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# Bis[4-(2-hydroxybenzylideneamino)-benzoato-$\kappa O$]tetrakis(methanol-$\kappa O$)-manganese(II)

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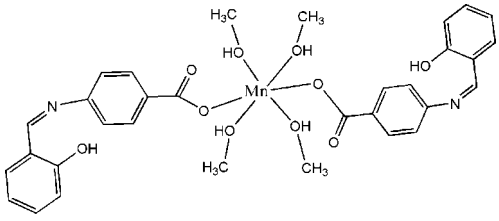
Key indicators: single-crystal X-ray study; $T$ = 293 K; mean $\sigma$(C–C) = 0.003 Å; $R$ factor = 0.039; $wR$ factor = 0.102; data-to-parameter ratio = 16.5.

In the title mononuclear complex, $[Mn(C_{14}H_{10}NO_3)_2(CH_3OH)_4]$, the $Mn^{II}$ atom, lying on an inversion centre, exhibits a distorted octahedral geometry, defined by two O atoms from two monodentate ligands and four O atoms from four methanol molecules. The crystal structure involves intramolecular O—H···N and O—H···O and intermolecular O—H···O hydrogen bonds.

## Related literature

For general background, see: Deeth (2008); Dubois *et al.* (2008); Huang *et al.* (2004).




## Experimental

### Crystal data

$[Mn(C_{14}H_{10}NO_3)_2(CH_4O)_4]$
$M_r$ = 663.57
Monoclinic, $P2_1/c$
$a$ = 15.0341 (6) Å
$b$ = 11.8819 (4) Å
$c$ = 8.8178 (3) Å
$\beta$ = 98.912 (4)°
$V$ = 1556.14 (10) Å$^3$
$Z$ = 2
Mo $K\alpha$ radiation
$\mu$ = 0.49 mm$^{-1}$
$T$ = 293 K
0.6 × 0.6 × 0.3 mm

### Data collection

Oxford Diffraction Gemini S Ultra diffractometer
Absorption correction: multi-scan (*CrysAlis RED*; Oxford Diffraction, 2006)
$T_{min}$ = 0.823, $T_{max}$ = 1.000 (expected range = 0.711–0.865)
10167 measured reflections
3374 independent reflections
2008 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.032

### Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.039
$wR(F^2)$ = 0.102
$S$ = 0.92
3374 reflections
205 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.55 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.31 e Å$^{-3}$

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

| | | | |
|---|---|---|---|
| Mn1—O3 | 2.1275 (15) | Mn1—O4 | 2.2023 (14) |
| Mn1—O5 | 2.1803 (13) | | |

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

| $D$—H···$A$ | $D$—H | H···$A$ | $D$···$A$ | $D$—H···$A$ |
|---|---|---|---|---|
| O1—H1$A$···N1 | 0.85 | 1.83 | 2.619 (2) | 153 |
| O4—H4$B$···O2$^{i}$ | 0.85 | 1.84 | 2.621 (2) | 151 |
| O5—H5$B$···O2 | 0.85 | 1.83 | 2.618 (2) | 153 |

Symmetry code: (i) $-x+1, y+\frac{1}{2}, -z+\frac{1}{2}$.

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: *SHELXTL* (Sheldrick, 2008) and *Mercury* (Macrae *et al.*, 2006); software used to prepare material for publication: *SHELXTL*.

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: HY2192).

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# supporting information

*Acta Cryst.* (2009). E**65**, m634 [doi:10.1107/S160053680901681X]

# Bis[4-(2-hydroxybenzylideneamino)benzoato-$\kappa O$]tetrakis(methanol-$\kappa O$)manganese(II)

**Min Zhong, Jia-Huang Lin, Jing Shang, Ting-Hong Huang and Xiu-Jian Wang**

## S1. Comment

General molecular mechanics method for transition metal carboxylates and the multiple coordination modes in manganese(II) complexes have been reported recently (Deeth, 2008). Information on the structures of manganese(II) carboxylates continues to be collected, and at the same time new applications of such complexes are being discovered in magnetic properties, potential biological significance and ferrimagnet (Huang *et al.*, 2004). The chemistry of organo-manganese(II) complexes of Schiff base has stemmed from the reported biocidal and catalytic activities of organo-manganese(II) compounds (Dubois *et al.*, 2008). We report here a new monomeric manganese(II) compound, which contains the Schiff base ligand, *N*-(4-carboxyphenyl)salicylideneimine (Fig.1). The $Mn^{II}$ atom has a distorted octahedral geometry (Table 1). There exist intra- and intermolecular hydrogen bonds in the crystal structure (Table 2). The intermolecular hydrogen bonds is used to form a two-dimensional supramolecular network (Fig. 2).

## S2. Experimental

Manganese(II) acetate tetrahydrate (0.049 g, 0.2 mmol) was dissolved in 8 ml deionized water, giving a transparent solution (A), and *N*-(4-carboxyphenyl)salicylideneimine (0.097 g, 0.4 mmol) was dissolved in 10 ml me thanol (B). Then solution B was mixed with A and a suspension was obtained. Ammonia was added to the above mixture dropwise under magnetic stirring until pH value is neutral. The resulting suspension was transferred into a 25 ml Teflon-lined stainless-steel autoclave. The autoclave was sealed and maintained at 363 K for 12 h under autogenous pressure. After the reaction was completed, the resulting colourless block crystals were collected by filtration.

## S3. Refinement

H atoms were positioned geometrically and refined as riding atoms, with C—H = 0.93 (aromatic) and 0.96 ($CH_3$) Å and O—H = 0.85 Å, and with $U_{iso}$(H) = 1.2$U_{eq}$(C,*O*).

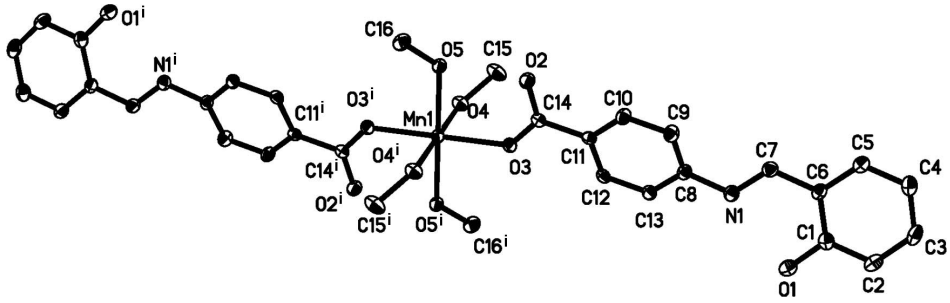


**Figure 1**

Molecular structure of the title compound. Displacement ellipsoids are drawn at the 30% probability level. H atoms have been omitted for clarity. [Symmetry code: (i) -*x* + 1, -*y*, -*z*.]

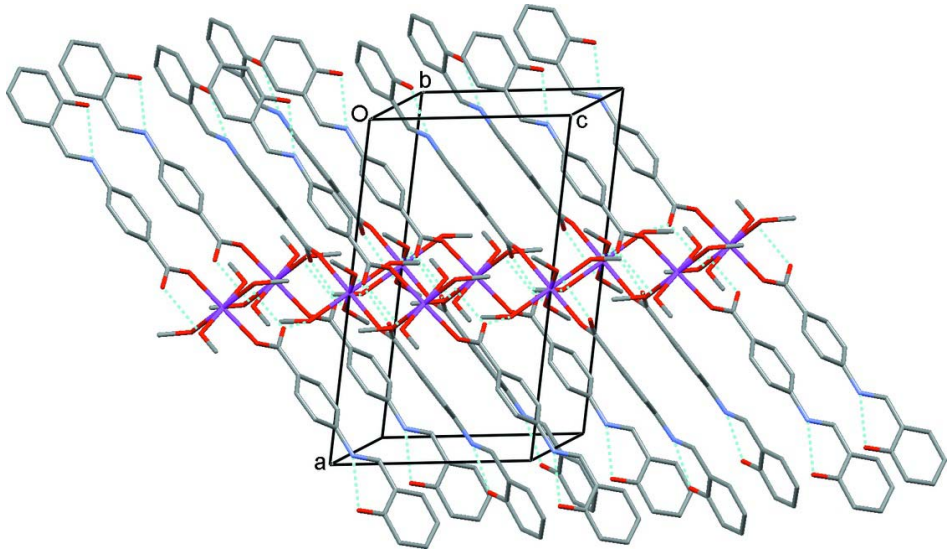


**Figure 2**

Crystal packing of the title compound, showing hydrogen bonds (dashed lines).

### Bis[4-(2-hydroxybenzylideneamino)benzoato-*κO*]tetrakis(methanol- *κO*)manganese(II)

*Crystal data*

$[Mn(C_{14}H_{10}NO_3)_2(CH_4O)_4]$
$M_r$ = 663.57
Monoclinic, $P2_1/c$
Hall symbol: -P 2ybc
$a$ = 15.0341 (6) Å
$b$ = 11.8819 (4) Å
$c$ = 8.8178 (3) Å
$\beta$ = 98.912 (4)°
$V$ = 1556.14 (10) Å$^3$
$Z$ = 2
$F(000)$ = 694
$D_x$ = 1.416 Mg m$^{-3}$
Mo $K\alpha$ radiation, $\lambda$ = 0.71073 Å
Cell parameters from 3622 reflections
$\theta$ = 2.7–29.8°
$\mu$ = 0.49 mm$^{-1}$
$T$ = 293 K
Block, colorless
0.6 × 0.6 × 0.3 mm

*Data collection*

Oxford Diffraction Gemini S Ultra diffractometer
Radiation source: Enhance (Mo) X-ray Source
Graphite monochromator
Detector resolution: 16.0855 pixels mm$^{-1}$
$\omega$ scans
Absorption correction: multi-scan (*CrysAlis RED*; Oxford Diffraction, 2006)

$T_{min}$ = 0.823, $T_{max}$ = 1.000
10167 measured reflections
3374 independent reflections
2008 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.032

$\theta_{max}$ = 27.0°, $\theta_{min}$ = 2.7°
$h$ = −19→16
$k$ = −15→14
$l$ = −11→11

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.039
$wR(F^2)$ = 0.102
$S$ = 0.92
3374 reflections
205 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
$w = 1/[\sigma^2(F_o^2) + (0.058P)^2]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} < 0.001$
$\Delta\rho_{max}$ = 0.55 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.31 e Å$^{-3}$

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

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ |
|---|---|---|---|---|
| Mn1 | 0.5000 | 0.0000 | 0.0000 | 0.02171 (15) |
| O1 | 1.09324 (11) | 0.03911 (14) | 0.80222 (19) | 0.0404 (4) |
| H1A | 1.0420 | 0.0210 | 0.7533 | 0.048* |
| O2 | 0.57922 (10) | −0.20216 (13) | 0.26345 (18) | 0.0350 (4) |
| O3 | 0.60735 (10) | −0.03061 (12) | 0.18268 (17) | 0.0291 (4) |
| N1 | 0.94227 (12) | −0.06941 (15) | 0.7155 (2) | 0.0295 (5) |
| C1 | 1.11213 (15) | −0.0410 (2) | 0.9117 (3) | 0.0303 (6) |
| C2 | 1.19528 (16) | −0.0391 (2) | 1.0049 (3) | 0.0360 (6) |
| H2A | 1.2378 | 0.0151 | 0.9904 | 0.043* |
| C3 | 1.21437 (16) | −0.1187 (2) | 1.1196 (3) | 0.0397 (6) |
| H3A | 1.2704 | −0.1177 | 1.1815 | 0.048* |
| C4 | 1.15283 (15) | −0.1989 (2) | 1.1442 (3) | 0.0377 (6) |
| H4A | 1.1665 | −0.2511 | 1.2229 | 0.045* |
| C5 | 1.07051 (15) | −0.2014 (2) | 1.0510 (3) | 0.0332 (6) |
| H5A | 1.0288 | −0.2561 | 1.0675 | 0.040* |
| C6 | 1.04831 (14) | −0.12450 (18) | 0.9335 (2) | 0.0276 (5) |
| C7 | 0.96278 (15) | −0.13309 (19) | 0.8321 (3) | 0.0306 (5) |
| H7A | 0.9215 | −0.1870 | 0.8529 | 0.037* |
| C8 | 0.86185 (14) | −0.08573 (19) | 0.6112 (2) | 0.0269 (5) |
| C9 | 0.81878 (14) | −0.18938 (19) | 0.5844 (3) | 0.0312 (6) |
| H9A | 0.8412 | −0.2524 | 0.6402 | 0.037* |
| C10 | 0.74265 (14) | −0.19842 (19) | 0.4748 (3) | 0.0299 (5) |
| H10A | 0.7137 | −0.2675 | 0.4587 | 0.036* |
| C11 | 0.70884 (14) | −0.10594 (17) | 0.3887 (2) | 0.0225 (5) |
| C12 | 0.75350 (15) | −0.00380 (18) | 0.4146 (2) | 0.0259 (5) |
| H12A | 0.7322 | 0.0587 | 0.3567 | 0.031* |
| C13 | 0.82848 (15) | 0.00641 (19) | 0.5241 (2) | 0.0279 (5) |
| H13A | 0.8572 | 0.0757 | 0.5401 | 0.033* |
| C14 | 0.62646 (14) | −0.11436 (18) | 0.2699 (2) | 0.0234 (5) |

| | | | | |
|---|---|---|---|---|
| O4 | 0.42496 (10) | 0.08439 (12) | 0.16313 (16) | 0.0306 (4) |
| H4B | 0.4371 | 0.1543 | 0.1666 | 0.037* |
| O5 | 0.43893 (10) | −0.15779 (11) | 0.05698 (16) | 0.0271 (4) |
| H5B | 0.4791 | −0.1938 | 0.1163 | 0.033* |
| C15 | 0.42208 (19) | 0.0436 (2) | 0.3134 (3) | 0.0436 (7) |
| H15A | 0.3862 | 0.0932 | 0.3650 | 0.065* |
| H15B | 0.4821 | 0.0403 | 0.3695 | 0.065* |
| H15C | 0.3960 | −0.0303 | 0.3075 | 0.065* |
| C16 | 0.39223 (16) | −0.23800 (19) | −0.0468 (3) | 0.0368 (6) |
| H16A | 0.3730 | −0.2999 | 0.0103 | 0.055* |
| H16B | 0.4316 | −0.2651 | −0.1145 | 0.055* |
| H16C | 0.3406 | −0.2029 | −0.1058 | 0.055* |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Mn1 | 0.0265 (3) | 0.0162 (2) | 0.0218 (3) | −0.0006 (2) | 0.00172 (19) | 0.0002 (2) |
| O1 | 0.0353 (10) | 0.0405 (10) | 0.0447 (11) | −0.0090 (8) | 0.0041 (8) | 0.0001 (9) |
| O2 | 0.0365 (9) | 0.0240 (9) | 0.0407 (10) | −0.0064 (7) | −0.0061 (8) | 0.0091 (8) |
| O3 | 0.0313 (9) | 0.0259 (9) | 0.0282 (9) | −0.0022 (7) | −0.0011 (7) | 0.0067 (7) |
| N1 | 0.0296 (11) | 0.0303 (11) | 0.0282 (10) | −0.0001 (9) | 0.0029 (9) | −0.0037 (9) |
| C1 | 0.0333 (14) | 0.0307 (13) | 0.0272 (12) | 0.0057 (10) | 0.0061 (11) | −0.0047 (11) |
| C2 | 0.0260 (13) | 0.0373 (14) | 0.0454 (15) | −0.0033 (11) | 0.0077 (12) | −0.0122 (12) |
| C3 | 0.0247 (14) | 0.0523 (17) | 0.0392 (15) | 0.0064 (12) | −0.0040 (11) | −0.0083 (13) |
| C4 | 0.0366 (14) | 0.0417 (15) | 0.0331 (14) | 0.0070 (12) | 0.0002 (12) | 0.0001 (12) |
| C5 | 0.0286 (13) | 0.0352 (14) | 0.0354 (14) | −0.0022 (11) | 0.0035 (11) | −0.0022 (12) |
| C6 | 0.0223 (12) | 0.0336 (13) | 0.0271 (12) | 0.0010 (10) | 0.0044 (10) | −0.0069 (11) |
| C7 | 0.0304 (13) | 0.0313 (13) | 0.0302 (13) | −0.0033 (10) | 0.0053 (11) | −0.0027 (11) |
| C8 | 0.0245 (12) | 0.0312 (13) | 0.0249 (12) | −0.0004 (10) | 0.0036 (10) | −0.0059 (10) |
| C9 | 0.0293 (13) | 0.0247 (13) | 0.0373 (14) | 0.0055 (10) | −0.0015 (11) | 0.0034 (11) |
| C10 | 0.0293 (13) | 0.0226 (12) | 0.0355 (14) | −0.0011 (10) | −0.0022 (11) | −0.0010 (11) |
| C11 | 0.0252 (12) | 0.0214 (11) | 0.0225 (11) | 0.0003 (9) | 0.0086 (10) | −0.0014 (9) |
| C12 | 0.0330 (12) | 0.0224 (11) | 0.0223 (11) | 0.0000 (11) | 0.0043 (9) | 0.0032 (10) |
| C13 | 0.0336 (13) | 0.0244 (12) | 0.0251 (11) | −0.0048 (11) | 0.0025 (10) | −0.0020 (11) |
| C14 | 0.0276 (12) | 0.0201 (12) | 0.0237 (11) | 0.0025 (10) | 0.0075 (10) | −0.0001 (10) |
| O4 | 0.0433 (10) | 0.0183 (8) | 0.0317 (9) | 0.0003 (7) | 0.0105 (7) | −0.0017 (7) |
| O5 | 0.0306 (8) | 0.0180 (8) | 0.0309 (9) | −0.0023 (7) | −0.0010 (7) | 0.0019 (7) |
| C15 | 0.070 (2) | 0.0313 (13) | 0.0339 (14) | −0.0014 (13) | 0.0207 (14) | 0.0006 (12) |
| C16 | 0.0417 (15) | 0.0264 (13) | 0.0415 (15) | −0.0077 (11) | 0.0041 (12) | −0.0096 (11) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Mn1—O3 | 2.1275 (15) | C7—H7A | 0.9300 |
| Mn1—O3$^{i}$ | 2.1275 (15) | C8—C13 | 1.386 (3) |
| Mn1—O5$^{i}$ | 2.1802 (13) | C8—C9 | 1.394 (3) |
| Mn1—O5 | 2.1803 (13) | C9—C10 | 1.383 (3) |
| Mn1—O4 | 2.2023 (14) | C9—H9A | 0.9300 |
| Mn1—O4$^{i}$ | 2.2023 (14) | C10—C11 | 1.387 (3) |

| | | | |
|---|---|---|---|
| O1—C1 | 1.354 (3) | C10—H10A | 0.9300 |
| O1—H1A | 0.8500 | C11—C12 | 1.389 (3) |
| O2—C14 | 1.258 (2) | C11—C14 | 1.496 (3) |
| O3—C14 | 1.263 (2) | C12—C13 | 1.372 (3) |
| N1—C7 | 1.275 (3) | C12—H12A | 0.9300 |
| N1—C8 | 1.415 (3) | C13—H13A | 0.9300 |
| C1—C2 | 1.386 (3) | O4—C15 | 1.418 (3) |
| C1—C6 | 1.414 (3) | O4—H4B | 0.8500 |
| C2—C3 | 1.382 (3) | O5—C16 | 1.428 (2) |
| C2—H2A | 0.9300 | O5—H5B | 0.8500 |
| C3—C4 | 1.369 (3) | C15—H15A | 0.9600 |
| C3—H3A | 0.9300 | C15—H15B | 0.9600 |
| C4—C5 | 1.376 (3) | C15—H15C | 0.9600 |
| C4—H4A | 0.9300 | C16—H16A | 0.9600 |
| C5—C6 | 1.383 (3) | C16—H16B | 0.9600 |
| C5—H5A | 0.9300 | C16—H16C | 0.9600 |
| C6—C7 | 1.452 (3) | | |

| | | | |
|---|---|---|---|
| O3—Mn1—O3$^{i}$ | 180.00 (10) | C13—C8—C9 | 119.0 (2) |
| O3—Mn1—O5$^{i}$ | 91.39 (5) | C13—C8—N1 | 116.85 (19) |
| O3$^{i}$—Mn1—O5$^{i}$ | 88.61 (5) | C9—C8—N1 | 124.0 (2) |
| O3—Mn1—O5 | 88.61 (5) | C10—C9—C8 | 120.0 (2) |
| O3$^{i}$—Mn1—O5 | 91.39 (5) | C10—C9—H9A | 120.0 |
| O5$^{i}$—Mn1—O5 | 180.00 (7) | C8—C9—H9A | 120.0 |
| O3—Mn1—O4 | 89.34 (6) | C9—C10—C11 | 121.0 (2) |
| O3$^{i}$—Mn1—O4 | 90.66 (6) | C9—C10—H10A | 119.5 |
| O5$^{i}$—Mn1—O4 | 92.04 (5) | C11—C10—H10A | 119.5 |
| O5—Mn1—O4 | 87.96 (5) | C10—C11—C12 | 118.4 (2) |
| O3—Mn1—O4$^{i}$ | 90.66 (6) | C10—C11—C14 | 121.60 (19) |
| O3$^{i}$—Mn1—O4$^{i}$ | 89.34 (6) | C12—C11—C14 | 120.02 (19) |
| O5$^{i}$—Mn1—O4$^{i}$ | 87.96 (5) | C13—C12—C11 | 121.1 (2) |
| O5—Mn1—O4$^{i}$ | 92.04 (5) | C13—C12—H12A | 119.4 |
| O4—Mn1—O4$^{i}$ | 180.00 (7) | C11—C12—H12A | 119.4 |
| C1—O1—H1A | 104.9 | C12—C13—C8 | 120.5 (2) |
| C14—O3—Mn1 | 132.05 (14) | C12—C13—H13A | 119.7 |
| C7—N1—C8 | 121.23 (19) | C8—C13—H13A | 119.7 |
| O1—C1—C2 | 118.8 (2) | O2—C14—O3 | 123.5 (2) |
| O1—C1—C6 | 121.2 (2) | O2—C14—C11 | 119.14 (19) |
| C2—C1—C6 | 120.0 (2) | O3—C14—C11 | 117.32 (18) |
| C3—C2—C1 | 119.3 (2) | C15—O4—Mn1 | 123.20 (14) |
| C3—C2—H2A | 120.4 | C15—O4—H4B | 109.7 |
| C1—C2—H2A | 120.4 | Mn1—O4—H4B | 109.9 |
| C4—C3—C2 | 121.6 (2) | C16—O5—Mn1 | 127.52 (13) |
| C4—C3—H3A | 119.2 | C16—O5—H5B | 106.9 |
| C2—C3—H3A | 119.2 | Mn1—O5—H5B | 106.9 |
| C3—C4—C5 | 119.2 (2) | O4—C15—H15A | 109.5 |
| C3—C4—H4A | 120.4 | O4—C15—H15B | 109.5 |
| C5—C4—H4A | 120.4 | H15A—C15—H15B | 109.5 |

| | | | |
|---|---|---|---|
| C4—C5—C6 | 121.6 (2) | O4—C15—H15C | 109.5 |
| C4—C5—H5A | 119.2 | H15A—C15—H15C | 109.5 |
| C6—C5—H5A | 119.2 | H15B—C15—H15C | 109.5 |
| C5—C6—C1 | 118.4 (2) | O5—C16—H16A | 109.5 |
| C5—C6—C7 | 120.2 (2) | O5—C16—H16B | 109.5 |
| C1—C6—C7 | 121.4 (2) | H16A—C16—H16B | 109.5 |
| N1—C7—C6 | 122.4 (2) | O5—C16—H16C | 109.5 |
| N1—C7—H7A | 118.8 | H16A—C16—H16C | 109.5 |
| C6—C7—H7A | 118.8 | H16B—C16—H16C | 109.5 |
| | | | |
| O5$^{i}$—Mn1—O3—C14 | −173.33 (18) | C8—C9—C10—C11 | 1.0 (3) |
| O5—Mn1—O3—C14 | 6.67 (18) | C9—C10—C11—C12 | 0.3 (3) |
| O4—Mn1—O3—C14 | 94.64 (19) | C9—C10—C11—C14 | −179.90 (18) |
| O4$^{i}$—Mn1—O3—C14 | −85.36 (19) | C10—C11—C12—C13 | −1.0 (3) |
| O1—C1—C2—C3 | 178.3 (2) | C14—C11—C12—C13 | 179.17 (18) |
| C6—C1—C2—C3 | −0.6 (3) | C11—C12—C13—C8 | 0.4 (3) |
| C1—C2—C3—C4 | −0.5 (4) | C9—C8—C13—C12 | 0.8 (3) |
| C2—C3—C4—C5 | 1.0 (4) | N1—C8—C13—C12 | 176.55 (18) |
| C3—C4—C5—C6 | −0.2 (3) | Mn1—O3—C14—O2 | −1.2 (3) |
| C4—C5—C6—C1 | −0.9 (3) | Mn1—O3—C14—C11 | −179.75 (12) |
| C4—C5—C6—C7 | 176.7 (2) | C10—C11—C14—O2 | 10.7 (3) |
| O1—C1—C6—C5 | −177.6 (2) | C12—C11—C14—O2 | −169.4 (2) |
| C2—C1—C6—C5 | 1.3 (3) | C10—C11—C14—O3 | −170.6 (2) |
| O1—C1—C6—C7 | 4.8 (3) | C12—C11—C14—O3 | 9.2 (3) |
| C2—C1—C6—C7 | −176.2 (2) | O3—Mn1—O4—C15 | −41.12 (17) |
| C8—N1—C7—C6 | 174.53 (19) | O3$^{i}$—Mn1—O4—C15 | 138.88 (17) |
| C5—C6—C7—N1 | −174.7 (2) | O5$^{i}$—Mn1—O4—C15 | −132.49 (17) |
| C1—C6—C7—N1 | 2.8 (3) | O5—Mn1—O4—C15 | 47.51 (17) |
| C7—N1—C8—C13 | 157.1 (2) | O3—Mn1—O5—C16 | −142.12 (16) |
| C7—N1—C8—C9 | −27.4 (3) | O3$^{i}$—Mn1—O5—C16 | 37.88 (16) |
| C13—C8—C9—C10 | −1.5 (3) | O4—Mn1—O5—C16 | 128.49 (16) |
| N1—C8—C9—C10 | −176.92 (19) | O4$^{i}$—Mn1—O5—C16 | −51.51 (16) |

Symmetry code: (i) −*x*+1, −*y*, −*z*.

*Hydrogen-bond geometry (Å, º)*

| *D*—H···*A* | *D*—H | H···*A* | *D*···*A* | *D*—H···*A* |
|---|---|---|---|---|
| O1—H1*A*···N1 | 0.85 | 1.83 | 2.619 (2) | 153 |
| O4—H4*B*···O2$^{ii}$ | 0.85 | 1.84 | 2.621 (2) | 151 |
| O5—H5*B*···O2 | 0.85 | 1.83 | 2.618 (2) | 153 |

Symmetry code: (ii) −*x*+1, *y*+1/2, −*z*+1/2.