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# 8-Hydroxy-2-methylquinolinium tetrachlorido(quinolin-8-olato-$\kappa^2N,O$)-stannate(IV)

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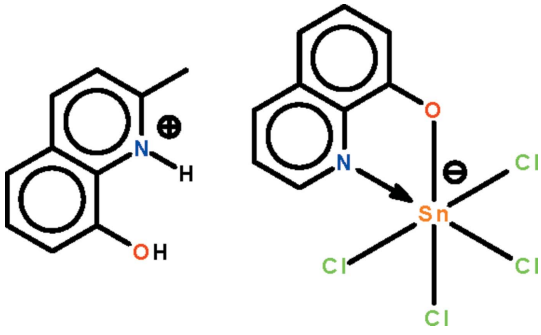
Key indicators: single-crystal X-ray study; $T$ = 100 K; mean $\sigma$(C–C) = 0.004 Å; $R$ factor = 0.025; $wR$ factor = 0.055; data-to-parameter ratio = 18.0.

The reaction of 8-hydroxyquinoline, 2-methylquinolin-8-ol and stannic chloride yields the protonated 8-hydroxy-2-methylquinolinium species. In the title salt, $(C_{10}H_{10}NO)[Sn(C_9H_6NO)Cl_4]$, the $Sn^{IV}$ cation is *N*,*O*-chelated by the quinolin-8-olate anion and is further coordinated by four $Cl^-$ anions in a distorted *cis*-$SnNOCl_4$ octahedral geometry. In the crystal, the cation is linked to the anion by an O—H···O hydrogen bond.

## Related literature

For the methanol solvate of the salt, see: Najafi *et al.* (2011).




## Experimental

### Crystal data

$(C_{10}H_{10}NO)[Sn(C_9H_6NO)Cl_4]$
$M_r$ = 564.83
Monoclinic, $P2_1/c$
$a$ = 8.9431 (3) Å
$b$ = 11.5892 (4) Å
$c$ = 20.1795 (8) Å
$\beta$ = 101.347 (4)°
$V$ = 2050.59 (13) Å$^3$
$Z$ = 4
Mo $K\alpha$ radiation
$\mu$ = 1.79 mm$^{-1}$
$T$ = 100 K
0.30 × 0.25 × 0.20 mm

### Data collection

Agilent SuperNova Dual diffractometer with an Atlas detector
Absorption correction: multi-scan (*CrysAlis PRO*; Agilent, 2012)
$T_{min}$ = 0.616, $T_{max}$ = 0.717
13674 measured reflections
4723 independent reflections
4222 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.029

### Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.025
$wR(F^2)$ = 0.055
$S$ = 1.06
4723 reflections
262 parameters
2 restraints
H atoms treated by a mixture of independent and constrained refinement
$\Delta\rho_{max}$ = 0.48 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.54 e Å$^{-3}$

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

| $D$—H···$A$ | $D$—H | H···$A$ | $D$···$A$ | $D$—H···$A$ |
|---|---|---|---|---|
| O2—H1···O1 | 0.84 (1) | 1.86 (1) | 2.683 (2) | 168 (3) |

Data collection: *CrysAlis PRO* (Agilent, 2012); cell refinement: *CrysAlis PRO*; data reduction: *CrysAlis PRO*; 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, 2010).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: XU5531).

## References

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# supplementary materials

*Acta Cryst.* (2012). E**68**, m738 [doi:10.1107/S1600536812019459]

## 8-Hydroxy-2-methylquinolinium tetrachlorido(quinolin-8-olato-$\kappa^2N,O$)stannate(IV)

**Ezzatollah Najafi, Mostafa M. Amini and Seik Weng Ng**

### Comment

The reaction of 8-hydroxyquinoline, 2-methyl-8-hydroxyquinoline and stannic chloride in methanol yields a protonated 2-methyl-8-hydroxyquinoline species. The $Sn^{IV}$atom in the methanol-solvated salt, $(C_{10}H_{10}NO)[SnCl_4(C_9H_6NO)]\cdot 2CH_3OH$, is *N*,*O*-chelated by the quinolin-8-olate (Najafi *et al.*, 2011). A repeat of the synthesis but isopropyl alcohol in place of methanol yielded the unsolvated salt (Scheme I). The $Sn^{IV}$atom in the salt is *N*,*O*-chelated by the quinolin-8-olate in a *cis*-$SnNOCl_4$ octahedral geometry. The cation is linked to the anion by an O–H···O hydrogen bond (Fig. 1, Table 1).

### Experimental

Stannic chloride pentahydrate (0.35 g, 1 mmol), 8-hydroxyquinoline (0.15 g, 1 mmol) and 2-methyl-8-hydroxyquinoline (0.16 g, 1 mmol) were loaded into a convection tube; the tube was filled with dry isopropyl alcohol and kept at 333 K. Yellow crystals were collected from the side arm after several days.

### Refinement

Carbon-bound H-atoms were placed in calculated positions [C–H 0.95 to 0.98 Å, $U_{iso}$(H) 1.2 to 1.5$U_{eq}$(C)] and were included in the refinement in the riding model approximation.

The hydroxy and ammonium H-atoms were located in a difference Fourier map, and were refined with distance restraints of O–H 0.84±0.01 and N–H 0.88±0.01 Å; their temperature factors were refined.

Omitted owing to bad disagreement wwere (5 6 0), (-6 5 3), (-5 6 2), (-4 7 1) and (1 10 3).

### Computing details

Data collection: *CrysAlis PRO* (Agilent, 2012); cell refinement: *CrysAlis PRO* (Agilent, 2012); data reduction: *CrysAlis PRO* (Agilent, 2012); 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, 2010).

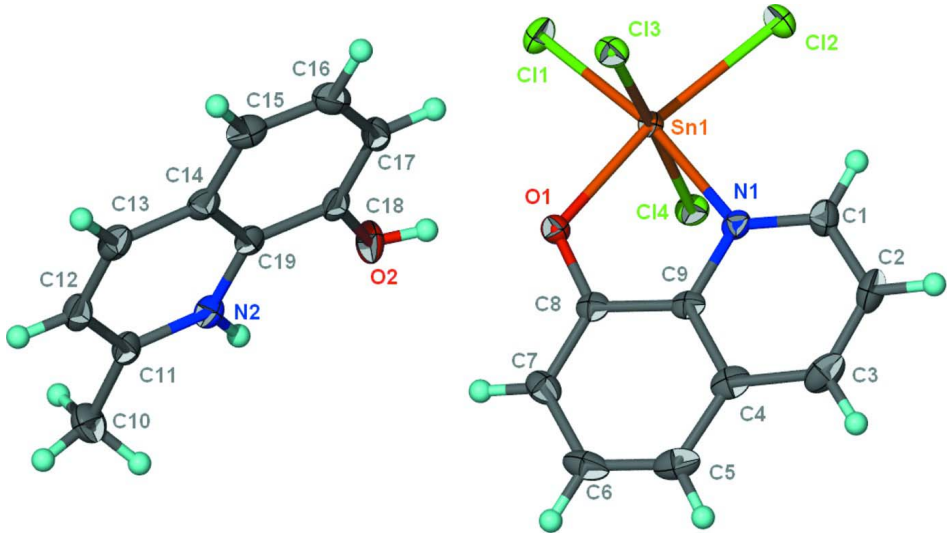


**Figure 1**

Thermal ellipsoid plot (Barbour, 2001) of $(C_{10}H_{10}NO)[SnCl_4(C_9H_6NO)]$ at the 70% probability level; hydrogen atoms are drawn as spheres of arbitrary radius.

### 8-Hydroxy-2-methylquinolinium tetrachlorido(quinolin-8-olato-$\kappa^2N,O$)stannate(IV)

*Crystal data*

$(C_{10}H_{10}NO)[Sn(C_9H_6NO)Cl_4]$
$M_r = 564.83$
Monoclinic, $P2_1/c$
Hall symbol: -P 2ybc
$a = 8.9431\ (3)$ Å
$b = 11.5892\ (4)$ Å
$c = 20.1795\ (8)$ Å
$\beta = 101.347\ (4)°$
$V = 2050.59\ (13)$ Å$^3$
$Z = 4$
$F(000) = 1112$
$D_x = 1.830$ Mg m$^{-3}$
Mo $K\alpha$ radiation, $\lambda = 0.71073$ Å
Cell parameters from 6840 reflections
$\theta = 2.3–27.5°$
$\mu = 1.79$ mm$^{-1}$
$T = 100$ K
Prism, yellow
0.30 × 0.25 × 0.20 mm

*Data collection*

Agilent SuperNova Dual diffractometer with an Atlas detector
Radiation source: SuperNova (Mo) X-ray Source
Mirror monochromator
Detector resolution: 10.4041 pixels mm$^{-1}$
$\omega$ scan
Absorption correction: multi-scan (*CrysAlis PRO*; Agilent, 2012)
$T_{min} = 0.616$, $T_{max} = 0.717$
13674 measured reflections
4723 independent reflections
4222 reflections with $I > 2\sigma(I)$
$R_{int} = 0.029$
$\theta_{max} = 27.6°$, $\theta_{min} = 2.3°$
$h = -11\rightarrow11$
$k = -14\rightarrow15$
$l = -17\rightarrow26$

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)] = 0.025$
$wR(F^2) = 0.055$
$S = 1.06$
4723 reflections
262 parameters
2 restraints
Primary atom site location: structure-invariant direct methods
Secondary atom site location: difference Fourier map
Hydrogen site location: inferred from neighbouring sites

H atoms treated by a mixture of independent and constrained refinement
$w = 1/[\sigma^2(F_o^2) + (0.0193P)^2 + 1.171P]$ where $P = (F_o^2 + 2F_c^2)/3$

$(\Delta/\sigma)_{max} = 0.001$
$\Delta\rho_{max} = 0.48$ e Å$^{-3}$
$\Delta\rho_{min} = -0.54$ e Å$^{-3}$

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

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ |
|---|---|---|---|---|
| Sn1 | 0.252394 (17) | 0.454836 (13) | 0.684298 (7) | 0.01219 (5) |
| Cl1 | 0.06888 (7) | 0.32750 (5) | 0.71370 (3) | 0.01978 (13) |
| Cl2 | 0.36818 (7) | 0.51365 (5) | 0.79638 (3) | 0.01813 (12) |
| Cl3 | 0.43713 (6) | 0.30303 (5) | 0.68659 (3) | 0.01751 (12) |
| Cl4 | 0.07496 (7) | 0.61568 (5) | 0.67319 (3) | 0.01740 (12) |
| O1 | 0.17767 (18) | 0.42497 (13) | 0.58138 (8) | 0.0149 (3) |
| O2 | 0.0249 (2) | 0.25623 (14) | 0.50577 (9) | 0.0221 (4) |
| N1 | 0.4033 (2) | 0.56783 (15) | 0.63929 (10) | 0.0141 (4) |
| N2 | −0.0535 (2) | 0.12664 (17) | 0.39515 (10) | 0.0161 (4) |
| C1 | 0.5172 (3) | 0.6332 (2) | 0.66989 (12) | 0.0188 (5) |
| H1A | 0.5461 | 0.6301 | 0.7177 | 0.023* |
| C2 | 0.5963 (3) | 0.7065 (2) | 0.63406 (13) | 0.0224 (6) |
| H2A | 0.6782 | 0.7523 | 0.6572 | 0.027* |
| C3 | 0.5545 (3) | 0.7115 (2) | 0.56511 (13) | 0.0227 (5) |
| H3 | 0.6070 | 0.7618 | 0.5403 | 0.027* |
| C4 | 0.4339 (3) | 0.6427 (2) | 0.53060 (12) | 0.0186 (5) |
| C5 | 0.3821 (3) | 0.6417 (2) | 0.45981 (13) | 0.0228 (6) |
| H5 | 0.4297 | 0.6892 | 0.4316 | 0.027* |
| C6 | 0.2630 (3) | 0.5720 (2) | 0.43221 (12) | 0.0227 (6) |
| H6 | 0.2276 | 0.5730 | 0.3846 | 0.027* |
| C7 | 0.1908 (3) | 0.4985 (2) | 0.47190 (12) | 0.0187 (5) |
| H7 | 0.1084 | 0.4511 | 0.4509 | 0.022* |
| C8 | 0.2391 (3) | 0.4952 (2) | 0.54069 (11) | 0.0145 (5) |
| C9 | 0.3609 (3) | 0.56980 (19) | 0.57047 (11) | 0.0147 (5) |
| C10 | −0.2450 (3) | 0.1085 (2) | 0.29236 (13) | 0.0254 (6) |
| H10A | −0.2408 | 0.1929 | 0.2898 | 0.038* |
| H10B | −0.3371 | 0.0854 | 0.3084 | 0.038* |
| H10C | −0.2472 | 0.0756 | 0.2474 | 0.038* |
| C11 | −0.1082 (3) | 0.0656 (2) | 0.34005 (12) | 0.0178 (5) |
| C12 | −0.0360 (3) | −0.0387 (2) | 0.33034 (12) | 0.0197 (5) |
| H12 | −0.0737 | −0.0843 | 0.2915 | 0.024* |
| C13 | 0.0878 (3) | −0.0750 (2) | 0.37615 (12) | 0.0193 (5) |
| H13 | 0.1363 | −0.1454 | 0.3687 | 0.023* |
| C14 | 0.1453 (3) | −0.0089 (2) | 0.43484 (12) | 0.0176 (5) |
| C15 | 0.2728 (3) | −0.0407 (2) | 0.48462 (13) | 0.0215 (5) |
| H15 | 0.3271 | −0.1096 | 0.4797 | 0.026* |
| C16 | 0.3176 (3) | 0.0281 (2) | 0.53985 (13) | 0.0227 (6) |
| H16 | 0.4045 | 0.0069 | 0.5728 | 0.027* |
| C17 | 0.2382 (3) | 0.1294 (2) | 0.54906 (12) | 0.0198 (5) |
| H17 | 0.2709 | 0.1751 | 0.5883 | 0.024* |
| C18 | 0.1135 (3) | 0.1629 (2) | 0.50175 (12) | 0.0169 (5) |
| C19 | 0.0689 (3) | 0.0939 (2) | 0.44380 (11) | 0.0153 (5) |

| | | | | |
|---|---|---|---|---|
| H1 | 0.071 (3) | 0.303 (2) | 0.5341 (12) | 0.036 (9)* |
| H2 | −0.099 (3) | 0.1922 (13) | 0.4000 (13) | 0.020 (7)* |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Sn1 | 0.01472 (9) | 0.01041 (8) | 0.01115 (8) | −0.00037 (6) | 0.00186 (6) | −0.00024 (6) |
| Cl1 | 0.0212 (3) | 0.0150 (3) | 0.0243 (3) | −0.0044 (2) | 0.0074 (2) | 0.0002 (2) |
| Cl2 | 0.0193 (3) | 0.0214 (3) | 0.0131 (3) | −0.0001 (2) | 0.0016 (2) | −0.0029 (2) |
| Cl3 | 0.0196 (3) | 0.0159 (3) | 0.0163 (3) | 0.0045 (2) | 0.0019 (2) | −0.0001 (2) |
| Cl4 | 0.0208 (3) | 0.0137 (3) | 0.0176 (3) | 0.0038 (2) | 0.0036 (2) | 0.0006 (2) |
| O1 | 0.0173 (8) | 0.0144 (8) | 0.0127 (8) | −0.0002 (7) | 0.0025 (6) | −0.0007 (6) |
| O2 | 0.0236 (9) | 0.0169 (9) | 0.0246 (10) | −0.0012 (8) | 0.0018 (8) | −0.0085 (7) |
| N1 | 0.0170 (10) | 0.0106 (9) | 0.0152 (10) | 0.0006 (8) | 0.0046 (8) | −0.0003 (7) |
| N2 | 0.0163 (10) | 0.0128 (10) | 0.0194 (10) | 0.0002 (8) | 0.0039 (8) | −0.0004 (8) |
| C1 | 0.0201 (12) | 0.0167 (12) | 0.0197 (12) | −0.0029 (10) | 0.0043 (10) | −0.0036 (10) |
| C2 | 0.0200 (12) | 0.0164 (12) | 0.0318 (15) | −0.0059 (10) | 0.0075 (11) | −0.0050 (10) |
| C3 | 0.0224 (13) | 0.0179 (12) | 0.0321 (15) | −0.0005 (11) | 0.0156 (11) | 0.0025 (11) |
| C4 | 0.0205 (12) | 0.0149 (11) | 0.0225 (13) | 0.0066 (10) | 0.0092 (10) | 0.0022 (10) |
| C5 | 0.0290 (14) | 0.0208 (13) | 0.0220 (13) | 0.0088 (11) | 0.0131 (11) | 0.0060 (10) |
| C6 | 0.0294 (14) | 0.0257 (14) | 0.0135 (12) | 0.0127 (12) | 0.0056 (10) | 0.0026 (10) |
| C7 | 0.0181 (12) | 0.0202 (12) | 0.0166 (12) | 0.0051 (10) | 0.0003 (9) | −0.0013 (10) |
| C8 | 0.0159 (11) | 0.0118 (10) | 0.0162 (11) | 0.0050 (9) | 0.0041 (9) | 0.0008 (9) |
| C9 | 0.0168 (11) | 0.0120 (11) | 0.0158 (11) | 0.0061 (9) | 0.0047 (9) | 0.0017 (9) |
| C10 | 0.0208 (13) | 0.0287 (15) | 0.0239 (14) | −0.0040 (11) | −0.0022 (11) | −0.0005 (11) |
| C11 | 0.0174 (12) | 0.0183 (12) | 0.0181 (12) | −0.0069 (10) | 0.0044 (10) | 0.0001 (9) |
| C12 | 0.0251 (13) | 0.0186 (12) | 0.0176 (12) | −0.0066 (11) | 0.0098 (10) | −0.0050 (9) |
| C13 | 0.0238 (13) | 0.0143 (11) | 0.0219 (13) | −0.0006 (10) | 0.0096 (10) | −0.0012 (10) |
| C14 | 0.0201 (12) | 0.0163 (11) | 0.0182 (12) | −0.0028 (10) | 0.0083 (10) | 0.0014 (9) |
| C15 | 0.0211 (13) | 0.0201 (13) | 0.0243 (13) | 0.0026 (11) | 0.0066 (11) | 0.0048 (10) |
| C16 | 0.0194 (12) | 0.0278 (14) | 0.0198 (13) | −0.0032 (11) | 0.0008 (10) | 0.0061 (11) |
| C17 | 0.0214 (12) | 0.0226 (13) | 0.0154 (12) | −0.0093 (11) | 0.0036 (10) | −0.0012 (10) |
| C18 | 0.0183 (12) | 0.0144 (11) | 0.0188 (12) | −0.0056 (10) | 0.0061 (9) | −0.0007 (9) |
| C19 | 0.0145 (11) | 0.0171 (11) | 0.0152 (11) | −0.0047 (10) | 0.0052 (9) | 0.0016 (9) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Sn1—O1 | 2.0818 (15) | C6—C7 | 1.409 (4) |
| Sn1—N1 | 2.201 (2) | C6—H6 | 0.9500 |
| Sn1—Cl1 | 2.3678 (6) | C7—C8 | 1.371 (3) |
| Sn1—Cl2 | 2.3938 (6) | C7—H7 | 0.9500 |
| Sn1—Cl3 | 2.4076 (6) | C8—C9 | 1.427 (3) |
| Sn1—Cl4 | 2.4296 (6) | C10—C11 | 1.486 (3) |
| O1—C8 | 1.348 (3) | C10—H10A | 0.9800 |
| O2—C18 | 1.353 (3) | C10—H10B | 0.9800 |
| O2—H1 | 0.835 (10) | C10—H10C | 0.9800 |
| N1—C1 | 1.321 (3) | C11—C12 | 1.402 (3) |
| N1—C9 | 1.366 (3) | C12—C13 | 1.362 (3) |
| N2—C11 | 1.328 (3) | C12—H12 | 0.9500 |
| N2—C19 | 1.372 (3) | C13—C14 | 1.419 (3) |

| | | | |
|---|---|---|---|
| N2—H2 | 0.878 (10) | C13—H13 | 0.9500 |
| C1—C2 | 1.395 (3) | C14—C19 | 1.402 (3) |
| C1—H1A | 0.9500 | C14—C15 | 1.412 (3) |
| C2—C3 | 1.369 (4) | C15—C16 | 1.364 (4) |
| C2—H2A | 0.9500 | C15—H15 | 0.9500 |
| C3—C4 | 1.411 (3) | C16—C17 | 1.404 (4) |
| C3—H3 | 0.9500 | C16—H16 | 0.9500 |
| C4—C9 | 1.411 (3) | C17—C18 | 1.373 (3) |
| C4—C5 | 1.412 (3) | C17—H17 | 0.9500 |
| C5—C6 | 1.365 (4) | C18—C19 | 1.408 (3) |
| C5—H5 | 0.9500 | | |

| | | | |
|---|---|---|---|
| O1—Sn1—N1 | 77.86 (7) | C8—C7—H7 | 119.9 |
| O1—Sn1—Cl1 | 92.52 (5) | C6—C7—H7 | 119.9 |
| N1—Sn1—Cl1 | 170.33 (5) | O1—C8—C7 | 123.2 (2) |
| O1—Sn1—Cl2 | 169.80 (5) | O1—C8—C9 | 118.6 (2) |
| N1—Sn1—Cl2 | 91.96 (5) | C7—C8—C9 | 118.2 (2) |
| Cl1—Sn1—Cl2 | 97.65 (2) | N1—C9—C4 | 121.5 (2) |
| O1—Sn1—Cl3 | 88.97 (5) | N1—C9—C8 | 117.0 (2) |
| N1—Sn1—Cl3 | 88.20 (5) | C4—C9—C8 | 121.5 (2) |
| Cl1—Sn1—Cl3 | 92.67 (2) | C11—C10—H10A | 109.5 |
| Cl2—Sn1—Cl3 | 91.28 (2) | C11—C10—H10B | 109.5 |
| O1—Sn1—Cl4 | 87.70 (4) | H10A—C10—H10B | 109.5 |
| N1—Sn1—Cl4 | 87.00 (5) | C11—C10—H10C | 109.5 |
| Cl1—Sn1—Cl4 | 91.66 (2) | H10A—C10—H10C | 109.5 |
| Cl2—Sn1—Cl4 | 91.26 (2) | H10B—C10—H10C | 109.5 |
| Cl3—Sn1—Cl4 | 174.65 (2) | N2—C11—C12 | 118.2 (2) |
| C8—O1—Sn1 | 114.70 (13) | N2—C11—C10 | 119.0 (2) |
| C18—O2—H1 | 110 (2) | C12—C11—C10 | 122.8 (2) |
| C1—N1—C9 | 120.0 (2) | C13—C12—C11 | 120.5 (2) |
| C1—N1—Sn1 | 128.84 (16) | C13—C12—H12 | 119.8 |
| C9—N1—Sn1 | 111.09 (14) | C11—C12—H12 | 119.8 |
| C11—N2—C19 | 124.2 (2) | C12—C13—C14 | 120.8 (2) |
| C11—N2—H2 | 116.8 (16) | C12—C13—H13 | 119.6 |
| C19—N2—H2 | 119.0 (17) | C14—C13—H13 | 119.6 |
| N1—C1—C2 | 122.0 (2) | C19—C14—C15 | 118.4 (2) |
| N1—C1—H1A | 119.0 | C19—C14—C13 | 117.4 (2) |
| C2—C1—H1A | 119.0 | C15—C14—C13 | 124.2 (2) |
| C3—C2—C1 | 119.2 (2) | C16—C15—C14 | 119.7 (2) |
| C3—C2—H2A | 120.4 | C16—C15—H15 | 120.2 |
| C1—C2—H2A | 120.4 | C14—C15—H15 | 120.2 |
| C2—C3—C4 | 120.5 (2) | C15—C16—C17 | 121.4 (2) |
| C2—C3—H3 | 119.8 | C15—C16—H16 | 119.3 |
| C4—C3—H3 | 119.8 | C17—C16—H16 | 119.3 |
| C3—C4—C9 | 116.8 (2) | C18—C17—C16 | 120.5 (2) |
| C3—C4—C5 | 124.8 (2) | C18—C17—H17 | 119.8 |
| C9—C4—C5 | 118.4 (2) | C16—C17—H17 | 119.8 |
| C6—C5—C4 | 119.4 (2) | O2—C18—C17 | 126.1 (2) |
| C6—C5—H5 | 120.3 | O2—C18—C19 | 115.5 (2) |

| | | | |
|---|---|---|---|
| C4—C5—H5 | 120.3 | C17—C18—C19 | 118.4 (2) |
| C5—C6—C7 | 122.2 (2) | N2—C19—C14 | 118.9 (2) |
| C5—C6—H6 | 118.9 | N2—C19—C18 | 119.5 (2) |
| C7—C6—H6 | 118.9 | C14—C19—C18 | 121.6 (2) |
| C8—C7—C6 | 120.2 (2) | | |

| | | | |
|---|---|---|---|
| N1—Sn1—O1—C8 | −7.95 (15) | C3—C4—C9—N1 | 1.3 (3) |
| Cl1—Sn1—O1—C8 | 171.04 (14) | C5—C4—C9—N1 | −178.8 (2) |
| Cl2—Sn1—O1—C8 | −4.8 (4) | C3—C4—C9—C8 | −179.0 (2) |
| Cl3—Sn1—O1—C8 | −96.33 (14) | C5—C4—C9—C8 | 0.9 (3) |
| Cl4—Sn1—O1—C8 | 79.48 (14) | O1—C8—C9—N1 | −2.5 (3) |
| O1—Sn1—N1—C1 | −176.9 (2) | C7—C8—C9—N1 | 177.7 (2) |
| Cl2—Sn1—N1—C1 | 3.69 (19) | O1—C8—C9—C4 | 177.8 (2) |
| Cl3—Sn1—N1—C1 | −87.52 (19) | C7—C8—C9—C4 | −2.0 (3) |
| Cl4—Sn1—N1—C1 | 94.85 (19) | C19—N2—C11—C12 | −0.6 (4) |
| O1—Sn1—N1—C9 | 6.51 (14) | C19—N2—C11—C10 | 177.8 (2) |
| Cl2—Sn1—N1—C9 | −172.94 (14) | N2—C11—C12—C13 | −0.6 (4) |
| Cl3—Sn1—N1—C9 | 95.84 (14) | C10—C11—C12—C13 | −179.0 (2) |
| Cl4—Sn1—N1—C9 | −81.79 (14) | C11—C12—C13—C14 | 0.6 (4) |
| C9—N1—C1—C2 | 0.8 (3) | C12—C13—C14—C19 | 0.6 (4) |
| Sn1—N1—C1—C2 | −175.60 (17) | C12—C13—C14—C15 | 179.9 (2) |
| N1—C1—C2—C3 | 0.3 (4) | C19—C14—C15—C16 | 0.4 (4) |
| C1—C2—C3—C4 | −0.6 (4) | C13—C14—C15—C16 | −178.9 (2) |
| C2—C3—C4—C9 | −0.1 (3) | C14—C15—C16—C17 | 1.1 (4) |
| C2—C3—C4—C5 | 179.9 (2) | C15—C16—C17—C18 | −0.9 (4) |
| C3—C4—C5—C6 | −179.4 (2) | C16—C17—C18—O2 | 177.8 (2) |
| C9—C4—C5—C6 | 0.7 (3) | C16—C17—C18—C19 | −0.6 (4) |
| C4—C5—C6—C7 | −1.2 (4) | C11—N2—C19—C14 | 1.9 (4) |
| C5—C6—C7—C8 | 0.1 (4) | C11—N2—C19—C18 | −177.3 (2) |
| Sn1—O1—C8—C7 | −171.77 (18) | C15—C14—C19—N2 | 178.8 (2) |
| Sn1—O1—C8—C9 | 8.4 (3) | C13—C14—C19—N2 | −1.8 (3) |
| C6—C7—C8—O1 | −178.3 (2) | C15—C14—C19—C18 | −2.0 (4) |
| C6—C7—C8—C9 | 1.5 (3) | C13—C14—C19—C18 | 177.4 (2) |
| C1—N1—C9—C4 | −1.6 (3) | O2—C18—C19—N2 | 2.7 (3) |
| Sn1—N1—C9—C4 | 175.39 (17) | C17—C18—C19—N2 | −178.7 (2) |
| C1—N1—C9—C8 | 178.7 (2) | O2—C18—C19—C14 | −176.5 (2) |
| Sn1—N1—C9—C8 | −4.3 (2) | C17—C18—C19—C14 | 2.1 (4) |

*Hydrogen-bond geometry (Å, º)*

| *D*—H···*A* | *D*—H | H···*A* | *D*···*A* | *D*—H···*A* |
|---|---|---|---|---|
| O2—H1···O1 | 0.84 (1) | 1.86 (1) | 2.683 (2) | 168 (3) |
| N2—H2···O2 | 0.88 (1) | 2.33 (2) | 2.667 (3) | 103 (2) |