

Poly[(μ_2 -2,2'-bipyridine- κ^2 N:N')bis(μ_3 -2,2,2-trifluoroacetato- κ^3 O:O:O')-disilver(I)]

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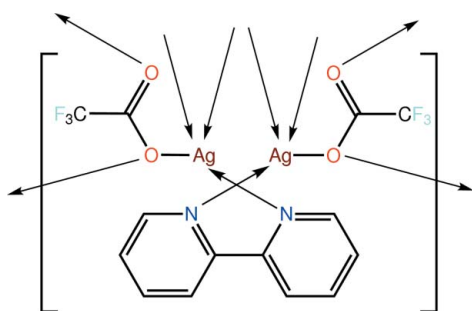
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 Key indicators: single-crystal X-ray study; $T = 98$ K; mean $\sigma(\text{C}-\text{C}) = 0.005$ Å; R factor = 0.031; wR factor = 0.091; data-to-parameter ratio = 14.5.

In the title salt, $[\text{Ag}_2(\text{CF}_3\text{CO}_2)_2(\text{C}_{10}\text{H}_8\text{N}_2)]_n$, which may also be regarded as a coordination polymer if long $\text{Ag}\cdots\text{O}$ interactions are considered, each of the N atoms of the somewhat twisted 2,2'-bipyridine molecule $[\text{N}-\text{C}-\text{C}-\text{N} = -27.5(4)^\circ]$ binds to an Ag atom, and each of the carboxylate ligands is tridentate, linking to three Ag atoms. The bidentate carboxylate O atoms bridge the same two Ag atoms, resulting in the formation of Ag_2O_2 rings. These rings are bridged by the 2,2'-bipyridine ligands, forming a chain along the b axis. The chains are linked into double chains *via* the remaining $\text{Ag}-\text{O}$ bonds and $\text{Ag}\cdots\text{Ag}$ contacts. As a consequence of the $\text{Ag}\cdots\text{Ag}$ contacts, the NO_4 donor set about each Ag atom is heavily distorted. Finally, the chains are linked into a three-dimensional network by a combination of $\text{C}-\text{H}\cdots\text{O}$ and $\text{C}-\text{H}\cdots\text{F}$ interactions.

Related literature

For structural diversity in the supramolecular structures of silver salts, see: Kundu *et al.* (2010). For a related Ag salt, see: Arman *et al.* (2010).



Experimental

Crystal data

$[\text{Ag}_2(\text{C}_2\text{F}_3\text{O}_2)_2(\text{C}_{10}\text{H}_8\text{N}_2)]$
 $M_r = 597.96$
 Monoclinic, $C2/c$
 $a = 24.597(6)$ Å
 $b = 6.8474(14)$ Å
 $c = 21.253(5)$ Å
 $\beta = 116.029(4)^\circ$

$V = 3216.5(13)$ Å³
 $Z = 8$
 Mo $K\alpha$ radiation
 $\mu = 2.53$ mm⁻¹
 $T = 98$ K
 $0.31 \times 0.29 \times 0.20$ mm

Data collection

Rigaku AFC12/SATURN724 diffractometer
 Absorption correction: multi-scan (*ABSCOR*; Higashi, 1995)
 $T_{\min} = 0.619$, $T_{\max} = 1.000$

10231 measured reflections
 3662 independent reflections
 3469 reflections with $I > 2\sigma(I)$
 $R_{\text{int}} = 0.037$

Refinement

$R[F^2 > 2\sigma(F^2)] = 0.031$
 $wR(F^2) = 0.091$
 $S = 1.09$
 3661 reflections

253 parameters
 H-atom parameters constrained
 $\Delta\rho_{\max} = 0.66$ e Å⁻³
 $\Delta\rho_{\min} = -0.65$ e Å⁻³

Table 1

Selected bond lengths (Å).

Ag1—O1	2.284 (2)	Ag2—O3	2.276 (2)
Ag1—N1	2.309 (3)	Ag2—O4 ⁱⁱⁱ	2.280 (3)
Ag1—O2 ⁱ	2.323 (3)	Ag2—N2	2.326 (3)
Ag1—O3 ⁱⁱ	2.844 (2)	Ag2—O1 ^{iv}	2.837 (2)
Ag1—O2	2.993 (3)	Ag2—O4	3.069 (3)
Ag1 ⁱ —Ag1 ⁱ	3.0675 (9)	Ag2 ⁱⁱⁱ —Ag2 ⁱⁱⁱ	2.9687 (8)
Ag1 ⁱ —Ag2	3.1941 (7)		

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

Table 2

Hydrogen-bond geometry (Å, °).

$D-\text{H}\cdots A$	$D-\text{H}$	$\text{H}\cdots A$	$D\cdots A$	$D-\text{H}\cdots A$
C4—H4 ^{iv} —O1 ^v	0.95	2.50	3.410 (4)	159
C8—H8 ^{vi} —O3 ^{vi}	0.95	2.58	3.287 (4)	132
C1—H1 ⁱⁱ —F6 ⁱⁱ	0.95	2.54	3.072 (4)	116
C2—H2 ⁱⁱⁱ —F4 ⁱⁱⁱ	0.95	2.55	3.145 (4)	121
C10—H10 ^{iv} —F3 ^{iv}	0.95	2.52	3.076 (4)	117

Symmetry codes: (ii) $x, y - 1, z$; (iv) $x, y + 1, z$; (v) $-x + \frac{1}{2}, y + \frac{1}{2}, -z + \frac{1}{2}$; (vi) $-x + \frac{1}{2}, y - \frac{1}{2}, -z + \frac{1}{2}$; (vii) $-x + 1, y, -z + \frac{1}{2}$.

Data collection: *CrystalClear* (Molecular Structure Corporation & Rigaku, 2005); cell refinement: *CrystalClear*; data reduction: *CrystalClear*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *ORTEP-3* (Farrugia, 1997) and *DIAMOND* (Brandenburg, 2006); software used to prepare material for publication: *pubCIF* (Westrip, 2010).

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: HB5622).

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supporting information

Acta Cryst. (2010). E66, m1209–m1210 [doi:10.1107/S1600536810035282]

Poly[(μ_2 -2,2'-bipyridine- κ^2 N:N')bis(μ_3 -2,2,2-trifluoroacetato- κ^3 O:O:O')]disilver(I)]

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S1. Comment

Supramolecular structures of silver salts are highly dependent upon the nature of counter anions and the presence of solvent (Kundu *et al.*, 2010). During the course of on-going crystal engineering studies on silver salts (Arman *et al.*, 2010), the title salt was isolated and characterized.

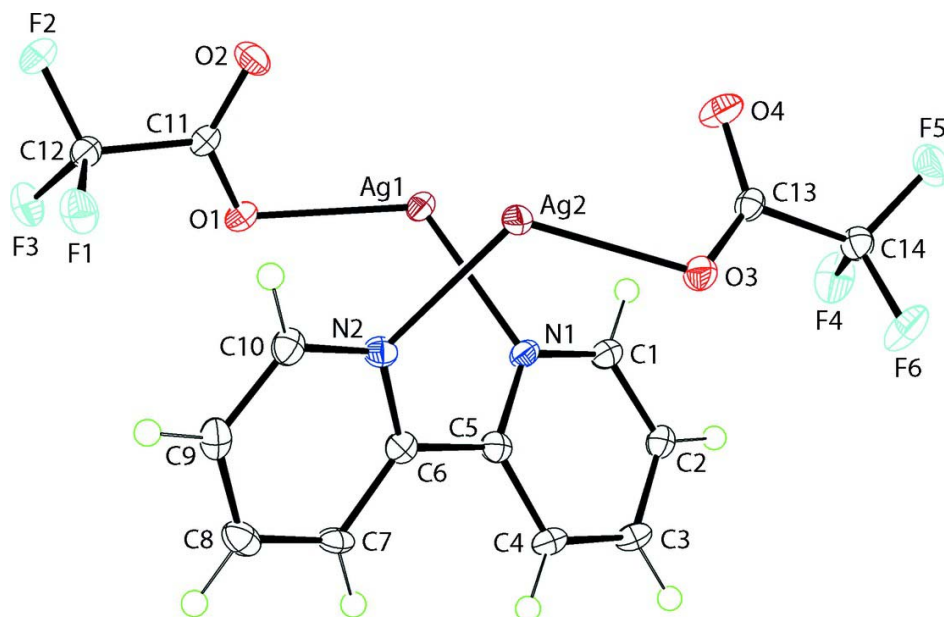
The asymmetric unit of (I) comprises two Ag cations, a 2,2'-bipyridine molecule and two trifluoroacetate anions, Fig. 1. Each of the 2,2'-bipyridine-N atoms coordinates to a Ag atom bringing into close proximity the Ag1 and Ag2 atoms [Ag1...Ag2 = 3.1941 (7) Å]. In order to relieve steric pressure, the 2,2'-bipyridine molecule is twisted as seen in the torsion angle [N1–C5–C6–N2 = -27.5 (4) °] and the dihedral angle formed between the pyridine rings of 26.93 (15) °. Each Ag atom forms a close Ag–O bond to a carboxylate-O, *i.e.* Ag1–O1 and Ag2–O3, Table 1, and each of the O1 and O3 atoms also bridges a neighbouring Ag atom to form a non-planar Ag₂O₂ ring. The second carboxylate-O atom in each case, *i.e.* O2 and O4, bridges to a different Ag atom so that each carboxylate ligand is tridentate. The supramolecular assembly is a double chain along the *b* axis whereby one row of Ag₂O₂ rings bridged by 2,2'-bipyridine molecules is connected to a second row *via* the Ag1–O2 and Ag2–O4 bonds and *vice versa*. Additional stability to the double chain is afforded by Ag1...Ag1 and Ag2...Ag2 interactions, Fig. 2 and Table 1. In terms of coordination geometry, each Ag atom exists within a NO₃ donor set which is grossly distorted owing to the presence of two close Ag...Ag contacts. Chains are consolidated in the crystal packing by a combination of C–H...O and C–H...F contacts, Table 2.

S2. Experimental

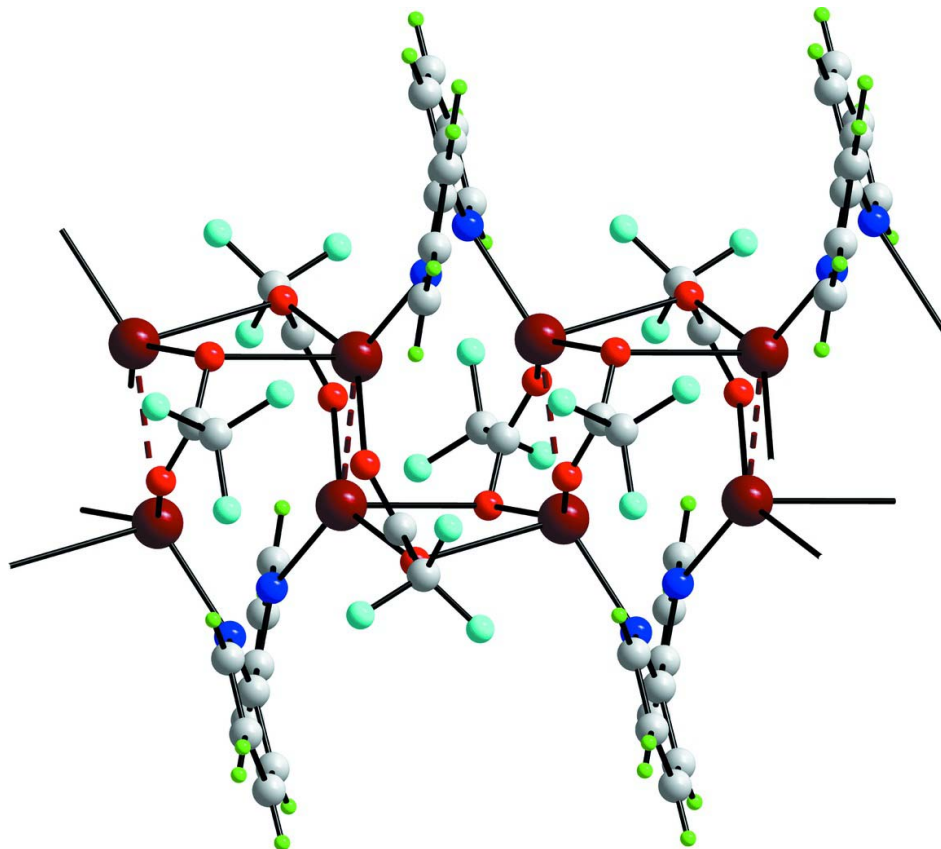
2,2'-Bipyridine (0.015 g, 0.1 mmol) was dissolved in 5 ml of methanol. Added to this was silver trifluoroacetate (0.044 g, 0.2 mmol) dissolved in 7 ml of methanol. The resulting solution was gently heated and allowed to stand for slow evaporation affording colourless blocks of (I) after five days.

S3. Refinement

C-bound H-atoms were placed in calculated positions (C–H 0.95 Å) and were included in the refinement in the riding model approximation with $U_{\text{iso}}(\text{H})$ set to $1.2U_{\text{eq}}(\text{C})$. In the final refinement a low angle reflection evidently effected by the beam stop were omitted, *i.e.* (200).

**Figure 1**

Asymmetric unit in the structure of (I) showing displacement ellipsoids at the 50% probability level.

**Figure 2**

Portion of the supramolecular double chain aligned along the *b* axis in (I).

Poly[(μ_2 -2,2'-bipyridine- $\kappa^2N:N'$)bis(μ_3 -2,2,2-trifluoroacetato- $\kappa^3O:O:O'$)]disilver(I)

Crystal data

[Ag₂(C₂F₃O₂)₂(C₁₀H₈N₂)] $M_r = 597.96$ Monoclinic, $C2/c$ Hall symbol: $-C\ 2yc$ $a = 24.597\ (6)\ \text{\AA}$ $b = 6.8474\ (14)\ \text{\AA}$ $c = 21.253\ (5)\ \text{\AA}$ $\beta = 116.029\ (4)^\circ$ $V = 3216.5\ (13)\ \text{\AA}^3$ $Z = 8$ $F(000) = 2288$ $D_x = 2.470\ \text{Mg m}^{-3}$ Mo $K\alpha$ radiation, $\lambda = 0.71069\ \text{\AA}$

Cell parameters from 8570 reflections

 $\theta = 1.8\text{--}40.5^\circ$ $\mu = 2.53\ \text{mm}^{-1}$ $T = 98\ \text{K}$

Block, colourless

 $0.31 \times 0.29 \times 0.20\ \text{mm}$

Data collection

Rigaku AFC12K/SATURN724

diffractometer

Radiation source: fine-focus sealed tube

Graphite monochromator

 ω scansAbsorption correction: multi-scan
(*ABSCOR*; Higashi, 1995) $T_{\min} = 0.619$, $T_{\max} = 1.000$

10231 measured reflections

3662 independent reflections

3469 reflections with $I > 2\sigma(I)$ $R_{\text{int}} = 0.037$ $\theta_{\max} = 27.5^\circ$, $\theta_{\min} = 1.8^\circ$ $h = -25 \rightarrow 31$ $k = -8 \rightarrow 8$ $l = -27 \rightarrow 27$

Refinement

Refinement on F^2

Least-squares matrix: full

 $R[F^2 > 2\sigma(F^2)] = 0.031$ $wR(F^2) = 0.091$ $S = 1.09$

3661 reflections

253 parameters

0 restraints

Primary atom site location: structure-invariant
direct methodsSecondary atom site location: difference Fourier
mapHydrogen site location: inferred from
neighbouring sites

H-atom parameters constrained

 $w = 1/[\sigma^2(F_o^2) + (0.0473P)^2 + 8.2186P]$ where $P = (F_o^2 + 2F_c^2)/3$ $(\Delta/\sigma)_{\max} < 0.001$ $\Delta\rho_{\max} = 0.66\ \text{e \AA}^{-3}$ $\Delta\rho_{\min} = -0.65\ \text{e \AA}^{-3}$

Special details

Geometry. All s.u.'s (except the s.u. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell s.u.'s are taken into account individually in the estimation of s.u.'s in distances, angles and torsion angles; correlations between s.u.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell s.u.'s is used for estimating s.u.'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 (\AA^2)

	x	y	z	$U_{\text{iso}}^*/U_{\text{eq}}$
Ag1	0.270544 (11)	0.27690 (4)	0.078818 (12)	0.01708 (10)
Ag2	0.239869 (12)	0.73275 (4)	0.063674 (12)	0.01661 (10)
F1	0.05870 (11)	0.2464 (3)	0.01451 (13)	0.0250 (5)
F2	0.04349 (10)	0.0721 (4)	-0.07648 (10)	0.0313 (5)

F3	0.07622 (10)	-0.0612 (3)	0.02507 (11)	0.0243 (4)
F4	0.45993 (11)	0.7568 (3)	0.16884 (13)	0.0287 (5)
F5	0.45617 (9)	0.9732 (3)	0.09408 (11)	0.0298 (5)
F6	0.43891 (9)	1.0540 (3)	0.18104 (11)	0.0296 (5)
O1	0.18662 (10)	0.1008 (3)	0.06300 (11)	0.0186 (5)
O2	0.15108 (12)	0.2233 (3)	-0.04584 (13)	0.0207 (5)
O3	0.32741 (11)	0.9056 (3)	0.11732 (12)	0.0189 (5)
O4	0.35046 (13)	0.7790 (4)	0.03384 (13)	0.0234 (5)
N1	0.32454 (12)	0.4507 (4)	0.18047 (13)	0.0148 (5)
N2	0.20388 (13)	0.5665 (4)	0.13321 (13)	0.0161 (5)
C1	0.38483 (15)	0.4390 (5)	0.20200 (16)	0.0179 (6)
H1	0.3991	0.4009	0.1689	0.021*
C2	0.42676 (14)	0.4794 (5)	0.26943 (17)	0.0187 (6)
H2	0.4688	0.4668	0.2826	0.022*
C3	0.40639 (15)	0.5387 (5)	0.31752 (16)	0.0185 (6)
H3	0.4343	0.5682	0.3643	0.022*
C4	0.34421 (15)	0.5545 (4)	0.29617 (15)	0.0166 (6)
H4	0.3291	0.5951	0.3283	0.020*
C5	0.30455 (14)	0.5100 (4)	0.22711 (16)	0.0156 (6)
C6	0.23773 (14)	0.5279 (4)	0.20229 (16)	0.0147 (6)
C7	0.21148 (15)	0.5069 (4)	0.24806 (15)	0.0160 (6)
H7	0.2361	0.4826	0.2964	0.019*
C8	0.14863 (16)	0.5217 (5)	0.22253 (18)	0.0205 (6)
H8	0.1300	0.5092	0.2531	0.025*
C9	0.11430 (15)	0.5549 (5)	0.15166 (18)	0.0193 (6)
H9	0.0715	0.5625	0.1325	0.023*
C10	0.14338 (15)	0.5769 (4)	0.10896 (17)	0.0182 (6)
H10	0.1195	0.6004	0.0604	0.022*
C11	0.14613 (14)	0.1417 (4)	0.00329 (15)	0.0156 (6)
C12	0.08041 (15)	0.0970 (5)	-0.00906 (16)	0.0174 (6)
C13	0.36199 (14)	0.8644 (4)	0.09028 (15)	0.0149 (6)
C14	0.42956 (15)	0.9154 (5)	0.13331 (16)	0.0174 (6)

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Ag1	0.01380 (15)	0.02195 (15)	0.01404 (15)	-0.00357 (9)	0.00477 (11)	-0.00392 (8)
Ag2	0.01414 (15)	0.02253 (15)	0.01274 (15)	-0.00263 (8)	0.00552 (11)	0.00048 (8)
F1	0.0216 (12)	0.0243 (10)	0.0344 (12)	0.0023 (8)	0.0171 (10)	-0.0020 (8)
F2	0.0195 (10)	0.0516 (14)	0.0162 (10)	-0.0099 (10)	0.0017 (8)	-0.0047 (9)
F3	0.0235 (10)	0.0207 (9)	0.0324 (11)	-0.0027 (8)	0.0158 (9)	0.0038 (8)
F4	0.0181 (11)	0.0223 (10)	0.0330 (13)	0.0050 (8)	-0.0005 (10)	0.0093 (8)
F5	0.0195 (10)	0.0442 (13)	0.0257 (11)	-0.0064 (10)	0.0100 (9)	0.0057 (9)
F6	0.0182 (10)	0.0323 (11)	0.0288 (11)	-0.0015 (8)	0.0017 (9)	-0.0153 (9)
O1	0.0154 (11)	0.0236 (11)	0.0126 (10)	-0.0014 (9)	0.0024 (9)	-0.0004 (8)
O2	0.0187 (13)	0.0276 (12)	0.0190 (12)	0.0018 (9)	0.0112 (11)	0.0058 (9)
O3	0.0144 (11)	0.0240 (11)	0.0180 (10)	-0.0016 (9)	0.0068 (9)	-0.0030 (9)
O4	0.0192 (13)	0.0307 (13)	0.0158 (12)	0.0028 (10)	0.0035 (11)	-0.0065 (9)

N1	0.0164 (12)	0.0141 (11)	0.0121 (11)	-0.0021 (10)	0.0045 (10)	-0.0019 (9)
N2	0.0171 (13)	0.0170 (12)	0.0133 (12)	0.0010 (10)	0.0058 (10)	0.0029 (9)
C1	0.0185 (15)	0.0191 (14)	0.0156 (14)	-0.0022 (12)	0.0070 (13)	-0.0038 (11)
C2	0.0140 (14)	0.0221 (15)	0.0185 (15)	-0.0027 (13)	0.0058 (12)	-0.0019 (12)
C3	0.0196 (16)	0.0204 (14)	0.0112 (13)	0.0010 (12)	0.0027 (12)	-0.0015 (11)
C4	0.0206 (16)	0.0149 (13)	0.0117 (13)	0.0010 (11)	0.0048 (12)	-0.0013 (11)
C5	0.0196 (15)	0.0117 (13)	0.0163 (14)	-0.0001 (12)	0.0086 (12)	0.0012 (10)
C6	0.0174 (14)	0.0102 (12)	0.0173 (14)	0.0011 (11)	0.0083 (12)	-0.0011 (10)
C7	0.0243 (16)	0.0141 (13)	0.0110 (13)	0.0007 (13)	0.0091 (12)	0.0022 (10)
C8	0.0291 (18)	0.0154 (14)	0.0245 (16)	-0.0005 (13)	0.0185 (15)	-0.0012 (12)
C9	0.0162 (15)	0.0160 (13)	0.0268 (16)	-0.0010 (12)	0.0105 (13)	-0.0021 (12)
C10	0.0175 (15)	0.0162 (14)	0.0185 (14)	-0.0010 (12)	0.0057 (13)	0.0018 (11)
C11	0.0137 (14)	0.0162 (13)	0.0138 (13)	-0.0009 (12)	0.0031 (11)	-0.0016 (11)
C12	0.0154 (15)	0.0203 (15)	0.0155 (14)	-0.0012 (12)	0.0059 (12)	-0.0027 (11)
C13	0.0119 (14)	0.0150 (13)	0.0142 (13)	0.0000 (11)	0.0024 (11)	0.0008 (11)
C14	0.0152 (15)	0.0184 (14)	0.0171 (14)	0.0006 (12)	0.0057 (12)	0.0008 (11)

Geometric parameters (Å, °)

Ag1—O1	2.284 (2)	O4—Ag2 ⁱⁱⁱ	2.280 (3)
Ag1—N1	2.309 (3)	N1—C5	1.348 (4)
Ag1—O2 ⁱ	2.323 (3)	N1—C1	1.349 (4)
Ag1—O3 ⁱⁱ	2.844 (2)	N2—C10	1.346 (4)
Ag1—O2	2.993 (3)	N2—C6	1.359 (4)
Ag1—Ag1 ⁱ	3.0675 (9)	C1—C2	1.377 (4)
Ag1—Ag2	3.1941 (7)	C1—H1	0.9500
Ag2—O3	2.276 (2)	C2—C3	1.382 (4)
Ag2—O4 ⁱⁱⁱ	2.280 (3)	C2—H2	0.9500
Ag2—N2	2.326 (3)	C3—C4	1.396 (5)
Ag2—O1 ^{iv}	2.837 (2)	C3—H3	0.9500
Ag2—O4	3.069 (3)	C4—C5	1.394 (4)
Ag2—Ag2 ⁱⁱⁱ	2.9687 (8)	C4—H4	0.9500
F1—C12	1.348 (4)	C5—C6	1.495 (4)
F2—C12	1.328 (4)	C6—C7	1.391 (4)
F3—C12	1.333 (4)	C7—C8	1.400 (5)
F4—C14	1.346 (4)	C7—H7	0.9500
F5—C14	1.326 (4)	C8—C9	1.385 (5)
F6—C14	1.333 (4)	C8—H8	0.9500
O1—C11	1.254 (4)	C9—C10	1.388 (4)
O2—C11	1.237 (4)	C9—H9	0.9500
O2—Ag1 ⁱ	2.322 (3)	C10—H10	0.9500
O3—C13	1.250 (4)	C11—C12	1.550 (4)
O4—C13	1.250 (4)	C13—C14	1.545 (4)
O1—Ag1—N1	121.42 (9)	C5—C4—C3	119.1 (3)
O1—Ag1—O2 ⁱ	140.48 (9)	C5—C4—H4	120.5
N1—Ag1—O2 ⁱ	94.01 (9)	C3—C4—H4	120.5
O1—Ag1—Ag1 ⁱ	86.13 (5)	N1—C5—C4	121.9 (3)

N1—Ag1—Ag1 ⁱ	149.60 (7)	N1—C5—C6	117.7 (3)
O2 ⁱ —Ag1—Ag1 ⁱ	65.77 (7)	C4—C5—C6	120.4 (3)
O1—Ag1—Ag2	110.04 (6)	N2—C6—C7	121.6 (3)
N1—Ag1—Ag2	66.67 (7)	N2—C6—C5	117.0 (3)
O2 ⁱ —Ag1—Ag2	99.26 (6)	C7—C6—C5	121.4 (3)
Ag1 ⁱ —Ag1—Ag2	93.284 (12)	C6—C7—C8	119.6 (3)
O3—Ag2—O4 ⁱⁱⁱ	143.51 (9)	C6—C7—H7	120.2
O3—Ag2—N2	118.43 (9)	C8—C7—H7	120.2
O4 ⁱⁱⁱ —Ag2—N2	93.99 (10)	C9—C8—C7	118.4 (3)
O3—Ag2—Ag2 ⁱⁱⁱ	85.12 (6)	C9—C8—H8	120.8
O4 ⁱⁱⁱ —Ag2—Ag2 ⁱⁱⁱ	70.16 (7)	C7—C8—H8	120.8
N2—Ag2—Ag2 ⁱⁱⁱ	151.77 (7)	C8—C9—C10	119.1 (3)
O3—Ag2—Ag1	109.14 (6)	C8—C9—H9	120.5
O4 ⁱⁱⁱ —Ag2—Ag1	98.63 (6)	C10—C9—H9	120.5
N2—Ag2—Ag1	66.22 (7)	N2—C10—C9	123.0 (3)
Ag2 ⁱⁱⁱ —Ag2—Ag1	92.459 (12)	N2—C10—H10	118.5
C11—O1—Ag1	107.24 (19)	C9—C10—H10	118.5
C11—O2—Ag1 ⁱ	131.1 (2)	O2—C11—O1	128.8 (3)
C13—O3—Ag2	109.72 (19)	O2—C11—C12	115.3 (3)
C13—O4—Ag2 ⁱⁱⁱ	127.5 (2)	O1—C11—C12	115.7 (3)
C5—N1—C1	118.0 (3)	F2—C12—F3	107.7 (3)
C5—N1—Ag1	126.7 (2)	F2—C12—F1	107.7 (3)
C1—N1—Ag1	112.5 (2)	F3—C12—F1	106.1 (2)
C10—N2—C6	118.3 (3)	F2—C12—C11	112.1 (2)
C10—N2—Ag2	113.3 (2)	F3—C12—C11	113.1 (3)
C6—N2—Ag2	123.9 (2)	F1—C12—C11	109.9 (3)
N1—C1—C2	123.4 (3)	O4—C13—O3	129.3 (3)
N1—C1—H1	118.3	O4—C13—C14	114.0 (3)
C2—C1—H1	118.3	O3—C13—C14	116.7 (3)
C1—C2—C3	118.7 (3)	F5—C14—F6	107.3 (3)
C1—C2—H2	120.7	F5—C14—F4	106.7 (3)
C3—C2—H2	120.7	F6—C14—F4	106.2 (3)
C2—C3—C4	118.9 (3)	F5—C14—C13	113.3 (3)
C2—C3—H3	120.5	F6—C14—C13	113.1 (3)
C4—C3—H3	120.5	F4—C14—C13	109.7 (3)
O1—Ag1—Ag2—O3	159.39 (8)	C1—C2—C3—C4	0.3 (5)
N1—Ag1—Ag2—O3	42.84 (9)	C2—C3—C4—C5	0.1 (5)
O2 ⁱ —Ag1—Ag2—O3	-47.55 (9)	C1—N1—C5—C4	-1.4 (4)
Ag1 ⁱ —Ag1—Ag2—O3	-113.53 (6)	Ag1—N1—C5—C4	158.2 (2)
O1—Ag1—Ag2—O4 ⁱⁱⁱ	-44.62 (9)	C1—N1—C5—C6	178.3 (3)
N1—Ag1—Ag2—O4 ⁱⁱⁱ	-161.18 (10)	Ag1—N1—C5—C6	-22.1 (4)
O2 ⁱ —Ag1—Ag2—O4 ⁱⁱⁱ	108.43 (9)	C3—C4—C5—N1	0.5 (5)
Ag1 ⁱ —Ag1—Ag2—O4 ⁱⁱⁱ	42.45 (7)	C3—C4—C5—C6	-179.2 (3)
O1—Ag1—Ag2—N2	45.95 (9)	C10—N2—C6—C7	-2.5 (4)
N1—Ag1—Ag2—N2	-70.61 (11)	Ag2—N2—C6—C7	152.2 (2)
O2 ⁱ —Ag1—Ag2—N2	-161.00 (10)	C10—N2—C6—C5	177.8 (3)
Ag1 ⁱ —Ag1—Ag2—N2	133.03 (8)	Ag2—N2—C6—C5	-27.5 (4)

O1—Ag1—Ag2—Ag2 ⁱⁱⁱ	-114.92 (6)	N1—C5—C6—N2	-27.5 (4)
N1—Ag1—Ag2—Ag2 ⁱⁱⁱ	128.52 (7)	C4—C5—C6—N2	152.2 (3)
O2 ⁱ —Ag1—Ag2—Ag2 ⁱⁱⁱ	38.13 (7)	N1—C5—C6—C7	152.8 (3)
Ag1 ⁱ —Ag1—Ag2—Ag2 ⁱⁱⁱ	-27.845 (17)	C4—C5—C6—C7	-27.5 (4)
N1—Ag1—O1—C11	132.75 (19)	N2—C6—C7—C8	1.3 (4)
O2 ⁱ —Ag1—O1—C11	-76.9 (2)	C5—C6—C7—C8	-179.0 (3)
Ag1 ⁱ —Ag1—O1—C11	-33.61 (19)	C6—C7—C8—C9	0.7 (5)
Ag2—Ag1—O1—C11	58.5 (2)	C7—C8—C9—C10	-1.5 (5)
O4 ⁱⁱⁱ —Ag2—O3—C13	-78.8 (2)	C6—N2—C10—C9	1.7 (5)
N2—Ag2—O3—C13	131.3 (2)	Ag2—N2—C10—C9	-155.6 (3)
Ag2 ⁱⁱⁱ —Ag2—O3—C13	-32.30 (19)	C8—C9—C10—N2	0.3 (5)
Ag1—Ag2—O3—C13	58.6 (2)	Ag1 ⁱ —O2—C11—O1	31.3 (5)
O1—Ag1—N1—C5	-20.2 (3)	Ag1 ⁱ —O2—C11—C12	-153.5 (2)
O2 ⁱ —Ag1—N1—C5	178.2 (2)	Ag1—O1—C11—O2	15.3 (4)
Ag1 ⁱ —Ag1—N1—C5	132.1 (2)	Ag1—O1—C11—C12	-159.9 (2)
Ag2—Ag1—N1—C5	79.9 (2)	O2—C11—C12—F2	27.9 (4)
O1—Ag1—N1—C1	140.4 (2)	O1—C11—C12—F2	-156.2 (3)
O2 ⁱ —Ag1—N1—C1	-21.3 (2)	O2—C11—C12—F3	149.9 (3)
Ag1 ⁱ —Ag1—N1—C1	-67.4 (3)	O1—C11—C12—F3	-34.2 (4)
Ag2—Ag1—N1—C1	-119.6 (2)	O2—C11—C12—F1	-91.8 (3)
O3—Ag2—N2—C10	140.1 (2)	O1—C11—C12—F1	84.1 (3)
O4 ⁱⁱⁱ —Ag2—N2—C10	-22.5 (2)	Ag2 ⁱⁱⁱ —O4—C13—O3	26.8 (5)
Ag2 ⁱⁱⁱ —Ag2—N2—C10	-76.4 (3)	Ag2 ⁱⁱⁱ —O4—C13—C14	-156.6 (2)
Ag1—Ag2—N2—C10	-120.2 (2)	Ag2—O3—C13—O4	15.0 (4)
O3—Ag2—N2—C6	-15.7 (3)	Ag2—O3—C13—C14	-161.6 (2)
O4 ⁱⁱⁱ —Ag2—N2—C6	-178.3 (2)	O4—C13—C14—F5	38.5 (4)
Ag2 ⁱⁱⁱ —Ag2—N2—C6	127.8 (2)	O3—C13—C14—F5	-144.4 (3)
Ag1—Ag2—N2—C6	84.0 (2)	O4—C13—C14—F6	160.9 (3)
C5—N1—C1—C2	1.8 (5)	O3—C13—C14—F6	-22.0 (4)
Ag1—N1—C1—C2	-160.6 (3)	O4—C13—C14—F4	-80.7 (3)
N1—C1—C2—C3	-1.3 (5)	O3—C13—C14—F4	96.5 (3)

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

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

$D-H\cdots A$	$D-H$	$H\cdots A$	$D\cdots A$	$D-H\cdots A$
C4—H4 ^v —O1 ^v	0.95	2.50	3.410 (4)	159
C8—H8 ^{vi} —O3 ^{vi}	0.95	2.58	3.287 (4)	132
C1—H1 ⁱⁱ —F6 ⁱⁱ	0.95	2.54	3.072 (4)	116
C2—H2 ^{vii} —F4 ^{vii}	0.95	2.55	3.145 (4)	121
C10—H10 ^{iv} —F3 ^{iv}	0.95	2.52	3.076 (4)	117

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