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Syntheses and Structures of Tris(*para*-Tolyl)-, Tris(3-Fluorophenyl)-, and Tris(4-Fluorophenyl)antimony Dioximates

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Abstract—Tris(*para*-tolyl)antimony bis(2-oxybenzaldoximate) (**I**), tris(*para*-tolyl)antimony bis(2-nitrobenzaldoximate) (**II**), tris(*para*-tolyl)antimony bis(2-bromobenzaldoximate) (**III**), tris(3-fluorophenyl)antimony bis(2-oxybenzaldoximate) (**IV**), tris(4-fluorophenyl)antimony bis(2-bromobenzaldoximate) (**V**), and tris(4-fluorophenyl)antimony bis(2-nitrobenzaldoximate) (**VI**) are synthesized by the reactions of tris(*para*-tolyl)-, tris(3-fluorophenyl)-, and tris(4-fluorophenyl)antimony with 2-oxy-, 2-nitro-, and 2-bromobenzaldoxime in diethyl ether in the presence of *tert*-butyl hydroperoxide. The Sb atoms in complexes **I**–**VI** have a distorted trigonal bipyramidal coordination mode with the oximate ligands in the axial positions. CIF files CCDC nos. 1062231 (**I**), 1059962 (**II**), 1465384 (**III**), 1465109 (**IV**), 1471948 (**V**), and 1060387 (**VI**).

Keywords: synthesis, structure, triarylantimony dioximate

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INTRODUCTION

As established earlier, the oxidative addition reactions, where hydrogen peroxide acts as an oxidant of the metal atom, are very efficient for the synthesis of triphenyl- and tri-*para*-tolylantimony dioximates [1–3]. The yield of the target product in these reactions can be increased by the use of *tert*-butyl hydroperoxide as an oxidant [4]. At the same time, triarylantimony dioximates containing heteroatoms in the aryl rings are unknown. Continuing the investigation of the one-pot synthesis of triarylantimony dioximates, we carried out for the first time the oxidative addition reactions involving tris(3-fluorophenyl)antimony, tris(4-fluorophenyl)antimony, tri(*para*-tolyl)antimony, and oximes in the presence of *tert*-butyl hydroperoxide and studied the structures of tris(*para*-tolyl)antimony bis(2-oxybenzaldoximate) (**I**), tris(*para*-tolyl)antimony bis(2-nitrobenzaldoximate) (**II**), tris(*para*-tolyl)antimony bis(2-bromobenzaldoximate) (**III**), tris(3-fluorophenyl)antimony bis(2-oxybenzaldoximate) (**IV**), tris(4-fluorophenyl)antimony bis(2-bromobenzaldoximate) (**V**), and tris(4-fluorophenyl)antimony bis(2-nitrobenzaldoximate) (**VI**) obtained in high yields.

EXPERIMENTAL

Synthesis of complex I. A mixture of tris(*para*-tolyl)antimony (150 mg, 0.38 mmol), 2-oxybenzaldoxime (104 mg, 0.76 mmol), and a 70% solution of tertiary butyl hydroperoxide (49 mg, 0.38 mmol) in diethyl ether (10 mL) was kept at 20°C for 24 h. After the slow evaporation of the solvent, a solid residue was recrystallized from a benzene–octane (2 : 1) system of solvents. The yield of colorless crystals of complex **I** was 0.250 g (99%), mp = 151°C. IR, ν, cm^{-1}: 3086, 3061, 3046, 3030, 2984, 2949, 2918, 2864, 2357, 2164, 1684, 1674, 1668, 1653, 1645, 1595, 1564, 1493, 1476, 1456, 1418, 1396, 1335, 1310, 1290, 1261, 1211, 1190, 1153, 1113, 1072, 1036, 1018, 982, 953, 901, 800, 789, 756, 743, 725, 700, 679, 660, 552, 490, 480, 422.

For $C_{35}H_{33}N_2O_4Sb$		
anal. calcd., %:	C, 62.99;	H, 4.99.
Found, %:	C, 62.79;	H, 5.08.

Compounds **II**–**VI** were synthesized similarly.

II: 91% yield of orange crystals, mp = 202°C (with decomp.). IR, ν, cm^{-1}: 3064, 3020, 2970, 2954, 2920, 2862, 2733, 2661, 2607, 2590, 2555, 2492, 2422, 2358, 2310, 2231, 2139, 1608, 1591, 1558, 1525, 1494, 1394, 1346, 1311, 1298, 1211, 1186, 1066, 1041, 1018, 966, 947, 929, 889, 881, 846, 800, 783, 744, 694, 640, 584, 551, 514, 486, 443, 418.

For $C_{70}H_{62}N_8O_{12}Sb_2$		
anal. calcd., %:	C, 57.95;	H, 4.32.
Found, %:	C, 57.86;	H, 4.47.

III: 99% yield of colorless crystals, mp = 184°C. IR, ν, cm^{-1}: 3068, 3059, 3024, 2987, 2972, 2951, 2916, 2862, 2731, 2667, 2607, 2540, 2513, 2378, 2351, 2320, 2310, 2146, 2131, 2085, 2017, 1992, 1950, 1899, 1869, 1843, 1830, 1799, 1749, 1716, 1695, 1683, 1627, 1591, 1579, 1552, 1521, 1490, 1465, 1433, 1419, 1394, 1328, 1311, 1276, 1267, 1232, 1203, 1186, 1159, 1114, 1066, 1045, 1016, 954, 943, 923, 894, 871, 837, 796, 750, 694, 640, 584, 547, 528, 484, 474, 447, 418.

For $C_{35}H_{31}N_2O_2Br_2Sb$		
anal. calcd., %:	C, 56.86;	H, 3.95.
Found, %:	C, 56.69;	H, 4.09.

IV: 99% yield of pale orange crystals, mp = 240°C (with decomp.). IR, ν, cm^{-1}: 3190, 3128, 3101, 3088, 3066, 3043, 3026, 2978, 2870, 2818, 2752, 2731, 2681, 2646, 2571, 2528, 2503, 2486, 2436, 2399, 2384, 2349, 2322, 2276, 2229, 2166, 2139, 2098, 2069, 2023, 1942, 1909, 1872, 1830, 1811, 1789, 1762, 1716, 1687, 1618, 1585, 1519, 1492, 1471, 1419, 1332, 1300, 1263, 1220, 1192, 1165, 1155, 1118, 1083, 1056,1035, 974, 954, 900, 883, 854, 792, 781, 758, 717, 678, 661, 559, 543, 520, 476, 439, 424.

For $C_{32}H_{23}N_2O_4F_4Sb$		
anal. calcd., %:	C, 55.11;	H, 3.33.
Found, %:	C, 55.02;	H, 3.44.

V: 98% yield of pale yellow crystals, mp = 142°C. IR, ν, cm^{-1}: 3095, 2924, 2854, 2555, 2465, 2358, 2322, 2277, 2216, 1633, 1583, 1558, 1489, 1465, 1436, 1392, 1332, 1303, 1271, 1236, 1163, 1114, 1056, 1022, 948, 931, 924, 877, 821, 810, 754, 694, 642, 549, 509, 474, 445, 418.

For $C_{32}H_{22}N_2F_3Br_2O_2Sb$		
anal. calcd., %:	C, 47.74;	H, 2.76.
Found, %:	C, 47.63;	H, 2.87.

VI: 95% yield of orange crystals, mp = 160°C. IR, ν, cm^{-1}: 3095, 3062, 3034, 2970, 2858, 2825, 2553, 2505, 2453, 2389, 2382, 2351, 2310, 2233, 2040, 1608, 1581, 1558, 1529, 1489, 1448, 1392, 1346, 1303, 1226, 1163, 1014, 966, 941, 927, 891, 883, 848, 829, 808, 785, 742, 696, 642, 576, 559, 511, 443, 418.

For $C_{32}H_{21}N_4O_6F_3Sb$		
anal. calcd., %:	C, 52.20;	H, 2.88.
Found, %:	C, 52.06;	H, 2.81.

The IR spectra of compounds **I–VI** were recorded on a Shimadzu IRAffinity-1S spectrometer in KBr pellets in a range of 4000–400 cm^{-1}.

X-ray diffraction analyses of the crystals of compounds **I–VI** were carried out on a D8 Quest diffractometer (Bruker) (MoK_α radiation, λ = 0.71073 Å, graphite monochromator) at 296(2) K. Data were collected and edited, unit cell parameters were refined, and an absorption correction was applied using the SMART and SAINT-Plus programs [5]. All calculations on structure determination and refinement were performed using the SHELXL/PC [6] and OLEX2 programs [7]. The structures were solved by a direct method and refined by least squares in the anisotropic approximation for non-hydrogen atoms. The main crystallographic data and refinement results for the structures of compounds **I–VI** are presented in Table 1. Selected bond lengths and bond angles are listed in Table 2.

The full tables of atomic coordinates, bond lengths, and bond angles were deposited with the Cambridge Crystallographic Data Centre (CIF files CCDC nos. 1062231 (**I**), 1059962 (**II**), 1465384 (**III**), 1465109 (**IV**), 1471948 (**V**), and 1060387 (**VI**); deposit@ccdc.cam.ac.uk; http://www.ccdc.cam.ac.uk).

RESULTS AND DISCUSSION

Triarylantimony dioximates were synthesized by the oxidative addition from triarylantimony and oxime in the presence of *tert*-butyl peroxide in diethyl ether.

$$Ar_3Sb + 2HON{=}CHAr' + \textit{tert}\text{-}BuOOH \rightarrow Ar_3Sb(ON{=}CHAr')_2 + \textit{tert}\text{-}BuOH + H_2O$$

Ar = *p*-Tol; Ar' = C_6H_4OH-2 (**I**), $C_6H_4NO_2$-2 (**II**), C_6H_4Br-2 (**III**),

Ar = 3-FC_6H_4; Ar' = C_6H_4OH-2 (**IV**),

Ar = 4-FC_6H_4; Ar' = C_6H_4Br-2 (**V**), $C_6H_4NO_2$-2 (**VI**).

According to the X-ray diffraction data, in compounds **I–VI**, the antimony atoms have a distorted trigonal bipyramidal coordination mode with the oximate ligands in the axial positions (Figs. 1–6). The crystal structure of compound **II** contains two types of crystallographically independent molecules (A, B), whose geometric parameters differ insignificantly. The conformation of the aryl rings relative to the equatorial planes (C_3) in molecules of compounds **II–VI** is "propeller-like": the dihedral angles between the corresponding planes are C(21)–C(26) 6.66°, C(11)–C(16) 55.82°, C(1)–C(6) 67.16° (**I**); C(1)–C(6) 27.57°, C(11)–C(16) 47.55°, C(21)–C(26) 73.98° (**IIA**); C(51)–C(56) 27.66°, C(61)–C(66) 47.50°, C(71)–C(76) 73.88° (**IIB**); C(21)–C(26) 37.33°, C(1)–C(6) 57.50°, C(11)–C(16) 71.90° (**III**); C(11)–C(12') 47.71°, C(1)–C(6) 64.40°, C(1')–C(6') 64.40° (**IV**); C(1)–C(6) 15.06°, C(21)–C(26) 69.77°, C(11)–C(16) 72.37° (**V**); and C(11)–C(16) 15.07°,

Table 1. Crystallographic data and experimental and refinement parameters for the structures of complexes **I**–**VI**

Parameter	Value					
	I	**II**	**III**	**IV**	**V**	**VI**
FW	667.38	1450.78	793.22	348.65	805.09	736.28
Crystal system	Monoclinic	Triclinic	Monoclinic	Tetragonal	Triclinic	Monoclinic
Space group	$P2_1/n$	$P\bar{1}$	$P2_1/n$	$I4_1/a$	$P\bar{1}$	$P2_1/n$
a, Å	13.2377(6)	14.1280(5)	9.9375(15)	16.6470(7)	11.9164(3)	14.3269(5)
b, Å	12.9813(5)	15.2464(6)	33.462(6)	16.6470(7)	12.1717(4)	14.7513(5)
c, Å	21.2061(8)	15.9296(5)	10.581(2)	20.8771(9)	12.3025(4)	14.8979(5)
α, deg	90.00	90.003(2)	90	90	108.0640(10)	90.00
β, deg	106.722(2)	98.293(2)	108.694(6)	90	92.2250(10)	95.6780(10)
γ, deg	90.00	89.990(2)	90	90	111.8740(10)	90.00
V, Å^3	3490.0(2)	3395.4(2)	3332.8(10)	5785.5(4)	1550.02(8)	3133.08(19)
Z	4	2	4	16	2	4
ρ_{calcd}, g/cm^3	1.270	1.419	1.5807	1.6010	1.725	1.561
μ, mm^{-1}	0.827	0.862	3.258	1.020	3.517	0.948
F(000)	1360.0	1472.0	1563.9	2780.8	784.0	1468.0
Crystal size, mm	0.17 × 0.42 × 0.1	0.62 × 0.56 × 0.28	0.45 × 0.28 × 0.14	0.87 × 0.64 × 0.44	0.61 × 0.25 × 0.24	0.77 × 0.45 × 0.27
Range of data collection over 2θ, deg	4.52–54.42	2.92–50.96	6.82–44.94	6.92–55.02	6.76–50.78	6.68–58.34
Ranges of reflection indices	$-16 \le h \le 16$, $-16 \le k \le 16$, $-27 \le l \le 27$	$-17 \le h \le 17$, $-18 \le k \le 18$, $-19 \le l \le 19$	$-10 \le h \le 10$, $-35 \le k \le 35$, $-11 \le l \le 11$	$-21 \le h \le 21$, $-21 \le k \le 21$, $-27 \le l \le 27$	$-14 \le h \le 14$, $-14 \le k \le 14$, $-14 \le l \le 14$	$-19 \le h \le 19$, $-20 \le k \le 20$, $-20 \le l \le 20$
Measured reflections	33019	51267	29572	39282	19540	8451
Independent reflections	7703	12458	4325	3326	5329	127647
R_{int}	0.0822	0.0341	0.0361	0.0441	0.0278	0.0321
Refinement parameters	384	835	382	196	379	415
GOOF	1.002	1.071	1.080	1.067	1.045	1.049
R factors for $F^2 > 2\sigma(F^2)$	$R_1 = 0.0556$ $wR_2 = 0.1646$	$R_1 = 0.0519$ $wR_2 = 0.1206$	$R_1 = 0.0400$ $wR_2 = 0.0912$	$R_1 = 0.0569$ $wR_2 = 0.1133$	$R_1 = 0.0446$ $wR_2 = 0.1072$	$R_1 = 0.0431$ $wR_2 = 0.1065$
R factors for all reflections	$R_1 = 0.1223$, $wR_2 = 0.2029$	$R_1 = 0.0684$, $wR_2 = 0.1351$	$R_1 = 0.0476$, $wR_2 = 0.0959$	$R_1 = 0.0707$, $wR_2 = 0.1299$	$R_1 = 0.0588$, $wR_2 = 0.1187$	$R_1 = 0.0576$, $wR_2 = 0.1236$
Residual electron density (max/min), *e*/Å^3	1.50/–0.41	0.82/–0.50	1.33/–1.25	2.65/–1.12	1.32/–1.24	0.90/–0.65

Table 2. Selected bond lengths (*d*) and bond angles (ω) in the structures of complexes **I–VI**

Bond	*d*, Å	Angle	ω, deg
		I	
Sb(1)–O(1)	2.088(4)	O(1)Sb(1)C(1)	87.37(19)
Sb(1)–O(3)	2.070(4)	O(1)Sb(1)C(11)	92.44(19)
Sb(1)–C(1)	2.108(6)	O(1)Sb(1)C(21)	90.2(2)
Sb(1)–C(11)	2.099(5)	O(3)Sb(1)O(1)	178.53(16)
Sb(1)–C(21)	2.111(7)	O(3)Sb(1)C(1)	92.4(2)
O(4)–C(42)	1.386(10)	O(3)Sb(1)C(11)	86.42(19)
O(2)–C(32)	1.340(9)	O(3)Sb(1)C(21)	91.2(2)
O(1)–N(1)	1.381(6)	C(1)Sb(1)C(21)	120.8(2)
O(3)–N(2)	1.401(6)	C(11)Sb(1)C(1)	118.4(2)
N(1)–C(37)	1.262(7)	C(11)Sb(1)C(21)	120.8(2)
N(2)–C(47)	1.282(7)	N(1)O(1)Sb(1)	108.5(3)
C(37)–C(31)	1.457(8)	N(2)O(3)Sb(1)	108.4(3)
		IIA	
Sb(1)–O(1)	2.069(3)	O(1)Sb(1)O(4)	177.22(14)
Sb(1)–O(4)	2.071(3)	C(1)Sb(1)C(21)	116.11(18)
Sb(1)–C(1)	2.107(5)	C(11)Sb(1)C(1)	123.40(19)
Sb(1)–C(11)	2.106(5)	C(11)Sb(1)C(21)	120.49(19)
Sb(1)–C(21)	2.110(5)	O(1)Sb(1)C(1)	91.52(16)
N(3)–O(4)	1.394(5)	O(1)Sb(1)C(11)	92.54(16)
N(1)–O(1)	1.381(6)	O(4)Sb(1)C(1)	91.01(15)
N(1)–C(37)	1.271(7)	O(4)Sb(1)C(1)	85.76(14)
N(3)–C(47)	1.266(6)	O(1)Sb(1)C(21)	88.14(17)
C(14)–C(17)	1.518(10)	O(4)Sb(1)C(21)	90.97(17)
C(24)–C(27)	1.518(8)	N(1)O(1)Sb(1)	102.6(3)
C(4)–C(7)	1.492(7)	N(3)O(4)Sb(1)	109.2(2)
		IIB	
Sb(2)–O(10)	2.067(3)	O(10)Sb(2)O(7)	177.18(14)
Sb(2)–O(7)	2.072(3)	C(61)Sb(2)C(71)	120.43(19)
Sb(2)–C(61)	2.100(5)	C(61)Sb(2)C(51)	123.20(19)
Sb(2)–C(71)	2.105(5)	C(51)Sb(2)C(71)	116.36(18)
Sb(2)–C(51)	2.105(5)	O(10)Sb(2)C(71)	88.12(17)
O(10)–N(7)	1.379(6)	O(10)Sb(2)C(61)	91.13(17)
O(7)–N(5)	1.389(5)	O(7)Sb(2)C(51)	85.76(14)
N(7)–C(97)	1.272(7)	O(7)Sb(2)C(61)	90.96(15)
N(5)–C(87)	1.265(6)	O(7)Sb(2)C(71)	92.45(16)
C(54)–C(57)	1.493(8)	O(10)Sb(2)C(51)	91.51(16)
C(64)–C(67)	1.515(10)	N(5)O(7)Sb(2)	109.3(2)
C(74)–C(77)	1.511(8)	N(7)O(10)Sb(2)	102.9(3)
		III	
Sb(1)–O(1)	2.074(3)	O(2)Sb(1)O(1)	174.71(16)
Sb(1)–O(2)	2.071(4)	C(1)Sb(1)O(1)	93.11(18)
Sb(1)–C(1)	2.111(6)	C(1)Sb(1)O(2)	91.85(18)
Sb(1)–C(11)	2.110(5)	C(11)Sb(1)O(1)	93.66(18)
Sb(1)–C(21)	2.103(5)	C(11)Sb(1)O(2)	85.80(17)
Br(1)–C(32)	1.899(6)	C(11)Sb(1)C(1)	116.2(2)
Br(2)–C(42)	1.904(6)	C(21)Sb(1)O(1)	85.03(18)
O(1)–N(1)	1.376(6)	C(21)Sb(1)O(2)	90.80(18)
O(2)–N(2)	1.387(6)	C(21)Sb(1)C(1)	121.6(2)
N(1)–C(37)	1.294(7)	C(21)Sb(1)C(11)	122.2(2)
N(2)–C(47)	1.282(7)	N(1)O(1)Sb(1)	109.3(3)
C(4)–C(7)	1.515(9)	N(2)O(2)Sb(1)	109.1(3)

Table 2. (Contd.)

Bond	*d*, Å	Angle	ω, deg
		IV	
Sb(1)–O(1)	2.081(3)	O(1')Sb(1)O(1)	176.14(19)
Sb(1)–O(1')	2.081(3)	C(1')Sb(1)O(1')	91.58(16)
Sb(1)–C(1)	2.099(4)	C(1')Sb(1)O(1)	86.47(16)
Sb(1)–C(1')	2.099(4)	C(1)Sb(1)O(1')	86.47(16)
Sb(1)–C(11)	2.125(7)	C(1)Sb(1)O(1)	91.58(16)
O(1)–N(1)	1.398(5)	C(1')Sb(1)C(1)	119.4(2)
O(2)–C(22)	1.353(6)	C(11)Sb(1)O(1)	91.93(10)
F(1)–C(3)	1.345(6)	C(11)Sb(1)O(1')	91.93(10)
N(1)–C(27)	1.271(6)	C(11)Sb(1)C(1)	120.30(12)
C(13)–F(2)	1.084(14)	C(11)Sb(1)C(1')	120.30(12)
C(1)–C(6)	1.379(7)	N(1)O(1)Sb(1)	111.4(3)
		V	
Sb(1)–O(1)	2.063(3)	O(1)Sb(1)C(1)	92.44(19)
Sb(1)–C(1)	2.108(6)	O(1)Sb(1)C(21)	92.63(18)
Sb(1)–C(21)	2.112(5)	O(1)Sb(1)O(2)	176.43(16)
Sb(1)–O(2)	2.074(3)	O(1)Sb(1)C(11)	85.94(17)
Sb(1)–C(11)	2.120(5)	C(1)Sb(1)C(21)	117.5(2)
F(1)–C(4)	1.378(9)	C(1)Sb(1)C(11)	122.7(2)
F(3)–C(24)	1.353(8)	C(21)Sb(1)C(11)	119.9(2)
F(2)–C(14)	1.342(7)	O(2)Sb(1)C(1)	91.10(19)
O(2)–N(2)	1.384(6)	O(2)Sb(1)C(21)	86.10(18)
O(1)–N(1)	1.385(6)	O(2)Sb(1)C(11)	91.80(17)
N(2)–C(47)	1.263(7)	N(1)O(1)Sb(1)	112.1(3)
N(1)–C(37)	1.267(8)	N(2)O(2)Sb(1)	110.0(3)
		VI	
Sb(1)–O(1)	2.0652(19)	O(1)Sb(1)O(4)	177.10(9)
Sb(1)–O(4)	2.084(2)	O(1)Sb(1)C(11)	85.21(9)
Sb(1)–C(11)	2.108(3)	O(1)Sb(1)C(1)	93.02(11)
Sb(1)–C(1)	2.115(3)	O(1)Sb(1)C(21)	91.28(10)
Sb(1)–C(21)	2.117(3)	O(4)Sb(1)C(11)	92.00(10)
O(1)–N(1)	1.391(3)	O(4)Sb(1)C(1)	87.48(12)
O(4)–N(3)	1.381(4)	O(4)Sb(1)C(21)	90.91(11)
F(1)–C(4)	1.364(5)	C(11)Sb(1)C(1)	116.20(12)
F(2)–C(14)	1.351(4)	C(11)Sb(1)C(21)	122.92(13)
F(3)–C(24)	1.355(5)	C(1)Sb(1)C(21)	120.88(12)
N(1)–C(37)	1.258(4)	N(1)O(1)Sb(1)	110.53(15)
N(3)–C(47)	1.248(4)	N(3)O(4)Sb(1)	103.96(18)

C(21)–C(26) 52.53°, C(1)–C(6) 78.88° (**VI**). The sums of the angles in the equatorial planes are equal to a theoretical value of 360° within the experimental error. The antimony atoms do not almost shift from the [C_3] planes (0.001–0.019 Å). The CSbC equatorial angles slightly differ from an ideal value of 120° (Table 2). The CSbO angles between the equatorial and axial bonds in the structures of complexes **I–VI** vary within 85.03(18)°–93.66(18)° (Table 2). The average Sb–C bond lengths in molecules of compounds **I–VI** differ slightly (2.103(5)–2.113(3) Å), as well as the Sb–O bonds (2.063(3)–2.088(4) Å). In the structures of complexes **I–VI**, the Sb–O axial bonds are shorter than the equatorial Sb–C bonds, which is characteristic of other triarylantimony dioximates [8]. It can be mentioned that some elongation of the Sb–C bonds in molecules of the 4-fluorophenyl derivatives is observed in pairs of the compounds (**III** and **V**, **II** and **VI**) with the same oximate ligands but different aryl substituents at the antimony atoms having the groups with opposite inductive effects (CH_3 and F) in the *para*-positions, while this dependence is not observed for the Sb–O bonds. In compounds **I** and **IV**, the equatorial and axial bonds are nearly equal (Table 2).

Molecules of all triarylantimony dioximates contain intramolecular contacts between the antimony

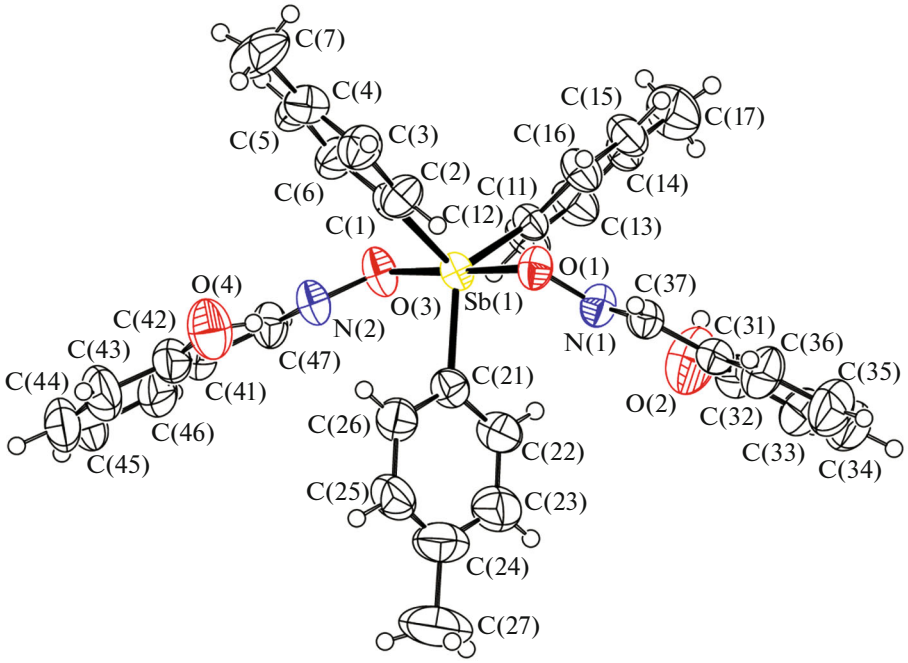

Fig. 1. Molecular structure of complex **I**.

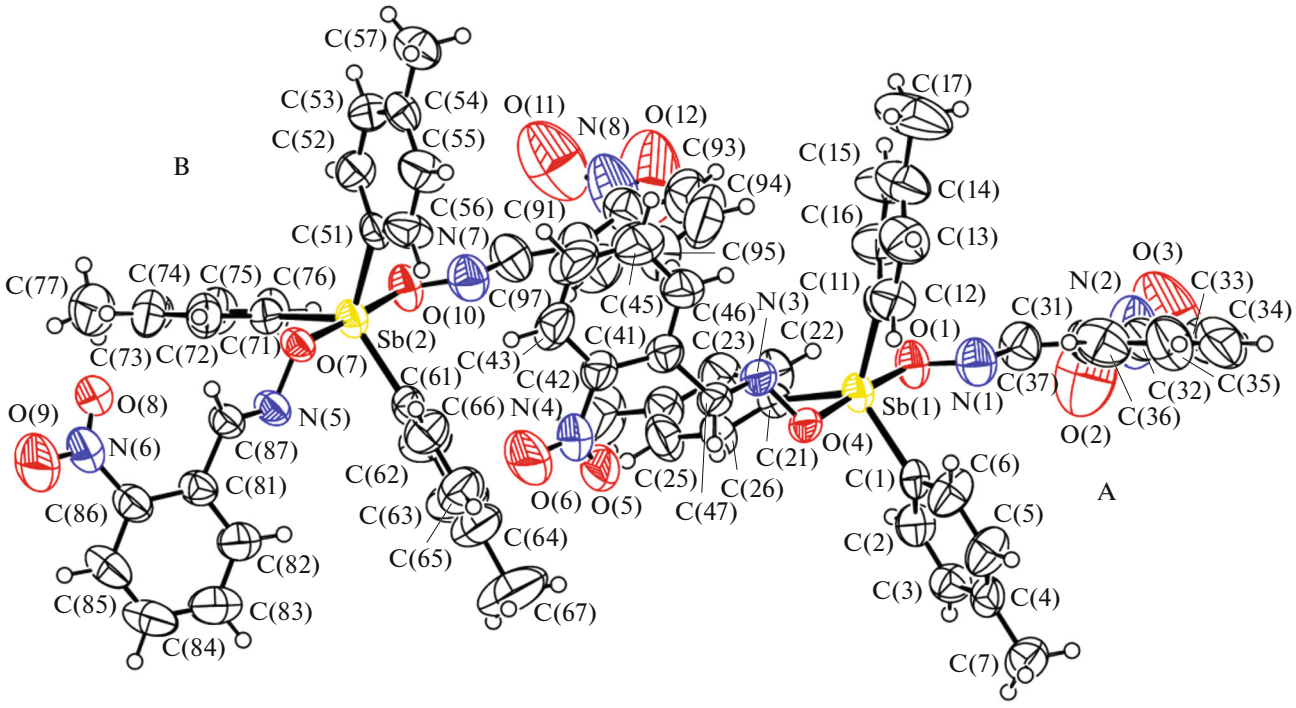

Fig. 2. Molecular structure of complex **II**.

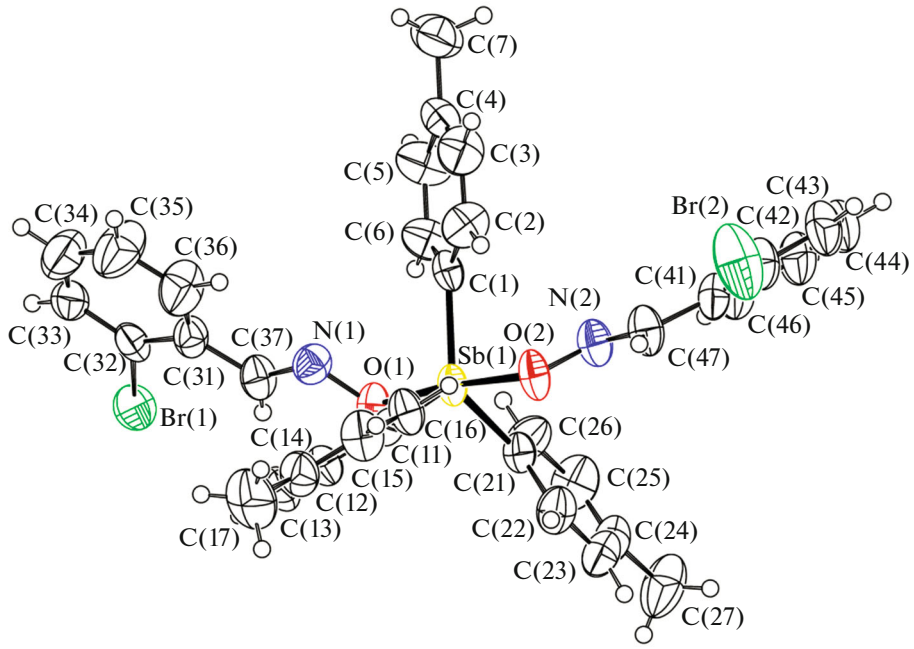

Fig. 3. Molecular structure of complex **III**.

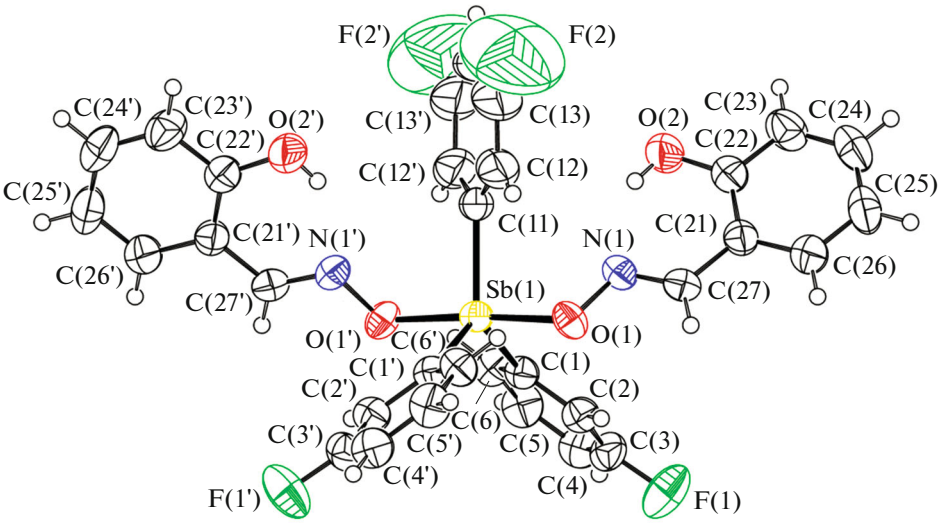

Fig. 4. Molecular structure of complex **IV**.

and nitrogen atoms of the oximate ligands. The Sb···N distances (2.844(5), 2.844(5) Å (**I**); 2.727(4), 2.851(4) Å (**IIA**); 2.729(4), 2.850(4) Å (**IIB**); 2.844(5), 2.843(4) Å (**III**); 2.900(5), 2.900(5) Å (**IV**); 2.884(6), 2.860(5) Å (**V**); and 2.764(3), 2.866(2) Å (**VI**)) are substantially shorter than the sum of the van der Waals radii of the antimony and nitrogen atoms (3.8 Å [9]). As follows from the data presented, the strength of these contacts is independent of the Sb–O bond lengths and does not induce an expected elongation of the N–O bonds of 1.376(6)–1.401(6) Å in complexes **I–VI**. In molecules of all the six triarylantimony dioximates, the NOSb bond angles are close to the theoretical value (102.6(3)°–111.4(3)°).

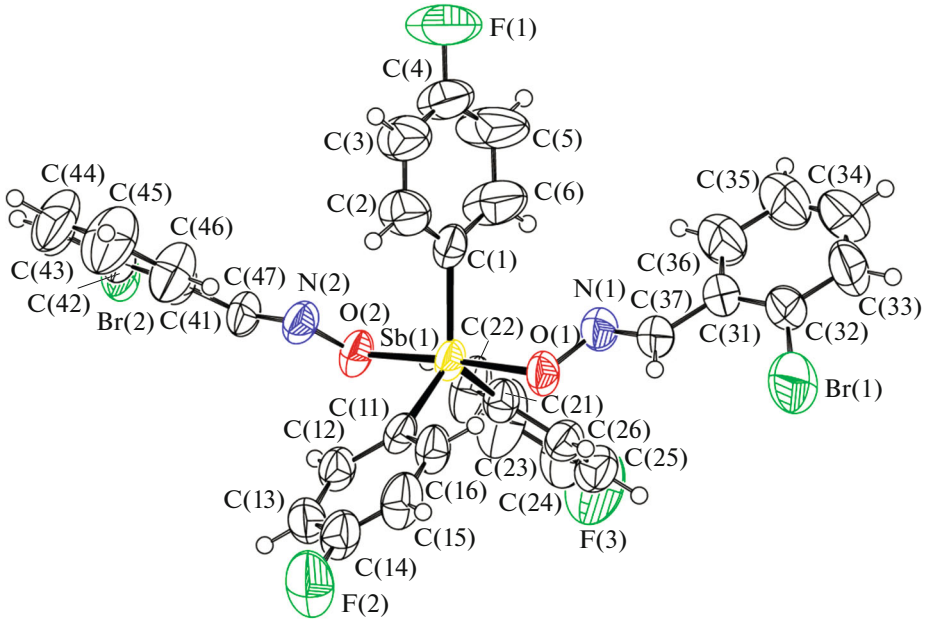

Fig. 5. Molecular structure of complex **V**.

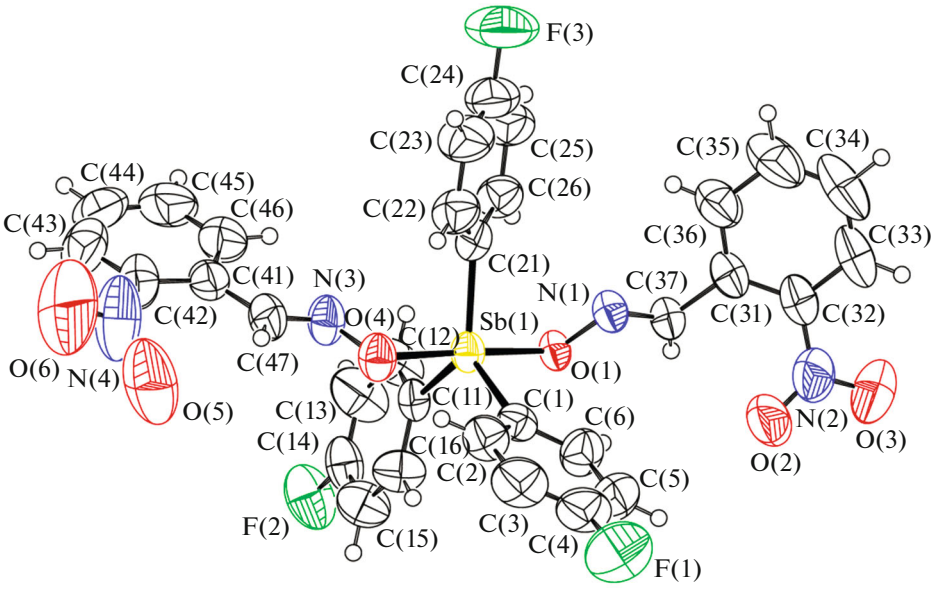

Fig. 6. Molecular structure of complex **VI**.

The structural organization in the crystals is mainly caused by weak intermolecular hydrogen bonds of the H···O, H···F, and H···Br type.

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