | 0.8540 | 0.021* |
| C28 | 0.5066 (4) | 0.7659 (3) | 0.4504 (2) | 0.0159 (9) |
| C29 | 0.4938 (4) | 0.8749 (3) | 0.4479 (2) | 0.0180 (10) |
| C30 | 0.0954 (4) | 0.6894 (3) | 0.4722 (2) | 0.0147 (9) |
| C31 | 0.1256 (4) | 0.7772 (3) | 0.4582 (2) | 0.0150 (9) |
| H31 | 0.2112 | 0.7774 | 0.4423 | 0.018* |
| C32 | 0.0285 (5) | 0.8645 (3) | 0.4677 (2) | 0.0186 (10) |
| H32 | 0.0485 | 0.9244 | 0.4587 | 0.022* |
| C33 | −0.0963 (5) | 0.8647 (3) | 0.4902 (3) | 0.0225 (11) |
| H33 | −0.1615 | 0.9248 | 0.4963 | 0.027* |
| C34 | −0.1273 (5) | 0.7780 (3) | 0.5038 (3) | 0.0230 (11) |

| | | | | |
|---|---|---|---|---|
| H34 | −0.2133 | 0.7782 | 0.5191 | 0.028* |
| C35 | −0.0303 (5) | 0.6904 (3) | 0.4948 (2) | 0.0189 (10) |
| H35 | −0.0507 | 0.6307 | 0.5043 | 0.023* |
| C36 | 0.1645 (4) | 0.5244 (3) | 0.3820 (2) | 0.0129 (9) |
| C37 | 0.0671 (4) | 0.5790 (3) | 0.3314 (2) | 0.0156 (9) |
| H37 | 0.0206 | 0.6443 | 0.3399 | 0.019* |
| C38 | 0.0372 (5) | 0.5388 (4) | 0.2684 (3) | 0.0244 (11) |
| H38 | −0.0290 | 0.5767 | 0.2337 | 0.029* |
| C39 | 0.1038 (5) | 0.4439 (3) | 0.2564 (3) | 0.0231 (11) |
| H39 | 0.0833 | 0.4165 | 0.2133 | 0.028* |
| C40 | 0.1998 (5) | 0.3883 (3) | 0.3063 (3) | 0.0231 (11) |
| H40 | 0.2447 | 0.3227 | 0.2981 | 0.028* |
| C41 | 0.2302 (5) | 0.4287 (3) | 0.3684 (3) | 0.0199 (10) |
| H41 | 0.2972 | 0.3905 | 0.4024 | 0.024* |
| C42 | 0.2131 (4) | 0.4938 (3) | 0.5487 (2) | 0.0137 (9) |
| H42A | 0.1259 | 0.5155 | 0.5740 | 0.016* |
| H42B | 0.2286 | 0.4266 | 0.5354 | 0.016* |
| C43 | 0.2848 (4) | 0.6229 (3) | 0.6363 (2) | 0.0134 (9) |
| C44 | 0.1606 (5) | 0.6641 (3) | 0.6664 (2) | 0.0200 (10) |
| H44 | 0.1048 | 0.6248 | 0.6792 | 0.024* |
| C45 | 0.1174 (5) | 0.7612 (3) | 0.6780 (3) | 0.0274 (12) |
| H45 | 0.0329 | 0.7884 | 0.6995 | 0.033* |
| C46 | 0.1990 (6) | 0.8198 (3) | 0.6579 (3) | 0.0313 (13) |
| H46 | 0.1688 | 0.8873 | 0.6644 | 0.038* |
| C47 | 0.3228 (6) | 0.7794 (3) | 0.6289 (3) | 0.0306 (13) |
| H47 | 0.3781 | 0.8191 | 0.6159 | 0.037* |
| C48 | 0.3675 (5) | 0.6805 (3) | 0.6185 (3) | 0.0219 (10) |
| H48 | 0.4536 | 0.6526 | 0.5994 | 0.026* |
| C49 | 0.3078 (4) | 0.4276 (3) | 0.7060 (2) | 0.0132 (9) |
| C50 | 0.2893 (4) | 0.3372 (3) | 0.7047 (2) | 0.0159 (9) |
| H50 | 0.2852 | 0.3139 | 0.6560 | 0.019* |
| C51 | 0.2767 (4) | 0.2804 (3) | 0.7737 (3) | 0.0182 (10) |
| H51 | 0.2634 | 0.2189 | 0.7722 | 0.022* |
| C52 | 0.2837 (5) | 0.3134 (3) | 0.8447 (3) | 0.0220 (10) |
| H52 | 0.2737 | 0.2750 | 0.8920 | 0.026* |
| C53 | 0.3050 (5) | 0.4020 (3) | 0.8470 (3) | 0.0220 (10) |
| H53 | 0.3121 | 0.4237 | 0.8959 | 0.026* |
| C54 | 0.3161 (5) | 0.4597 (3) | 0.7781 (2) | 0.0175 (10) |
| H54 | 0.3295 | 0.5212 | 0.7800 | 0.021* |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Ag1 | 0.01193 (18) | 0.01480 (16) | 0.01485 (16) | −0.00570 (13) | 0.00048 (13) | −0.00078 (12) |
| Ag2 | 0.01034 (18) | 0.01539 (16) | 0.01353 (16) | −0.00444 (13) | 0.00060 (13) | −0.00059 (12) |
| P1 | 0.0113 (6) | 0.0147 (5) | 0.0135 (5) | −0.0060 (5) | 0.0002 (4) | −0.0003 (4) |
| P2 | 0.0111 (6) | 0.0137 (5) | 0.0135 (5) | −0.0050 (5) | 0.0003 (4) | −0.0001 (4) |
| P3 | 0.0109 (6) | 0.0130 (5) | 0.0129 (5) | −0.0037 (5) | −0.0005 (4) | −0.0009 (4) |

| | | | | | | |
|---|---|---|---|---|---|---|
| P4 | 0.0109 (6) | 0.0134 (5) | 0.0130 (5) | −0.0049 (4) | 0.0006 (4) | −0.0003 (4) |
| Cl1 | 0.0465 (17) | 0.0385 (15) | 0.0165 (13) | −0.0238 (11) | −0.0117 (11) | −0.0080 (11) |
| Cl1′ | 0.0584 (16) | 0.025 (2) | 0.0436 (13) | −0.0322 (17) | 0.0145 (11) | −0.0131 (13) |
| Cl2 | 0.0471 (9) | 0.0215 (6) | 0.0367 (7) | −0.0159 (6) | 0.0141 (6) | 0.0016 (5) |
| F1 | 0.0584 (16) | 0.025 (2) | 0.0436 (13) | −0.0322 (17) | 0.0145 (11) | −0.0131 (13) |
| F2 | 0.038 (3) | 0.042 (5) | 0.091 (6) | 0.000 (2) | 0.001 (3) | −0.041 (4) |
| F1′ | 0.0465 (17) | 0.0385 (15) | 0.0165 (13) | −0.0238 (11) | −0.0117 (11) | −0.0080 (11) |
| F2′ | 0.038 (3) | 0.042 (5) | 0.091 (6) | 0.000 (2) | 0.001 (3) | −0.041 (4) |
| F3 | 0.0203 (17) | 0.0193 (14) | 0.0465 (18) | 0.0022 (12) | −0.0024 (14) | −0.0060 (12) |
| F4 | 0.0327 (18) | 0.0242 (14) | 0.0307 (15) | −0.0107 (13) | −0.0047 (13) | −0.0084 (12) |
| O1 | 0.020 (2) | 0.0295 (18) | 0.0294 (18) | −0.0095 (15) | −0.0020 (15) | −0.0104 (14) |
| O2 | 0.023 (2) | 0.0186 (16) | 0.0300 (18) | −0.0023 (15) | 0.0043 (15) | −0.0004 (14) |
| O3 | 0.0178 (18) | 0.0216 (16) | 0.0220 (16) | −0.0112 (14) | −0.0002 (14) | −0.0012 (13) |
| O4 | 0.0201 (19) | 0.0148 (15) | 0.0239 (17) | −0.0009 (14) | −0.0021 (14) | 0.0031 (13) |
| C1 | 0.021 (3) | 0.017 (2) | 0.019 (2) | −0.013 (2) | 0.009 (2) | −0.0082 (18) |
| C2 | 0.023 (3) | 0.033 (3) | 0.044 (3) | −0.007 (2) | −0.001 (3) | −0.021 (2) |
| C3 | 0.007 (2) | 0.016 (2) | 0.017 (2) | −0.0036 (18) | −0.0012 (17) | −0.0001 (16) |
| C4 | 0.020 (3) | 0.019 (2) | 0.015 (2) | −0.006 (2) | −0.0015 (19) | 0.0017 (17) |
| C5 | 0.022 (3) | 0.017 (2) | 0.022 (2) | −0.005 (2) | −0.002 (2) | −0.0024 (18) |
| C6 | 0.014 (3) | 0.019 (2) | 0.024 (2) | −0.0048 (19) | 0.0042 (19) | 0.0008 (18) |
| C7 | 0.016 (3) | 0.021 (2) | 0.019 (2) | −0.004 (2) | −0.0037 (19) | 0.0054 (18) |
| C8 | 0.012 (2) | 0.021 (2) | 0.018 (2) | −0.0034 (19) | −0.0001 (18) | 0.0004 (17) |
| C9 | 0.016 (2) | 0.012 (2) | 0.016 (2) | −0.0035 (18) | −0.0012 (18) | −0.0003 (16) |
| C10 | 0.015 (3) | 0.020 (2) | 0.021 (2) | −0.003 (2) | 0.0019 (19) | −0.0012 (18) |
| C11 | 0.025 (3) | 0.018 (2) | 0.027 (3) | −0.002 (2) | 0.009 (2) | 0.0006 (19) |
| C12 | 0.039 (3) | 0.021 (2) | 0.024 (3) | −0.007 (2) | 0.001 (2) | −0.008 (2) |
| C13 | 0.034 (3) | 0.021 (2) | 0.024 (2) | −0.015 (2) | 0.001 (2) | −0.0048 (19) |
| C14 | 0.020 (3) | 0.022 (2) | 0.018 (2) | −0.008 (2) | −0.0010 (19) | −0.0002 (18) |
| C15 | 0.017 (2) | 0.013 (2) | 0.015 (2) | −0.0049 (18) | −0.0005 (18) | −0.0024 (16) |
| C16 | 0.014 (2) | 0.024 (2) | 0.011 (2) | −0.0063 (19) | 0.0009 (18) | −0.0048 (17) |
| C17 | 0.021 (3) | 0.026 (2) | 0.018 (2) | −0.009 (2) | −0.004 (2) | 0.0018 (18) |
| C18 | 0.016 (3) | 0.044 (3) | 0.024 (3) | −0.008 (2) | 0.004 (2) | −0.007 (2) |
| C19 | 0.022 (3) | 0.045 (3) | 0.032 (3) | −0.003 (3) | 0.004 (2) | −0.024 (2) |
| C20 | 0.019 (3) | 0.029 (3) | 0.045 (3) | 0.000 (2) | −0.004 (2) | −0.020 (2) |
| C21 | 0.024 (3) | 0.027 (3) | 0.031 (3) | −0.012 (2) | 0.001 (2) | −0.009 (2) |
| C22 | 0.016 (2) | 0.014 (2) | 0.013 (2) | −0.0093 (18) | 0.0002 (18) | 0.0012 (16) |
| C23 | 0.010 (2) | 0.015 (2) | 0.020 (2) | −0.0039 (18) | 0.0005 (18) | 0.0000 (17) |
| C24 | 0.014 (3) | 0.023 (2) | 0.022 (2) | −0.010 (2) | −0.0038 (19) | 0.0060 (18) |
| C25 | 0.019 (3) | 0.030 (3) | 0.014 (2) | −0.012 (2) | −0.0054 (19) | 0.0037 (18) |
| C26 | 0.028 (3) | 0.025 (2) | 0.019 (2) | −0.014 (2) | 0.004 (2) | −0.0053 (19) |
| C27 | 0.016 (3) | 0.017 (2) | 0.021 (2) | −0.0079 (19) | −0.0008 (19) | 0.0000 (17) |
| C28 | 0.015 (3) | 0.012 (2) | 0.021 (2) | −0.0068 (19) | 0.0046 (19) | −0.0003 (17) |
| C29 | 0.016 (3) | 0.015 (2) | 0.024 (2) | −0.0062 (19) | −0.0003 (19) | −0.0011 (17) |
| C30 | 0.016 (2) | 0.013 (2) | 0.014 (2) | −0.0036 (18) | 0.0009 (18) | −0.0013 (16) |
| C31 | 0.011 (2) | 0.021 (2) | 0.013 (2) | −0.0050 (19) | −0.0018 (17) | −0.0012 (17) |
| C32 | 0.020 (3) | 0.012 (2) | 0.020 (2) | 0.0007 (19) | −0.004 (2) | −0.0034 (17) |
| C33 | 0.020 (3) | 0.019 (2) | 0.023 (2) | 0.004 (2) | 0.002 (2) | −0.0086 (19) |
| C34 | 0.013 (3) | 0.031 (3) | 0.023 (2) | −0.003 (2) | 0.001 (2) | −0.006 (2) |

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|---|---|---|---|---|---|---|
| C35 | 0.018 (3) | 0.021 (2) | 0.020 (2) | −0.009 (2) | 0.0002 (19) | −0.0050 (18) |
| C36 | 0.013 (2) | 0.015 (2) | 0.014 (2) | −0.0087 (18) | 0.0016 (17) | −0.0031 (16) |
| C37 | 0.013 (2) | 0.017 (2) | 0.015 (2) | −0.0030 (19) | 0.0003 (18) | −0.0002 (17) |
| C38 | 0.019 (3) | 0.038 (3) | 0.016 (2) | −0.009 (2) | −0.001 (2) | 0.001 (2) |
| C39 | 0.022 (3) | 0.038 (3) | 0.018 (2) | −0.021 (2) | 0.002 (2) | −0.007 (2) |
| C40 | 0.030 (3) | 0.019 (2) | 0.027 (2) | −0.016 (2) | 0.004 (2) | −0.0079 (19) |
| C41 | 0.023 (3) | 0.018 (2) | 0.018 (2) | −0.006 (2) | −0.002 (2) | 0.0007 (17) |
| C42 | 0.015 (2) | 0.014 (2) | 0.013 (2) | −0.0052 (18) | −0.0007 (17) | −0.0006 (16) |
| C43 | 0.018 (3) | 0.0097 (19) | 0.013 (2) | −0.0049 (18) | −0.0027 (18) | −0.0007 (15) |
| C44 | 0.019 (3) | 0.022 (2) | 0.019 (2) | −0.007 (2) | 0.0006 (19) | −0.0004 (18) |
| C45 | 0.026 (3) | 0.025 (3) | 0.028 (3) | −0.001 (2) | 0.003 (2) | −0.010 (2) |
| C46 | 0.047 (4) | 0.016 (2) | 0.030 (3) | −0.007 (2) | 0.000 (3) | −0.009 (2) |
| C47 | 0.050 (4) | 0.025 (3) | 0.026 (3) | −0.024 (3) | 0.001 (3) | −0.005 (2) |
| C48 | 0.024 (3) | 0.023 (2) | 0.022 (2) | −0.012 (2) | 0.002 (2) | −0.0037 (19) |
| C49 | 0.007 (2) | 0.017 (2) | 0.013 (2) | −0.0013 (18) | 0.0032 (17) | 0.0004 (16) |
| C50 | 0.011 (2) | 0.019 (2) | 0.018 (2) | −0.0071 (19) | 0.0013 (18) | −0.0008 (17) |
| C51 | 0.011 (2) | 0.014 (2) | 0.026 (2) | −0.0019 (18) | 0.0048 (19) | 0.0013 (18) |
| C52 | 0.021 (3) | 0.023 (2) | 0.020 (2) | −0.006 (2) | −0.003 (2) | 0.0061 (18) |
| C53 | 0.022 (3) | 0.028 (3) | 0.016 (2) | −0.008 (2) | −0.001 (2) | −0.0031 (19) |
| C54 | 0.020 (3) | 0.014 (2) | 0.018 (2) | −0.0048 (19) | 0.0010 (19) | −0.0026 (17) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Ag1—O1 | 2.382 (3) | C18—H18 | 0.9500 |
| Ag1—P1 | 2.4194 (12) | C19—C20 | 1.370 (7) |
| Ag1—P2$^{i}$ | 2.419 (1) | C19—H19 | 0.9500 |
| Ag1—Ag1$^{i}$ | 3.1078 (6) | C20—C21 | 1.402 (7) |
| Ag2—O3 | 2.383 (3) | C20—H20 | 0.9500 |
| Ag2—P3 | 2.430 (1) | C21—H21 | 0.9500 |
| Ag2—P4$^{ii}$ | 2.429 (1) | C22—C23 | 1.392 (6) |
| Ag2—Ag2$^{ii}$ | 2.9950 (6) | C22—C27 | 1.401 (6) |
| P1—C9 | 1.810 (4) | C23—C24 | 1.395 (6) |
| P1—C3 | 1.821 (4) | C23—H23 | 0.9500 |
| P1—C15 | 1.834 (4) | C24—C25 | 1.376 (6) |
| P2—C16 | 1.813 (4) | C24—H24 | 0.9500 |
| P2—C22 | 1.822 (4) | C25—C26 | 1.385 (6) |
| P2—C15 | 1.836 (4) | C25—H25 | 0.9500 |
| P2—Ag1$^{i}$ | 2.4188 (12) | C26—C27 | 1.370 (6) |
| P3—C30 | 1.816 (4) | C26—H26 | 0.9500 |
| P3—C36 | 1.825 (4) | C27—H27 | 0.9500 |
| P3—C42 | 1.843 (4) | C28—C29 | 1.539 (5) |
| P4—C43 | 1.816 (4) | C30—C35 | 1.387 (6) |
| P4—C49 | 1.818 (4) | C30—C31 | 1.397 (6) |
| P4—C42 | 1.834 (4) | C31—C32 | 1.395 (6) |
| P4—Ag2$^{ii}$ | 2.4291 (12) | C31—H31 | 0.9500 |
| Cl1—C2 | 1.683 (5) | C32—C33 | 1.380 (7) |
| Cl1′—C2 | 1.652 (5) | C32—H32 | 0.9500 |
| Cl2—C29 | 1.737 (4) | C33—C34 | 1.387 (6) |

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|---|---|---|---|
| F1—C2 | 1.413 (6) | C33—H33 | 0.9500 |
| F2—C2 | 1.375 (7) | C34—C35 | 1.395 (6) |
| F1′—C2 | 1.402 (6) | C34—H34 | 0.9500 |
| F2′—C2 | 1.378 (7) | C35—H35 | 0.9500 |
| F3—C29 | 1.360 (4) | C36—C37 | 1.390 (6) |
| F4—C29 | 1.354 (4) | C36—C41 | 1.392 (6) |
| O1—C1 | 1.235 (5) | C37—C38 | 1.392 (6) |
| O2—C1 | 1.236 (5) | C37—H37 | 0.9500 |
| O3—C28 | 1.254 (5) | C38—C39 | 1.378 (7) |
| O4—C28 | 1.240 (5) | C38—H38 | 0.9500 |
| C1—C2 | 1.547 (6) | C39—C40 | 1.377 (7) |
| C3—C4 | 1.392 (6) | C39—H39 | 0.9500 |
| C3—C8 | 1.397 (5) | C40—C41 | 1.382 (6) |
| C4—C5 | 1.372 (6) | C40—H40 | 0.9500 |
| C4—H4 | 0.9500 | C41—H41 | 0.9500 |
| C5—C6 | 1.388 (6) | C42—H42A | 0.9900 |
| C5—H5 | 0.9500 | C42—H42B | 0.9900 |
| C6—C7 | 1.389 (6) | C43—C44 | 1.388 (6) |
| C6—H6 | 0.9500 | C43—C48 | 1.397 (6) |
| C7—C8 | 1.386 (6) | C44—C45 | 1.376 (6) |
| C7—H7 | 0.9500 | C44—H44 | 0.9500 |
| C8—H8 | 0.9500 | C45—C46 | 1.402 (7) |
| C9—C14 | 1.386 (6) | C45—H45 | 0.9500 |
| C9—C10 | 1.396 (6) | C46—C47 | 1.376 (8) |
| C10—C11 | 1.390 (6) | C46—H46 | 0.9500 |
| C10—H10 | 0.9500 | C47—C48 | 1.395 (6) |
| C11—C12 | 1.393 (7) | C47—H47 | 0.9500 |
| C11—H11 | 0.9500 | C48—H48 | 0.9500 |
| C12—C13 | 1.373 (7) | C49—C50 | 1.387 (6) |
| C12—H12 | 0.9500 | C49—C54 | 1.396 (6) |
| C13—C14 | 1.378 (6) | C50—C51 | 1.387 (6) |
| C13—H13 | 0.9500 | C50—H50 | 0.9500 |
| C14—H14 | 0.9500 | C51—C52 | 1.380 (6) |
| C15—H15A | 0.9900 | C51—H51 | 0.9500 |
| C15—H15B | 0.9900 | C52—C53 | 1.378 (6) |
| C16—C17 | 1.390 (6) | C52—H52 | 0.9500 |
| C16—C21 | 1.397 (6) | C53—C54 | 1.387 (6) |
| C17—C18 | 1.384 (7) | C53—H53 | 0.9500 |
| C17—H17 | 0.9500 | C54—H54 | 0.9500 |
| C18—C19 | 1.392 (7) | | |

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| O1—Ag1—P1 | 100.92 (9) | C21—C20—H20 | 119.9 |
| O1—Ag1—P2$^{i}$ | 103.78 (9) | C16—C21—C20 | 119.4 (5) |
| P1—Ag1—P2$^{i}$ | 151.19 (4) | C16—C21—H21 | 120.3 |
| O1—Ag1—Ag1$^{i}$ | 136.10 (8) | C20—C21—H21 | 120.3 |
| P2$^{i}$—Ag1—Ag1$^{i}$ | 91.48 (3) | C23—C22—C27 | 118.9 (4) |
| P1—Ag1—Ag1$^{i}$ | 80.72 (3) | C23—C22—P2 | 122.4 (3) |
| O3—Ag2—P3 | 104.14 (8) | C27—C22—P2 | 118.4 (3) |

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| O3—Ag2—P4$^{ii}$ | 101.43 (8) | C22—C23—C24 | 120.1 (4) |
| P3—Ag2—P4$^{ii}$ | 149.67 (4) | C22—C23—H23 | 120.0 |
| O3—Ag2—Ag2$^{ii}$ | 134.22 (7) | C24—C23—H23 | 120.0 |
| P4$^{ii}$—Ag2—Ag2$^{ii}$ | 78.04 (3) | C25—C24—C23 | 120.0 (4) |
| P3—Ag2—Ag2$^{ii}$ | 95.23 (3) | C25—C24—H24 | 120.0 |
| C9—P1—C3 | 105.99 (19) | C23—C24—H24 | 120.0 |
| C9—P1—C15 | 103.98 (19) | C24—C25—C26 | 120.1 (4) |
| C3—P1—C15 | 102.13 (19) | C24—C25—H25 | 119.9 |
| C9—P1—Ag1 | 119.10 (15) | C26—C25—H25 | 119.9 |
| C3—P1—Ag1 | 113.66 (15) | C27—C26—C25 | 120.4 (4) |
| C15—P1—Ag1 | 110.26 (15) | C27—C26—H26 | 119.8 |
| C16—P2—C22 | 103.7 (2) | C25—C26—H26 | 119.8 |
| C16—P2—C15 | 106.9 (2) | C26—C27—C22 | 120.5 (4) |
| C22—P2—C15 | 104.17 (18) | C26—C27—H27 | 119.8 |
| C16—P2—Ag1$^{i}$ | 118.83 (15) | C22—C27—H27 | 119.8 |
| C22—P2—Ag1$^{i}$ | 109.27 (15) | O4—C28—O3 | 129.2 (4) |
| C15—P2—Ag1$^{i}$ | 112.61 (15) | O4—C28—C29 | 115.7 (4) |
| C30—P3—C36 | 105.1 (2) | O3—C28—C29 | 115.0 (4) |
| C30—P3—C42 | 105.46 (19) | F4—C29—F3 | 104.5 (3) |
| C36—P3—C42 | 104.87 (18) | F4—C29—C28 | 111.2 (3) |
| C30—P3—Ag2 | 119.03 (15) | F3—C29—C28 | 111.3 (3) |
| C36—P3—Ag2 | 112.02 (15) | F4—C29—Cl2 | 108.8 (3) |
| C42—P3—Ag2 | 109.25 (15) | F3—C29—Cl2 | 109.3 (3) |
| C43—P4—C49 | 104.85 (19) | C28—C29—Cl2 | 111.5 (3) |
| C43—P4—C42 | 102.48 (19) | C35—C30—C31 | 119.7 (4) |
| C49—P4—C42 | 105.27 (19) | C35—C30—P3 | 121.1 (3) |
| C43—P4—Ag2$^{ii}$ | 121.28 (15) | C31—C30—P3 | 119.3 (3) |
| C49—P4—Ag2$^{ii}$ | 109.90 (14) | C32—C31—C30 | 119.2 (4) |
| C42—P4—Ag2$^{ii}$ | 111.71 (14) | C32—C31—H31 | 120.4 |
| C1—O1—Ag1 | 107.5 (3) | C30—C31—H31 | 120.4 |
| C28—O3—Ag2 | 109.5 (3) | C33—C32—C31 | 120.7 (4) |
| O1—C1—O2 | 130.1 (4) | C33—C32—H32 | 119.7 |
| O1—C1—C2 | 113.9 (4) | C31—C32—H32 | 119.7 |
| O2—C1—C2 | 115.9 (4) | C32—C33—C34 | 120.5 (4) |
| F2′—C2—F1′ | 100.4 (6) | C32—C33—H33 | 119.8 |
| F2—C2—F1 | 99.3 (6) | C34—C33—H33 | 119.8 |
| F2—C2—C1 | 113.2 (7) | C33—C34—C35 | 119.1 (5) |
| F2′—C2—C1 | 108.0 (8) | C33—C34—H34 | 120.5 |
| F1′—C2—C1 | 109.5 (5) | C35—C34—H34 | 120.5 |
| F1—C2—C1 | 105.0 (5) | C30—C35—C34 | 120.9 (4) |
| F2′—C2—Cl1′ | 111.8 (6) | C30—C35—H35 | 119.6 |
| F1′—C2—Cl1′ | 109.7 (4) | C34—C35—H35 | 119.6 |
| C1—C2—Cl1′ | 116.3 (3) | C37—C36—C41 | 118.4 (4) |
| F2—C2—Cl1 | 111.4 (6) | C37—C36—P3 | 123.0 (3) |
| F1—C2—Cl1 | 106.8 (5) | C41—C36—P3 | 118.2 (3) |
| C1—C2—Cl1 | 118.8 (3) | C36—C37—C38 | 120.5 (4) |
| C4—C3—C8 | 119.5 (4) | C36—C37—H37 | 119.7 |
| C4—C3—P1 | 119.6 (3) | C38—C37—H37 | 119.7 |

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| C8—C3—P1 | 120.8 (3) | C39—C38—C37 | 119.8 (4) |
| C5—C4—C3 | 120.8 (4) | C39—C38—H38 | 120.1 |
| C5—C4—H4 | 119.6 | C37—C38—H38 | 120.1 |
| C3—C4—H4 | 119.6 | C40—C39—C38 | 120.6 (4) |
| C4—C5—C6 | 120.3 (4) | C40—C39—H39 | 119.7 |
| C4—C5—H5 | 119.9 | C38—C39—H39 | 119.7 |
| C6—C5—H5 | 119.9 | C39—C40—C41 | 119.6 (4) |
| C5—C6—C7 | 119.2 (4) | C39—C40—H40 | 120.2 |
| C5—C6—H6 | 120.4 | C41—C40—H40 | 120.2 |
| C7—C6—H6 | 120.4 | C40—C41—C36 | 121.2 (4) |
| C8—C7—C6 | 121.1 (4) | C40—C41—H41 | 119.4 |
| C8—C7—H7 | 119.5 | C36—C41—H41 | 119.4 |
| C6—C7—H7 | 119.5 | P4—C42—P3 | 108.4 (2) |
| C7—C8—C3 | 119.1 (4) | P4—C42—H42A | 110.0 |
| C7—C8—H8 | 120.4 | P3—C42—H42A | 110.0 |
| C3—C8—H8 | 120.4 | P4—C42—H42B | 110.0 |
| C14—C9—C10 | 119.2 (4) | P3—C42—H42B | 110.0 |
| C14—C9—P1 | 119.6 (4) | H42A—C42—H42B | 108.4 |
| C10—C9—P1 | 121.2 (3) | C44—C43—C48 | 119.6 (4) |
| C11—C10—C9 | 119.7 (4) | C44—C43—P4 | 120.6 (3) |
| C11—C10—H10 | 120.1 | C48—C43—P4 | 119.7 (4) |
| C9—C10—H10 | 120.1 | C45—C44—C43 | 120.8 (4) |
| C10—C11—C12 | 120.2 (5) | C45—C44—H44 | 119.6 |
| C10—C11—H11 | 119.9 | C43—C44—H44 | 119.6 |
| C12—C11—H11 | 119.9 | C44—C45—C46 | 119.6 (5) |
| C13—C12—C11 | 119.8 (4) | C44—C45—H45 | 120.2 |
| C13—C12—H12 | 120.1 | C46—C45—H45 | 120.2 |
| C11—C12—H12 | 120.1 | C47—C46—C45 | 119.9 (4) |
| C12—C13—C14 | 120.4 (5) | C47—C46—H46 | 120.0 |
| C12—C13—H13 | 119.8 | C45—C46—H46 | 120.0 |
| C14—C13—H13 | 119.8 | C46—C47—C48 | 120.5 (5) |
| C13—C14—C9 | 120.8 (5) | C46—C47—H47 | 119.8 |
| C13—C14—H14 | 119.6 | C48—C47—H47 | 119.8 |
| C9—C14—H14 | 119.6 | C47—C48—C43 | 119.5 (5) |
| P1—C15—P2 | 110.3 (2) | C47—C48—H48 | 120.3 |
| P1—C15—H15A | 109.6 | C43—C48—H48 | 120.3 |
| P2—C15—H15A | 109.6 | C50—C49—C54 | 118.8 (4) |
| P1—C15—H15B | 109.6 | C50—C49—P4 | 120.2 (3) |
| P2—C15—H15B | 109.6 | C54—C49—P4 | 120.7 (3) |
| H15A—C15—H15B | 108.1 | C51—C50—C49 | 120.7 (4) |
| C17—C16—C21 | 119.4 (4) | C51—C50—H50 | 119.7 |
| C17—C16—P2 | 122.7 (3) | C49—C50—H50 | 119.7 |
| C21—C16—P2 | 117.2 (4) | C52—C51—C50 | 119.9 (4) |
| C18—C17—C16 | 120.9 (5) | C52—C51—H51 | 120.0 |
| C18—C17—H17 | 119.5 | C50—C51—H51 | 120.0 |
| C16—C17—H17 | 119.5 | C53—C52—C51 | 120.1 (4) |
| C17—C18—C19 | 119.2 (5) | C53—C52—H52 | 120.0 |
| C17—C18—H18 | 120.4 | C51—C52—H52 | 120.0 |

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| C19—C18—H18 | 120.4 | C52—C53—C54 | 120.2 (4) |
| C20—C19—C18 | 120.8 (5) | C52—C53—H53 | 119.9 |
| C20—C19—H19 | 119.6 | C54—C53—H53 | 119.9 |
| C18—C19—H19 | 119.6 | C53—C54—C49 | 120.2 (4) |
| C19—C20—C21 | 120.2 (5) | C53—C54—H54 | 119.9 |
| C19—C20—H20 | 119.9 | C49—C54—H54 | 119.9 |

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| O1—Ag1—P1—C9 | 158.28 (17) | C19—C20—C21—C16 | 1.4 (7) |
| P2$^{i}$—Ag1—P1—C9 | 9.62 (18) | C16—P2—C22—C23 | 14.1 (4) |
| Ag1$^{i}$—Ag1—P1—C9 | −66.32 (15) | C15—P2—C22—C23 | 125.9 (4) |
| O1—Ag1—P1—C3 | 32.26 (17) | Ag1$^{i}$—P2—C22—C23 | −113.5 (3) |
| P2$^{i}$—Ag1—P1—C3 | −116.40 (16) | C16—P2—C22—C27 | −172.3 (3) |
| Ag1$^{i}$—Ag1—P1—C3 | 167.66 (15) | C15—P2—C22—C27 | −60.5 (4) |
| O1—Ag1—P1—C15 | −81.72 (16) | Ag1$^{i}$—P2—C22—C27 | 60.0 (3) |
| P2$^{i}$—Ag1—P1—C15 | 129.63 (15) | C27—C22—C23—C24 | −0.3 (6) |
| Ag1$^{i}$—Ag1—P1—C15 | 53.68 (14) | P2—C22—C23—C24 | 173.3 (3) |
| O3—Ag2—P3—C30 | −11.10 (17) | C22—C23—C24—C25 | 0.1 (6) |
| P4$^{ii}$—Ag2—P3—C30 | −157.73 (15) | C23—C24—C25—C26 | 0.3 (7) |
| Ag2$^{ii}$—Ag2—P3—C30 | 127.08 (15) | C24—C25—C26—C27 | −0.5 (7) |
| O3—Ag2—P3—C36 | 112.04 (16) | C25—C26—C27—C22 | 0.3 (7) |
| P4$^{ii}$—Ag2—P3—C36 | −34.59 (17) | C23—C22—C27—C26 | 0.1 (6) |
| Ag2$^{ii}$—Ag2—P3—C36 | −109.78 (14) | P2—C22—C27—C26 | −173.7 (3) |
| O3—Ag2—P3—C42 | −132.21 (16) | Ag2—O3—C28—O4 | 11.0 (6) |
| P4$^{ii}$—Ag2—P3—C42 | 81.16 (16) | Ag2—O3—C28—C29 | −172.5 (3) |
| Ag2$^{ii}$—Ag2—P3—C42 | 5.97 (14) | O4—C28—C29—F4 | −29.1 (5) |
| P2$^{i}$—Ag1—O1—C1 | −129.4 (3) | O3—C28—C29—F4 | 153.9 (4) |
| P1—Ag1—O1—C1 | 65.6 (3) | O4—C28—C29—F3 | −145.2 (4) |
| Ag1$^{i}$—Ag1—O1—C1 | −22.3 (4) | O3—C28—C29—F3 | 37.9 (5) |
| P4$^{ii}$—Ag2—O3—C28 | −65.3 (3) | O4—C28—C29—Cl2 | 92.5 (4) |
| P3—Ag2—O3—C28 | 131.1 (3) | O3—C28—C29—Cl2 | −84.4 (4) |
| Ag2$^{ii}$—Ag2—O3—C28 | 19.0 (3) | C36—P3—C30—C35 | 60.9 (4) |
| Ag1—O1—C1—O2 | −3.4 (6) | C42—P3—C30—C35 | −49.6 (4) |
| Ag1—O1—C1—C2 | 178.4 (3) | Ag2—P3—C30—C35 | −172.6 (3) |
| O1—C1—C2—F2 | −18.6 (7) | C36—P3—C30—C31 | −118.2 (3) |
| O2—C1—C2—F2 | 163.0 (6) | C42—P3—C30—C31 | 131.3 (3) |
| O1—C1—C2—F2′ | −39.4 (7) | Ag2—P3—C30—C31 | 8.2 (4) |
| O2—C1—C2—F2′ | 142.2 (6) | C35—C30—C31—C32 | 0.5 (6) |
| O1—C1—C2—F1′ | −147.8 (6) | P3—C30—C31—C32 | 179.7 (3) |
| O2—C1—C2—F1′ | 33.8 (7) | C30—C31—C32—C33 | −0.5 (6) |
| O1—C1—C2—F1 | 88.6 (6) | C31—C32—C33—C34 | 0.2 (7) |
| O2—C1—C2—F1 | −89.8 (6) | C32—C33—C34—C35 | 0.2 (7) |
| O1—C1—C2—Cl1′ | 87.2 (5) | C31—C30—C35—C34 | −0.1 (6) |
| O2—C1—C2—Cl1′ | −91.3 (5) | P3—C30—C35—C34 | −179.2 (3) |
| O1—C1—C2—Cl1 | −152.1 (4) | C33—C34—C35—C30 | −0.3 (7) |
| O2—C1—C2—Cl1 | 29.5 (6) | C30—P3—C36—C37 | 17.4 (4) |
| C9—P1—C3—C4 | 150.5 (4) | C42—P3—C36—C37 | 128.4 (4) |
| C15—P1—C3—C4 | 41.9 (4) | Ag2—P3—C36—C37 | −113.2 (4) |
| Ag1—P1—C3—C4 | −76.9 (4) | C30—P3—C36—C41 | −169.0 (3) |

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| C9—P1—C3—C8 | −33.6 (4) | C42—P3—C36—C41 | −58.0 (4) |
| C15—P1—C3—C8 | −142.2 (4) | Ag2—P3—C36—C41 | 60.3 (4) |
| Ag1—P1—C3—C8 | 99.1 (4) | C41—C36—C37—C38 | −0.5 (7) |
| C8—C3—C4—C5 | 1.6 (7) | P3—C36—C37—C38 | 173.0 (4) |
| P1—C3—C4—C5 | 177.5 (4) | C36—C37—C38—C39 | 0.6 (7) |
| C3—C4—C5—C6 | −0.3 (7) | C37—C38—C39—C40 | 0.1 (7) |
| C4—C5—C6—C7 | −0.6 (7) | C38—C39—C40—C41 | −0.7 (7) |
| C5—C6—C7—C8 | 0.2 (7) | C39—C40—C41—C36 | 0.7 (7) |
| C6—C7—C8—C3 | 1.0 (7) | C37—C36—C41—C40 | −0.1 (7) |
| C4—C3—C8—C7 | −1.9 (7) | P3—C36—C41—C40 | −174.0 (4) |
| P1—C3—C8—C7 | −177.8 (3) | C43—P4—C42—P3 | 63.2 (3) |
| C3—P1—C9—C14 | 142.2 (3) | C49—P4—C42—P3 | 172.6 (2) |
| C15—P1—C9—C14 | −110.6 (4) | Ag2$^{ii}$—P4—C42—P3 | −68.2 (2) |
| Ag1—P1—C9—C14 | 12.6 (4) | C30—P3—C42—P4 | −97.8 (2) |
| C3—P1—C9—C10 | −40.2 (4) | C36—P3—C42—P4 | 151.5 (2) |
| C15—P1—C9—C10 | 67.0 (4) | Ag2—P3—C42—P4 | 31.2 (2) |
| Ag1—P1—C9—C10 | −169.8 (3) | C49—P4—C43—C44 | −54.0 (4) |
| C14—C9—C10—C11 | −1.5 (6) | C42—P4—C43—C44 | 55.8 (4) |
| P1—C9—C10—C11 | −179.1 (3) | Ag2$^{ii}$—P4—C43—C44 | −178.9 (3) |
| C9—C10—C11—C12 | 1.3 (7) | C49—P4—C43—C48 | 129.3 (3) |
| C10—C11—C12—C13 | 0.2 (7) | C42—P4—C43—C48 | −121.0 (3) |
| C11—C12—C13—C14 | −1.5 (7) | Ag2$^{ii}$—P4—C43—C48 | 4.3 (4) |
| C12—C13—C14—C9 | 1.3 (7) | C48—C43—C44—C45 | 0.8 (6) |
| C10—C9—C14—C13 | 0.2 (6) | P4—C43—C44—C45 | −176.0 (3) |
| P1—C9—C14—C13 | 177.9 (3) | C43—C44—C45—C46 | 1.1 (7) |
| C9—P1—C15—P2 | 62.7 (3) | C44—C45—C46—C47 | −1.9 (7) |
| C3—P1—C15—P2 | 172.8 (2) | C45—C46—C47—C48 | 0.7 (7) |
| Ag1—P1—C15—P2 | −66.1 (2) | C46—C47—C48—C43 | 1.2 (7) |
| C16—P2—C15—P1 | −99.2 (2) | C44—C43—C48—C47 | −2.0 (6) |
| C22—P2—C15—P1 | 151.4 (2) | P4—C43—C48—C47 | 174.8 (3) |
| Ag1$^{i}$—P2—C15—P1 | 33.1 (2) | C43—P4—C49—C50 | 155.4 (4) |
| C22—P2—C16—C17 | 75.3 (4) | C42—P4—C49—C50 | 47.7 (4) |
| C15—P2—C16—C17 | −34.4 (4) | Ag2$^{ii}$—P4—C49—C50 | −72.7 (4) |
| Ag1$^{i}$—P2—C16—C17 | −163.2 (3) | C43—P4—C49—C54 | −31.0 (4) |
| C22—P2—C16—C21 | −95.5 (4) | C42—P4—C49—C54 | −138.7 (4) |
| C15—P2—C16—C21 | 154.8 (3) | Ag2$^{ii}$—P4—C49—C54 | 100.9 (3) |
| Ag1$^{i}$—P2—C16—C21 | 26.0 (4) | C54—C49—C50—C51 | 1.2 (7) |
| C21—C16—C17—C18 | −0.9 (7) | P4—C49—C50—C51 | 174.9 (3) |
| P2—C16—C17—C18 | −171.5 (3) | C49—C50—C51—C52 | −0.5 (7) |
| C16—C17—C18—C19 | 1.8 (7) | C50—C51—C52—C53 | −1.0 (7) |
| C17—C18—C19—C20 | −1.1 (7) | C51—C52—C53—C54 | 1.7 (7) |
| C18—C19—C20—C21 | −0.5 (8) | C52—C53—C54—C49 | −1.0 (7) |
| C17—C16—C21—C20 | −0.7 (7) | C50—C49—C54—C53 | −0.5 (7) |
| P2—C16—C21—C20 | 170.4 (4) | P4—C49—C54—C53 | −174.1 (4) |

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