A New Series of Chromium(III) Complexes of Schiff Bases obtained from Substituted Salicylaldehydes and Amines

Shoichiro Yamada and Katsumoto Iwasaki
Institute of Chemistry, College of General Education, Osaka University, Toyonaka, Osaka

(Received June 4, 1968)

Schiff base complexes of various transition elements have been reported in the literature.[1,2] However, synthesis of chromium(III) complexes of *C*, *N*-disubstituted salicylideneimines has been considered to be very difficult, and the complexes of the Cr(X-sal. R)$_3$ type, for example, have never been isolated (Fig. 1). The present paper deals with successful preparation of a series of these chromium (III) complexes.

The new chromium(III) complexes, which are given in Table 1, were prepared by the following general method. To a suspension of chromium(III) acetate hydrate (0.01 mol) in ethylene glycol were added salicylaldehyde or 5, 6-benzosalicylaldehyde (0.03 mol), an alkyl or an aryl amine (0.03 mol) and an aqueous solution of sodium carbonate (0.01 mol, 67% of the theoretical amount), and the resulting solution was heated on an oil-bath at about 120°C for two or three hours. After the red solution was cooled to room temperature, the precipitate was filtered off, washed with ethanol and recrystallized from ethanol. Brown-purple to orange-red crystals of the compound, the colour depending appreciably upon the size of the particles, were obtained in good yield. The crystals are soluble in common organic solvents.

TABLE 1. ANALYTICAL DATA OF CHROMIUM(III) COMPLEXES OF THE Cr(X-sal. R)$_3$ TYPE

		Calcd, %			Found, %		
X	R	C	H	N	C	H	N
H	CH_3	63.42	5.32	9.25	63.09	5.18	9.05
	C_2H_5	65.31	6.09	8.46	65.56	6.27	8.14
	n-C_3H_7	66.89	6.74	7.80	66.24	6.84	7.61
	iso-C_3H_7	66.89	6.74	7.80	66.48	6.73	7.86
	Ph*	73.11	4.72	6.56	72.76	4.59	6.41
5, 6-Benzo	CH_3	71.51	5.00	6.95	71.14	5.19	6.70
	C_2H_5	72.43	5.61	6.50	72.13	5.46	6.50
	n-C_3H_7	73.23	6.15	6.10	72.67	6.10	6.03
	iso-C_3H_7	73.23	6.15	6.10	72.98	6.06	6.10
	Ph	77.45	4.59	5.31	77.69	4.20	5.04

* The notation Ph denotes a phenyl group.

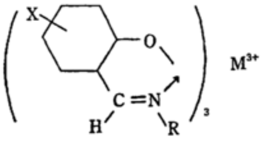

Fig. 1. M(X-sal. R)$_3$.

Elemental analyses, as shown in Table 1, indicate that these complexes have the formulae of Cr(X-sal. R)$_3$, in agreement with the formulae expected on the basis of the magnetic moments, which were determined to be about 3.79 to 3.86 B.M. at room temperature corresponding to three unpaired electrons. Infrared spectra of these complexes show an absorption band at about 1530 to 1540 cm^{-1} due to the C=N stretching vibration, indicating the formation of the Schiff bases.

Although the two types of configuration, a *mer*- and a *fac*-form, are possible for these complexes, only one form of the two was isolated as crystals in the present work. In any case, it is likely that all the chromium(III) complexes so far prepared take the same type of configuration, since they show nearly identical electronic absorption spectra having a d-d band maximum at about 18000 cm^{-1}.

It is interesting to note that the complexes of the Cr(X-sal. *iso*-C_3H_7)$_3$ type, X being H and 5, 6-benzo, have been prepared in the present work, since it was believed to be very difficult due to the steric hindrance to synthesize the corresponding complexes of cobalt(III), which have only recently been isolated.[3]

The details of this work will be reported elsewhere later.

---

[1] R. H. Holm, G. W. Everett, Jr., and A. Chakravorty, "Progress in Inorganic Chemistry," Vol. VII, ed. by F. A. Cotton, Interscience Publishers, New York, N. Y. (1966), p. 83.

[2] S. Yamada, *Coordin. Chem. Reviews*, **1**, 415 (1966).

[3] S. Yamada, E. Ohno and K. Yamanouchi, This Bulletin, **41**, 535 (1968).