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NOTE

Complexes of Cu(II), Ni(II) and Co(II) with Schiff Base Derived from Salicylaldehyde and *o*-Aminophenol with Some Neutral Nitrogen Donor Ligands

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Complexes of the type [MLL'_3] where M = Cu(II), Co(II) and Ni(II); L = salicylaldehyde-*o*-aminophenol; L′ = γ-picoline, quinoline, pyridine and 2-aminopyrimidine were synthesised. IR spectra indicate the coordination of both the ligands to metal ion. Magnetic and electronic spectral studies provide the evidence for the existence of octahedral geometry for all the complexes.

In the present communication we have reported studies on some complexes of Cu(II), Ni(II) and Co(II) with the ligand salicylaldehyde *o*-aminophenol and some neutral ligands. All the complexes are characterized on the basis of elemental analyses, conductance measurements, magnetic and spectral (UV and IR) studies.

The Schiff's base was prepared as reported earlier[1]. The complexes were prepared by mixing the methanolic solution of metal salts, Schiff's base and neutral ligands (γ-picoline, quinoline, pyridine and 2-aminopyrimidine) in 1:1:3 molar ratio. The Cu(II) complexes were formed immediately. The Ni(II) and Co(II) complexes were formed on refluxing the mixture for 1 h. The resulting complexes were filtered, washed with methanol, ether and dried *in vacuo*. The elemental analyses were carried out by standard methods. The molecular weights of the complexes were determined by Rast's camphor method. Molar conductances of the complexes were measured using a Systronics 304 direct reading conductivity meter. Magnetic moments were determined by Gouy's method. IR spectra were recorded on a Unicam SP 200 double beam spectrophotometer. Electronic spectra were recorded on a Unicam SP 500 spectrophotometer. The analytical and magnetic moment data are given in Table-1.

The elemental analyses suggest the formula [MLL'_3] for the complexes where M = Cu(II), Ni(II) and Co(II); L = salicylaldehyde *o*-aminophenol (SA-*o*AP); L′ = neutral ligands like γ-picoline (γ-pic), quinoline (Q), pyridine (Py) and 2-aminopyrimidine (2-AmPy). All the complexes melt above 200°C. The molecular weight measurements indicate that all the complexes are monomeric in nature. Low molar conductance values indicate that all the complexes are non-electrolytes.

TABLE-1
ANALYTICAL AND PHYSICAL DATA OF COMPLEXES

Compound	Colour	Mol. Wt. Found (Calcd.)	Analysis % Found (Calcd.)		μ_{eff} B.M.
			M	N	
Cu(Sal-*o*AP)(γ-pic)$_3$	Green	548.70	11.39	10.08	1.81
		(553.50)	(11.47)	(10.11)	
Cu(Sal-*o*AP)(Q)$_3$	Black	671.80	9.43	8.38	1.83
		(661.50)	(9.59)	(8.46)	
Cu(Sal-*o*AP)(Py)$_3$	Dark green	504.60	12.46	10.82	1.86
		(511.50)	(12.41)	(10.94)	
Cu(Sal-*o*AP)(2-AmPy)$_3$	Greenish black	551.30	12.01	17.43	1.89
		(559.50)	(11.34)	(17.51)	
Co(Sal-*o*AP)(γ-pic)$_3$	Dark green	537.80	10.01	10.13	3.90
		(548.93)	(10.73)	(10.20)	
Co(Sal-*o*AP)(Q)$_3$	Brick red	649.38	8.88	8.49	4.02
		(656.93)	(8.97)	(8.52)	
Co(Sal-*o*AP)(Py)$_3$	Grey	498.70	11.49	10.98	4.12
		(506.93)	(11.62)	(11.04)	
Co(Sal-*o*AP)(2-AmPy)$_3$	Greenish black	561.28	10.53	17.54	4.28
		(554.93)	(10.61)	(17.65)	
Ni(Sal-*o*AP)(γ-pic)$_3$	Yellow	531.46	16.58	9.39	3.08
		(548.70)	(10.69)	(10.20)	
Ni(Sal-*o*AP)(Q)$_3$	Red	663.59	8.87	8.43	3.18
		(656.70)	(8.93)	(8.52)	
Ni(Sal-*o*AP)(Py)$_3$	Yellow	513.28	11.46	10.98	3.21
		(506.70)	(11.58)	(11.05)	
Ni(Sal-*o*AP)(2-AmPy)$_3$	Brown	569.33	10.42	17.51	3.14
		(554.70)	(10.58)	(17.66)	

The IR spectrum of the ligand shows a strong band at 1630 cm^{-1} due to azomethane ν(C=N) mode. This band shifts to lower energy by 10–25 cm^{-1} in the complexes indicating coordination through azomethane nitrogen[2]. The Schiff's base shows a strong band at 1540–1525 cm^{-1} due to ν(C—O) (phenolic)[3]. In the complexes the band shifts to higher energy by 5 cm^{-1} indicating the coordination of phenolic oxygen atom to the metal ion. This positive shift is expected due to the maintenance of a ring current arising from the electron delocalisation in the chelate ring. The Schiff's base exhibits a medium intense band at 2700 cm^{-1} due to intramolecularly hydrogen bonded ν(OH)[3]. The absence of this band in the complexes indicates the deprotonation of the phenolic groups and coordination of oxygen atoms to metal ion. Thus the IR data suggest the dibasic tridentate nature and ONO donor behaviour of the Schiff's base. The bands at 1640 cm^{-1} and 1580 cm^{-1} due to γ-picoline, quinoline, pyridine and 2-amino pyrimidine suggest the coordination of the ligands to metal ion through nitrogen atom[4]. The IR spectra of the complexes revealed that both the ligands are coordinated to metal ion.

The Cu(II) complexes have normal magnetic moment values in the range

1.81–1.89 B.M.[5] The electronic spectra of the complexes show a broad band around 14300 cm^{-1} which may be assigned to the transition $^2E_g \rightarrow {}^2T_{2g}$ in an octahedral field[6]. The Ni(II) complexes have magnetic moment values between 3.08–3.21 B.M.[5] The electronic spectra of Ni(II) complexes show three well resolved bands at 10000, 16400, 25800 cm^{-1} assigned to $^3A_{2g}(F) \rightarrow {}^3T_{2g}(F)$, $^3A_{2g}(F) \rightarrow {}^3T_{1g}(F)$ and $^3A_{2g}(F) \rightarrow {}^3t_{1g}(P)$ transitions respectively under an octahedral environment around Ni(II) ion[6]. The Co(II) complexes have magnetic moment values of 3.9–4.28 B.M. expected for high spin octahedral Co(II)[5] and two bands at 9000 and 16300 cm^{-1} which can be assigned to the transitions $^4T_{1g}(F) \rightarrow {}^4T_{2g}(F)$ and $^4T_{1g}(F) \rightarrow {}^4A_{2g}(F)$ respectively which suggest octahedral geometry[6].

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