

# THE STUDY OF TRANSITION METAL COMPLEXES USING SCHIFF BASE LIGAND

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## Abstract

*The preparation of the ligand and the complexes. The Schiff base ligand 3-amino 2-methylquinazoline 4(3H) 2,4-dinitro phenyl hydrazone has been prepared by the condensation of 3-amino 2-methyl quinazoline and 2,4-dinitro phenyl hydrazine. The complexes of Fe(II), Co(II), Ni(II), Cr(II) and Cu(II) metals have been prepared with the ligand in aqueous ethanolic solution. Physico-chemical methods for elemental analysis, measurement of magnetic moment, electrical conductivity, electronic transition and I.R. spectra have also been incorporated to this chapter.*

**Keywords :-** Fe(II), Co(II), Ni(II), Cr(II) and Cu(II)

## Introduction

A condensation product of a carbonyl compound and a primary amine is known as Schiff base. The functional group of a Schiff base is known as azomethine group (A) which contains a lone pair of electrons on nitrogen atom. Due to the presence of a lone pair of electrons on nitrogen atom the compound is basic in nature. This compound was discovered by H.Schiff' in 1869 and thus known as Schiff base.

## **Schiff Base :**

Transition metal complexes with Schiff bases as ligands have been amongst the mostly widely studied coordination compounds. In general the azomethine group  $>C=N$  which is the functional group of a Schiff base is aided in forming a stable complex by either a second such group (Fig. 1), an acidic group like a phenolic OH (Fig. 2) or another donor group (Fig. 2). The formation of a chelate ring seems essential for the production of stable complexes with ligands containing the  $>C=N$  group. Schiff' may be regarded as the first to have defined the composition

of a metal complex with such a ligand by establishing the 1: 2 metal ligand ratio in copper complexes derived from N-aryl-salicylaldimines. Subsequently studies have utilized Schiff bases derived from salicylaldehyde or related phenolic aldehydes to a very large extent owing to the ease with which they can be prepared. The pioneer work of Pfeiffer must be referred to in this regard. In a classic series of papers reviewed in 1940<sup>2</sup>, he and his collaborators studied problems of synthesis, metal-exchange, ligand replacement, transamination, stereochemistry, and esterification, utilizing particularly salicylaldimine derivatives of copper (II), and these studies paved the way for much of the present day interest in such metal complexes.

Previous Work on Schiff bases B.T. Thaker reported reactions of aminoalkanols have been carried out with mixed and bis (Schiff base) complexes of Nickel (II). In these reactions both the ligands combine with the aminoalcohol forming tridentate ligand, here H atom of the -OH group is not removed. Therefore, both the ligands are retained and they behave as bidentate ligands. M.M. Patel and his co-workers reported Palladium (II) chelates or a-oximinoacetoacetarilamiedthiosemicarbazone.

P.K. Panda and his co-workers reported a number of complexes having the general formula  $MLX_2$ , is described in which  $M(II) = Co, Ni, Cu$  and  $Zn$ , "L" stands for phenyl urea  $X = Cl, Br$ , or  $NO$ . These are characterized on the basis of elemental analysis, molar conductance, magnetic susceptibility, infrared and electronic spectral data. Bipin B. Mahapatra and his co-workers reported complexes of  $Cu(II)$  and  $Cd(II)$  with Tetradentate Schiff's bases. T.N. Srivastava and his co-workers reported the direct interaction of antimony tri- and Penta- Chloride with Salicylidencaniline and its amine ring substituted derivatives results in the formation of adducts with 1:1 stoichiometry. The newly synthesized compounds have been characterized through elemental analysis, molar conductance measurement and infrared data. It is concluded that the ligands coordinate to the metal atom through their azomethine nitrogen giving rise to four and six coordinated antimony complexes.

B.A. Jani and his co-workers reported Preparation and reactions of some new mixed Schiff complexes of  $Cu(II)$  and  $Ni(II)$  containing 2-OH acetophenone and 2-OH Propiophenone moieties, have been described, followed by their characterisation with the help of elemental analysis, magnetic and spectral studies. Study of mixed ligand complexes containing nitrated

products of above ketones and isolation of the free unsymmetrical Schiff base by the demetallation of the tetradentate Schiff base complex of Cu(I) have been carried out to further confirm the mixed nature of above complexes.

A. Syamal and his co-workers reported zinc(II) complexes with the Schiff bases derived from Salicylaldehyde or substituted Salicylaldehyde and orthoaminobenzylaldehyde. Sudagar Mal and his co-workers reported substituted effect on the strength of Intramolecular Hydrogen Bonding in Schiff bases. V.K. Agrawal and his co-workers reported Cu(I) and Pd(II) forms 1:2 complexes with 4-methylaminoanil of 2,5-dihydroxyacetophenone (MAADAP) and 2,5-dichloroaminocanil of 2,5-dihydroxyacetophenone (DAADAP). The structure of these complexes have been characterised on the basis of electronic spectra, magnetic moment and IR spectral studies. V.V.Ramanujam and his co-workers reported 12 Copper (II) and Zinc (II) complexes of Schiff bases obtained by the condensation of salicylaldehyde and Pyruvic acid with DL-2-aminobutyric acid, 3-aminobutyric acid, 4-aminobutyric and L-Methionine, L-histidine, DL-asparagine and L-glutamine have been synthesized and characterized. A seven membered ring is stabilized by its fusion with another ring in Schiff base complexes derived from 4-aminobutyric acid. O.P.Arora and his co-workers reported 13 some mixed ligand complexes of Ni(II) ethylacetoacetate with Schiff bases are synthesized and characterized and characterized by elemental analysis, magnetic, electronic and I.R. spectral studies. The results indicate that the complexes have near octahedral structure and the ligand is coordinated through atom of azomethine donor, H.S. Verma and his co-workers reported complexes of Copper(II), Ni(II), Cobalt(II) and Iron(II) with Schiff's bases derived from 2-Pyrrolidone and aromatic amines.

Mrs. P.R.Shukla and co-workers 15 reported complexes of Copper(II), Ni(II), Cobalt(II) and Iron(II) with Schiff's bases derived from, 2-Pyrrolidone and aromatic amines. B.Dash and his co-workers reported 16 a new series of Schiff bases derived from 4-substituted and 4,5-disubstituted-2-amino thiozoles and vanillin was synthesized. Cycloaddition of Schiff bases with thio-glycollic acid yielded thiazolidone derivatives. Condensation of the Schiff bases with chloroacetyl chloride and subsequent reaction with piperidine and morpholine yielded corresponding acetoxy derivatives. The compounds were characterized by elemental analysis and IR spectra. They were also screened for their fungicidal activity. K.B. Pandeya and his co-workers reported magnetic moment, IR spectra, electronic spectra and ESR spectra of oxovanadium (IV) complexes Fig. (1.12) of tetradentate Schiff

bases obtained from 2-hydroxy-1-naphthaldehyde and some diamines, viz., o-phenylenediamine, ethylenediamine and propylenediamine have been described.

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