

## ***SYNTHESIZE AND CHARACTERIZATION THE THE MACROCYCLIC AND ALICYCLIC LIGANDS IN COORDINATION CHEMISTRY***

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### **Abstract**

*In this particular work we discuss about classes of macrocycles, overall qualities, various kinds of artificial methods, possible applications as well as the pioneering work extracted from various opinions, hundreds and articles huge selection of research publications described by different eminent chemists throughout the earth during past several years. The continued efforts of chemists to proliferate this chemistry are not just because of structural novelties of the compounds but additionally as a result of diverse applications of theirs. Therefore, the hassle embodied in this specific analysis is going to designed the synthesis and physico chemic studies of macrocyclic and the complexes of theirs with initial row transition metal ions Mn(II) Fe(II) Co(II), Ni(II) and Zn(II) through organic and template strategies showing new structural abilities. Some of the complexes will likely be examined for antimicrobial pursuits.*

***Keywords: Coordination, chemistry, compounds, physic, chemic, etc.***

### **1. INTRODUCTION**

Coordination chemistry is among the most energetic research fields in chemistry these days, although it's got a story of a century. Of the nineteenth century coordination compounds attracted interest because of their huge value to the normal trouble of substance bonding as also for their very own special as well as interesting properties. Alfred Werner was the founding father of coordination chemistry. His most prominent paper titled Contribution of inorganic compounds marked the start of contemporary coordination chemistry. Werner's coordination principle continues to be a guiding principle in inorganic chemistry. The concept of his not just gave insight into stereochemical factors, but likewise stimulated for synthesis of variations of coordination compounds. A 100 years after the formulation of the coordination concept, stereo chemical considerations are once again at the centre of attention in the improvement of metallic complexes. Coordination chemistry normally centers on the synthesis of coordination compounds, the synthesis of the supplies is usually not an end in itself. Coordination compounds are actually employed in all of branches of chemistry, from theoretical modeling to manufacturing and consumer products. The range of contemporary coordination chemistry now and also the evolution of coordination chemistry into a link between various areas of contemporary chemistry had been impressively demonstrated. Bio-inorganic chemistry might be molecular precursors for novel substances, supramolecular chemistry; of homogeneous metal catalysis coordination devices comprise the essential building blocks. Coordination chemistry has registered a major development throughout the final several years. This particular department of chemistry has

undergone a lot of changes with higher understanding of the dynamics of the substance bond as well as framework of coordination complexes. The conceptual base of bonding and structure in coordination chemistry has developed from simple Lewis acid base suggestions and soft and hard acids & bases, sequentially, via valence bond concept, crystal field concept, ligand field concept, the angular overlap version, and onward from a range of molecular orbital models, Study of the reactions of coordination compounds has been manifested in magnificent contribution to the understanding of the mechanisms of theirs. The fantastic variety of attributes of the bonds around metals is actually the magnificence of coordination chemistry.

## 2. LITERATURE REVIEW

**Marchetti et al., (2019)** Pyrazolone based ligands are quickly getting popular for using in catalysis, in biological programs, in sensors, in purposeful substances and as pigments for dyes. A lot of metal complexes with pyrazolone based ligands have been reported after 80s of the previous century, and many of them had been discovered possessing exciting characteristics, for example catalytic activity, anticancer, antioxidant, anti-microbial and antifungal activity, as well as enhanced optical, photoluminescence, and NLO qualities with respect to easy pyrazolone based ligands..

**Latif et al., (2019)** Schiff bases and also the complexes of theirs are in fact adaptable compounds synthesized from the condensation of an amino compound with carbonyl compounds and extensively useful for manufacturing purposes and in addition show a wide range of biological activities and antibacterial, anti HIV, anticancer, anti inflammatory, ant proliferative, anti malarial, antiviral, antifungal, anthelmintic and antipyretic properties. Great deals of Schiff base complexes show exceptional catalytic physical exercise in various responses and in the presence of moisture. Within the last few years, there were many accounts on the applications of theirs in homogeneous and heterogeneous catalysis. The steep thermal also as humidity stabilities of huge Schiff base complexes had been very helpful attributes for the application of theirs as catalysts in reactions involving for temperatures which are actually high.

**Dosh et al., (2019)** The research included preparation of New Schiff base by two steps: Preparation of Schiff base (HDEA) by react (4-aminoantipyrine) with (Benzoin) as first step then react the prepared Schiff base with (3-aminoacetophenon) to have the new Schiff base(HDEAP) as second step. The reaction was follow by TLC technic and the melting point was measure. The new Schiff base (HDEAP) was characterize by available spectral technics of Mass spectra, <sup>1</sup>H-NMR, Infra-Red spectra and Uv-Vis spectra. The complexes of new Schiff base (HDEAP) with Co(II) , Ni(II) and Cu(II) were prepare.

**Salassaet al., (2019)** Oxadiazoles are heterocyclic ring systems that find application in different scientific disciplines, from medicinal chemistry to optoelectronics. Coordination with metals (especially the transition ones) proved to enhance the intrinsic characteristics of these organic ligands and many metal complexes of oxadiazoles showed attractive characteristics for different research fields. In this review, we provide a general overview on different metal complexes and polymers containing oxadiazole moieties, reporting the principal synthetic approaches adopted for their preparation and showing the variety of applications they found in the last 40 years.

### **3. OBJECTIVES**

- i. To synthesize and characterize the Macrocyclic and Alicyclic ligands in Coordination chemistry.
- ii. To deals with the synthesis and spectral characterization of tetraiminemacrocyclic ligand and diamidediiminetetraazamacrocyclic Complexes.

### **4. METHODOLOGY**

#### **4.1 Techniques Used**

There are many physico chemical strategies readily available for the research of coordination compounds of the methods will used in the investigation of the newly synthesized complexes discussed in the present study are provided below:

1. Infrared Spectroscopy
2. Nuclear Magnetic Resonance Spectroscopy
3. Electron Paramagnetic Resonance Spectroscopy
4. Ultraviolet and Visible (Ligand Field) Spectroscopy

#### **4.2 Elemental Analyses**

The chemical analysis is quite helpful in fixing the stoichiometric composition of the ligand as well as its metal complexes. Carbon, hydrogen and nitrogen analyses were carried out on a Perkin Elmer-2400 analyzer. Chloride was analyzed by conventional method<sup>1</sup>. For the metal estimation<sup>2</sup>, a known amount of complex was decomposed with a mixture of nitric, perchloric and sulfuric acids in a beaker. It was then dissolved in water and made up to known volume so as to titrate it with standard EDTA. For chloride estimation, a known amount of the sample was decomposed in a platinum crucible and dissolved in water with a little concentrated nitric acid. The solution was then treated with silver nitrate solution. The precipitate was then dried and weighed.

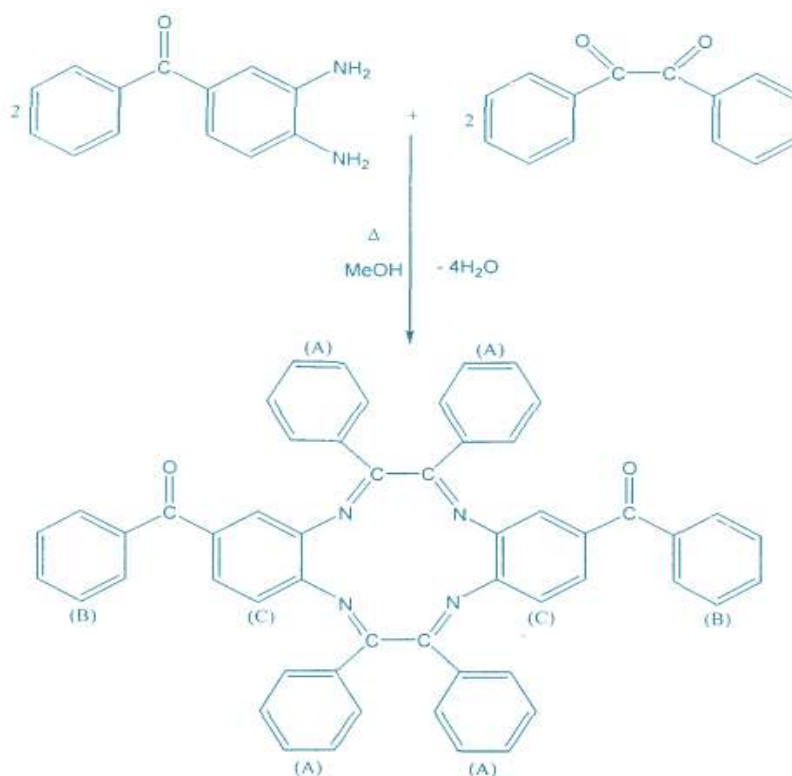
#### **4.3 Materials Used**

Several Metal salts, including FeCl<sub>3</sub> anhydrous, CoCl<sub>2</sub>.6H<sub>2</sub>O as well as CuCl<sub>2</sub>.2H<sub>2</sub>O (E. Merck) etc. will be commercially available unadulterated samples. Benzil (BDH) and 3,4-diaminobenzophenone (Fluka) will be used as received. Methanol used as solvent will be dried by the conventional method

### **5. RESULT AND ANALYSIS**

A tetraimine Schiff foundation macrocyclic ligand, (L) has been ready by the condensation among benzil and 3,4diaminobenzophenone (1:1 molar ratio) in methanol as shown in Figure one. The degree of the purity of the ligand was examined by T.L.C on silica gel coated plates. The T.L.C of the

ligand, (L) exposes the presence of both [one one] and also [2+2] condensation item. The [1+1] condensation item (crude yield: < 25 %) and also [2+2] condensation product (crude yield: >60 %) had been divided as major and minor condensation solutions, respectively. The [2+2] condensation item was recrystallized from methanol resulting in a pale yellow microcrystalline item (m.p. 140 142<sup>0</sup>C) and was recognized on the foundation of the outcomes of elemental analyses, FAB mass, IR as well as H NMR spectroscopy. The FAB mass spectrum captured at room temperature of the metal open ligand, L confirms the recommended method by displaying a peak at m/z 773 corresponding to the macrocyclic moiety, [(C<sub>54</sub>H<sub>36</sub>N<sub>4</sub>O<sub>2</sub>)', calcd. atomic mass 772.904 a.m.u]. Complexation reactions between the ligand, (The metal and l) salts have been carried out to take a look at the coordination ability of the ligand, (L). The complexes had been well prepared by response of the ligand, (L) with proper metal salts in 1:1 molar ratios in methanol.



**Figure 1 Preparation and structure of ligand (L).**

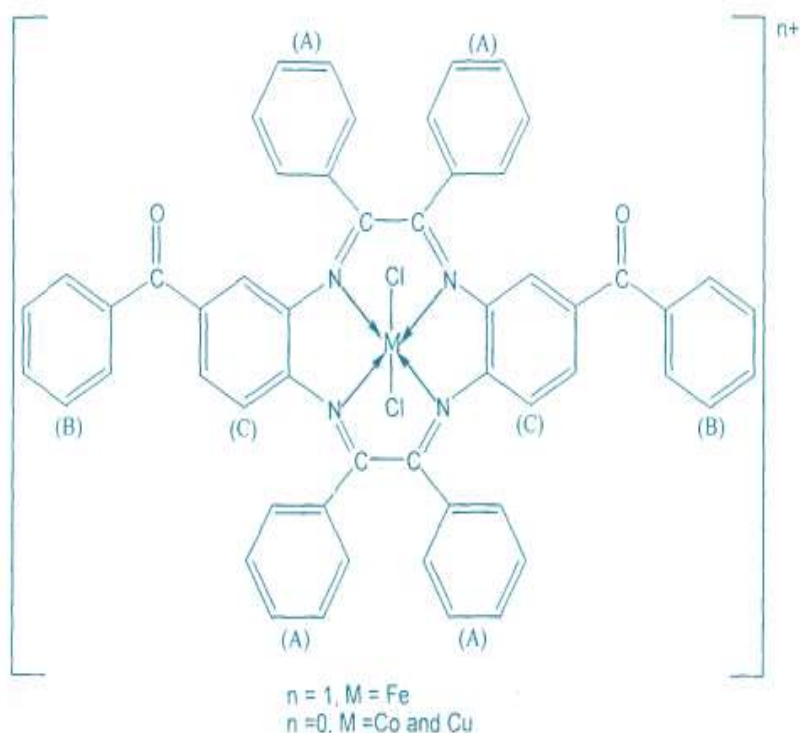


Figure 2: Suggested structure of macrocyclic complexes

Table 1: Physical and Analytical data of the ligand and its complexes

Compounds	F.W. (Calc.)	Color	M.P (°C)	Yield (%)	Found (Calc.) %					Molar Conductance ( $\text{cm}^2\Omega^{-1}\text{mol}^{-1}$ )
					C	H	N	M	Cl	
Ligand (L)	772.90	Pale Yellow	140	>60	84.70 (83.91)	4.70 (4.70)	7.42 (7.24)	-	-	-
[FeLCl <sub>2</sub> ]Cl	935.10	Wine red	231	58	69.00 (69.40)	3.80 (3.90)	5.94 (6.00)	6.00 (6.00)	11.30 (11.40)	68
[CoLCl <sub>2</sub> ]	902.74	Brown	220	63	70.90 (71.80)	4.00 (4.09)	6.00 (6.20)	6.32 (6.50)	7.40 (7.90)	20
[CuLCl <sub>2</sub> ]	907.40	Dark Brown	205	69	71.00 (71.50)	3.80 (4.00)	6.14 (6.20)	7.14 (7.00)	7.22 (7.81)	23

## 5.1 FT-IR Spectra

The IR spectra (4000-200  $\text{cm}^{-1}$ ) of the complexes and both Hg and Cu include absorption bands qualities of different functional groups of macrocyclic moiety providing info about the development of macrocyclic ligand and the coordination mode of its in the complexes. The appropriate IR bands with the likely tasks of theirs are revealed in Table two. To be able to stay away from the apparent confusion between the absorption bands corresponding to the carbonyl group of benzil and 3,4-diaminobenzophenone within condensed device, the IR spectrum of the ligand have been in contrast to regard to the IR spectra of 3,4 diaminobenzophenone and benzil. The development of the macrocyclic ligand continues to be established by the look of the  $\nu(\text{C}=\text{N})$  band during  $1625 \text{ cm}^{-1}$  as well as the absence of the  $\nu(\text{NH}_2)$  band at  $3400 \text{ cm}^{-1}$  indicating that Schiff foundation condensation among carbonyl groups of benzil & amino groups of 3,4 diaminobenzophenone has taken place. A major band change of  $\nu(\text{C}=\text{N})$  stretching function showing up in  $1580\text{-}1560 \text{ cm}^{-1}$  region for the complexes as in comparison to no cost ligand recommend the involvement of imine nitrogens of the  $(\text{C}=\text{N})$  groups in coordination with metallic ions. Additionally 2 clear unique bands in the areas  $333\text{-}320 \text{ cm}^{-1}$  as well as  $450\text{-}420 \text{ cm}^{-1}$  were assigned to  $\nu(\text{M-N})$  and  $\nu(\text{M-Cl})$ , respectively which offer evidence that is compelling for the coordinated metal ion in the ligand framework'. The alternative absorption peaks corresponding to aliphatic  $\nu(\text{C-H})$  as well as  $\nu(\text{C}=\text{C})$  show up at their correct positions.\

## 6. CONCLUSION

The paper reports synthesis of completely new acyclic binuclear and macrocyclic trinuclear copper(II) as well as nickel(II) complexes to learn the electrochemical, DNA binding as well as DNA cleavage qualities. The acyclic binuclear copper(II) complexes exhibited 2 one electron quasireversible reduction at cathodic possibility of the region. The macrocyclic trinuclear copper(II) complexes exhibited 3 one electron quasi reversible reduction at cathodic possibility of the region.

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