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## Structure Reports

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# Trimethylphenylammonium dibromido-triphenylstannate(IV)

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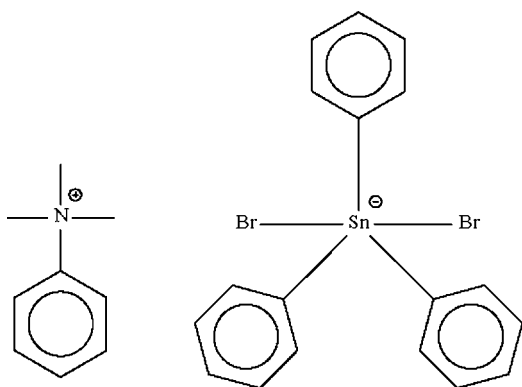
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Key indicators: single-crystal X-ray study;  $T = 100$  K; mean  $\sigma(\text{C}-\text{C}) = 0.004$  Å;  
 $R$  factor = 0.016;  $wR$  factor = 0.042; data-to-parameter ratio = 21.3.

The five-coordinate Sn atom in the title salt,  $[(\text{CH}_3)_3(\text{C}_6\text{H}_6)\text{N}][\text{SnBr}_2(\text{C}_6\text{H}_5)_3]$ , exists in a distorted *trans*- $\text{C}_3\text{SnBr}_2$  trigonal-bipyramidal coordination geometry. In the crystal structure no obvious hydrogen bonding is observed.

## Related literature

There are few examples of dihalogenotriarylstannate salts having a counter-ion that does not participate in hydrogen bonding, which appears to assist in stabilizing the salt, see: Beckmann *et al.* (2002); Harrison *et al.* (1978); Kuhn *et al.* (2001); Ng (1995); Wharf & Simard (1991).



## Experimental

### Crystal data

$(\text{C}_6\text{H}_{14}\text{N})[\text{SnBr}_2(\text{C}_6\text{H}_5)_3]$   
 $M_r = 646.02$   
Monoclinic,  $P2_1$   
 $a = 9.0010$  (1) Å  
 $b = 16.7778$  (2) Å  
 $c = 9.2448$  (1) Å  
 $\beta = 111.003$  (1)°

$V = 1303.37$  (3) Å<sup>3</sup>  
 $Z = 2$   
Mo  $K\alpha$  radiation  
 $\mu = 4.06$  mm<sup>-1</sup>  
 $T = 100$  K  
 $0.30 \times 0.25 \times 0.20$  mm

### Data collection

Bruker SMART APEX  
diffractometer  
Absorption correction: multi-scan  
(*SADABS*; Sheldrick, 1996)  
 $T_{\min} = 0.567$ ,  $T_{\max} = 0.746$   
(expected range = 0.337–0.444)

12525 measured reflections  
5966 independent reflections  
5889 reflections with  $I > 2\sigma(I)$   
 $R_{\text{int}} = 0.012$

### Refinement

$R[F^2 > 2\sigma(F^2)] = 0.016$   
 $wR(F^2) = 0.042$   
 $S = 1.06$   
5966 reflections  
280 parameters  
1 restraint

H-atom parameters constrained  
 $\Delta\rho_{\text{max}} = 0.38$  e Å<sup>-3</sup>  
 $\Delta\rho_{\text{min}} = -0.22$  e Å<sup>-3</sup>  
Absolute structure: Flack (1983),  
2872 Friedel pairs  
Flack parameter: 0.011 (3)

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: *pubCIF* (Westrip, 2009).

We thank the University of Malaya (RG020/09AFR) for supporting this study.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: TK2456).

## References

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## supporting information

*Acta Cryst.* (2009). E65, m714 [doi:10.1107/S1600536809019722]

## Trimethylphenylammonium dibromidotriphenylstannate(IV)

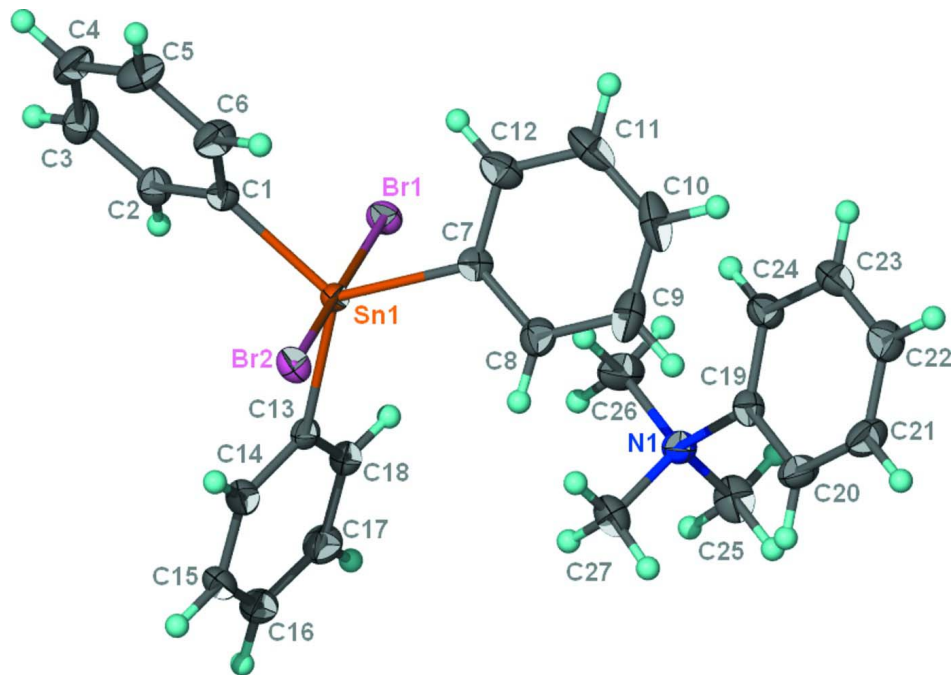
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### S1. Experimental

Bis(4-dimethylaminopyridinium) dibromidotriphenylstannate (1.0 g, 1.6 mmol) and trimethylphenylammonium bromide (0.34 g, 1.6 mmol) were heated in ethanol for 1 hour. Colorless crystals separated after a few days.

### S2. Refinement

Hydrogen atoms were placed at calculated positions (C–H 0.95–0.98 Å) and were treated as riding on their parent atoms, with  $U(\text{H})$  set to 1.2–1.5 times  $U_{\text{eq}}(\text{C})$ .



**Figure 1**

Thermal ellipsoid plot (Barbour, 2001) of  $[\text{PhMe}_3\text{N}][\text{SnBr}_2\text{Ph}_3]$  at the 70% probability level. Hydrogen atoms are drawn as spheres of arbitrary radius.

### Trimethylphenylammonium dibromidotriphenylstannate(IV)

#### Crystal data

$(\text{C}_9\text{H}_{14}\text{N})[\text{SnBr}_2(\text{C}_6\text{H}_5)_3]$

$M_r = 646.02$

Monoclinic,  $P2_1$

Hall symbol: P 2yb

$a = 9.0010 (1) \text{ \AA}$

$b = 16.7778 (2) \text{ \AA}$

$c = 9.2448 (1) \text{ \AA}$

$\beta = 111.003 (1)^\circ$

$V = 1303.37 (3) \text{ \AA}^3$   
 $Z = 2$   
 $F(000) = 636$   
 $D_x = 1.646 \text{ Mg m}^{-3}$   
 Mo  $K\alpha$  radiation,  $\lambda = 0.71073 \text{ \AA}$   
 Cell parameters from 9930 reflections

$\theta = 2.4\text{--}28.3^\circ$   
 $\mu = 4.06 \text{ mm}^{-1}$   
 $T = 100 \text{ K}$   
 Block, colorless  
 $0.30 \times 0.25 \times 0.20 \text{ mm}$

*Data collection*

Bruker SMART APEX  
 diffractometer  
 Radiation source: fine-focus sealed tube  
 Graphite monochromator  
 $\omega$  scans  
 Absorption correction: multi-scan  
 (SADABS; Sheldrick, 1996)  
 $T_{\min} = 0.567$ ,  $T_{\max} = 0.746$

12525 measured reflections  
 5966 independent reflections  
 5889 reflections with  $I > 2\sigma(I)$   
 $R_{\text{int}} = 0.012$   
 $\theta_{\max} = 27.5^\circ$ ,  $\theta_{\min} = 2.4^\circ$   
 $h = -11 \rightarrow 11$   
 $k = -21 \rightarrow 21$   
 $l = -12 \rightarrow 12$

*Refinement*

Refinement on  $F^2$   
 Least-squares matrix: full  
 $R[F^2 > 2\sigma(F^2)] = 0.016$   
 $wR(F^2) = 0.042$   
 $S = 1.06$   
 5966 reflections  
 280 parameters  
 1 restraint  
 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  
 $w = 1/[\sigma^2(F_o^2) + (0.0283P)^2 + 0.211P]$   
 where  $P = (F_o^2 + 2F_c^2)/3$   
 $(\Delta/\sigma)_{\max} = 0.001$   
 $\Delta\rho_{\max} = 0.38 \text{ e \AA}^{-3}$   
 $\Delta\rho_{\min} = -0.22 \text{ e \AA}^{-3}$   
 Absolute structure: Flack (1983), 2872 Friedel  
 pairs  
 Absolute structure parameter: 0.011 (3)

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters ( $\text{\AA}^2$ )*

	<i>x</i>	<i>y</i>	<i>z</i>	$U_{\text{iso}}^*/U_{\text{eq}}$
Sn1	0.800735 (16)	0.499537 (6)	0.968485 (15)	0.01425 (4)
Br1	0.50474 (2)	0.441885 (12)	0.78666 (2)	0.01891 (5)
Br2	1.10719 (2)	0.544697 (12)	1.14791 (2)	0.01839 (5)
N1	0.4280 (2)	0.36054 (11)	1.3067 (2)	0.0184 (3)
C1	0.8550 (2)	0.52187 (12)	0.7653 (2)	0.0173 (4)
C2	0.7539 (3)	0.56900 (13)	0.6462 (3)	0.0213 (4)
H2	0.6596	0.5903	0.6549	0.026*
C3	0.7901 (3)	0.58504 (15)	0.5146 (3)	0.0254 (5)
H3	0.7209	0.6175	0.4346	0.030*
C4	0.9258 (3)	0.55404 (16)	0.4999 (3)	0.0273 (5)
H4	0.9495	0.5649	0.4097	0.033*
C5	1.0273 (3)	0.50715 (18)	0.6166 (3)	0.0292 (5)
H5	1.1205	0.4855	0.6060	0.035*
C6	0.9933 (3)	0.49146 (15)	0.7499 (3)	0.0250 (5)
H6	1.0645	0.4600	0.8304	0.030*
C7	0.8524 (2)	0.38465 (13)	1.0804 (2)	0.0157 (4)
C8	0.8729 (3)	0.37779 (14)	1.2360 (3)	0.0220 (4)
H8	0.8638	0.4235	1.2931	0.026*

C9	0.9068 (3)	0.30373 (16)	1.3081 (3)	0.0301 (5)
H9	0.9167	0.2985	1.4135	0.036*
C10	0.9261 (3)	0.23781 (15)	1.2269 (3)	0.0315 (6)
H10	0.9494	0.1873	1.2764	0.038*
C11	0.9113 (3)	0.24555 (14)	1.0730 (3)	0.0299 (5)
H11	0.9264	0.2005	1.0176	0.036*
C12	0.8743 (3)	0.31912 (14)	0.9998 (3)	0.0249 (5)
H12	0.8641	0.3243	0.8944	0.030*
C13	0.6992 (2)	0.59342 (13)	1.0628 (2)	0.0159 (4)
C14	0.7844 (3)	0.66346 (13)	1.1201 (2)	0.0202 (4)
H14	0.8905	0.6686	1.1227	0.024*
C15	0.7154 (3)	0.72562 (13)	1.1732 (3)	0.0229 (4)
H15	0.7747	0.7728	1.2120	0.027*
C16	0.5604 (3)	0.71924 (14)	1.1700 (3)	0.0253 (5)
H16	0.5126	0.7622	1.2041	0.030*
C17	0.4761 (3)	0.64944 (15)	1.1163 (3)	0.0250 (5)
H17	0.3710	0.6441	1.1161	0.030*
C18	0.5447 (2)	0.58699 (13)	1.0626 (2)	0.0186 (4)
H18	0.4855	0.5396	1.0256	0.022*
C19	0.5292 (2)	0.28835 (13)	1.3666 (2)	0.0175 (4)
C20	0.6100 (3)	0.28234 (14)	1.5255 (3)	0.0238 (5)
H20	0.6051	0.3244	1.5924	0.029*
C21	0.6975 (3)	0.21445 (15)	1.5849 (3)	0.0264 (5)
H21	0.7536	0.2100	1.6933	0.032*
C22	0.7040 (3)	0.15287 (14)	1.4874 (3)	0.0242 (4)
H22	0.7628	0.1059	1.5290	0.029*
C23	0.6246 (3)	0.15991 (13)	1.3294 (3)	0.0227 (4)
H23	0.6302	0.1179	1.2626	0.027*
C24	0.5367 (3)	0.22799 (13)	1.2673 (3)	0.0206 (4)
H24	0.4826	0.2330	1.1586	0.025*
C25	0.2875 (3)	0.35662 (15)	1.3594 (3)	0.0265 (5)
H25A	0.3257	0.3534	1.4727	0.040*
H25B	0.2234	0.3094	1.3147	0.040*
H25C	0.2221	0.4046	1.3249	0.040*
C26	0.3650 (3)	0.36554 (15)	1.1328 (3)	0.0317 (6)
H26A	0.4542	0.3686	1.0958	0.048*
H26B	0.2985	0.4132	1.0997	0.048*
H26C	0.3012	0.3180	1.0894	0.048*
C27	0.5184 (3)	0.43595 (14)	1.3676 (3)	0.0246 (4)
H27A	0.6096	0.4394	1.3336	0.037*
H27B	0.5563	0.4358	1.4810	0.037*
H27C	0.4484	0.4819	1.3278	0.037*

Atomic displacement parameters ( $\text{\AA}^2$ )

	$U^{11}$	$U^{22}$	$U^{33}$	$U^{12}$	$U^{13}$	$U^{23}$
Sn1	0.01733 (6)	0.01231 (6)	0.01367 (6)	0.00070 (5)	0.00626 (4)	0.00004 (5)
Br1	0.01852 (9)	0.01789 (10)	0.01856 (10)	-0.00257 (7)	0.00452 (8)	-0.00274 (8)

Br2	0.01643 (9)	0.01616 (10)	0.01963 (10)	-0.00018 (7)	0.00289 (7)	-0.00003 (8)
N1	0.0194 (8)	0.0184 (9)	0.0166 (8)	0.0022 (7)	0.0056 (7)	0.0002 (7)
C1	0.0205 (9)	0.0167 (10)	0.0149 (9)	-0.0030 (7)	0.0064 (7)	-0.0023 (7)
C2	0.0207 (10)	0.0206 (10)	0.0219 (10)	-0.0020 (8)	0.0069 (8)	0.0007 (8)
C3	0.0246 (11)	0.0295 (12)	0.0183 (10)	-0.0072 (9)	0.0030 (8)	0.0035 (9)
C4	0.0313 (12)	0.0360 (13)	0.0164 (10)	-0.0127 (10)	0.0107 (9)	-0.0040 (9)
C5	0.0279 (11)	0.0385 (13)	0.0262 (11)	0.0014 (11)	0.0157 (9)	-0.0030 (11)
C6	0.0255 (10)	0.0293 (13)	0.0206 (10)	0.0051 (9)	0.0087 (8)	0.0017 (9)
C7	0.0108 (8)	0.0177 (9)	0.0160 (9)	0.0051 (7)	0.0014 (7)	0.0017 (8)
C8	0.0217 (10)	0.0222 (11)	0.0248 (11)	0.0014 (8)	0.0114 (9)	0.0022 (9)
C9	0.0276 (12)	0.0338 (13)	0.0323 (13)	0.0033 (10)	0.0148 (10)	0.0152 (11)
C10	0.0212 (10)	0.0212 (11)	0.0508 (16)	0.0022 (9)	0.0113 (11)	0.0155 (11)
C11	0.0252 (11)	0.0155 (10)	0.0466 (15)	0.0006 (9)	0.0101 (11)	-0.0062 (11)
C12	0.0246 (11)	0.0203 (11)	0.0264 (11)	-0.0016 (8)	0.0048 (9)	-0.0052 (9)
C13	0.0192 (9)	0.0152 (9)	0.0130 (8)	0.0030 (7)	0.0054 (7)	0.0030 (8)
C14	0.0229 (10)	0.0178 (10)	0.0197 (10)	-0.0006 (8)	0.0072 (8)	0.0007 (8)
C15	0.0329 (12)	0.0143 (10)	0.0213 (10)	-0.0016 (8)	0.0095 (9)	-0.0023 (8)
C16	0.0344 (12)	0.0202 (11)	0.0259 (11)	0.0079 (9)	0.0165 (10)	0.0015 (9)
C17	0.0263 (11)	0.0261 (11)	0.0270 (11)	0.0056 (9)	0.0150 (9)	0.0026 (9)
C18	0.0212 (9)	0.0176 (10)	0.0181 (9)	0.0003 (8)	0.0082 (8)	0.0013 (8)
C19	0.0155 (9)	0.0171 (10)	0.0198 (10)	0.0017 (7)	0.0061 (8)	0.0029 (8)
C20	0.0291 (11)	0.0254 (11)	0.0193 (11)	0.0052 (9)	0.0114 (9)	-0.0007 (9)
C21	0.0307 (12)	0.0310 (13)	0.0183 (10)	0.0081 (10)	0.0096 (9)	0.0039 (9)
C22	0.0240 (10)	0.0217 (11)	0.0273 (11)	0.0068 (8)	0.0099 (9)	0.0046 (9)
C23	0.0244 (10)	0.0167 (10)	0.0276 (11)	0.0001 (8)	0.0099 (9)	-0.0028 (9)
C24	0.0211 (10)	0.0184 (10)	0.0192 (10)	-0.0003 (8)	0.0034 (8)	-0.0011 (8)
C25	0.0165 (10)	0.0271 (12)	0.0373 (13)	0.0025 (9)	0.0115 (9)	0.0040 (10)
C26	0.0450 (14)	0.0278 (13)	0.0158 (10)	0.0150 (10)	0.0029 (10)	0.0027 (9)
C27	0.0257 (10)	0.0174 (10)	0.0304 (11)	-0.0012 (8)	0.0094 (9)	0.0006 (9)

*Geometric parameters (Å, °)*

Sn1—Br1	2.7657 (2)	C13—C18	1.395 (3)
Sn1—Br2	2.7667 (2)	C13—C14	1.399 (3)
Sn1—C1	2.137 (2)	C14—C15	1.390 (3)
Sn1—C7	2.158 (2)	C14—H14	0.9500
Sn1—C13	2.156 (2)	C15—C16	1.389 (3)
N1—C27	1.500 (3)	C15—H15	0.9500
N1—C26	1.503 (3)	C16—C17	1.387 (4)
N1—C19	1.497 (3)	C16—H16	0.9500
N1—C25	1.511 (3)	C17—C18	1.394 (3)
C1—C2	1.396 (3)	C17—H17	0.9500
C1—C6	1.399 (3)	C18—H18	0.9500
C2—C3	1.394 (3)	C19—C24	1.385 (3)
C2—H2	0.9500	C19—C20	1.390 (3)
C3—C4	1.378 (4)	C20—C21	1.382 (3)
C3—H3	0.9500	C20—H20	0.9500
C4—C5	1.382 (4)	C21—C22	1.386 (3)

C4—H4	0.9500	C21—H21	0.9500
C5—C6	1.397 (3)	C22—C23	1.382 (3)
C5—H5	0.9500	C22—H22	0.9500
C6—H6	0.9500	C23—C24	1.391 (3)
C7—C12	1.381 (3)	C23—H23	0.9500
C7—C8	1.388 (3)	C24—H24	0.9500
C8—C9	1.391 (3)	C25—H25A	0.9800
C8—H8	0.9500	C25—H25B	0.9800
C9—C10	1.382 (4)	C25—H25C	0.9800
C9—H9	0.9500	C26—H26A	0.9800
C10—C11	1.387 (4)	C26—H26B	0.9800
C10—H10	0.9500	C26—H26C	0.9800
C11—C12	1.389 (3)	C27—H27A	0.9800
C11—H11	0.9500	C27—H27B	0.9800
C12—H12	0.9500	C27—H27C	0.9800
C1—Sn1—C7	120.02 (8)	C18—C13—Sn1	120.68 (16)
C1—Sn1—C13	119.42 (8)	C14—C13—Sn1	120.82 (14)
C7—Sn1—C13	120.54 (7)	C15—C14—C13	120.7 (2)
C1—Sn1—Br2	89.20 (5)	C15—C14—H14	119.7
C13—Sn1—Br2	91.91 (5)	C13—C14—H14	119.7
C7—Sn1—Br2	87.71 (5)	C16—C15—C14	120.5 (2)
C1—Sn1—Br1	90.06 (5)	C16—C15—H15	119.8
C13—Sn1—Br1	92.62 (5)	C14—C15—H15	119.8
C7—Sn1—Br1	88.51 (5)	C15—C16—C17	119.3 (2)
Br1—Sn1—Br2	175.151 (7)	C15—C16—H16	120.4
C27—N1—C26	107.47 (18)	C17—C16—H16	120.4
C27—N1—C19	111.54 (16)	C16—C17—C18	120.5 (2)
C26—N1—C19	112.77 (17)	C16—C17—H17	119.8
C27—N1—C25	108.64 (17)	C18—C17—H17	119.8
C26—N1—C25	107.97 (18)	C17—C18—C13	120.6 (2)
C19—N1—C25	108.32 (17)	C17—C18—H18	119.7
C2—C1—C6	118.6 (2)	C13—C18—H18	119.7
C2—C1—Sn1	120.17 (15)	C24—C19—C20	121.1 (2)
C6—C1—Sn1	121.19 (15)	C24—C19—N1	120.93 (18)
C3—C2—C1	120.5 (2)	C20—C19—N1	117.91 (19)
C3—C2—H2	119.8	C19—C20—C21	119.2 (2)
C1—C2—H2	119.8	C19—C20—H20	120.4
C4—C3—C2	120.4 (2)	C21—C20—H20	120.4
C4—C3—H3	119.8	C22—C21—C20	120.4 (2)
C2—C3—H3	119.8	C22—C21—H21	119.8
C5—C4—C3	120.0 (2)	C20—C21—H21	119.8
C5—C4—H4	120.0	C21—C22—C23	119.8 (2)
C3—C4—H4	120.0	C21—C22—H22	120.1
C4—C5—C6	120.2 (2)	C23—C22—H22	120.1
C4—C5—H5	119.9	C22—C23—C24	120.6 (2)
C6—C5—H5	119.9	C22—C23—H23	119.7
C5—C6—C1	120.4 (2)	C24—C23—H23	119.7

C5—C6—H6	119.8	C19—C24—C23	118.8 (2)
C1—C6—H6	119.8	C19—C24—H24	120.6
C12—C7—C8	120.1 (2)	C23—C24—H24	120.6
C12—C7—Sn1	120.01 (15)	N1—C25—H25A	109.5
C8—C7—Sn1	119.79 (15)	N1—C25—H25B	109.5
C9—C8—C7	119.7 (2)	H25A—C25—H25B	109.5
C9—C8—H8	120.2	N1—C25—H25C	109.5
C7—C8—H8	120.2	H25A—C25—H25C	109.5
C10—C9—C8	120.2 (2)	H25B—C25—H25C	109.5
C10—C9—H9	119.9	N1—C26—H26A	109.5
C8—C9—H9	119.9	N1—C26—H26B	109.5
C9—C10—C11	119.8 (2)	H26A—C26—H26B	109.5
C9—C10—H10	120.1	N1—C26—H26C	109.5
C11—C10—H10	120.1	H26A—C26—H26C	109.5
C12—C11—C10	120.1 (2)	H26B—C26—H26C	109.5
C12—C11—H11	120.0	N1—C27—H27A	109.5
C10—C11—H11	120.0	N1—C27—H27B	109.5
C7—C12—C11	120.0 (2)	H27A—C27—H27B	109.5
C7—C12—H12	120.0	N1—C27—H27C	109.5
C11—C12—H12	120.0	H27A—C27—H27C	109.5
C18—C13—C14	118.46 (19)	H27B—C27—H27C	109.5
C13—Sn1—C1—C2	-38.04 (19)	C10—C11—C12—C7	0.1 (3)
C7—Sn1—C1—C2	143.32 (15)	C1—Sn1—C13—C18	113.96 (16)
Br2—Sn1—C1—C2	-129.79 (16)	C7—Sn1—C13—C18	-67.41 (18)
Br1—Sn1—C1—C2	55.01 (16)	Br2—Sn1—C13—C18	-155.88 (16)
C13—Sn1—C1—C6	140.49 (17)	Br1—Sn1—C13—C18	22.41 (16)
C7—Sn1—C1—C6	-38.1 (2)	C1—Sn1—C13—C14	-63.53 (18)
Br2—Sn1—C1—C6	48.75 (17)	C7—Sn1—C13—C14	115.10 (17)
Br1—Sn1—C1—C6	-126.46 (17)	Br2—Sn1—C13—C14	26.62 (16)
C6—C1—C2—C3	0.2 (3)	Br1—Sn1—C13—C14	-155.09 (16)
Sn1—C1—C2—C3	178.79 (16)	C18—C13—C14—C15	-1.0 (3)
C1—C2—C3—C4	0.5 (3)	Sn1—C13—C14—C15	176.54 (16)
C2—C3—C4—C5	-0.4 (4)	C13—C14—C15—C16	-0.2 (3)
C3—C4—C5—C6	-0.4 (4)	C14—C15—C16—C17	1.4 (3)
C4—C5—C6—C1	1.1 (4)	C15—C16—C17—C18	-1.5 (3)
C2—C1—C6—C5	-1.0 (3)	C16—C17—C18—C13	0.4 (3)
Sn1—C1—C6—C5	-179.56 (19)	C14—C13—C18—C17	0.9 (3)
C1—Sn1—C7—C12	-19.52 (19)	Sn1—C13—C18—C17	-176.66 (16)
C13—Sn1—C7—C12	161.86 (15)	C27—N1—C19—C24	-131.5 (2)
Br2—Sn1—C7—C12	-107.26 (16)	C26—N1—C19—C24	-10.4 (3)
Br1—Sn1—C7—C12	69.69 (16)	C25—N1—C19—C24	109.0 (2)
C1—Sn1—C7—C8	156.62 (15)	C27—N1—C19—C20	51.2 (2)
C13—Sn1—C7—C8	-22.00 (19)	C26—N1—C19—C20	172.2 (2)
Br2—Sn1—C7—C8	68.87 (15)	C25—N1—C19—C20	-68.3 (2)
Br1—Sn1—C7—C8	-114.17 (15)	C24—C19—C20—C21	-0.8 (3)
C12—C7—C8—C9	-3.6 (3)	N1—C19—C20—C21	176.6 (2)
Sn1—C7—C8—C9	-179.74 (16)	C19—C20—C21—C22	-0.4 (4)

## supporting information

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C7—C8—C9—C10	2.5 (3)	C20—C21—C22—C23	1.1 (4)
C8—C9—C10—C11	-0.1 (3)	C21—C22—C23—C24	-0.7 (4)
C9—C10—C11—C12	-1.2 (4)	C20—C19—C24—C23	1.1 (3)
C8—C7—C12—C11	2.3 (3)	N1—C19—C24—C23	-176.13 (19)
Sn1—C7—C12—C11	178.46 (17)	C22—C23—C24—C19	-0.4 (3)

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