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# Poly[4-(dimethylamino)pyridinium [($\mu_6$-5-carboxybenzene-1,2,4-tricarboxyato-$\kappa^6O^1:O^{1'}:O^2:O^4:O^{4'}:O^5$)diargentate(I)]]

**Xiao-Fei Zhu, Yan-Hong Zhou, Li Guan and Hong Zhang***

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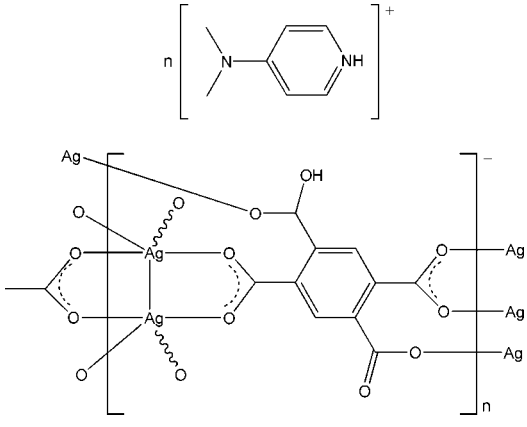
Key indicators: single-crystal X-ray study; $T$ = 293 K; mean $\sigma$(C–C) = 0.003 Å; $R$ factor = 0.018; $wR$ factor = 0.046; data-to-parameter ratio = 11.8.

In the title compound, $\{(C_7H_{11}N_2)[Ag_2(C_{10}H_3O_8)]\}_n$, the polymeric anion consists of two $Ag^I$ atoms and a $Hbtc^{3-}$ ligand ($H_4$btc = benzene-1,2,4,5-tetracarboxylic acid). Each $Ag^I$ atom is coordinated by four O atoms from three different $Hbtc^{3-}$ ligands. The two $Ag^I$ atoms are bridged by two bidentate carboxylate groups into an $Ag_2O_4$ cyclic unit, with an Ag···Ag distance of 2.8189 (3) Å. In this way, the Ag atoms are connected by the $Hbtc^{3-}$ ligands into an extended two-dimensional layer structure. A three-dimensional network is accomplished through O—H···O hydrogen bonds between the anionic layers. The cationic guest $Hdmap^+$ [dmap = 4-(dimethylamino)pyridine] is trapped in the network and adheres to the layer by an N—H···O hydrogen bond.

## Related literature

For general background to metal-organic frameworks with 1,2,4,5-benzenetetracarboxylate liganda, see: Cao *et al.* (2002); Hu *et al.* (2004); Li *et al.* (2003). For related complexes, see: Chen (2008); Sun *et al.* (2003); Zheng *et al.* (2002, 2003).



## Experimental

### Crystal data

$(C_7H_{11}N_2)[Ag_2(C_{10}H_3O_8)]$
$M_r$ = 590.04
Triclinic, $P\overline{1}$
$a$ = 9.7192 (3) Å
$b$ = 9.9936 (5) Å
$c$ = 10.4968 (3) Å
$\alpha$ = 113.304 (4)°
$\beta$ = 97.140 (3)°
$\gamma$ = 103.260 (3)°
$V$ = 884.65 (7) Å$^3$
$Z$ = 2
Mo $K\alpha$ radiation
$\mu$ = 2.27 mm$^{-1}$
$T$ = 293 K
0.24 × 0.18 × 0.14 mm

### Data collection

Oxford Diffraction Gemini R Ultra diffractometer
Absorption correction: multi-scan (*CrysAlis RED*; Oxford Diffraction, 2006)
$T_{min}$ = 0.611, $T_{max}$ = 0.725
7226 measured reflections
3124 independent reflections
2808 reflections with $I > 2\sigma I$)
$R_{int}$ = 0.012

### Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.018
$wR(F^2)$ = 0.046
$S$ = 1.06
3124 reflections
265 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.35 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.47 e Å$^{-3}$

**Table 1**
Selected bond lengths (Å).

| | | | |
|---|---|---|---|
| Ag1—O1 | 2.5220 (15) | Ag2—O4 | 2.2091 (15) |
| Ag1—O3$^{i}$ | 2.1784 (15) | Ag2—O5$^{iii}$ | 2.2224 (16) |
| Ag1—O3 | 2.7573 (19) | Ag2—O5$^{iv}$ | 2.873 (2) |
| Ag1—O6$^{ii}$ | 2.1765 (15) | Ag2—O7$^{iv}$ | 2.4442 (15) |

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

**Table 2**
Hydrogen-bond geometry (Å, °).

| $D$—H···$A$ | $D$—H | H···$A$ | $D$···$A$ | $D$—H···$A$ |
|---|---|---|---|---|
| N2—H···O7$^{v}$ | 0.84 | 1.88 | 2.720 (2) | 177 |
| O2—H2···O8$^{vi}$ | 0.82 | 1.73 | 2.541 (2) | 173 |

Symmetry codes: (v) $x-1, y+1, z$; (vi) $x-1, y, z$.

Data collection: *CrysAlis CCD* (Oxford Diffraction, 2006); cell refinement: *CrysAlis RED* (Oxford Diffraction, 2006); data reduction: *CrysAlis RED*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *DIAMOND* (Brandenburg, 1999); software used to prepare material for publication: *SHELXL97*.

We gratefully acknowledge financial support from the NSF of China (grant No. 20771023), the 863 Program (grant No. 2007 A A03z218) and the Analysis and Testing Foundation of Northeast Normal University.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: HY2204).

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# supporting information

*Acta Cryst.* (2009). E**65**, m994–m995 [doi:10.1107/S1600536809028839]

## Poly[4-(dimethylamino)pyridinium [($\mu_6$-5-carboxybenzene-1,2,4-tricarboxyato-$\kappa^6O^1:O^{1'}:O^2:O^4:O^{4'}:O^5$)diargentate(I)]]

**Xiao-Fei Zhu, Yan-Hong Zhou, Li Guan and Hong Zhang**

### S1. Comment

More efforts have been made to construct MOFs (metal organic frameworks) materials by using 1,2,4,5-benzenetetracarboxylic acid ($H_4$btc) as molecular building block, owing to its complexed coordination modes to metal ions and various dimensionalities (Cao *et al.*, 2002; Hu *et al.*, 2004; Li *et al.*, 2003). According to literature, the combination of $H_4$btc, as a polydentate ligand and silver(I) can produce various architectures, involving in $[Ag_2(pbi)_2(H_2btc)]_n$ [pbi = 2-(3-pyridyl)-1*H*-benzimidazole] (Chen, 2008), $[Ag(\mu_3\text{-hmt})]_2[Ag(NH_3)_2]_2(btc).3H_2O$ (hmt = hexamethylenetetramine) (Zheng *et al.*, 2002), $[Ag_8(\mu_3\text{-hmt})_2(\mu_4\text{-hmt})_2(\mu\text{-btc})_2(\mu\text{-}H_2O)_3].18H_2O$ (Zheng *et al.*, 2003), and $[Ag(bipy)][H_2btc]_{0.5}.H_2O$ (Sun *et al.*, 2003). Herein, the title complex, [Hdmap][$Ag_2$(Hbtc)] (dmap = 4-dimethylaminopyridine), with a layer structure is reported.

The structure of the title compound contains two crystallographically independent $Ag^I$ atoms, one $(Hbtc)^{3-}$ ligand and one $(Hdmap)^+$ cantion. Each $Ag^I$ atom is coordinated by four carboxylate O atoms from three different Hbtc ligands (Fig. 1), with three close bond distances [average Ag1—O = 2.2923 (15) and Ag2—O = 2.2919 (15) Å] and one long bond distance [Ag1—O = 2.7573 (19) and Ag2—O = 2.873 (2) Å] (Table 1). It is worth noting that two adjacent Ag1 and Ag2 atoms are bridged by two bidentate carboxylate groups into an $Ag_2O_4$ cyclic unit, with an Ag···Ag distance of 2.8189 (3) Å. The Hbtc ligand connects six Ag atoms, leading to a two-dimensional anionic layer (Fig. 2). The interlayer O—H···O hydrogen bonds hold adjacent layers together to bring out a supramolecular network. The cationic guest $(Hdmap)^+$ is trapped in the network and adhere to the layer by an N—H···O hydrogen bond (Table 2).

### S2. Experimental

A mixture of pyromelitic acid anhydride (0.218 g, 0.1 mmol) in distilled water (10 ml) was stirred at 333 K for 1 h until to get clear solution and then a DMF solution (2 ml) of $AgNO_3$ (0.169 g, 0.1 mmol) was added on stirring for 1 h under ambient condition. The resulting solution was allowed to stand in air at room temperature for 3 d. Colorless crystals were collected in 77.8% yield based on $AgNO_3$.

### S3. Refinement

H atoms were positioned geometrically and refined as riding atoms, with C—H = 0.93 (aromatic) and 0.96 (methyl), N—H = 0.84 and O—H = 0.82 Å, and with $U_{iso}$(H) = 1.2(or 1.5 for methyl and hydroxyl)$U_{eq}$(C, N, O).

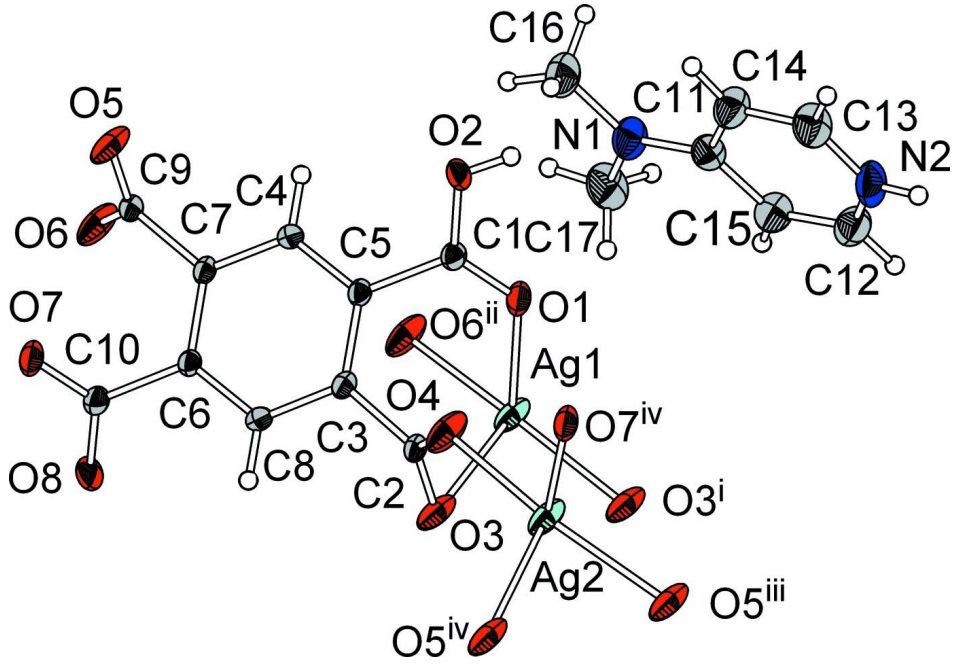


**Figure 1**

The asymmetric unit of the title compound. Displacement ellipsoids are drawn at the 50% probability level. [Symmetry codes: (i) 1 - *x*, 1 - *y*, 2 - *z*; (ii) 1 - *x*, -*y*, 1 - *z*; (iii) *x*, 1 + *y*, 1 + *z*; (iv) 1 - *x*, -*y*, 2 - *z*.]

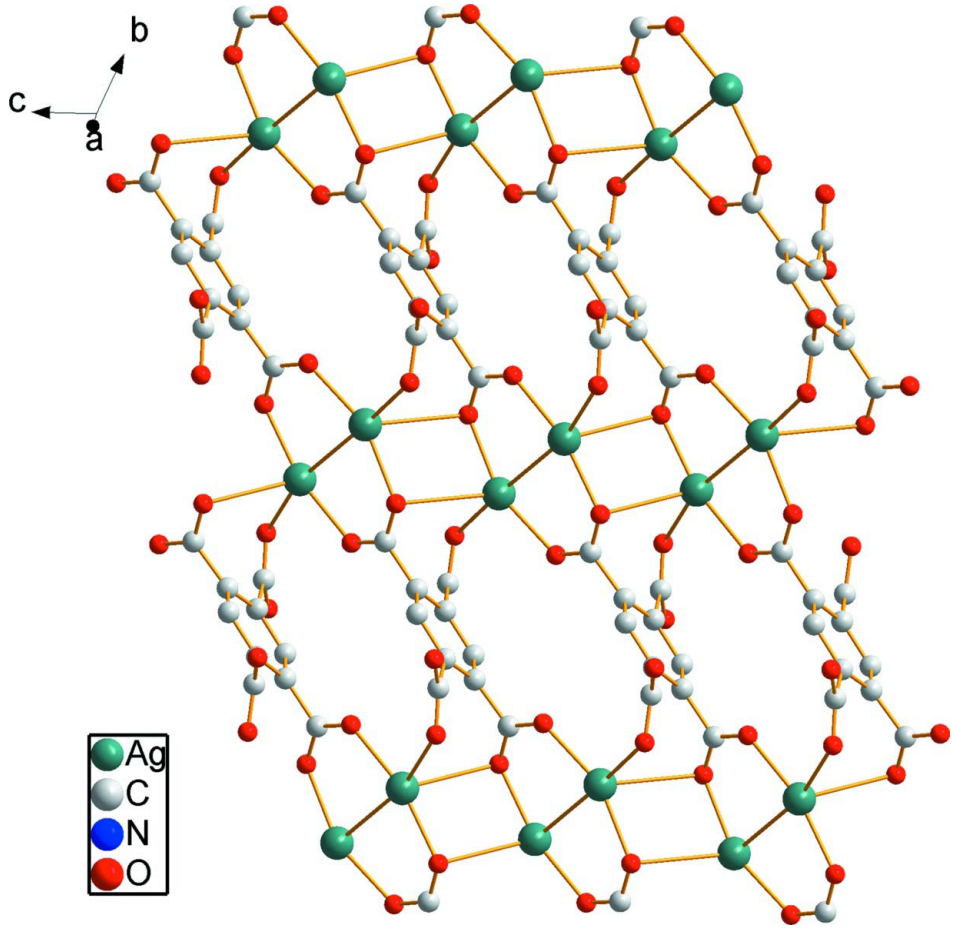


**Figure 2**

A view of the two-dimensional layer in the title compound. H atoms are omitted for clarity.

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*Crystal data*

$(C_7H_{11}N_2)[Ag_2(C_{10}H_3O_8)]$
$M_r = 590.04$
Triclinic, $P\overline{1}$
Hall symbol: -P 1
$a = 9.7192$ (3) Å
$b = 9.9936$ (5) Å
$c = 10.4968$ (3) Å
$\alpha = 113.304$ (4)°
$\beta = 97.140$ (3)°
$\gamma = 103.260$ (3)°
$V = 884.65$ (7) Å$^3$
$Z = 2$
$F(000) = 576$
$D_x = 2.215$ Mg m$^{-3}$
Mo $K\alpha$ radiation, $\lambda = 0.71073$ Å
Cell parameters from 3901 reflections
$\theta = 4.4$–25.0°
$\mu = 2.27$ mm$^{-1}$
$T = 293$ K
Block, colorless
0.24 × 0.18 × 0.14 mm

*Data collection*

Oxford Diffraction Gemini R Ultra diffractometer
Radiation source: fine-focus sealed tube
Graphite monochromator
Detector resolution: 10.0 pixels mm$^{-1}$
$\omega$ scans
Absorption correction: multi-scan (*CrysAlis RED*; Oxford Diffraction, 2006)

$T_{min}$ = 0.611, $T_{max}$ = 0.725
7226 measured reflections
3124 independent reflections
2808 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.012

$\theta_{max}$ = 25.0°, $\theta_{min}$ = 4.4°
$h$ = −11→11
$k$ = −11→11
$l$ = −12→12

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.018
$wR(F^2)$ = 0.046
$S$ = 1.06
3124 reflections
265 parameters
0 restraints
Primary atom site location: structure-invariant direct methods
Secondary atom site location: difference Fourier map

Hydrogen site location: inferred from neighbouring sites
H-atom parameters constrained
$w = 1/[\sigma^2(F_o^2) + (0.0251P)^2 + 0.4969P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.003
$\Delta\rho_{max}$ = 0.35 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.47 e Å$^{-3}$
Extinction correction: *SHELXL97* (Sheldrick, 2008), $Fc^*=kFc[1+0.001xFc^2\lambda^3/\sin(2\theta)]^{-1/4}$
Extinction coefficient: 0.0157 (6)

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

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ |
|---|---|---|---|---|
| Ag1 | 0.421397 (19) | 0.410977 (18) | 0.802682 (17) | 0.02690 (8) |
| Ag2 | 0.421385 (19) | 0.385653 (19) | 1.290598 (17) | 0.02889 (9) |
| O1 | 0.22857 (16) | 0.20334 (17) | 0.81649 (18) | 0.0277 (4) |
| O2 | 0.10698 (15) | −0.04467 (17) | 0.71974 (19) | 0.0329 (4) |
| H2 | 0.0364 | −0.0126 | 0.7220 | 0.049* |
| O3 | 0.57621 (18) | 0.37804 (17) | 1.02125 (17) | 0.0326 (4) |
| O4 | 0.4252 (2) | 0.21751 (18) | 1.07819 (17) | 0.0344 (4) |
| O5 | 0.41174 (19) | −0.39642 (18) | 0.45762 (18) | 0.0357 (4) |
| O6 | 0.5636 (2) | −0.23946 (18) | 0.39821 (17) | 0.0341 (4) |
| O7 | 0.75751 (16) | −0.21312 (17) | 0.65497 (17) | 0.0251 (3) |
| O8 | 0.87465 (16) | 0.03113 (17) | 0.7214 (2) | 0.0336 (4) |
| C1 | 0.2265 (2) | 0.0702 (2) | 0.7685 (2) | 0.0178 (4) |
| C2 | 0.4977 (2) | 0.2487 (2) | 0.9985 (2) | 0.0173 (4) |
| C3 | 0.4930 (2) | 0.1181 (2) | 0.8600 (2) | 0.0160 (4) |
| C4 | 0.3628 (2) | −0.0996 (2) | 0.6355 (2) | 0.0177 (4) |
| H4 | 0.2755 | −0.1617 | 0.5684 | 0.021* |
| C5 | 0.3627 (2) | 0.0251 (2) | 0.7570 (2) | 0.0160 (4) |
| C6 | 0.6223 (2) | −0.0377 (2) | 0.7128 (2) | 0.0157 (4) |
| C7 | 0.4913 (2) | −0.1332 (2) | 0.6121 (2) | 0.0153 (4) |
| C8 | 0.6218 (2) | 0.0862 (2) | 0.8348 (2) | 0.0185 (4) |
| H8 | 0.7093 | 0.1493 | 0.9012 | 0.022* |
| C9 | 0.4888 (2) | −0.2673 (2) | 0.4775 (2) | 0.0168 (4) |
| C10 | 0.7617 (2) | −0.0765 (2) | 0.6939 (2) | 0.0192 (4) |
| N1 | 0.0720 (2) | 0.4030 (2) | 0.1392 (2) | 0.0333 (5) |
| N2 | −0.1309 (2) | 0.6318 (3) | 0.4369 (2) | 0.0378 (5) |
| H | −0.1683 | 0.6777 | 0.5021 | 0.045* |
| C11 | 0.0048 (2) | 0.4765 (3) | 0.2354 (2) | 0.0271 (5) |
| C12 | −0.0362 (3) | 0.7091 (3) | 0.3890 (3) | 0.0354 (6) |

| | | | | |
|---|---|---|---|---|
| H12 | −0.0172 | 0.8144 | 0.4240 | 0.042* |
| C13 | −0.1624 (3) | 0.4795 (3) | 0.3866 (3) | 0.0375 (6) |
| H13 | −0.2296 | 0.4279 | 0.4204 | 0.045* |
| C14 | −0.0985 (3) | 0.3988 (3) | 0.2872 (3) | 0.0343 (6) |
| H14 | −0.1223 | 0.2931 | 0.2533 | 0.041* |
| C15 | 0.0325 (3) | 0.6369 (3) | 0.2906 (3) | 0.0333 (6) |
| H15 | 0.0981 | 0.6930 | 0.2592 | 0.040* |
| C16 | 0.0426 (3) | 0.2378 (3) | 0.0780 (3) | 0.0407 (6) |
| H16A | −0.0540 | 0.1883 | 0.0172 | 0.061* |
| H16B | 0.0505 | 0.2065 | 0.1535 | 0.061* |
| H16C | 0.1119 | 0.2095 | 0.0231 | 0.061* |
| C17 | 0.1797 (3) | 0.4867 (4) | 0.0902 (3) | 0.0423 (7) |
| H17A | 0.2588 | 0.5591 | 0.1700 | 0.063* |
| H17B | 0.1351 | 0.5400 | 0.0473 | 0.063* |
| H17C | 0.2160 | 0.4161 | 0.0210 | 0.063* |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Ag1 | 0.03846 (13) | 0.01606 (11) | 0.01917 (11) | 0.00464 (7) | 0.01347 (8) | 0.00093 (7) |
| Ag2 | 0.04268 (13) | 0.01682 (11) | 0.02185 (11) | 0.00567 (8) | 0.01695 (8) | 0.00245 (8) |
| O1 | 0.0209 (8) | 0.0163 (8) | 0.0436 (10) | 0.0084 (6) | 0.0142 (7) | 0.0076 (7) |
| O2 | 0.0123 (7) | 0.0184 (8) | 0.0581 (11) | 0.0053 (6) | 0.0090 (7) | 0.0065 (8) |
| O3 | 0.0409 (10) | 0.0154 (8) | 0.0288 (9) | 0.0006 (7) | 0.0191 (7) | −0.0016 (7) |
| O4 | 0.0535 (11) | 0.0211 (8) | 0.0240 (8) | 0.0075 (7) | 0.0231 (8) | 0.0037 (7) |
| O5 | 0.0431 (10) | 0.0148 (8) | 0.0356 (9) | −0.0001 (7) | 0.0255 (8) | −0.0019 (7) |
| O6 | 0.0553 (11) | 0.0201 (8) | 0.0233 (8) | 0.0081 (7) | 0.0245 (8) | 0.0034 (7) |
| O7 | 0.0233 (8) | 0.0173 (8) | 0.0361 (9) | 0.0103 (6) | 0.0155 (7) | 0.0084 (7) |
| O8 | 0.0143 (8) | 0.0191 (8) | 0.0614 (12) | 0.0046 (6) | 0.0133 (7) | 0.0108 (8) |
| C1 | 0.0168 (10) | 0.0168 (11) | 0.0191 (10) | 0.0056 (8) | 0.0084 (8) | 0.0058 (9) |
| C2 | 0.0181 (10) | 0.0166 (10) | 0.0149 (9) | 0.0087 (8) | 0.0047 (8) | 0.0027 (8) |
| C3 | 0.0185 (10) | 0.0132 (10) | 0.0154 (10) | 0.0056 (8) | 0.0061 (8) | 0.0045 (8) |
| C4 | 0.0146 (10) | 0.0155 (10) | 0.0173 (10) | 0.0036 (8) | 0.0026 (8) | 0.0026 (8) |
| C5 | 0.0151 (10) | 0.0132 (10) | 0.0199 (10) | 0.0049 (7) | 0.0079 (8) | 0.0061 (8) |
| C6 | 0.0144 (10) | 0.0132 (10) | 0.0185 (10) | 0.0047 (7) | 0.0067 (8) | 0.0050 (8) |
| C7 | 0.0173 (10) | 0.0130 (9) | 0.0160 (9) | 0.0063 (8) | 0.0073 (8) | 0.0049 (8) |
| C8 | 0.0155 (10) | 0.0143 (10) | 0.0187 (10) | 0.0028 (8) | 0.0031 (8) | 0.0016 (8) |
| C9 | 0.0168 (10) | 0.0164 (10) | 0.0150 (10) | 0.0071 (8) | 0.0035 (8) | 0.0036 (8) |
| C10 | 0.0181 (10) | 0.0173 (11) | 0.0199 (10) | 0.0063 (8) | 0.0074 (8) | 0.0045 (9) |
| N1 | 0.0372 (11) | 0.0354 (11) | 0.0322 (11) | 0.0154 (9) | 0.0194 (9) | 0.0141 (9) |
| N2 | 0.0413 (12) | 0.0458 (13) | 0.0318 (11) | 0.0272 (10) | 0.0174 (10) | 0.0123 (10) |
| C11 | 0.0270 (12) | 0.0322 (13) | 0.0235 (11) | 0.0108 (10) | 0.0076 (9) | 0.0122 (10) |
| C12 | 0.0420 (14) | 0.0289 (13) | 0.0338 (13) | 0.0143 (11) | 0.0061 (11) | 0.0113 (11) |
| C13 | 0.0364 (14) | 0.0422 (15) | 0.0414 (14) | 0.0136 (11) | 0.0216 (12) | 0.0213 (13) |
| C14 | 0.0383 (14) | 0.0280 (13) | 0.0401 (14) | 0.0111 (11) | 0.0188 (12) | 0.0150 (12) |
| C15 | 0.0369 (13) | 0.0308 (13) | 0.0344 (13) | 0.0097 (10) | 0.0128 (11) | 0.0156 (11) |
| C16 | 0.0437 (15) | 0.0410 (16) | 0.0369 (14) | 0.0218 (12) | 0.0152 (12) | 0.0102 (13) |
| C17 | 0.0371 (14) | 0.0576 (18) | 0.0399 (15) | 0.0176 (13) | 0.0225 (12) | 0.0236 (14) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Ag1—O1 | 2.5220 (15) | C6—C8 | 1.387 (3) |
| Ag1—O3$^{i}$ | 2.1784 (15) | C6—C7 | 1.400 (3) |
| Ag1—O3 | 2.7573 (19) | C6—C10 | 1.507 (3) |
| Ag1—O6$^{ii}$ | 2.1765 (15) | C7—C9 | 1.507 (3) |
| Ag2—O4 | 2.2091 (15) | C8—H8 | 0.9300 |
| Ag2—O5$^{iii}$ | 2.2224 (16) | N1—C11 | 1.336 (3) |
| Ag2—O5$^{iv}$ | 2.873 (2) | N1—C16 | 1.455 (3) |
| Ag2—O7$^{iv}$ | 2.4442 (15) | N1—C17 | 1.460 (3) |
| Ag1—Ag2$^{i}$ | 2.8189 (3) | N2—C12 | 1.339 (3) |
| O1—C1 | 1.216 (3) | N2—C13 | 1.341 (3) |
| O2—C1 | 1.306 (2) | N2—H | 0.84 |
| O2—H2 | 0.82 | C11—C15 | 1.417 (3) |
| O3—C2 | 1.252 (3) | C11—C14 | 1.420 (3) |
| O4—C2 | 1.244 (3) | C12—C15 | 1.355 (3) |
| O5—C9 | 1.255 (3) | C12—H12 | 0.9300 |
| O6—C9 | 1.240 (3) | C13—C14 | 1.361 (3) |
| O7—C10 | 1.249 (3) | C13—H13 | 0.9300 |
| O8—C10 | 1.257 (2) | C14—H14 | 0.9300 |
| C1—C5 | 1.496 (3) | C15—H15 | 0.9300 |
| C2—C3 | 1.508 (3) | C16—H16A | 0.9600 |
| C3—C8 | 1.392 (3) | C16—H16B | 0.9600 |
| C3—C5 | 1.401 (3) | C16—H16C | 0.9600 |
| C4—C5 | 1.387 (3) | C17—H17A | 0.9600 |
| C4—C7 | 1.392 (3) | C17—H17B | 0.9600 |
| C4—H4 | 0.9300 | C17—H17C | 0.9600 |
| | | | |
| O6$^{ii}$—Ag1—O3$^{i}$ | 165.22 (6) | C4—C7—C6 | 118.95 (18) |
| O6$^{ii}$—Ag1—O1 | 88.08 (6) | C4—C7—C9 | 120.01 (17) |
| O3$^{i}$—Ag1—O1 | 104.84 (6) | C6—C7—C9 | 120.99 (17) |
| O6$^{ii}$—Ag1—Ag2$^{i}$ | 82.64 (4) | C6—C8—C3 | 121.33 (18) |
| O3$^{i}$—Ag1—Ag2$^{i}$ | 83.04 (4) | C6—C8—H8 | 119.3 |
| O1—Ag1—Ag2$^{i}$ | 162.98 (4) | C3—C8—H8 | 119.3 |
| O3—Ag1—O1 | 80.23 (5) | O6—C9—O5 | 126.56 (19) |
| O3—Ag1—O3$^{i}$ | 82.06 (6) | O6—C9—C7 | 117.07 (18) |
| O3—Ag1—O6$^{ii}$ | 107.63 (5) | O5—C9—C7 | 116.36 (17) |
| O3—Ag1—Ag2$^{i}$ | 116.16 (4) | O7—C10—O8 | 124.57 (19) |
| O4—Ag2—O5$^{iii}$ | 158.69 (7) | O7—C10—C6 | 117.63 (17) |
| O4—Ag2—O7$^{iv}$ | 97.68 (6) | O8—C10—C6 | 117.78 (18) |
| O5$^{iii}$—Ag2—O7$^{iv}$ | 97.08 (5) | C11—N1—C16 | 122.5 (2) |
| O4—Ag2—Ag1$^{i}$ | 81.08 (4) | C11—N1—C17 | 120.8 (2) |
| O5$^{iii}$—Ag2—Ag1$^{i}$ | 81.40 (4) | C16—N1—C17 | 116.8 (2) |
| O7$^{iv}$—Ag2—Ag1$^{i}$ | 168.58 (4) | C12—N2—C13 | 120.7 (2) |
| O5$^{iv}$—Ag2—O4 | 119.23 (5) | C12—N2—H | 120.9 |
| O5$^{iv}$—Ag2—O5$^{iii}$ | 78.86 (6) | C13—N2—H | 118.3 |
| O5$^{iv}$—Ag2—O7$^{iv}$ | 78.31 (5) | N1—C11—C15 | 121.4 (2) |
| O5$^{iv}$—Ag2—Ag1$^{i}$ | 112.29 (4) | N1—C11—C14 | 122.1 (2) |

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| C1—O1—Ag1 | 123.41 (13) | C15—C11—C14 | 116.4 (2) |
| C1—O2—H2 | 109.5 | N2—C12—C15 | 121.3 (2) |
| C2—O3—Ag1$^{i}$ | 123.07 (13) | N2—C12—H12 | 119.3 |
| C2—O4—Ag2 | 124.47 (14) | C15—C12—H12 | 119.3 |
| C9—O5—Ag2$^{v}$ | 123.12 (13) | N2—C13—C14 | 121.5 (2) |
| C9—O6—Ag1$^{ii}$ | 124.62 (14) | N2—C13—H13 | 119.3 |
| C10—O7—Ag2$^{iv}$ | 121.06 (12) | C14—C13—H13 | 119.3 |
| O1—C1—O2 | 123.50 (18) | C13—C14—C11 | 119.7 (2) |
| O1—C1—C5 | 122.02 (17) | C13—C14—H14 | 120.1 |
| O2—C1—C5 | 114.46 (17) | C11—C14—H14 | 120.1 |
| O4—C2—O3 | 126.86 (19) | C12—C15—C11 | 120.3 (2) |
| O4—C2—C3 | 117.34 (18) | C12—C15—H15 | 119.8 |
| O3—C2—C3 | 115.79 (17) | C11—C15—H15 | 119.8 |
| C8—C3—C5 | 118.74 (18) | N1—C16—H16A | 109.5 |
| C8—C3—C2 | 119.06 (17) | N1—C16—H16B | 109.5 |
| C5—C3—C2 | 122.18 (17) | H16A—C16—H16B | 109.5 |
| C5—C4—C7 | 121.14 (18) | N1—C16—H16C | 109.5 |
| C5—C4—H4 | 119.4 | H16A—C16—H16C | 109.5 |
| C7—C4—H4 | 119.4 | H16B—C16—H16C | 109.5 |
| C4—C5—C3 | 119.97 (18) | N1—C17—H17A | 109.5 |
| C4—C5—C1 | 119.38 (17) | N1—C17—H17B | 109.5 |
| C3—C5—C1 | 120.24 (17) | H17A—C17—H17B | 109.5 |
| C8—C6—C7 | 119.81 (18) | N1—C17—H17C | 109.5 |
| C8—C6—C10 | 120.10 (17) | H17A—C17—H17C | 109.5 |
| C7—C6—C10 | 119.93 (17) | H17B—C17—H17C | 109.5 |

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| O6$^{ii}$—Ag1—O1—C1 | 31.61 (18) | C10—C6—C7—C9 | −5.6 (3) |
| O3$^{i}$—Ag1—O1—C1 | −155.65 (17) | C7—C6—C8—C3 | 0.1 (3) |
| Ag2$^{i}$—Ag1—O1—C1 | 88.4 (2) | C10—C6—C8—C3 | −175.26 (19) |
| O5$^{iii}$—Ag2—O4—C2 | 43.7 (3) | C5—C3—C8—C6 | −2.1 (3) |
| O7$^{iv}$—Ag2—O4—C2 | 177.18 (18) | C2—C3—C8—C6 | 176.43 (19) |
| Ag1$^{i}$—Ag2—O4—C2 | 8.66 (17) | Ag1$^{ii}$—O6—C9—O5 | 1.1 (3) |
| Ag1—O1—C1—O2 | −150.04 (16) | Ag1$^{ii}$—O6—C9—C7 | −179.62 (13) |
| Ag1—O1—C1—C5 | 28.3 (3) | Ag2$^{v}$—O5—C9—O6 | 11.0 (3) |
| Ag2—O4—C2—O3 | −2.3 (3) | Ag2$^{v}$—O5—C9—C7 | −168.32 (13) |
| Ag2—O4—C2—C3 | 177.08 (13) | C4—C7—C9—O6 | 120.2 (2) |
| Ag1$^{i}$—O3—C2—O4 | −9.4 (3) | C6—C7—C9—O6 | −57.5 (3) |
| Ag1$^{i}$—O3—C2—C3 | 171.21 (13) | C4—C7—C9—O5 | −60.4 (3) |
| O4—C2—C3—C8 | −119.5 (2) | C6—C7—C9—O5 | 121.9 (2) |
| O3—C2—C3—C8 | 60.0 (3) | Ag2$^{iv}$—O7—C10—O8 | 151.16 (17) |
| O4—C2—C3—C5 | 59.0 (3) | Ag2$^{iv}$—O7—C10—C6 | −27.2 (2) |
| O3—C2—C3—C5 | −121.6 (2) | C8—C6—C10—O7 | 132.8 (2) |
| C7—C4—C5—C3 | −1.1 (3) | C7—C6—C10—O7 | −42.6 (3) |
| C7—C4—C5—C1 | 171.50 (18) | C8—C6—C10—O8 | −45.6 (3) |
| C8—C3—C5—C4 | 2.6 (3) | C7—C6—C10—O8 | 139.0 (2) |
| C2—C3—C5—C4 | −175.89 (19) | C16—N1—C11—C15 | −178.3 (2) |
| C8—C3—C5—C1 | −170.00 (18) | C17—N1—C11—C15 | 1.6 (3) |
| C2—C3—C5—C1 | 11.5 (3) | C16—N1—C11—C14 | 1.2 (4) |

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| O1—C1—C5—C4 | −138.5 (2) | C17—N1—C11—C14 | −178.8 (2) |
| O2—C1—C5—C4 | 39.9 (3) | C13—N2—C12—C15 | −1.2 (4) |
| O1—C1—C5—C3 | 34.1 (3) | C12—N2—C13—C14 | 0.9 (4) |
| O2—C1—C5—C3 | −147.48 (19) | N2—C13—C14—C11 | 0.3 (4) |
| C5—C4—C7—C6 | −0.8 (3) | N1—C11—C14—C13 | 179.2 (2) |
| C5—C4—C7—C9 | −178.56 (19) | C15—C11—C14—C13 | −1.2 (3) |
| C8—C6—C7—C4 | 1.3 (3) | N2—C12—C15—C11 | 0.2 (4) |
| C10—C6—C7—C4 | 176.73 (18) | N1—C11—C15—C12 | −179.5 (2) |
| C8—C6—C7—C9 | 179.04 (19) | C14—C11—C15—C12 | 0.9 (3) |

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

*Hydrogen-bond geometry (Å, º)*

| *D*—H···*A* | *D*—H | H···*A* | *D*···*A* | *D*—H···*A* |
|---|---|---|---|---|
| N2—H···O7$^{vi}$ | 0.84 | 1.88 | 2.720 (2) | 177 |
| O2—H2···O8$^{vii}$ | 0.82 | 1.73 | 2.541 (2) | 173 |

Symmetry codes: (vi) *x*−1, *y*+1, *z*; (vii) *x*−1, *y*, *z*.