GREEN SYNTHESIS CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY OF COMPLEX OF AMIDE LIGAND WITH Co(II).

**Swati Panchariya[1,] Dr Sapna Nehra[2] (Chemistry) University Jaipur Nirwan.
Swati Panchariya , Bikaner, Rajasthan**

Abstract.

The present investigation clarifies the formation, spectroscopic, or antibiotic investigations of just a few Cobalt (II) complex such as ligands with amide groups. On the basis of analysis of elements, ir spectra, electronically spectra, and magnetic susceptibility tests, the compounds were successfully characterized. The ligands and complexes are also believed to have antibacterial activity against the pathogens S. aureus and E. coli. The complex' diffusing reflectance spectra exhibit bands corresponding to $4T_1g(F) \rightarrow 4T_2g(F)$, $4T_1g(F) \rightarrow 4A_2g(F)$, and $4T_1g(F) \rightarrow 4T_1g(P)$ transitions in the range of approximately 11375 cm-1 to 26316 cm-1. These also corresponds to the octahedral the environment surrounds the copper. The complex's magnetic moment (3.86 BM) suggests a high octahedral environment. Complexes can be synthesis more rapidly, easily, and environmental positively with the use of the use of microwaves

Key words: Amide ligand antibacterial spectra

Introduction-

The Amides are important for life in nature. A great deal of an animal's body is formed out of proteins that are all polyamides [1]. They are the fundamental components of the body's skin, muscles, the neurons, the blood, antibodies, antibodies, enzymes, and many other hormones. These may be discovered in every cell that exists. Compounds with a number of –CONH2 ligands group or an easy derivatives [such as –CONHR, –CONR2, where R = methyl, phenyl, SiMe3, etc.] connected to metal are known to as metals or a metalloid amino acids. The initial instances of metals amino acids are the sodium and potassium amides. A metal or metalloid amide can have a single, two, or three coordinated nitrogen atoms. Certain essential natural compounds, such as B12 vitamin, chlorophyll (a dihydroporphyrin), and heamin (a porphyrin), are examples of these metal amides. Various branches of science and biology additionally acknowledge the significance of molecules containing amide groups [2–7].

Cobalt is a brittle, shiny, silver-white element. Chemical activities allow it to produce a range of compounds.

Water has no effect on cobalt and it remains stable in air. Cobalt has the same magnetic properties as iron and can be made into a permanent magnet. Cobalt is utilized in a wide range of alloys, including high speed steels, cemented carbides, super alloys for gas turbine aviation engine parts, magnetic recording media, and catalysts for the chemical and petroleum sectors.

Cobalt blue is a crucial component of an artist's palette and can be used by producers in the making of stained-

glass windows, ceramics and porcelain, and pottery. Cobalt sulphate finds application in electroplating, batteries, enamels, ceramics, and as a drying agent in inks and varnishes [8].

Co-60 is a versatile source of radiation that can be used in industrial radiography to identify structural flows in metal parts as well as in radiotherapy and food sterilization. While cobalt levels in soils range from as low as 0.1 ppm to as high as 70 ppm, the average level is 8 ppm.

In the maritime setting, cobalt is required by Amide ligand formation of transition metal complexes The organisms known as or blue-green algae, and other organisms the fix nitrogen. Cobalt is frequently discovered in the form of ores and is not found as a free metal. Cobalt is often produced as a byproduct of mining activities for nickel and copper as opposed to being mined separate. Soil, dust, seawater, volcanic emission levels, and smoke from shrub and forest fires are additional sources of cobalt.

The primary sources of cobalt emissions are those that use it to make steel and other alloys. From these sources, it might be released into the air, land, or water. Automated repair shops might be the primary causes of cobalt pollution (into the atmosphere). Additionally, it is released when nickel, copper, silver, lead, and iron are mined or refined.

Environment-related emissions of cobalt may come from manufacturing Cobalt was added by humans through the burning of coal, the extraction and processing of ores containing cobalt, and the creation and use of cobalt compounds, which all released trace amounts of cobalt into the atmosphere.

The environment does not naturally contain radioactive isotopes of cobalt; instead, they are emitted through the operation of nuclear power plants and nuclear accidents.

They are not very hazardous because of their comparatively short half-lives [10]. In modest amounts, cobalt is necessary for many living things, including humans. It is a major component of vitamin B12, or cobalamin, which serves two main coenzyme functions in the body: first, methylcobalamin promotes methionine synthesis, and second, deoxyadenosylcobalamin plays a crucial role in the energy metabolism of glucose precursor in ruminants.

Methionine supply ultimately influences DNA synthesis.Additionally, vitamin B12 isFood including mineral aid in the creation of haemoglobin and in the absorption of iron. The finest food to eat for cobalt are liver, kidney, and beef. A great deal of the 2.5–5 mg of vitamin B12 that every adult's body has is kept in the liver [11]. Consumed by humans as well as animals, cobalt is a precursor to enzymes like all the other trace elements in the soil.

Its nutrient-dense compounds include antioxidant, immune-boosting, endocrine-balancing, antibacterial, and free radical-scavenger capabilities. Human activity can expose individuals to cobalt because it circulates widely in the environment and is frequently found in food, drink, and air. Skin contact with cobalt-containing soil or water may potentially increase exposure.When copperquantity of beer over a number of years, as cobalt sulphate, which serves as a froth stabiliser, is present. Cardiogenic shock, sinus tachycardia, left ventricular failure, and enlarged hearts were the symptoms.

Humans who are exposed to cobalt over an extended period of time through inhalation may experience respiratory symptoms such as inflammation of the respiratory tract, wheezing, asthma, reduced lung function, pneumonia, fibrosis, heart enlargement, liver congestion, and kidney congestion.Testicular atrophy, a reduction in sperm motility, and a notable extension of the estrus cycle are all brought on by inhaling cobalt dust. Oral ingestion has the potential to impede growth and reduce neonatal pup survival.Animals:

lifelong cobalt inhalation did not raise the risk of tumours in hamsters, but it did directly inject in deficiency may result in low white blood cell is important, degeneration of the spinal cord and serious nerve trunks, and pernicious anaemia, it is which shows as extreme exhaustion, headaches, dizziness, and shortness of breath. Unusual enlargement of red blood cells combined with decreased platelet production results in poor clotting and

bruising.

Loss of appetite, thiamine (vitamin B1) deficiency, decreased plasma levels of ascorbate, glucose, and alkaline phosphates, elevated plasma levels of pyruvate, pyruvate kinase, serum forminino-glutamic acid, and thryoxine, which impact hypothalamic function, are all symptoms of cobalt deficiency, also known as "pining" in livestock. The occurrence of Johnne's illness, or paratuberculosis, the ruminant counterpart of Crohn's disease in humans, is linked to cobalt deficiency [13].

Experimental work-

2.2 Materials and methods

Apparatus

(i) EC Double Beam UV-VIS Spectrophotometer (UV 5704SS), with quartz cell of 10 mm light path was used for Electronic spectral measurements.

(ii) IR spectra were recorded on Bruker Optic Model Alpha (FT-IR) (Zn-Se Optics, ATR) (4000-500cm-1) using KBr discussed for iR spectra

(iii) Microwave synthesis was carried out in domestic microwave oven 2450MHz, 800W and GMBR.

(iv) All biological activities have been carried out with horizontal laminar,

Materials and method

Creation of Cobalt (II) complexes with ligand-containing amide groups, In order to create Cobalt (II) complexes with amide group-containing ligands, a 250 ml round-bottom flask containing a solution of Cobalt chloride (0.001 mole in 30 ml ethanol) was filled with 0.003 mole of each amide ligand . The mixture was then slowly stirred. The reaction mixture was let to stand at room temperature for six to seven hours while being continuously stirred with a magnetic stirrer. The reaction mixture in the alternate green synthesis was exposed to radiation for two to ten minutes at a power of 600 W in a microwave reactor. Both techniques produced solid precipitates that were separated and crystallized. The crystals underwent vacuum drying, alcohol was used to purify and recrystallize them.

Results and Discussion-

At room temperature, the amide group-containing ligands interacted with different cobalt (II) salts. Complexes ranged in hue from pink to crimson red. Under standard laboratory settings, these were found to be crystalline and stable for a longer amount of time. However, they were broken down by diluted mineral acids and were soluble in DMF but insoluble in other common non-polar solvents. the complexes' physicochemical and analytical data. The complexes' non-electrolytic character is indicated by the values of λ max (15). The theoretically estimated values of cobalt and the measured values of C, H, N, and cobalt.

Vibration spectra.

The complexes' distinctive infrared bands. The free amide group containing ligands causes the bands due to the amide v(N-H) mode at 3166-3417cm-1 to shift towards higher frequencies, while the cobalt complexes cause the v(C=O) (amide -I) frequency to shift negatively, indicating that the amide group's carbonyl oxygen atom is involved in coordination with the metal ion and that the amide nitrogen is not involved (16). The decrease in the double bond character of C = O and the consequent increase in the double bond character of C-N explain this (17, 18). Stated differently, the decrease in frequencies and the increase in frequencies are caused by the lengthening of the C = O bond and the shortening of the C-N bond, respectively. The 16–87 cm–1 negative shifting of the pyrimidine ring peak in complexes to the comparison of ligands indicates that nitrogen

contributes in bonding. The ultimate structural conclusion of the complexes and the manner of bonding within them are supported by these equal observations.

Magnetic Susceptibility Measurements-

Tables 2 give the findings of the magnetic susceptibility experiments that were conducted at 2980k in the solid state. The complexes' magnetic moments, which represent three unpaired electrons, fall between 4.9 and 5.2 BM. This denotes the existence of a quartet ground state term 4 F (S = 3/2), or Co (II) (d7), which can be formed in either a weak field octahedral or tetrahedral configuration. When a field is octahedral.

Magnetic Susceptibility measurements Thus, depending on the L-term that is still connected to the ground state orbital triplet, the moment would lie within the bounds of [4S(S+1)] ½ (=3.8BM) and [4S(S+1)+L(L+1)]1/2 (=5.2 BM). The experimental moments for octahedral high spin Co (II) complexes that have been documented in the literature fall between 4.2 and 5.2 BM.In these situations, the experimental moments documented in the literature fall between 4.4 and 4.7 BM, and there is a significant overlap between these values for different octahedral and tetrahedral complexes.

As a result, it is doubtful that the generic stereochemical interaction supported by magnetic evidence alone is valid. The magnetic moment values of the complexes under investigation were greater than the spin-only value (3.87 BM), which might be explained by orbital contribution.

Electronic Spectra-

The electronic configuration of the Co (II) ion is 3d7, which in octahedral fields can result in either low spin t2g 6 eg1 or high spin t2g 5 eg2. In fact, complexes with relatively high values of the Iigand field splitting parameter (Dq >150 cm-1) are necessary to cause spin pairing with cobalt (II). Thus, for complexes containing metal ions, it will be assumed that the weak crystal field is in good approximation. Based on the ground state term 4 F of the cobalt (II) metal ion and the same spin multiplicity in 4 P of the higher state. Three bands, which correspond to the subsequent transitions, should thus be anticipated in octahedral complexes.4T2g (F) (v1) Rs 4T1g (F)

4A2g (F) Rs 4T1g (F). Transitions to g should be anticipated.Four T1g (F) Rs Four T2g (F) (v1) Four T1g (F) Rs Four A2g (F) (v2) Four T1g (F) Rs Four T1g (P) (v3)

These shifts take place at around 8000, 17000, and 20,000 cm-1, in that order. Extremely weak, the v2 transition frequently presents as a shoulder. The cobalt (II) complexes under investigation in this work exhibit two bands with centres at 8000–11000 cm-1, 13000–16800 cm-1, and 20000-23000 cm-1. These bands can be attributed to 4T1g (F) • 4T2g (F) (v1), 4T1g (F) • 4A2g (F) (v2), and 4T1g (F) • 4T1g (P) (v3), respectively. They are characteristic of high spin octahedral complexes.

Antibacterial activity-

Muller Hinton Agar medium has been used to test the compounds' antibacterial activity against E. Coli and S. Aureus in order to determine their biological appropriateness.

Biological evaluation

Muller Hinton Agar medium (Hi media) was used to test the compounds' antibacterial activity against E. Coli and S. Aureus in order to determine their biological appropriateness. illustrate the activity, which was conducted using the paper disc method, and demonstrate the modest antibacterial activities of all the Ligand and Cobalt(II) complexes against these bacteria. The following Co (II) complexes with amide group containing ligands have antibacterial properties against both E. Coli and S. Aureus: against E. Coli.

Conclusion-

Based on the aforementioned data, the following conclusions can be drawn about the concrete cobalt complex structures of amide groups including ligands. According to tests of magnetic susceptibility, cobalt (II) has a magnetic moment value between 4.9 and 5.2 BM, which is higher than the spin-only value of 3.87 BM because of an orbital contribution that suggests the presence of three unpaired electrons, which corresponds to high spin octahedral complexes. The cobalt complexes' octahedral geometry is further supported by electronic spectrum measurements, which cite a number of distinctive absorption bands. Highest activity against E. Coli and highest activity against S. Aureus have been observed using.

Table- 1 Physico-chemical Data of Co (II) Metal Complexes (C.M. = Conventional method, M.M.= Microwave method)

S. N.	Complexes	Reaction period		Yield %		Elemental analysis Calculated (Found)%		
		C.M. hrs.	M.M. min.	C.M.	M.M.	C	H	N
1	[Co-(Amide ligand)$_3$]Cl$_2$	6	2.30	35	45	39.92 (39.88)	3.88 (3.82)	23.29 (23.21)

Table-2 Magnetic moments and electronic Spectral data of ligand and Co (II) metal complex

S.N.	Ligand and Complex	R$_f$ value	μ_{eff} (BM)	Electronic Spectral Bands λ_{max} (cm^{-1})	Tentative assignments	Expected Geometry
1	[Co-(Amide ligand)$_3$]Cl$_2$	(0.729)^h	4.86	15873,18604,26315	4T1g(F)→4T2g(F), 4T1g(F)→4A2g(F) 4T1g(F)→ 4T1g(P)	Distorted Octahedral

a= ethyl acetate:carbon tetrachloride(6:4)

Table- 3 IR Vibrational frequencies of Co (II) transition metal complexes.

S N	Complexes	ν_{N-H} (amide)	$(\nu_{C=O})^a$	$(\nu_{C-N+\delta N-H})^b$	$(\nu_{N-H+\delta C-N})^c$	Pyrimi dinyl	ν_{M-N}	ν_{M-O}	ν_{M-cl}
1	Amide ligand	3339	1735	1408	1288	1618			
	[Co-(Amide ligand)$_3$]Cl$_2$	3418	1664	1443	1360	1561	489	498	----

Table 4: Antimicrobial activity of synthesized compounds

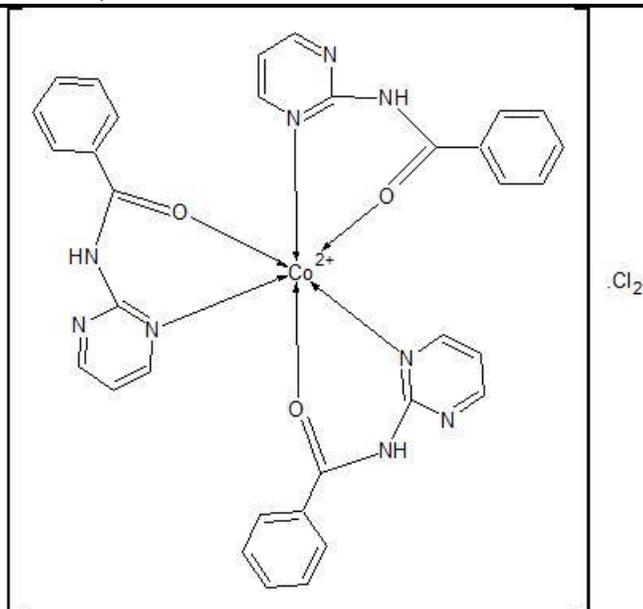| S. No.	Compounds		Zone of inhibition (in mm)		
	(100 ppm)		*E. coli*	*S. aureus*	*B. subtilis*
3	Co(*Amide ligand*)Cl$_2$]	C$_2$	6.5	6.2	9.0

Fig. 1: Tentative Structure of the complexes Co(II).

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