

COPPER II AND ITS COMPLEXES IN HUMAN HEALTH

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RECEIVED : 10 December, 2017

Though copper is a trace metal yet it is essential as copper exhibits considerable biochemical action. Copper II when attached with some macrocyclic ligands make certain properties which are very much useful for human health. Copper II and its complexes is stemming from their potential use as antimicrobial, antiviral, antibacterial, anti-inflammatory, antitumor agents and many more.

KEYWORDS : Copper II, Macrocyclic Ligands, Biochemical Action.

INTRODUCTION

Copper plays a very significant role medically and biologically. Deficiency of copper can lead to a variety of adverse effects such as increased fragility in bones, aneurysm formation in arteries and a loss of lysyl oxidase in cartilage [1-4]. A number of reviews [5-11] have been published on the general biochemistry of copper, electronics aspect of active sites [12, 13], and relevant model chemistry of simple copper complexes [14, 15].

Macrocyclic ligands are always attractive in the generation for new chemistry because they offer a wide variety of donor atoms, ionic charge, coordination number geometry of the resultant complexes [16-20]. Macrocyclic ligands complex are of great importance in enhancing various industrial application and in a number of biological processes such as biomedical application of macrocyclic ligands complexes.

The aim of during this work is to do the synthesis with macrocyclic ligand *i.e.* N_4L^1 and their metal complexes $[Cu(L^1)Cl_2]$ having their use in human health.

As Cu(II) is the most studied metal ion among all the transition metal ion [16, 17] Cu(II) complexes are known to play a significant role either in naturally occurring biological system or as pharmacological agent [18, 19].

EXPERIMENTAL SECTION

Malonic acid, succinic acid, glutaric acid – E-Merck and other solutions were made in laboratory.

Materials and Methods

2 mmol of malonic acid or succinic acid or glutaric acid in dry methanol was mixed in 2 m mol solution in dry methanol of diamines *i.e.* $\text{NH}_2(\text{y})\text{NH}_2$ (where $\text{y} = -\text{NHCONH}$, and refluxed for 3hrs. Solid ligand has obtained. In this solution 1mmol CuCl_2 solution in dry methanol was mixed and again refluxed, found solid product filtered, dried and recrystallized.

These prepared complexes were $[\text{Cu}(\text{L}^1)\text{Cl}_2]$ which were characterized by elemental analysis molar conductance. UV visible, IR and magnetic susceptibility.

Scheme – 1

Where $\text{L}^1 = \text{N}_4\text{L}^1$, $\text{Y} = -\text{NHCONH}-$, $n = 1$

RESULT AND DISCUSSION

Tetra aza macrocyclic Cu(II) complexes were synthesized having the general composition $[\text{Cu Cl}_2 \text{L}]$ [21].

The molar conductance measurement in DMF shows that all the complex are non electrolytes indicating that the ions are coordinated to the metal ion. The complexes may be formulated as $[\text{Cu Cl}_2 \text{L}]$.

Magnetic moments of all the complexes at room temperature lie in the range 1.98 to 2.02BM Corresponding to one unpaired electron.

Table-1. Analytical data of $[\text{Cu}(\text{L})\text{Cl}_2]$ complex where $\text{L} = \text{L}^1$

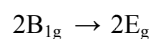
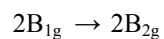
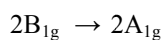
S. No.	Complex	Elemental analysis % (calculated) found			Molar conductance $\text{ohm}^{-1} \text{Mol}^{-1} \text{cm}^2$ in DMF
		C	H	N	
1	$[\text{CuCl}_2 \text{L}^1]$	25.0 (25.2)	3.0 (3.1)	29.4 (29.5)	20

In I.R. spectra the presence of strong band characteristics for the stretching mode of the coordinate. $\text{C}=\text{N}$ at $1580\text{-}1620 \text{ cm}^{-1}$ groups provide strong evidence for the presence of a closed cyclic production.

The electronic spectra of the six coordinated Cu^{2+} complexes have either D_{4h} or D_{4v} symmetry and the E_g & T_{2g} level of the ^2D free ion term will split into B_{1g} , A_{1g} , B_{2g} and E_g levels respectively. Thus spin allowed transition are expected in the visible and near IR region. These bonds have been assigned to the following transition in order of increasing energy.

Table 2. Electronic spectral bands of $[\text{Cu}(\text{L})\text{Cl}_2]$ complex.

S. No.	Complex	λ_{max} UV (cm^{-1})
1.	$[\text{CuCl}_2 \text{L}^1]$	17920; 22320



On the basis of elemental analysis, molar conductance, IR, UV and visible magnetic moment, the possible structure of these all prepared $[\text{Cu Cl}_2 \text{L}]$.

Metal complexes have assigned, suggesting octahedral geometry. And indicating the chemically synthesized copper (II) macrocyclic complex use in human health as anticancer agent, antitumor agent.

CONCLUSION

In the present communication we have synthesized and characterized copper (II) complexes containing tetra aza macrocyclic ligands.

Based on the analytical & spectral data, we assume that the complex is octahedral in geometry.

The complex was found of the tested series were found to have good antibacterial activity.

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