

Studies on Mixed Ligand Complexes of Copper (II), Nickel(II) and Cobalt (II) with Some Schiff Bases and Dimethylglyoxime.

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Abstract : The present paper deals with the preparation of ligand mixed ligands complexes with Copper(II), Nickel (II), Cobalt(II) with Schiff Bases .Salicylaldehyde thiosemicarbazone (Stsc) N-salicylledene anthranillic acid (SAA), salicylaldehyde o-aminophenol (Sal-oAP) and dimethylglyoxime (Dmg).

Keywords: Schiff base, Salicylaldehyde, thiosemicarbazone, N-salicylledene, anthranillic acid Salicylaldehyd o-aminophenol dimethylglyoxime).

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I. Introduction:

Metal complexes of Schiff bases¹⁻¹ have played a central role in the development of coordination chemistry and are known over a century for their increasing uses as biochemical and antimicrobial agents Pfeiffer at al⁵, carried out a systematic study of Schiff base complexes. Thereafter a lot of work has been done on the complexes of Schiff bases⁶⁻⁹. In this communication the results of the physio-chemical and biocidal studies of the Cu(II), Ni(II), Zn(II) and Mn(II) complexes of Schiff base

II. Experimental:

All the chemicals (A.R) were used as such. The Schiff bases were prepared as per known methods⁶⁻⁸. Ethanolic solution of metal salts, Schiff bases and dimethylglyoxime were mixed in 1:1:1 molar ratio. The thiosemicarbazone complexes were isolated in presence of dilute NH₄OH solution. The Cu(II) and Ni(II) complexes were formed immediately. The Co(II) complexes were formed by refluxing the mixture for 3h. The resulting complexes were filtered, washed with ethanol followed by ether and dried under reduced pressure over fused CaCl₂. The complexes were insoluble in water but sparingly soluble in some organic solvents.

Ir spectra were recorded on a Shimadzu -480 spectrophotometer electronic spectra (Nitrobenzene) on a Shimadzu 160-A spectrophotometer magnetic susceptibility at room temperature by Guoy balance, molar conductance (10⁻³M) in nitrobenzene and molecular weight by Rast camphor method.

III. Results and Discussion

The magnetic susceptibility, analytical and molar conductance data are given in Table-1. Elemental analyses of the complexes correspond to the formula [MLL(H₂O)], where M = Cu(II), Ni(II) and Co(II); L = Schiff bases; L = Dimethylglyoxime. All the complexes melt above 200°C. The molecular weight data indicate the compounds to be the Studies on Mixed

Monomeric. The low molar conductance values (3.36-6.61 cm² mol⁻¹) show that the complexes are nonelectrolytic in nature.

Ir spectral studies: Ir spectrum of salicylaldehyde thiosemicarbazone shows a broad band at 3100 and 3100 cm⁻¹ assigned to (ν NH₂ and ν OH) and ν CH stretching of aromatic ring respectively⁹. Deprotonation of the phenolic OH and coordination to the metal ion through oxygen is indicated by the occurrence of ν C-O at ~1360 cm⁻¹¹⁰. A sharp band at ~1630 cm⁻¹ (C=N) of the Schiff base indicates the coordination through azomethine nitrogen^[10]. The coordination to the metal ion by deprotonation of C-SH group is evident by the absence of the band ~2690 cm⁻¹ in all the complexes¹⁰. A new band at ~660 cm⁻¹ (C-S) also appeared in the 2600 cm⁻¹ due to ν OH mode of carboxylic and phenolic OH group¹⁰. The ν C=O band of free COOH group shifted to lower frequency in all the complexes indicating the vibration of the coordination azomethine appears, at ~1600 cm⁻¹ instead of at ~1630 cm⁻¹ in the free ligand¹⁰. The ν_{as} and ν_s vibrations of COO⁻ group appear at ~1855 and 1635 cm⁻¹ respectively. The phenolic O-H inplane bending vibration of free ligand expected around ~1400 cm⁻¹ is absent here

indicating deprotonation of phenolic OH group. The C=O stretching is shifted from 1200 cm^{-1} in free ligand to around 1230-1220 cm^{-1} in the complexes. The spectrum of Salicylaldehyde o-aminophenol shows a strong band at ~ 1630 due to azomethine ν C=N mode which shifts to lower energy by 10-25 cm^{-1} in the complexes indicating coordination through azomethine nitrogen¹⁰. In the free ligand a strong band at 1525-1540 cm^{-1} due to ν C-O phenolic shifts to higher energy by 5 cm^{-1} in the complexes indicating the coordination of the phenolic oxygen atom to the metal ion¹⁰. The Schiff base exhibits a medium intense band at ~ 2700 cm^{-1} due to intramolecularly hydrogen bonded ν OH¹⁰. The above facts indicate that all the three Schiff bases behave as bidentate tridentate ligands. The spectrum of dimethylglyoxime shows a broad band at ~ 3200 cm^{-1} (ν OH) associated with inter or intramolecularly hydrogen bonding¹⁷. A band at ~ 1450 cm^{-1} (C=N) in the free ligand shifted to higher frequency region 1590-1550 cm^{-1} in the complexes. The ligand shows two N-O bands at 990 and 925 cm^{-1} which shifted to 1262-1067 cm^{-1} in the complexes¹⁸. From the IR spectral data it is evident that both the ligands are coordinated to the metal ion. The presence of coordinated water molecular in the complexes is indicated by the presence of bands at ~ 3400 and ~ 830 cm^{-1} .

Magnetic and Electronic Spectral Studies : The room temperature magnetic moment values of the Cu(II), Ni(II) and Co(II) complexes are found to be 1.90-1.98, 2.62-2.91 and 3.43-3.57 B.M. respectively¹⁹.

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