

Synthesis And Characterization of Co (II) , Ni (II) And Cu(II) Complexes With N-And O- Donor Sites Ligand By Infrared Spectra

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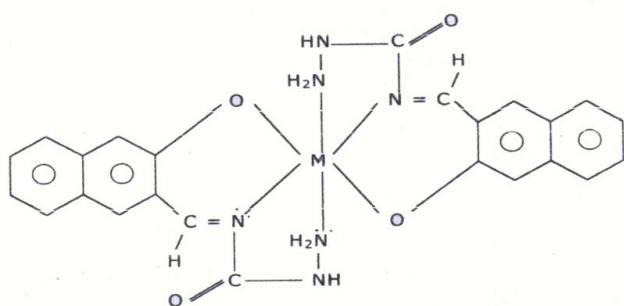
Abstract- The infrared spectra of metal complexes Co(II), Ni(II) and Cu(II) with the ligand 3-hydroxy-2 naphthalidene semicarbazone have been examined. The bands in the IR region in the spectra of the complexes which are significantly absent in the spectrum of the ligand appearing at $640-540\text{ cm}^{-1}$ and $500-380\text{ cm}^{-1}$ may be due to $VM - N$ and $VM - O$ respectively.

Keywords- Complexes 3-hydroxy-2-naphthalidene semicarbazone, infrared studies, octahedral geometry.

I. INTRODUCTION

Co (II) , Ni (II), and Cu (II) Chlorides are found to form complexes of types, ML_2 , where the ligand .

L= Anion of 3-hydroxy-2- naphthalidene Semicarbazone



M = Co(II), Ni(II), Cu(II)

Fig. 1

The compound has been characterised by elemental analysis, magnetic moment determination and IR¹spectral studies. The complexes have octahedral geometry with two N- and one O-donor sites of the ligand.

The IR Spectra of complexes under investigation have been examined and the coordination of the ligand through OH, C=N and NH₂ have been observed.

The ligand exhibits band of 3460- 3420 and 3210-3200 cm^{-1} assignable to $V_{as}NH_2$ & $V_s NH_2$ respectively. The significant lowering of these bands indicates participation of NH₂ group in coordination. The bands at 3270 cm^{-1} and 1650 cm^{-1} spectrum of the ligand assignable to V_{N-H} and $V_{>C=O}$ respectively remains unperturbed in the spectra of the complexes suggesting non- participation of NH group and O-atom of the Carbonyl group in coordination . The sharp and intense band at 1500 cm^{-1} assignable to $V_{C=N}$ in the spectrum of the ligand shows a significant red shift suggesting coordination to take place through azomethine linkage.

II. EXPERIMENTAL

- Equimolar amounts of 3 hydroxy-2- naphthaldehyde and semicarbazide were refluxed in methanol for two hours. The hot solution was filtered when yellow crystals of the ligand 3-hydroxy-2-naphthalidene were deposited on cooling which were recrystallised from methanol (m.p. 230-232⁰c)
- The metal complexes have been prepared by allowing metal salts to catalyse the condensation of 3-hydroxy-2-naphthaldehyde with semicarbazide hydrochloride.

III. RESULTS AND DISCUSSION

The infrared spectra of complexes under investigation have examined and the coordination of the ligand through OH, C=N and NH₂ have been observed.

Table-1 Principal ir bands of the ligand and Co(II), Ni(II) and Cu (II) complexes

Bands	Ligand HL (in cm^{-1})	CoL ₂ (in cm^{-1})	NiL ₂ (in cm^{-1})	CuL ₂ (in cm^{-1})
VO-H	3380	-	-	-
V_pNH_2	3440	3410	3405	3400
$V_{as}NH_2$	3210	3180	3185	3190
V_{NH}	3270	3270	3270	3270
$V_{C=N}$	1500	1475	1480	1480
$V_{M=O}$	-	610	615	625
V_{NH}	-	415	410	420

1. The NH₂ Group:

The ligand exhibits bands at 3460-3420 and 3210-3200 cm^{-1} ^{2,3} assignable to $\nu_{as}NH_2$ and ν_sNH_2 respectively. The significant lowering of these bands indicates participation of NH₂ group in coordination.

2. The NH Group:

The band at 3270 cm^{-1} in the spectrum of the ligand assignable to ν_{N-H} ⁴ remains unperturbed in the spectra of the complexes suggesting non participation of NH group in coordination.

3. The carbonyl (CO) Group:

The sharp absorption band at 1650 cm^{-1} owing to $>C=O$ stretching vibration in the i.r. spectrum of the ligand remains unaltered in intensity in metal complexes and is found in the region 1650-1660 cm^{-1} . This indicates that oxygen atom of the carboxyl group is not involved in coordination with the metal ions in the complexes.

4. The $>C=N$ group:

The sharp and intense band at 1500 cm^{-1} assignable to $\nu_{C=N}$ in the spectrum of the ligand exhibits a significant red shift suggesting coordination to take place through azomethine linkage.

5. The O-H group:

The broad and intense band at 3380 cm^{-1} assignable to ν_{O-H} in the spectra of the disappears in the spectra of complexes indicating deprotonation and coordination of the oxygen atom of OH group to the metal ion.

The bands in the I.r. region in the spectra of the complexes which are significantly absent in the spectrum of the ligand, appearing at 640-540 and 500-380 cm^{-1} may be due to ν_{M-N} and ν_{M-O} respectively.

On the basis of above discussions metal complexes can be assigned structure as shown in the Fig. 1

IV. ACKNOWLEDGEMENT

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