Heterobinuclear Complexes of Alkaline Earth Metals with Transition Metal Complexes Containing ONNO Ligands

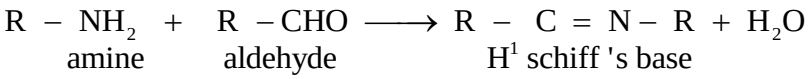
Manish Kumar[1], Dr. Sanjay Kumar[2], Rudra Narayan Yadav[3], Dr.Rajesh Kumar[4]
Department of Chemistry, Patna University, Patna-800005 (Bihar)

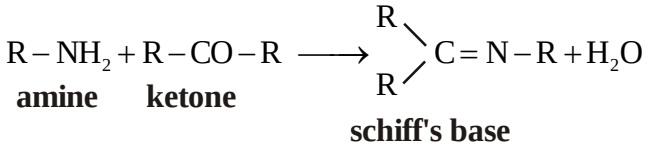
***Abstract*—A several binuclear complexes having ligands capable of binds two metals, are synthesized and studied. These complexes have been of great importance to the biological point of view. Several schiff's bases are formed from the reaction between carbonyl compounds and amines, which have ONNO donor atoms behaves chelating agent, it is tetradentate ligand and forms complexes with transition metals. Alkali metals forms number of heterobinuclear oxygen bridged complexes with transition metals, from this inspiration, concept of developing heterobinuclear complexes with alkaline earth metals and transition metals has developed, which is the basis of the present work. Research shows that strontium renelate reduces the risk of fractures and also increased bone density, whereas of compound barium are used in radiology and X-ray examination, schiff's bases are important compounds uses in medicinal as well as pharmaceutical sectors, which has anti-microbial, analysis, anti-inflammatory as well as antioxidant properties. The main aim of the study to develop heterobinuclear complexes having two metal centres, one with transition metal and other metal is strontium or barium.**

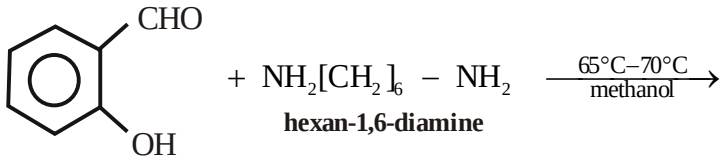
***Index Terms*—Heterobinuclear complexes, Alkaline earth metals, Schiff's base, Strontium renelate, Barium sulphate, Transition metal complexes etc.**

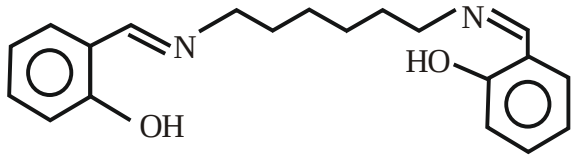
I. INTRODUCTION

Transition metal complexes have several applications in medicinal as well in pharmaceutical sectors, and versatile biological importance and uses. Schiff's bases are formed by the reaction between amines and aldehydes or ketones.









Schiff's base ligand

Schiff's bases use widely with which co-ordinated metal ions and show great biological importance like anti-microbial, anti-fungal, anti-inflammatory, anti-oxidant, anti-viral etc. The presence of – C = N-group

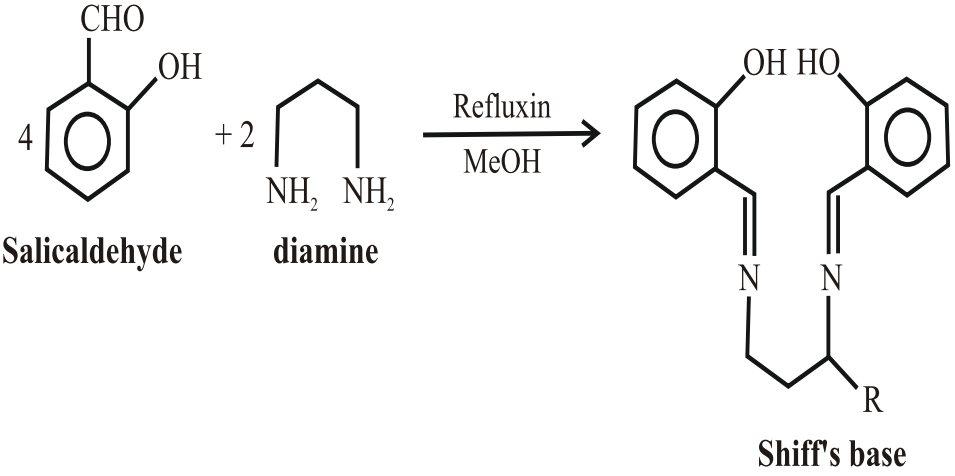
in schiff's base complex compounds is the vital role to play biological properties hence, used in various sectors. Schiff's base forms stable complexes with alkali metals, transition metals, lanthahides, activated and alkaline earth metals.

Salicaldehyde and diamines combines and to produce transition metal complexes of N_2O_2 - schiff's base acts as luminescent materials and has catalytic properties. In this review, we have highlighted❖ mechanism of action of schiff's bases having N_2O_2 donor sites co-ordinated to the Cu or Ni or Zn transition metals and also with Sr or Ba particular attention is given to the physiochemical properties of metals and their use in several applications or sectors.

II. METHODOLOGY AND DISCUSSION

All the chemicals were of AR grade.

Preparation of transition metal schiff's bases:



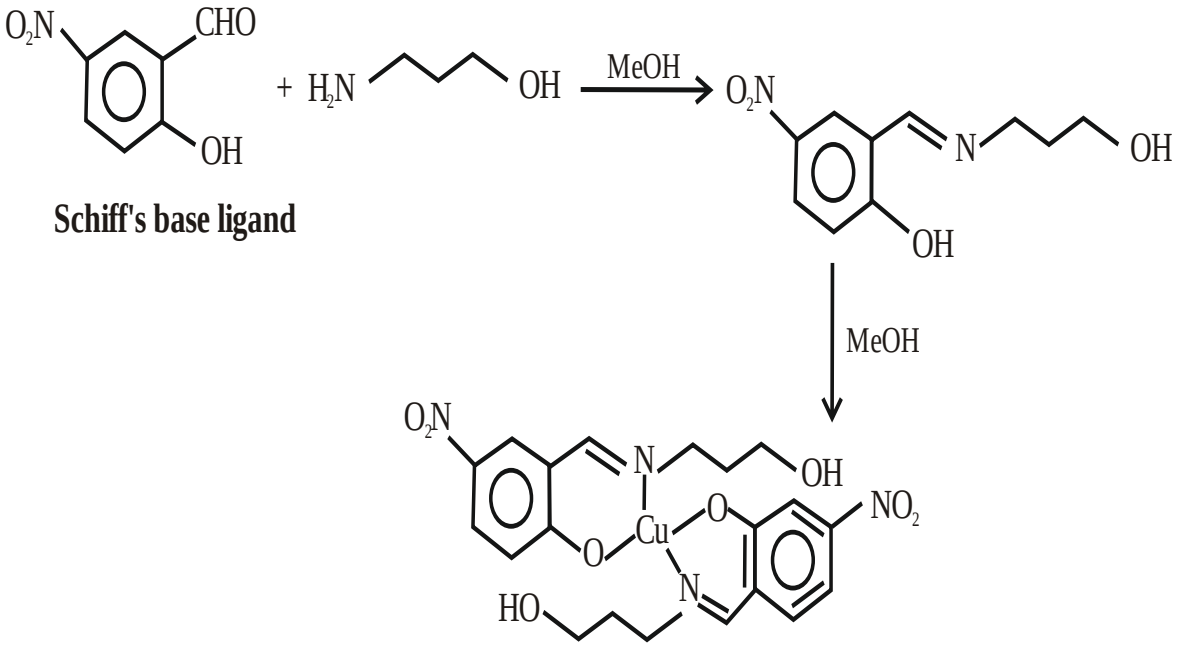
❖ Ni-complexes

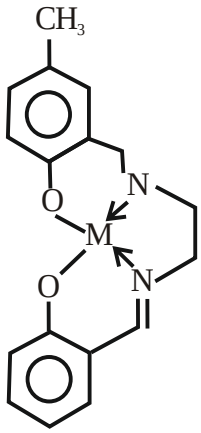
(i) [Ni(L_1) (H_2O)] Cl_2: Schiff's base (L_1) = terepthaldehyde + 2 - aminophenol (1:1).

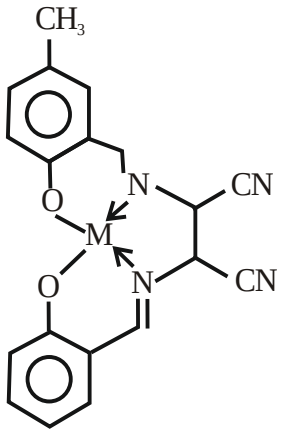
(ii) [Ni(L_2) (H_2O)$_2$] Cl_2: Schiff's base (L_2) = terepthaldehyde + O-phenylenediamine (1:2).

(iii) [Ni (II) L_1]: Schiff's base (L_1) = 5-methylsalicyladehyde + ethylenediamine (1:1).

(iv) [Ni (II)L_2]: Schiff's base (L_2) = 5-methylsaliyladehyde + diaminomoleonitrile (1:1).







M = Ni or Cu

❖ Preparation of salts of Sr and Ba with organic acids:

$$\underset{\text{metal}}{Sr} + \underset{\text{acid}}{R-COOH} \longrightarrow \underset{\text{metal salts}}{Br(RCOO)_2} + H_2$$

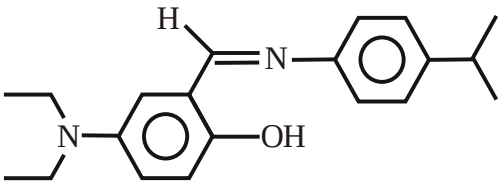
$$\underset{\text{metal}}{Ba} + \underset{\text{acid}}{R-COOH} \longrightarrow \underset{\text{metal salts}}{Ba(RCOO)_2} + H_2$$

Both Sr and Ba exhibit similar chemical behaviour due to their same group in periodic table, leading to similar reactions with organic acids. Salts of Sr and Ba are generally water soluble.

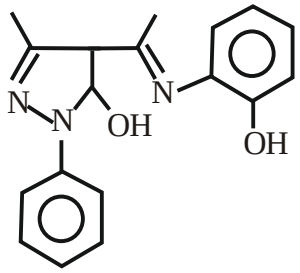
When metal salts react with schiff's base, which acts as chalating ligand to the metal ion, forms a stable metal ligand bond, this is typicak lewis acid base reaction, schiff's base contains nitrogen and oxygen donor atoms and to form stable chelate rings with metal ions. Co-ordination number of complexes varies with schiff's base structure. Transition metals used can influence the complexex stability, geometry and its applications. The reaction generally occurs in a suitable solvent, mild heating, where the metal salt is added to a solution of the schiff's base ligand, allowing the complexes to form through co-ordination. When salicylandehyde and amine reacts with transition metal salts, a schiff's base ligand is derived.

A metal complexes with the schiff's base ligand co-ordinated through the nitrogen atom of the imine group and the oxygen atoms of the phenolic group and to form stable chelate ring complexes.

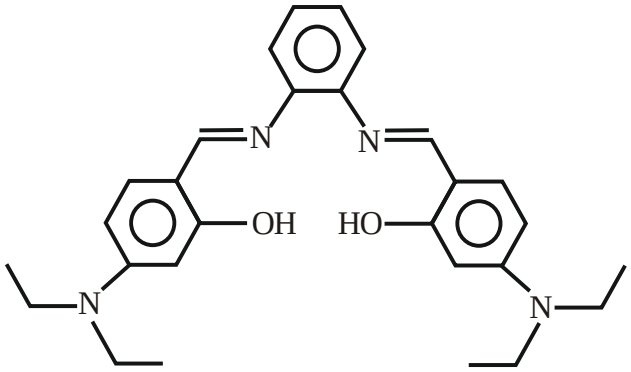
III. SCHIFF'S BASE DENTICITY



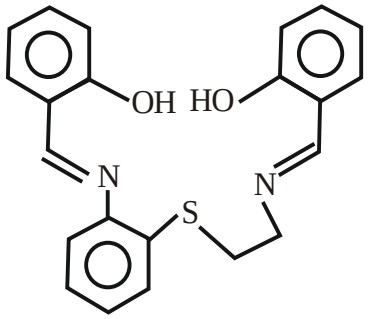
bidentate ligand



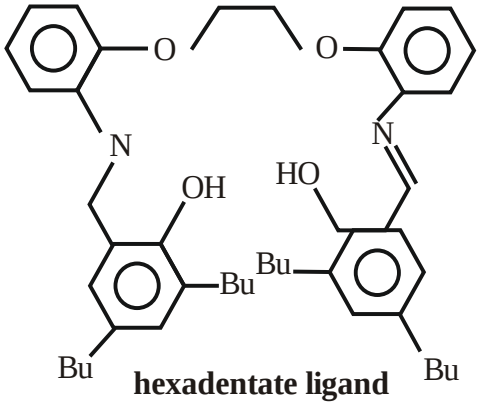
tridentate ligand



tetradentate ligand

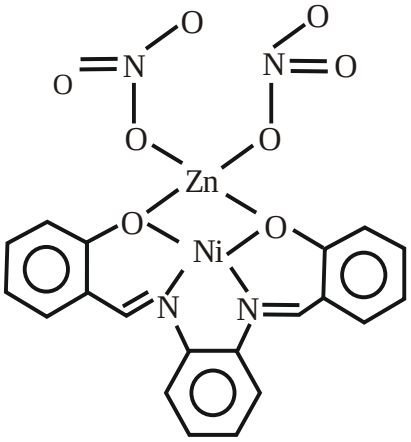


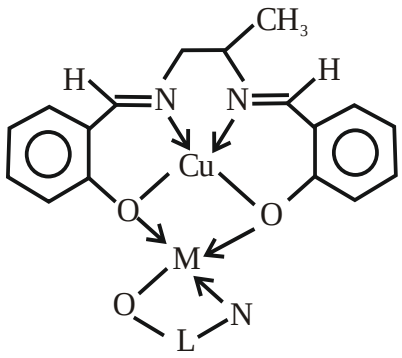
pentadentate ligand



hexadentate ligand

Heterobinuclear complex:





Heterobinuclear N_2O_2 schiff's base ligands are generally soluble in organic solvents like dichloromethane, ethanol, acetonitrile etc. whereas completely soluble in DMSO and DMF and DMSO.

The Cu (II) and Ni (II) complexes are formed with metal to ligand ratio of 2:1 stoicheiometry. The metal schiff's base complexes possess low molar conductance values indicate the non-electrolytic nature of the complexes.

The IR spectroscopic data confirms the co-ordination of metal ions to the ligand. From the IR spectral data, it was found that the heterobinucleating schiff's base ligand is a tetradentate ONNO chelating ligand and is co-ordinated to the transition metal ions through the

2-azomethine nitrogen atom and 2-phenolic oxygen atoms.

Electronic spectral data of all the complexes were recorded in the range of 200-800 nm.

H^1-NMR spectra of heterobinuleating schiff's base ligands have been useful in establishing the structure of ligands.

The synthesized heterobinuclear complexes showed good anti-microbial activities and also shows anti-fungal anti-viral and anti-oxidant activities.

IV. APPLICATIONS

Schiff's base metal complexes use in various sectors like medicinal, pharmaceutical, agriculture, health, chemical etc. The main applications in food industry, dye industry, catalysis, environment, analytical chemistry, chemo-sensing, bio-sensing, nanotechnology, energy storage and biomedical applications.

V. CONCLUSION

In this article, we discussed the synthesis of schiff's base ligands, its co-ordination modes having ONNO donorsites. Study of heterobinuclear metal schiff's base complexes is very interesting to the medicinal and biological point of view. These complexes provide the new compounds with structural, spectroscopic and biological properties, which attractive to synthetic chemists. We have tried to incorporate various metal schiff's base complexes of Cu or Ni or Zn metal and discussed their synthesis, characteristics and applications. The overall compatibility, stability and reactivity of the metal schiff's base complexes are directly influence by the overall charge, solubility co-ordination environment etc.

The main aim of the study to development heterobinuclear complexes having two metal centres, one with transition metal and other is alkaline earth metal is quite interesting to the medicinal as well as pharmaceutical point of view.

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