



SYNTHESIS, CHARACTERIZATION AND MAGNETIC PROPERTIES OF Co(II)-SCHIFF BASE COMPLEX

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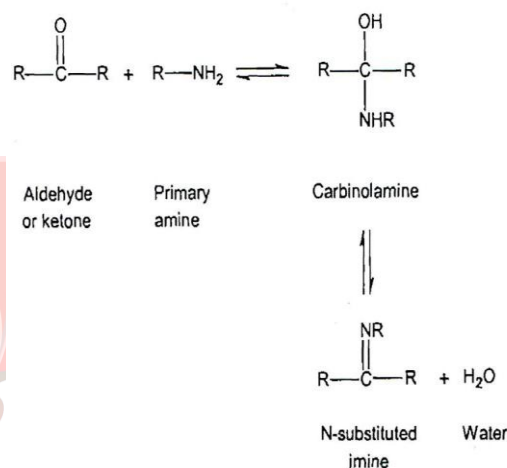
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ABSTRACT: *The study report on the synthesis of Co(II) DL- 2,4 diaminobutanoic acid and DL- 2,4 diaminopropionic acid and their characterization using IR and magnetic susceptibility studies. Our study reveals the presence of different mode of linkages and ligand with Co(II). The complexes have the analytical and industrial importance. The result of the study show that Co(II) schiff complex is paramagnetic in nature. It form outer orbital complex or high spin complex.*

Key words: Co(II)-schiff base complex, synthesis, characterization, magnetic susceptibility.

INTRODUCTION

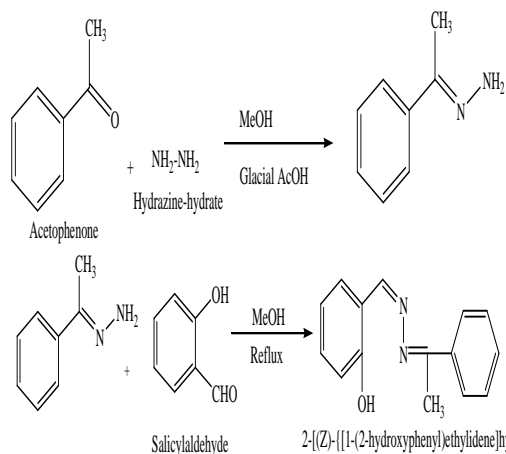
The nucleophilic addition of amino compound with compound, first workout by Hugo Schiff, in 1864. Fatherly the reaction named as Schiff Reaction and the isolated product termed as Schiff bases. Schiff bases are nitrogen analogue of aldehyde or ketone in which the carbonyl group has been replace by an imine or azomethine group Schiff bases play an important role in pharamacutics and medicine. Schiff bases are the polydentend legends assisted by metal ions, provides Highly organized super moleculer metal complexes.



The formation of a Schiff base from an aldehydes or ketones is a reversible reaction and generally takes place under acid or base catalysis.

PRESENT WORK:-

1] Synthesis of 2-[(Z)-{(1-(2-hydroxyphenyl) ethylidene) hydrazinylidne} methyl] phenol Schiff base was carried out by interacting acetophenone, hydrazine hydrate with salicylaldehyde.



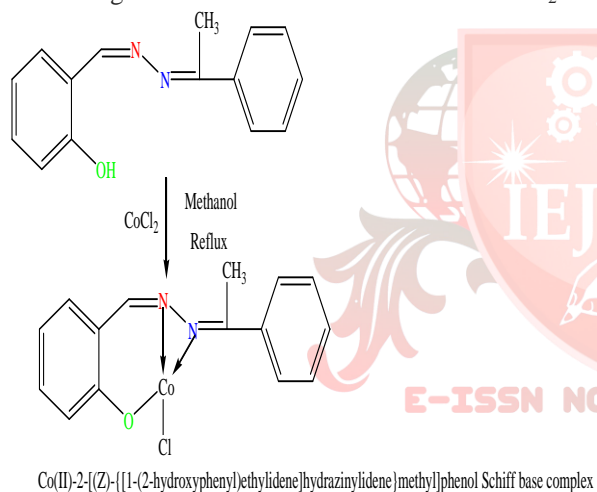
2.	3045cm-1	Ar =C-H stretching	3000-3100 cm-1
3.	1605cm-1	N=C-CH3 stretching	1600-1690 cm-1
4.	1566cm-1	N=C-H stretching	1590-1960 cm-1

TG-DTA

Thermo gravimetric analysis

Thermal decomposition studies of complex have been carried out as to corroborate the information obtained from the IR spectral studies to know the presence of water molecule in these complexes as well as to know their decomposition pattern. The simultaneous TG/DTA analysis of Co(II) was studied from ambient temperature 0 to 800 °C in nitrogen atmosphere using $\alpha\text{-Al}_2\text{O}_3$ as reference. An analysis of the thermogram of the complexes indicated that Co(II) complexes shows two step decomposition. The first weight loss 6.56 0%, in between temp. 55-120⁰C could be correlated with the loss of two coordinated water (calculated 6.01 %). The anhydrous compound does not remain stable at higher temperature; it undergoes rapid decomposition in the range 120-650°C with 79.72 % mass loss corresponds to decomposition of the complex (calcd. 80.70%) in second step. The decomposition is completed leading to the formation of stable residue of metal oxide CuO.

2] Synthesis of Cu(II)- 2-[(Z)-{(1-(2-hydroxyphenyl) ethylidene) hydra zinylidne} methyl]phenol Schiff base was carried out by interacting Schiff base with CoCl_2 .

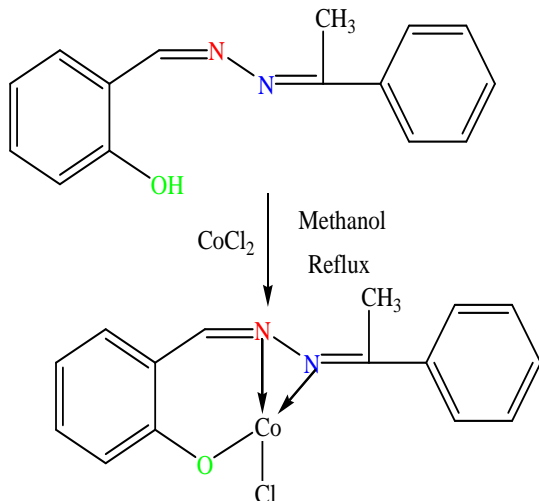


IR SPECTRUM

The IR spectrum was carried out in KBr pellets reproduce on IR Plate No.1 and the important absorption can be correlated in given Table No.2.

Sr . No.	ABSORPTION OBSERVED (cm-1)	ASSIGNMENT	ABSORPTION EXPECTED (cm-1)
1.	3608cm-1	O-H stretching	3600-3650 cm-1

On the above properties and spectral analysis and TG-DTA analysis the compound Co(II) Schiff base complex was assigned as Co(II)- 2-[(Z)-{(1-(2-hydroxyphenyl)ethylidene) hydrazinylidne} methyl] phenol Schiff base .



Co(II)-2-[(Z)-{1-(2-hydroxyphenyl)ethylidene}hydrazinylidene]methylphenyl Schiff base complex

MAGNETIC SUSCEPTIBILITY

Ions such as bivalent Fe on Fe^{3+} possess a permanent magnetic dipole moment a substance consisting of a system of a system of such non-interacting magnetic dipoles behaves as a permanent.

C) EXPERIMENTAL PART OF MAGNETIC SUSCEPTIBILITY DETERMINATION OF Cu(II)- SCHIFF BASE COMPLEX

Determination of Magnetic Susceptibility of Cu(II)-Schiff base complex is carried out by Quinckes Method described in chapter No. IV part B.

1. Locate the flask of Cu(II)-Schiff base solution. This flask is labeled with the mass of Cu(II)- Schiff base dissolved in a given volume of dimethyl formamide.
2. Calculate the number of moles of Cu^{2+} ions per unit volume of the solution. 1 mole of a substance has a weight in grams equal to its molecular weight, W_m .
3. Measure the density ρ of our solution using a specific gravity bottle. The method here is to (a) weigh the bottle + stopper when it is dry and empty, (b) fill it with distilled water and weight it again, (c) dry it with compressed air and fill it with your solution and weigh it again.

4. Calibrate the magnetic field against magnet current using the digital Hall probe.
5. Plot the calibration data of magnetic field versus current and try fitting the initial linear region with a straight line Excel
6. Finally before the actual experiment, use the Hall probe to test if there is any variation of B across the region of the magnet pole pieces
7. Transfer some solution to the U-tube so that meniscus is in the centre of the pole pieces
8. Measure the displacement h of the column of liquid as a function of applied field B.
9. Dispose of all solution when finished in the waste flask provided.
10. There is a strong solution of Fe(III)-Schiff base in a labeled bottle. Repeat measurement with some this stronger solution and use the equation (9) to determine whether data obtained are commensurate with this new concentrate.
11. Determine the susceptibility χ using (8). Compare χ with the value given in Kaye and Laby, which you should note is the mass susceptibility of the parent crystalline material (unit $m^3 kg^{-1}$ at $20^\circ C$). You can easily change this to volume susceptibility by density of salt ($\rho_{MnSO_4 \cdot 4H_2O} = 2.95 \times 10^3 kg m^{-3}$). The value you obtain will be different from the susceptibility of your solution since the number density of ions in you solution by a factor of about 10.
12. Make estimates of $\chi_a \rho_a$ and B_0 in equation 8 and show that their effects are negligible.
13. From your measured susceptibility χ obtain χ_{Fe} by correcting for χ_{water} . (Diamagnetic volume susceptibility of water $\chi_{water} = -0.90 \times 10^{-5}$)
14. Use equation:

$$\chi_{Cu} = \frac{Np^2 \mu_B^2 \mu_0}{3kT}$$

And your value of N to determine the effective number of Bohr magnetons of a Fe^{3+} ion compare your value with those given

D) Observation and Calculation of Magnetic Susceptibility:

Observation table: Calibration of Instrument

Sr. No.	Current passes through 50% CoCl_3 solution (Ampere)	Magnetic field (Gauss)	Reading
1	0	0	1.15
2	1	85	1.11
3	2	169	1.17
4	3	252	2.02
5	4	324	1.30
6	5	381	1.45

Observation table

For Calculation of magnetic susceptibility of Co (III)-Schiff complex in d Dimethyl Formamid

Sr.No.	Current passes through Experimental Solution(Ampere)	Magnetic field (Gauss)	Reading
1	0	0	1.40
2	1	85	1.42
3	2	169	1.45
4	3	252	1.50
5	4	324	1.52
6	5	381	1.55

Observation:

1. Weight of Density Bottle = 6.86 g.
2. Weight of density bottle+ Complex + Solvent= 19.49g
3. Weight of Density Bottle +Water= 20.61g

Calculation :

A) Calculation of Density of Solution by Formula

$$\rho = \rho_{\text{water}} \frac{(c-a)}{(b-a)}$$

B) Calculation of magnetic susceptibility by using formula

$$\chi = \frac{2[1+\frac{a}{A}]}{H} \times \rho gh$$

A= Area of wide limb

a=area of narrow limb

H=magnetic field (Gauss)

e=density of solution

g= acceleration due to gravity

h= difference in the height of solution raises.

C) The magnetic moment is calculated by using formula.

$$\mu_{\text{eff}} = 2.84 \sqrt{(xm) \times TB.M.}$$

$$\mu_{\text{eff}} = \mu_s = \sqrt{n(n+2)} B.M.$$

RESULT AND DISCUSSION:

According to magnetic study Schiff base acts as strong field ligand and hence pairing of metal electron i.e.Co(II) valence electron takes place. Magnetic study reveals that magnetic moment of Co(II) complex is nearly equal to one(I) and value of magnetic susceptibility is more than zero and less than one(by Quicke's method).

Therefore the present Co(II) Schiff complex is paramagnetic in nature. It form outer orbital complex or high spin complex.

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