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Tantalum(V)-Schiff Base Complexes

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Considerable amount of work has been reported on the stereochemically important and useful chelates of Schiff bases with bivalent metals[1-4] but only a few scattered references are available for similar complexes of tetravalent and pentavalent metals.[5,6] In earlier publications from this laboratory, a few titanium[7] and zirconium[8] compounds have been reported. In the present paper, the reactions of tantalum(V) alkoxides with Schiff bases have been studied and some of their important properties described.

Tantalum isopropoxides, prepared by the ammonia method[9] and Schiff bases, prepared by azeotropic condensation and vacuum distillation, are the starting materials for these reactions. The technique consists of the addition of stoichiometric quantity of the Schiff base to the anhydrous benzene solution of tantalum isopropoxide and refluxing the reac-

1) L. Sacconi and I. Bertini, *Inorg. Chem.*, **5**, 9 (1966).
2) M. Ciampolini and N. Nardi, *ibid.*, **5**, 41 (1966).
3) B. Kirson and H. Sechter, *Bull. Soc. Chim. Fr.*, **1966**, 2236.
4) S. Yamada, This Bulletin, **40**, 1864 (1967).
5) A. S. Kudravtsev and I. A. Savich, *Zh. Obshch, Khim.*, **33**, 3763 (1963).
6) Y.-Y. Chuang, I. A. Savich, A. V. Lapitskii, V. R. Samorokov and L. G. Titov, *Vestn, Mosk. Univ. Ser. II, Khim.*, 15, **3**, 40 (1960).
7) P. Prashar and J. P. Tandon, *J. Less-Common Metals*, **13**, 541 (1967).
8) P. Prashar and J. P. Tandon, *ibid.*, **15**, 219 (1968).
9) D. C. Bradley, W. Wardlaw and A. Whitley, *J. Chem. Soc.*, **1956**, 5, 1139, 2381.

TABLE 1

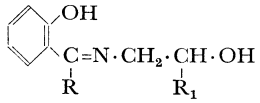
	Compound		Analysis: Metal %	Analysis: Nitrogen %	Molecular weights: Found	Molecular weights: Calcd	Molecular weights: Molarity
1	$Ta(OPr^i)_3SB$	(a)	35.09	2.78	622	521	1.2
	Pale yellow sticky solid	(b)	34.70	2.68			
2	$Ta(OPr^i)(SB)_2$	(a)	32.19	4.80	795	566	1.4
	Yellow foamy solid	(b)	31.96	4.94			
3	$Ta(SB)_2(SBH)$	(a)	25.78	6.12	707	671	1.1
	Yellow foamy solid	(b)	26.95	6.25			
4	$Ta(OPr^i)_3(S'B')$	(a)	35.19	2.52	674	535	1.3
	Pale yellow semi-solid	(b)	33.79	2.61			
5	$Ta(OPr^i)(S'B')_2$	(a)	29.75	4.60	787	594	1.3
	Yellow foamy solid	(b)	30.44	4.71			
6	$Ta(S'B')_2(S'B'H)$	(a)	25.33	5.75	715	713	1.0
	Yellow foamy solid	(b)	25.35	5.88			
7	$Ta(OPr^i)_3(S_1B_1)$	(a)	32.99	2.54	660	535	1.2
	Pale yellow semi-solid	(b)	33.79	2.61			
8	$Ta(OPr^i)(S_1B_1)_2$	(a)	29.50	4.64	831	594	1.4
	Yellow foamy solid	(b)	30.44	4.71			
9	$Ta(S_1B_1)_2(S_1B_1H)$	(a)	25.05	5.80	710	713	1.0
	Yellow foamy soild	(b)	25.35	5.88			
10	$Ta(OPr^i)_3(S_2B_2)$	(a)	33.04	2.50	649	549	1.2
	Pale yellow viscous compound	(b)	32.92	2.55			
11	$Ta(OPr^i)(S_2B_2)_2$	(a)	28.59	4.45	777	622	1.2
	Yellow foamy compound	(b)	29.07	4.50			
12	$Ta(S_2B_2)_2(S_2B_2H)$	(a)	23.38	5.46	716	755	0.9
	Yellow foamy solid	(b)	23.95	5.56			

where -SB-=anion of salicylidene-2-hydroxyethylamine
-S'B'-=anion of salicylidene-2-hydroxy-*n*-propylamine
$-S_1B_1-$=anion of *o*-hydroxyacetophenone-2-hydroxyethylimine
$-S_2B_2-$=anion of *o*-hydroxyacetophenone-2-hydroxy-*n*-propylimine.
a=analysis of the compound, b=calcd for the formula

tion mixture on a fractionation column. The reaction is completed by the removal of the isopropanol produced azeotropically and drying the reaction mixture in a vacuum. These reactions in different molar ratios can be presented as

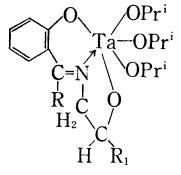
$$Ta(OPr^i)_5 + SBH_2 \longrightarrow Ta(OPr^i)_3(SB) + 2Pr^iOH,$$
$$Ta(OPr^i)_5 + 2SBH_2 \longrightarrow Ta(OPr^i)(SB)_2 + 4Pr^iOH,$$
$$Ta(OPr^i)_5 + 3SBH_2 \longrightarrow Ta(SB)_2(SBH) + 5Pr^iOH,$$

where SBH_2 represents the Schiff base and -SB- the corresponding anion of the Schiff base. The bases used in these reactions may be represented by the general formulae:

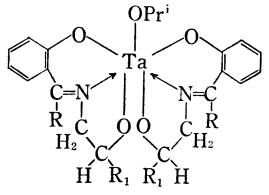


where in (I) R=H, R_1=H
(II) R=H, R_1=CH_3
(III) R=CH_3, R_1=H
and (IV) R=CH_3, R_1=CH_3.

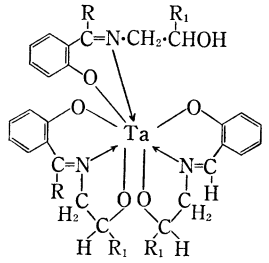
These reactions take place quite easily and the resulting compounds could be isolated in quantitative yields. Tantalum (V) - Schiff-base chelates are pale-yellow to dark-yellow foamy solids (Table 1), soluble in benzene, parent alcohol and chloroform and are non-volatile. Their molecular weights have been determined ebullioscopically in benzene and they are almost monomers. Their probable structures may be indicated as follows:



1:1 derivative



1:2 derivative



1:3 derivative

Analytical results and molecular weights of these derivatives are listed in the table.

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