SYNTHESIS AND CHARECTERIZATON OF SOME TRANSITION METAL COMPLEXES WITH SCHIFF BASE LIGAND AND THEIR APPLICATION IN AGRICULTURE

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ABSTRACT

The present investigation is carried out for synthesis the new Schiff base ligand by the 2-aminophenol and acetyl acetone, benzophenone and their complexes with the Cu (II), Zn (II), Mn (II), Fe (II) complexes. The experimental methods we used are characterization and analysis of complexes are Uv and IR. Schiff bases and their transition metal complexes, containing nitrogen and oxygen donor atoms, play an important role in biological and inorganic research and have been studied extensively due to their unique coordination and biological properties. Transition Metal Schiff base complexes have found applications in various fields such as medicine, agriculture industries.

Key words- Uv ,IR ,Schiff Base,Complexes,Transition metals.

INTRODUCTION

Schiff base have role in biological system as models to evaluate activity of protein. The characteristics properties of the Schiff base are their preparative accessibility, diversity, and structural variability, which make them very attractive. Most of the works carried on shiff base indicate that the environmental around the metal and the conformational flexibility of ligands are important because they allow metalloproteinase to carry out of specific biological function. For

example ,the flexibility of the ethylene diamine backbone in protein is the main structural feature for oxygen activation. **[Gudasi K.B. et al (2006)].** Through selective and directional non covalent forces such as hydrogen-bonding **.**Metal complexes play an essential role in agriculture, pharmaceutical and industrial chemistry. Ligand, a metal surrounded by a cluster of ions or molecule, is used for preparation of complexes compounds known as Schiff base ,which are condensation products of primary amines with active carbonyls. (RCH=NR1, where R & R1 represents alkyl \ or aryl substituent's). The development of field of bioinorganic Chemistry has increased the interest in Schiff base complexes, since it has been recognized that many of these complexes may serve as models for biologically important species **[klement R. et al. (1999)]**Schiff base complexes have been widely studied because they have industrial, antifungal, antibacterial, anticancer and herbicidal application **[Steed J.W. et al (2000))].** The coordination Compounds containing of –C=N– (azomethine) functional group(s) are known **Schiff bases,** azomethine, which are commonly synthesized via the condensation of primary amines and active carbonyl groups. They are an important class of compounds in medicinal and pharmaceutical field. It has been reported that Schiff bases and their metal complexes display a variety of applications in the biological, clinical, analytical and industrial fields..A Lewis base is a substance capable of donating one or more lone electron pairs while Lewis acid is a substance that accepts electrons. Ligands are molecules or ions that surround the metal in a complex ion. The interaction between a metal ion and ligands can be thought of as Lewis acid-base.

In broad definition, transition metals are the elements of atomic numbers 21-31, 39-49 and 71 81, inclusive. A more restricted classification of the transition element preferred by many chemists is limited to elements with atom in numbers 22-28, 40-46, and 72-78, inclusive. All of the elements in this classification have one or more electrons present in an unfilled d sub shell in at least one well-known oxidation state. Complexes are substances resulting from the coordination of a ligand (or an array of ligands) to a central atom. Transition metals have a distinct tendency to form complexes because of the presence of empty d orbital's to accept lone pairs of electrons from ligand .

Schiff bases, metal complexes, biological activity, nonlinear optical properties. Schiff bases derived from an amino and carbonyl compound are an important class of ligands that coordinate to metal ions via azomethine nitrogen and have been studied extensively **[Dhanraj c.j**

et al. (2009)] In azomethine derivatives, the C=N linkage is essential for biological activity, several azomethines were reported to possess remarkable antibacterial, antifungal, anticancer and diuretic activities **[Zaworotko M.j.(2001)]** . Schiff bases have wide applications in food industry, dye industry, analytical chemistry, catalysis, fungicidal, agrochemical and biological activities [**Howard J.k. et al (eds) (1999)]**

Experimental:-

Materials-

Copper (II) nitrate trihidrate, zinc (II) nitrate hexahydrate, 2-aminophenol, acetyl acetone, benzophenone was purchased from merk specialties private limited, Mumbai and used as such as received. All other chemical used were of synthesis grade and used without purification.

Synthesis of ligands:-

Preparation of ligand (L1):- The Schiff base was prepared by the condensation of 2-aminophenol and acetyl acetone solution. 5.45 gm of 2-aminophenol in 10 ml ethanol was refluxed with an ethanolic solution of acetyl acetone (5.1ml,10.0 m mol) continuously for 6 hours . After some time 1-2 drops of acetic acid was added. On cooling the solution at the room temperature brownish crystal were separated out, which were filtered and washed with methanol and were dried in room temperature and stored in dedicator containing $cacl_2$.

Preparation of ligand (L2) :- The Schiff base was prepared by the condensation of 2-aminophenol and benzophenone.A solution of 2-aminophenol (10.913gm) in 10 ml ethanol was refluxed with an ethanolic solution of benzophenone (18.221gm,10.0 m mol) continuously for 6 hours. After some time 1-2 drops of acetic acid was added. On cooling the solution at the room temperature brownish crystal were separated out which were filtered and washed twice with methanol and were dried in room temperature and stored in desiccators containing $cacl_2$.

Preparation of copper complexes:-

1:- [Cu (L1)]$(NO_3)_2$

For the synthesis of complex, 0.4822 gm, (1.0 m mol) of $Cu(NO_3)_2.6H_2O$ dissolved in 10 ml of ethanol then mixed with ethanolic solution (10 ml) of ligand1(0.31802gm, 2mmol). The resulting solution continued to stir for 30 minutes. After completion of reaction, red solution was obtained. The resultant clear solution was filtered and left for slow evaporation. After 3-4 days light red color crystals were collected which were suitable x-ray crystallography and washed with methanol and diethyl ether. These were dried at room temperature and stored in desiccators.

Where, L1 = Acetyloaceto-2-aminophenol

2:- [Cu (L2)]$(NO_3)_2$

To an ethanol solution (10ml) of Cu $(NO_3)_2.6H_2O$ (0.4822gm, 1.0 mol) a ethanol solution of L2 (0.4004 gm, 2 m mol) was added. The resulting solution continued to stir for 30 minutes. After completion of reaction red solution was obtained. The resultant clear solution was filtered and left for slow evaporation. After 3-4 days light red color crystals were collected which were suitable x-ray crystallography and washed with methanol and diethyl ether. These were dried with room temperature and stored in desiccators.

Where, L2 = 2-Aminophenolbenzophenone

Preparation of Zinc complexes:-

1:-[Zn (L1)] $(NO_3)_2$

To an ethanolic solution (10ml) of Zn $(NO_3)_2.6H_2O$ (0.2974gm, 1.0 mol) a ethol solution of L1 (0.31802gm, 2mmol) was added. The resulting solution continuously to stir for 30 minutes. After completion of reaction red solution was obtained. The resultant clear solution was filtered and left for slow evaporation. After 3-4 days light red color crystals were collected which were suitable x-ray crystallography and washed with methanol and diethyl ether. These were dried at room temperature and stored in desiccators.

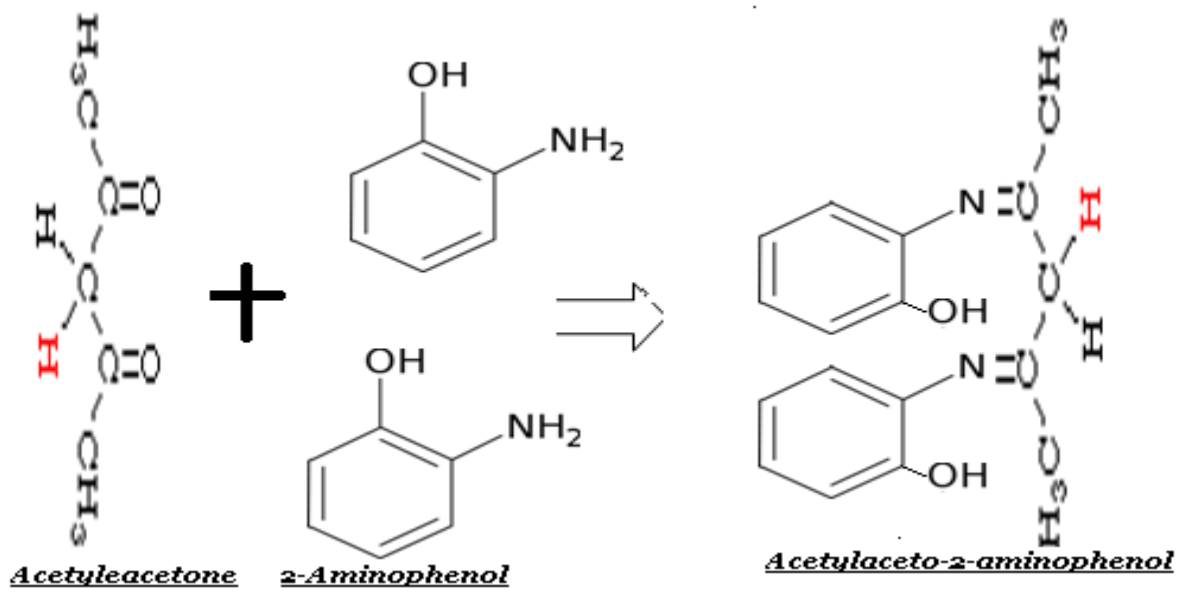
L1= Acetyloaceto-2-aminophenol

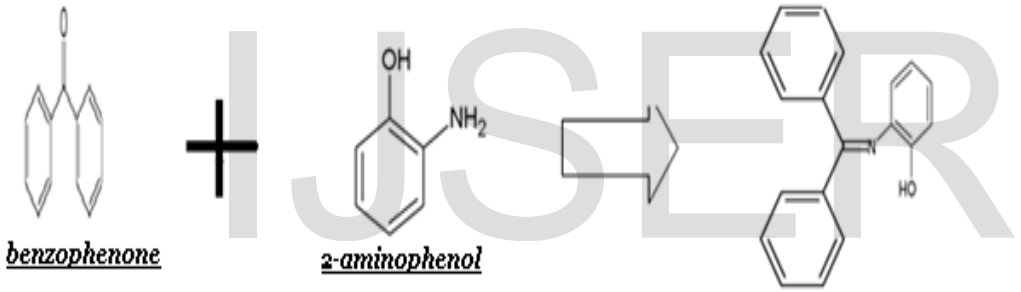
2:- [Zn (L2)] $(NO_3)_2$

To an ethanolic solution (10 ml) of $Zn(NO_3)_2.6H_2O$ (0.2974gm, 1.0 mol) a ethanol solution of L2 (0.4004gm, 2mmol) was added. The resulting solution continuously stirred for 30 minutes. After completion of reaction, red solution was obtained. The resultant clear solution was filtered and left for slow evaporation. After 3-4 days light red color crystals were collected which were suitable x-ray crystallography and washed with methanol and diethyl ether. These were dried with room temperature and stored in desiccators containing $cacl_2$.

L2 = 2-Aminophenolbenzophenon

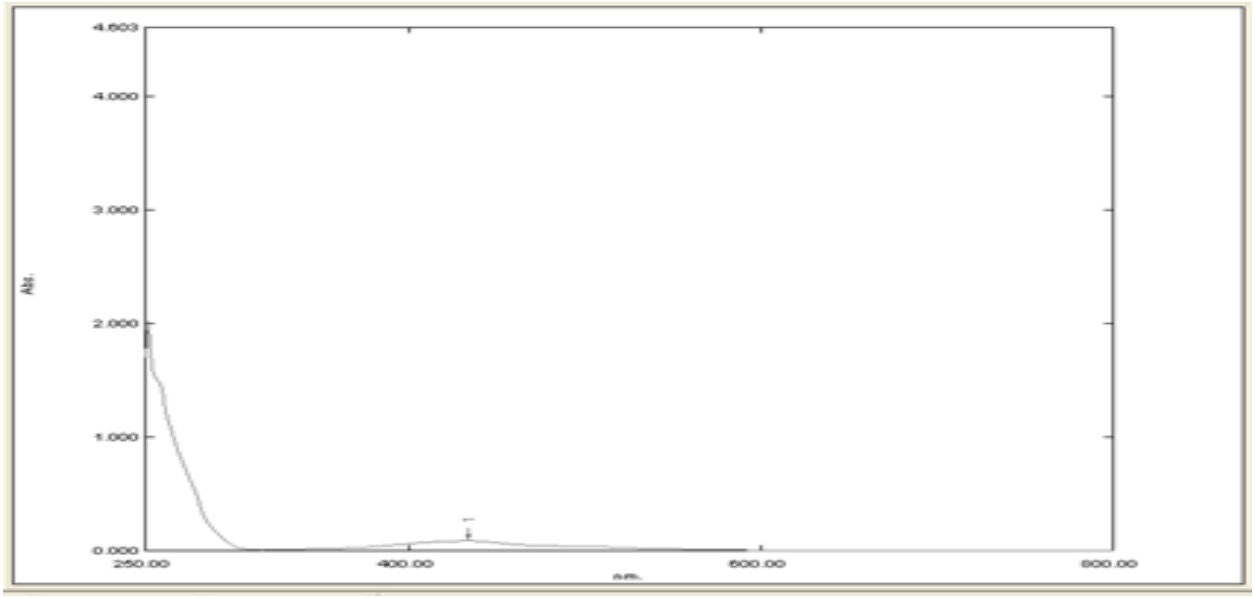
Structure of ligand-

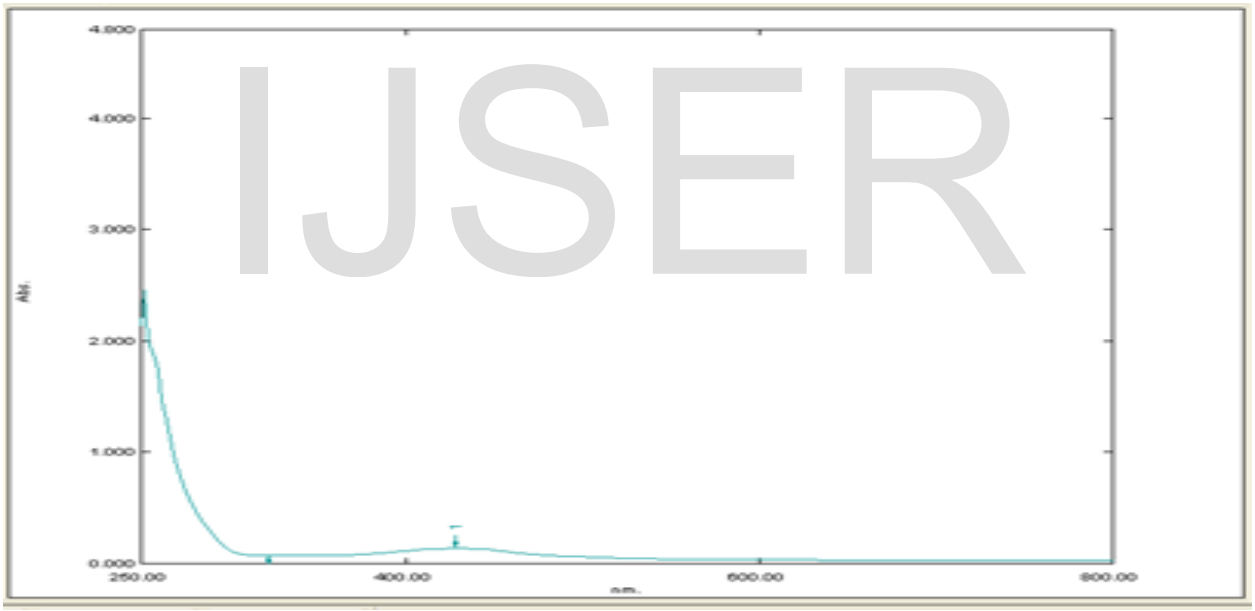




UV CHARECTERIZATION:-

Sample1.(ligand1) acetyleaceto-2-aminophenol

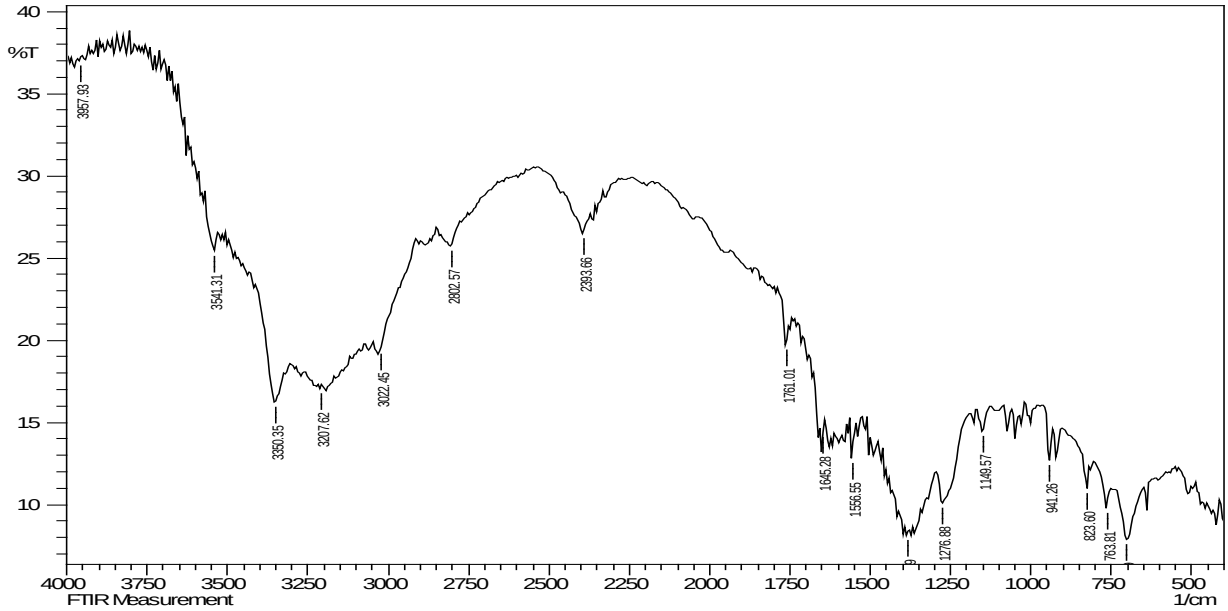




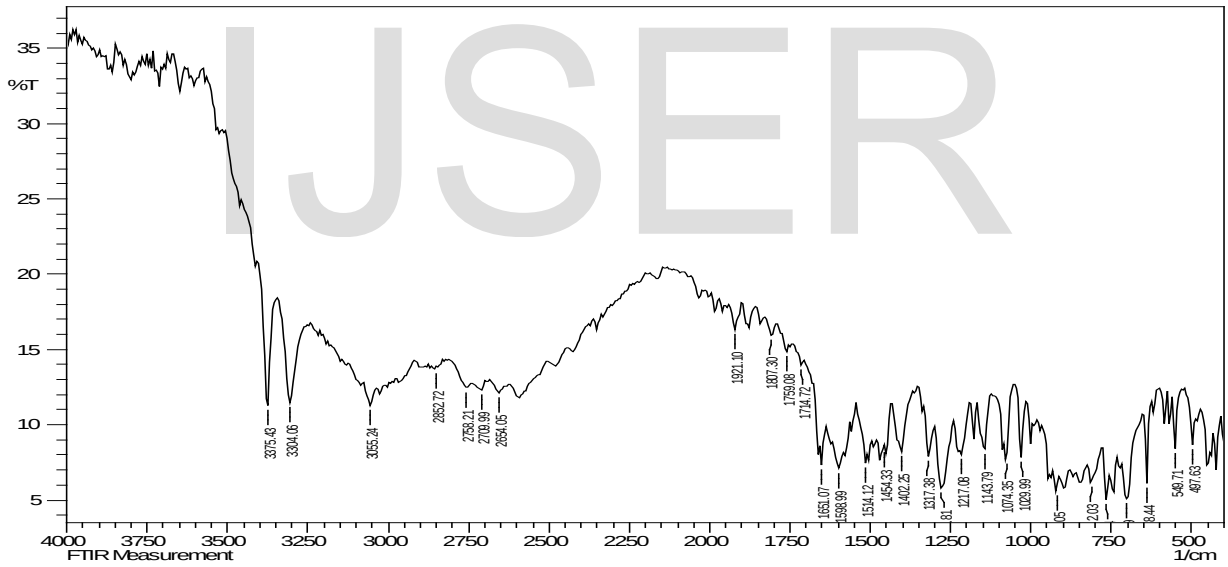
Sample2; (ligand2) 2-aminophenolbenzophenone

FTIR CHARECTERIZATION

Sample1. (ligand1) acetylaceto-2-aminophenol



Sample2 – (ligand2)2- aminophenolbenzophenone



Result

In this study we have reported the synthesize of new Schiff base ligands and their Cu (II) and Zn (II) complexes. The structural characterizations of synthesized compounds were made by using the Ir and UV spectral techniques. All the complexes have binuclear square pyramidal structure. All the spectral data support the complex formation.

Copper (II)/Zinc (ll) complexes

The transition metals especially first row transition metal ions are well known for their ability to form wide range of coordination complexes in which octahedral, tetrahedral, and square planar geometries predominate. Copper (II) and Zinc (II) is a typical transition metal ion to form complexes, but less typical in its reluctance to take up a regular octahedral (or) tetrahedral geometry. The magnitude of the splitting of the electronic energy levels in copper(II) complexes tend to be larger than other first row transition metals due to the presence of large John-Teller distortion. Copper is one of the essential trace elements present in living organisms. A number of important red ox enzymes like hemocyanins, superoxide dismutase, blue copper proteins etc., contain copper atoms bound to protein molecules. Copper (II) complexes with amino acids are cited as having potent anti-inflammatory and anti- ulcer activity. Copper ions are found to present in the active sties of large number of metalloproteinase, which involved in important biological electron transfer reactions as well as in the molecular oxygen red ox reactions. There has been a substantial interest in the rational design of novel transition metal complexes, which bind and cleave duplex DNA with high sequence or structure selectivity. The characterization of DNA recognition by small transition-metal complexes has been substantially aided by the DNA cleavage chemistry that is associated with red ox-active or photo activated metal complexes.

Application in agriculture

Plant Growth Regulator

N-acetylated compounds show growth inhibitory activity with seedling of wheat, rye and barley. Schiff bases show remarkable activities on plant hormone such as the auxins on root growth. Schiff base of ester and carboxylic acid show remarkable activity as plant growth hormone. Schiff bases of thiodiazole have good plant growth regulator activity towards auxin and cytokine.

REFERENCES-

- Chandra Sulekh & Gupta. L.K., (2005). Spectrochimica Acta Part A 62 1089-1094.

- Rani D.Sandhya, Ananthalakshmi P.V., Jayatyagaraju V. (1999) Indian Journal of Chemistry 38A 843.
- Gudasi K.B., Patil M.S., Vadavi R.S., Shenoy R.V., Patil S.A. (2006). Transition Metal Chemistry, 31 580.
- Klement R. Stock F., elias H., Aulus H. Pelican P., Valko M., Mazur M., (1999).Polyhedron, 18, 3617.
- Steed J.W., Stood J., (2000) supramolecular chemistry, wiley newyork.
- Dhanraj C.J., Nair M.S., (2009) Journal of Coord. Chem. 62 4018.
- Zaworotko M.j.(2001) Chem. Common, Polyhedron,23, 2045.
- Howard J.k.A., Allen F.H. (Eds) (1999), Implication Of molecular and materials structure for new technologies, kluwer, Dordrecht.