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(Dimethyl sulfoxide-κO)diphenyl(3-thioxo-3*H*-1,2-dithiole-4,5-dithiolato-κ^2S^4,S^5)tin(IV)

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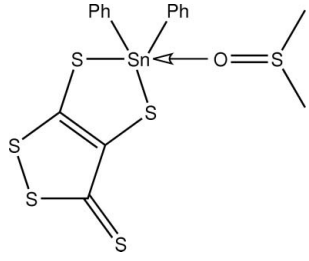
Key indicators: single-crystal X-ray study; T = 120 K; mean σ(C–C) = 0.005 Å; R factor = 0.037; wR factor = 0.088; data-to-parameter ratio = 20.9.

The Sn atom in the title compound, $[Sn(C_6H_5)_2(C_3S_5)(C_2H_6OS)]$, exists within a distorted trigonal-bipyramidal geometry defined by two S atoms of the 1,2-dithiole-3-thione-4,5-dithiolate dianion, two *ipso*-C atoms from the phenyl groups, and the O atom of the dimethyl sulfoxide molecule. In this description, one of the S atoms and the O occupy axial positions. In the crystal, centrosymmetrically related molecules associate *via* pairs of C—H···S contacts, forming dimeric aggregates.

Related literature

For background to the synthesis of dmt compounds, see: Steimecke *et al.* (1982). For related crystal structures, see: Aupers *et al.* (1998); Khan *et al.* (1998); Chohan *et al.* (1999); Bordinhão *et al.* (2006, 2008); Comerlato *et al.* (2008). For additional analysis of geometry, see: Addison *et al.* (1984).



Experimental

Crystal data

$[Sn(C_6H_5)_2(C_3S_5)(C_2H_6OS)]$
M_r = 547.35
Monoclinic, $P2_1/n$
a = 11.1420 (5) Å
b = 15.7237 (6) Å
c = 11.9646 (6) Å
β = 96.892 (2)°
V = 2080.97 (16) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 1.83 mm^{-1}
T = 120 K
0.24 × 0.16 × 0.10 mm

Data collection

Bruker–Nonius 95mm CCD camera on κ-goniostat diffractometer
Absorption correction: multi-scan (*SADABS*; Sheldrick, 2007)
T_{min} = 0.536, T_{max} = 0.746
22729 measured reflections
4770 independent reflections
3906 reflections with $I > 2\sigma(I)$
R_{int} = 0.057

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.037
$wR(F^2)$ = 0.088
S = 1.06
4770 reflections
228 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 0.85 e Å^{-3}
$\Delta\rho_{min}$ = −1.26 e Å^{-3}

Table 1
Selected bond lengths (Å).

Sn—C4	2.130 (3)	Sn—S1	2.4357 (9)
Sn—C10	2.133 (3)	Sn—S2	2.5582 (9)
Sn—O1	2.311 (2)		

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

D—H···A	D—H	H···A	D···A	D—H···A
C6—H6···S2^{i}	0.95	2.71	3.599 (4)	157

Symmetry code: (i) $-x+2, -y, -z$.

Data collection: *COLLECT* (Hooft, 1998); cell refinement: *DENZO* (Otwinowski & Minor, 1997) and *COLLECT*; data reduction: *DENZO* and *COLLECT*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *DIAMOND* (Brandenburg, 2006); software used to prepare material for publication: *publCIF* (Westrip, 2009).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: HB5220).

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(Dimethyl sulfoxide-κO)diphenyl(3-thioxo-3*H*-1,2-dithiole-4,5-dithiolato-κ^2S^4,S^5)tin(IV)

Nadia M. Comerlato, Edward R. T. Tiekink, James L. Wardell and Solange M. S. V. Wardell

S1. Comment

While several structures of (1,3-dithiole-2-thione-4,5-dithiolato)tin, [Sn-dmit], and (1,3-dithiole-2-one-4,5-dithiolato)tin [Sn-dmio] complexes have been reported (*e.g.*, Comerlato *et al.*, 2008), similar (1,2-dithiole-3-thione-4,5-dithiolato)tin complexes have been essentially neglected, with only one systematic study known (Bordinhão *et al.*, 2006; Bordinhão *et al.*, 2008); see Fig. 1 for chemical structures of dmit, dmio and dmt. The poor solubility of 1,2-dithiole-3-thione-4,5-dithiolato (dmt) complexes has been put forward as a major cause for the limited number of their reported crystal structures. Attempts to obtain good crystals of Ph_2Sn(dmt), prepared from reaction of Na_2(dmt) and Ph_2SnCl_2 in MeOH solution, failed as only amorphous material was obtained. However, crystallization of Ph_2Sn(dmt) from a DMSO/MeOH solution produced crystals of the DMSO solvate, (I), suitable for the X-Ray study reported herein.

As compounds, R_2Sn(dmit) and R_2Sn(dmio), having non-functionalized alkyl or aryl *R* groups (*e.g.*, *R* = Me, Et, Bu or Ph), are aggregated in both the solid–state and in non-coordinating solvents as a consequence of intermolecular Sn···S interactions., it is assumed that the R_2Sn(dmt) analogues are similarly aggregated. The formation of adducts such as [Ph_2Sn(dmt)(dmso)] will generally provide coordinatively saturated tin centres and hence result in appreciably more soluble species having essentially non-interacting cations and anions. Structures of ionic species, [Q][R_2Sn(dmit)*X*] and [Q][R_2Sn(dmio)*X*] [Q+ = onium cation, *X* = halide or pseudohalide], with 5-coordinate tin have also been determined (Chohan *et al.*, 1999; Khan *et al.*, 1998; Aupers *et al.*, 1998).

The Sn atom in (1) is five-coordinate, existing within a C_2OS_2 donor set defined by a chelating dmt ligand, two *ipso*-C atoms and the O atom derived from the DMSO molecule, Fig. 2. The coordination geometry is based on a trigonal bipyramid with the S2–Sn–O1 axial angle being 166.52 (6) °. As expected, the Sn–$S1_{equatorial}$ distance of 2.4357 (9) Å is shorter than the Sn–$S2_{axial}$ distance of 2.5582 (9) Å. The coordination geometry is distorted towards trigonal bipyramidal (TP). This is quantified by the value of τ = 0.72, which compares with the ideal values of 1.0 and 0.0 for TP and square pyramidal, respectively (Addison *et al.*, 1984).

The most prominent intermolecular interaction connecting molecules is of the type C–H···S and these occur between centrosymmetric pairs to form loosely associated dimers, Table 1 and Fig. 3.

S2. Experimental

To a stirred suspension of 4,5-bis(benzoylthio)-1,2-dithiole-3-thione (Steimecke *et al.*, 1982) (410 mg, 1 mmol) in methanol (10 ml), under argon, was added a sodium methoxide solution prepared from sodium (150 mg, 6.75 mmol) and methanol (10 ml). To the resulting purple solution of Na_2dmt was added with stirring a methanolic solution of Ph_2SnCl_2 (345 mg, 1 mmol). The reaction mixture was stirred for 1 h, rotary evaporated and the residue washed well with water. The solid residue (535 mg) was dissolved in a mixture of DMSO and MeOH (*ca* v:v 3:1) and left to slowly recrystallize to give (I); m.pt. 428–431 K (dec.) IR (KBr, cm^{-1}): 1061 (*v* C—S), 950, 941 (*v* S—O), 910, 827, 720 (*v* C=S).

S3. Refinement

All H atoms were geometrically placed (C–H = 0.95–0.98 Å) and refined as riding with U_{iso}(H) = 1.2–1.5U_{eq}(C). The maximum and minimum residual electron density peaks of 0.85 and 1.26 e Å^{-3}, respectively, were located 1.81 Å and 0.82 Å from the S1 and Sn atoms, respectively.

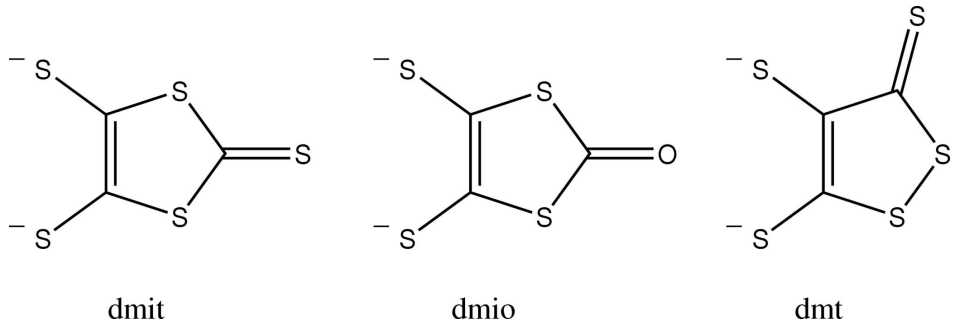

Figure 1

Preparation of the title compound.

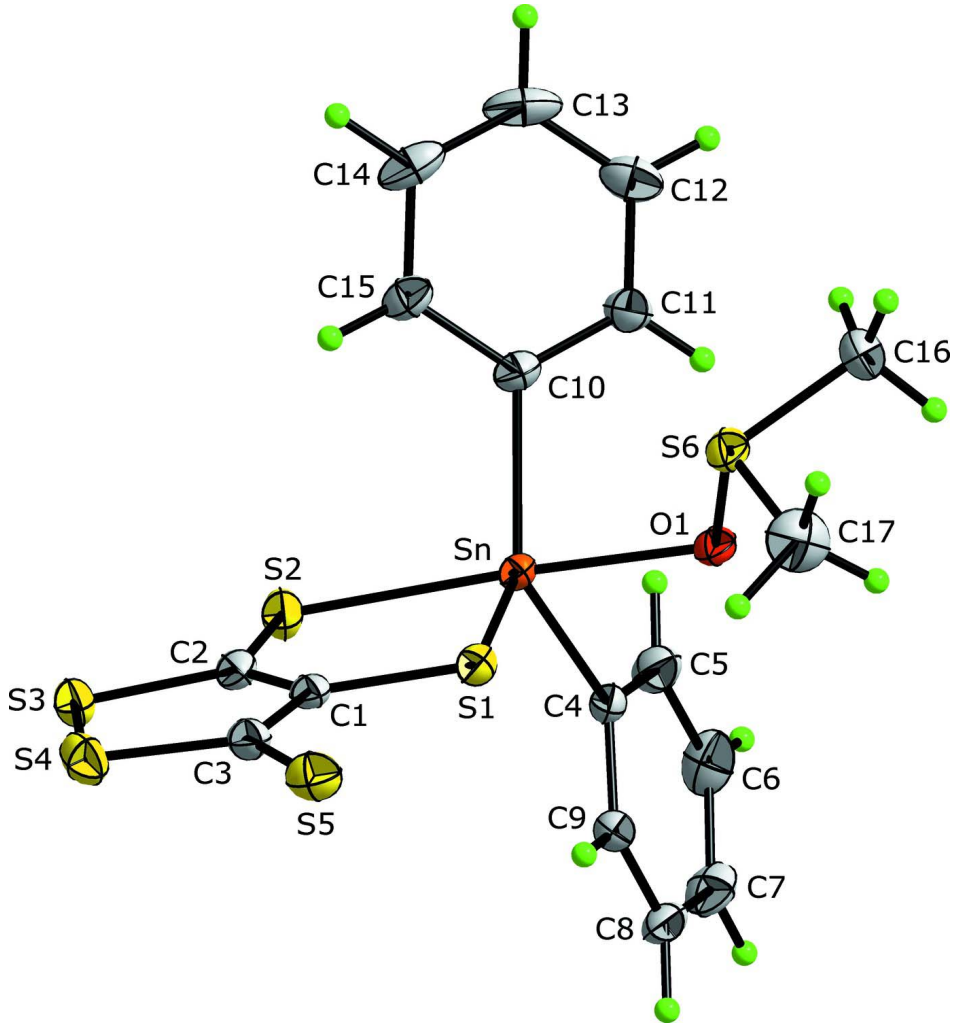

Figure 2

Molecular structure (I) showing displacement ellipsoids at the 50% probability level.

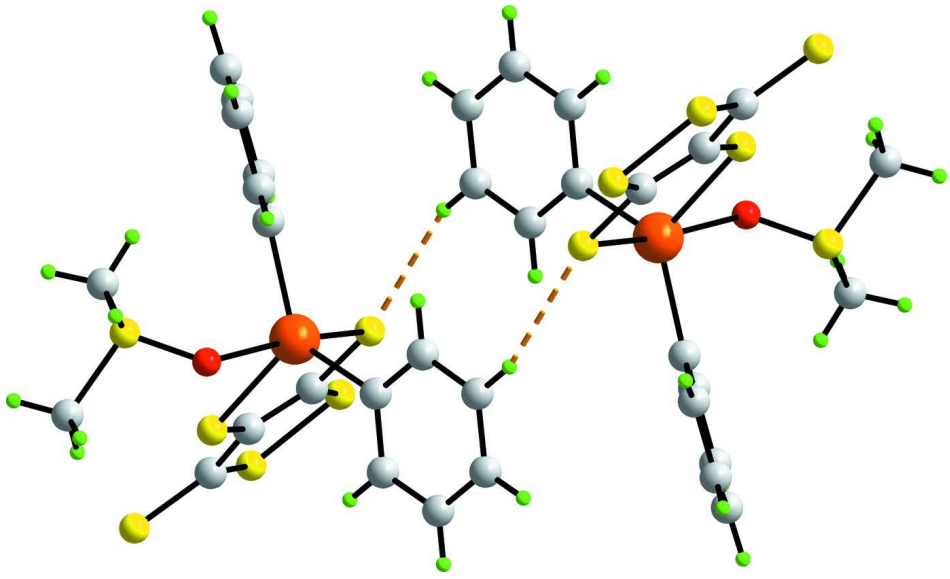

Figure 3

Supramolecular dimer in (I) mediated by C–H···S contacts (orange dashed lines). Colour code: Sn, orange; S, yellow;O, red; C, grey; and H, green.

(Dimethyl sulfoxide-*κO*)diphenyl(3-thioxo-3*H*-1,2-dithiole-4,5-dithiolato- κ^2S^4,S^5)tin(IV)

Crystal data

$[Sn(C_6H_5)_2(C_3S_5)(C_2H_6OS)]$
$M_r = 547.35$
Monoclinic, $P2_1/n$
Hall symbol: -P 2yn
$a = 11.1420\ (5)$ Å
$b = 15.7237\ (6)$ Å
$c = 11.9646\ (6)$ Å
$\beta = 96.892\ (2)°$
$V = 2080.97\ (16)$ Å^3
$Z = 4$
$F(000) = 1088$
$D_x = 1.747$ Mg m^{-3}
Mo $K\alpha$ radiation, $\lambda = 0.71069$ Å
Cell parameters from 44319 reflections
$\theta = 2.9–27.5°$
$\mu = 1.83$ mm^{-1}
$T = 120$ K
Block, yellow
0.24 × 0.16 × 0.10 mm

Data collection

Bruker–Nonius 95mm CCD camera on κ-goniostat diffractometer
Radiation source: Bruker-Nonius FR591 rotating anode
Graphite monochromator
Detector resolution: 9.091 pixels mm^{-1}
φ and ω scans
Absorption correction: multi-scan (*SADABS*; Sheldrick, 2007)
$T_{min} = 0.536$, $T_{max} = 0.746$
22729 measured reflections
4770 independent reflections
3906 reflections with $I > 2\sigma(I)$
$R_{int} = 0.057$
$\theta_{max} = 27.5°$, $\theta_{min} = 3.1°$
$h = -14\rightarrow14$
$k = -20\rightarrow19$
$l = -15\rightarrow15$

Refinement

Refinement on F^2
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)] = 0.037$
$wR(F^2) = 0.088$
$S = 1.06$
4770 reflections
228 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
$w = 1/[\sigma^2(F_o^2) + (0.0404P)^2 + 1.7706P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} < 0.001$
$\Delta\rho_{max} = 0.85$ e Å^{-3}
$\Delta\rho_{min} = -1.26$ e Å^{-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 $F^2 > 2\sigma(F^2)$ 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 (Å²)

	x	*y*	*z*	U_{iso}*/U_{eq}
Sn	0.823308 (19)	0.079364 (13)	0.201486 (19)	0.01886 (9)
S1	0.64254 (8)	0.07006 (5)	0.29688 (7)	0.02196 (18)
S2	0.68225 (8)	0.10256 (6)	0.01905 (8)	0.0263 (2)
S3	0.42347 (8)	0.12813 (5)	−0.02069 (8)	0.0266 (2)
S4	0.30214 (8)	0.12492 (6)	0.09713 (8)	0.0302 (2)
S5	0.35612 (8)	0.08574 (6)	0.33685 (9)	0.0301 (2)
S6	0.89763 (8)	0.13614 (5)	0.46902 (8)	0.0264 (2)
O1	0.9096 (2)	0.06287 (13)	0.38570 (19)	0.0218 (5)
C1	0.5279 (3)	0.09377 (19)	0.1865 (3)	0.0210 (7)
C2	0.5481 (3)	0.1063 (2)	0.0763 (3)	0.0226 (7)
C3	0.4068 (3)	0.0995 (2)	0.2126 (3)	0.0249 (7)
C4	0.8953 (3)	−0.0427 (2)	0.1706 (3)	0.0199 (7)
C5	1.0061 (3)	−0.0547 (2)	0.1308 (3)	0.0291 (8)
H5	1.0562	−0.0073	0.1200	0.035*
C6	1.0440 (3)	−0.1366 (2)	0.1067 (3)	0.0349 (9)
H6	1.1200	−0.1448	0.0798	0.042*
C7	0.9712 (3)	−0.2061 (2)	0.1217 (3)	0.0327 (9)
H7	0.9965	−0.2616	0.1037	0.039*
C8	0.8622 (3)	−0.1945 (2)	0.1626 (3)	0.0277 (8)
H8	0.8126	−0.2423	0.1735	0.033*
C9	0.8241 (3)	−0.1133 (2)	0.1883 (3)	0.0216 (7)
H9	0.7495	−0.1059	0.2179	0.026*
C10	0.9274 (3)	0.1927 (2)	0.1953 (3)	0.0212 (7)
C11	1.0477 (3)	0.1947 (2)	0.2438 (3)	0.0260 (7)
H11	1.0842	0.1443	0.2758	0.031*

C12	1.1145 (3)	0.2691 (2)	0.2459 (3)	0.0331 (9)
H12	1.1963	0.2698	0.2792	0.040*
C13	1.0608 (4)	0.3427 (2)	0.1990 (4)	0.0376 (10)
H13	1.1055	0.3943	0.2023	0.045*
C14	0.9438 (4)	0.3415 (2)	0.1480 (3)	0.0350 (9)
H14	0.9085	0.3919	0.1147	0.042*
C15	0.8763 (3)	0.2666 (2)	0.1450 (3)	0.0270 (8)
H15	0.7956	0.2658	0.1087	0.032*
C16	1.0469 (3)	0.1532 (2)	0.5361 (3)	0.0351 (9)
H16A	1.0823	0.0987	0.5628	0.053*
H16B	1.0443	0.1917	0.6002	0.053*
H16C	1.0962	0.1785	0.4824	0.053*
C17	0.8353 (4)	0.0869 (3)	0.5831 (4)	0.0423 (10)
H17A	0.7533	0.0670	0.5574	0.064*
H17B	0.8326	0.1281	0.6441	0.064*
H17C	0.8858	0.0384	0.6105	0.064*

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Sn	0.01908 (13)	0.01369 (12)	0.02314 (14)	0.00039 (8)	−0.00013 (9)	0.00187 (8)
S1	0.0222 (4)	0.0193 (4)	0.0241 (5)	0.0009 (3)	0.0015 (3)	0.0028 (3)
S2	0.0210 (4)	0.0330 (5)	0.0243 (5)	0.0008 (3)	0.0000 (4)	0.0059 (4)
S3	0.0213 (4)	0.0276 (4)	0.0293 (5)	0.0011 (3)	−0.0039 (4)	0.0000 (4)
S4	0.0194 (4)	0.0347 (5)	0.0356 (5)	0.0019 (4)	−0.0007 (4)	−0.0036 (4)
S5	0.0259 (5)	0.0298 (5)	0.0360 (6)	−0.0008 (3)	0.0096 (4)	−0.0007 (4)
S6	0.0326 (5)	0.0183 (4)	0.0263 (5)	0.0038 (3)	−0.0041 (4)	−0.0022 (3)
O1	0.0270 (13)	0.0153 (11)	0.0224 (13)	0.0015 (9)	0.0004 (10)	−0.0005 (9)
C1	0.0199 (16)	0.0128 (15)	0.0292 (19)	0.0002 (12)	−0.0021 (14)	−0.0015 (13)
C2	0.0222 (17)	0.0168 (15)	0.0276 (19)	0.0021 (13)	−0.0011 (14)	−0.0005 (13)
C3	0.0210 (17)	0.0190 (16)	0.034 (2)	−0.0001 (13)	−0.0012 (15)	−0.0006 (14)
C4	0.0210 (16)	0.0172 (15)	0.0203 (17)	0.0019 (13)	−0.0024 (13)	0.0010 (13)
C5	0.0271 (19)	0.0246 (17)	0.036 (2)	0.0000 (14)	0.0059 (16)	0.0053 (16)
C6	0.031 (2)	0.041 (2)	0.035 (2)	0.0111 (17)	0.0121 (17)	0.0045 (17)
C7	0.044 (2)	0.0218 (17)	0.032 (2)	0.0098 (16)	0.0041 (17)	−0.0024 (15)
C8	0.039 (2)	0.0174 (16)	0.0254 (19)	−0.0013 (14)	0.0002 (16)	0.0044 (14)
C9	0.0221 (17)	0.0195 (16)	0.0222 (18)	−0.0016 (13)	−0.0013 (14)	0.0008 (13)
C10	0.0257 (17)	0.0170 (15)	0.0216 (18)	−0.0003 (13)	0.0063 (14)	−0.0002 (13)
C11	0.0243 (17)	0.0233 (17)	0.030 (2)	−0.0018 (14)	0.0027 (15)	−0.0018 (14)
C12	0.029 (2)	0.034 (2)	0.038 (2)	−0.0086 (16)	0.0099 (17)	−0.0065 (17)
C13	0.049 (3)	0.0236 (18)	0.045 (2)	−0.0145 (17)	0.026 (2)	−0.0081 (17)
C14	0.050 (2)	0.0178 (17)	0.041 (2)	0.0041 (16)	0.021 (2)	0.0026 (16)
C15	0.0300 (19)	0.0197 (16)	0.032 (2)	0.0039 (14)	0.0051 (15)	0.0014 (14)
C16	0.035 (2)	0.033 (2)	0.034 (2)	−0.0047 (16)	−0.0112 (17)	0.0022 (17)
C17	0.049 (3)	0.049 (3)	0.031 (2)	−0.0049 (19)	0.012 (2)	−0.0018 (18)

Geometric parameters (Å, º)

Sn—C4	2.130 (3)	C7—C8	1.375 (5)
Sn—C10	2.133 (3)	C7—H7	0.9500
Sn—O1	2.311 (2)	C8—C9	1.392 (5)
Sn—S1	2.4357 (9)	C8—H8	0.9500
Sn—S2	2.5582 (9)	C9—H9	0.9500
S1—C1	1.764 (3)	C10—C11	1.396 (5)
S2—C2	1.718 (3)	C10—C15	1.398 (5)
S3—C2	1.734 (3)	C11—C12	1.386 (5)
S3—S4	2.0674 (13)	C11—H11	0.9500
S4—C3	1.744 (4)	C12—C13	1.390 (6)
S5—C3	1.667 (4)	C12—H12	0.9500
S6—O1	1.540 (2)	C13—C14	1.372 (6)
S6—C16	1.778 (4)	C13—H13	0.9500
S6—C17	1.781 (4)	C14—C15	1.395 (5)
C1—C2	1.379 (5)	C14—H14	0.9500
C1—C3	1.423 (5)	C15—H15	0.9500
C4—C5	1.388 (5)	C16—H16A	0.9800
C4—C9	1.395 (5)	C16—H16B	0.9800
C5—C6	1.396 (5)	C16—H16C	0.9800
C5—H5	0.9500	C17—H17A	0.9800
C6—C7	1.384 (5)	C17—H17B	0.9800
C6—H6	0.9500	C17—H17C	0.9800
C4—Sn—C10	121.97 (12)	C6—C7—H7	120.0
C4—Sn—O1	86.68 (10)	C7—C8—C9	120.3 (3)
C10—Sn—O1	87.79 (10)	C7—C8—H8	119.8
C4—Sn—S1	112.16 (9)	C9—C8—H8	119.8
C10—Sn—S1	123.38 (9)	C8—C9—C4	120.2 (3)
O1—Sn—S1	79.58 (6)	C8—C9—H9	119.9
C4—Sn—S2	100.73 (9)	C4—C9—H9	119.9
C10—Sn—S2	97.58 (9)	C11—C10—C15	118.8 (3)
O1—Sn—S2	166.52 (6)	C11—C10—Sn	120.2 (2)
S1—Sn—S2	87.16 (3)	C15—C10—Sn	121.0 (2)
C1—S1—Sn	101.66 (12)	C12—C11—C10	120.9 (3)
C2—S2—Sn	98.03 (12)	C12—C11—H11	119.6
C2—S3—S4	94.35 (12)	C10—C11—H11	119.6
C3—S4—S3	96.65 (12)	C11—C12—C13	119.5 (4)
O1—S6—C16	104.84 (17)	C11—C12—H12	120.3
O1—S6—C17	104.05 (17)	C13—C12—H12	120.3
C16—S6—C17	98.6 (2)	C14—C13—C12	120.5 (3)
S6—O1—Sn	118.36 (12)	C14—C13—H13	119.7
C2—C1—C3	117.9 (3)	C12—C13—H13	119.7
C2—C1—S1	124.0 (3)	C13—C14—C15	120.3 (3)
C3—C1—S1	118.0 (3)	C13—C14—H14	119.9
C1—C2—S2	128.8 (3)	C15—C14—H14	119.9
C1—C2—S3	117.3 (3)	C14—C15—C10	120.0 (3)

S2—C2—S3	113.9 (2)	C14—C15—H15	120.0
C1—C3—S5	128.2 (3)	C10—C15—H15	120.0
C1—C3—S4	113.7 (3)	S6—C16—H16A	109.5
S5—C3—S4	118.1 (2)	S6—C16—H16B	109.5
C5—C4—C9	119.3 (3)	H16A—C16—H16B	109.5
C5—C4—Sn	123.5 (2)	S6—C16—H16C	109.5
C9—C4—Sn	117.2 (2)	H16A—C16—H16C	109.5
C4—C5—C6	120.0 (3)	H16B—C16—H16C	109.5
C4—C5—H5	120.0	S6—C17—H17A	109.5
C6—C5—H5	120.0	S6—C17—H17B	109.5
C7—C6—C5	120.3 (3)	H17A—C17—H17B	109.5
C7—C6—H6	119.9	S6—C17—H17C	109.5
C5—C6—H6	119.9	H17A—C17—H17C	109.5
C8—C7—C6	119.9 (3)	H17B—C17—H17C	109.5
C8—C7—H7	120.0		

C4—Sn—S1—C1	−105.26 (14)	O1—Sn—C4—C5	−94.0 (3)
C10—Sn—S1—C1	92.39 (15)	S1—Sn—C4—C5	−171.4 (3)
O1—Sn—S1—C1	172.71 (12)	S2—Sn—C4—C5	97.3 (3)
S2—Sn—S1—C1	−4.83 (10)	C10—Sn—C4—C9	173.5 (2)
C4—Sn—S2—C2	116.74 (14)	O1—Sn—C4—C9	88.2 (3)
C10—Sn—S2—C2	−118.59 (14)	S1—Sn—C4—C9	10.8 (3)
O1—Sn—S2—C2	−5.7 (3)	S2—Sn—C4—C9	−80.5 (2)
S1—Sn—S2—C2	4.72 (11)	C9—C4—C5—C6	1.4 (5)
C2—S3—S4—C3	−1.58 (16)	Sn—C4—C5—C6	−176.4 (3)
C16—S6—O1—Sn	−130.43 (17)	C4—C5—C6—C7	0.3 (6)
C17—S6—O1—Sn	126.56 (19)	C5—C6—C7—C8	−1.3 (6)
C4—Sn—O1—S6	177.97 (16)	C6—C7—C8—C9	0.5 (6)
C10—Sn—O1—S6	55.76 (16)	C7—C8—C9—C4	1.2 (5)
S1—Sn—O1—S6	−68.78 (13)	C5—C4—C9—C8	−2.2 (5)
S2—Sn—O1—S6	−58.2 (3)	Sn—C4—C9—C8	175.8 (3)
Sn—S1—C1—C2	4.4 (3)	C4—Sn—C10—C11	−42.9 (3)
Sn—S1—C1—C3	−176.2 (2)	O1—Sn—C10—C11	41.8 (3)
C3—C1—C2—S2	−179.4 (3)	S1—Sn—C10—C11	117.8 (2)
S1—C1—C2—S2	0.0 (5)	S2—Sn—C10—C11	−150.6 (3)
C3—C1—C2—S3	0.1 (4)	C4—Sn—C10—C15	138.4 (3)
S1—C1—C2—S3	179.45 (17)	O1—Sn—C10—C15	−136.9 (3)
Sn—S2—C2—C1	−4.1 (3)	S1—Sn—C10—C15	−60.9 (3)
Sn—S2—C2—S3	176.36 (15)	S2—Sn—C10—C15	30.7 (3)
S4—S3—C2—C1	1.1 (3)	C15—C10—C11—C12	2.3 (5)
S4—S3—C2—S2	−179.35 (16)	Sn—C10—C11—C12	−176.4 (3)
C2—C1—C3—S5	178.8 (3)	C10—C11—C12—C13	−0.1 (6)
S1—C1—C3—S5	−0.6 (4)	C11—C12—C13—C14	−1.8 (6)
C2—C1—C3—S4	−1.6 (4)	C12—C13—C14—C15	1.4 (6)
S1—C1—C3—S4	179.03 (17)	C13—C14—C15—C10	0.9 (5)
S3—S4—C3—C1	2.0 (2)	C11—C10—C15—C14	−2.7 (5)
S3—S4—C3—S5	−178.38 (18)	Sn—C10—C15—C14	176.0 (3)
C10—Sn—C4—C5	−8.7 (4)		

Hydrogen-bond geometry (Å, º)

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
C6—H6···S2^{i}	0.95	2.71	3.599 (4)	157

Symmetry code: (i) −*x*+2, −*y*, −*z*.