



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

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Abstract.

The synthetic, spectroscopic, and antibacterial investigations on the few Copper (II) complexes with pyrimidine derivatives are described in the current research effort. on magnetic susceptibility tests, infrared spectra, electronic and elemental analysis, the compounds have been characterized. ligands and complexes have also been shown to exhibit antibacterial properties against the pathogens *S. aureus* and *E. coli*. reflectance spectrums display bands that correspond to the transitions between 2Eg and 2T2g and 2B1g and 2A1g. also correspond to the octahedral environment surrounding the copper. moment (1.88 BM) suggests a high octahedral environment. been discovered to be more straightforward, practical, and environmentally begin.

Keyword- Amide ligand, Antibacterial, Octahedral.

Introduction-

Amides are essential to the natural world. A significant portion of an animal's body is composed of proteins,

which are all polyamides¹. They are the main components of skin, muscles, neurons, blood, enzymes, antibodies, and numerous hormones. They are present in all living cells. Compounds with one or more –CONH₂ ligand groups or a simple derivative [such as –CONHR, –CONR₂, where R = methyl, phenyl, SiMe₃, etc.] linked to metal are referred to as metal or metalloids amides. The first examples of metal amides are potassium and sodium amides. A metal or metalloid amide can have one, two, or three coordinated environments, with nitrogen situated in one of these states. Numerous significant natural compounds, such as vitamin B₁₂, heme (a porphyrin), and chlorophyll (a dihydromorphine), are metal amides. The significance of amide groups that contain. Hospitals employ copper the knobs to stop the spread of an infection, whereas copper tubing in air conditioning systems reduces Legionnaire's disease. In domestic lakes and ponds, copper sulfate is used as a pesticide and to decrease algae. To completely eliminate mildew, it is an element of gardening powders and sprays. To evaluate the blood flow in the heart, positron emission tomography uses the radioisotope copper-62. 6. Few plants can survive in soil that is rich in copper, and the variety of flora is low in the vicinity of factories that dispose of copper. Copper poses a severe danger to agriculture productivity because of its impacts on plants. This could cause the organic matter's breakdown to drastically slow down. When agricultural soil is contaminated within recognition of the fact that the effects of copper toxicity come out at low levels, shelving are mostly affected. 8. Multiple protein-protein the complexes including the proteins dopachrome tautomerize, an enzyme known as and tyrosinase-related protein—all of which are copper-binding amino acids

that are vital to the bioprocess—were included as well in the concept that represented "tyrosine the metabolism and pigment biosynthesis." In the same way, amino acids that attach cooper promote the oxidation of amino acids by working in two physiological processes: oxidoreductase activities and amino acids oxidase activity 9–11.

Experimental work-

2.2 Materials and methods

In an effort to produce the copper (II) complexes with amide group that contained the ligands a 250 ml round bottom flask had been filled with the solution of Copper Chloride (0.001 mole in 30 ml ethanol). To this solution, we used a suitable amide ligand (0.003 mole) was added slowly while stirring continuously. The mixture of reactions was permitted to stand at room temperature for between six and seven hours while constantly being stirred with a magnetic stirrer. The reaction mixtures during the alternate green synthesis technique underwent exposure to radiation for two to ten minutes at an intensity of 600 W in the microwave reactor. Both techniques produced solid precipitates that were separated and crystallized. Alcohol was used to remove impurities, recrystallize, and then dry the crystals. Each the chemical complexes that were created and studied turned out to be colored crystalline or powder materials that were stable for an extended amount of time in standard laboratory settings, non-hygroscopic, and did not dissolve in the majority of organic solvents and water with only the exception of methyl alcohol and DMF. Certain complexes in DMF occurred to be non-electrolyte or covalent based on the conductivities that were successfully determined among these complexes (12). Table 1 shows the physical characteristics and elemental evaluation the results. The quantitative information and the complex's recommended molecule formula recognize quite successfully.

Results and Discussion-

(i) IR Spectra

Tables 3 show specific infrared spectral bands. A thorough examination of the distinctive infrared bands of the ligands containing amide groups and there complex with copper has produced certain significant structural and coordinated system the conclusion. The amide ν (N-H) mode's infrared bands, which are seen at 3175–3382 cm^{-1} for at ease amide bonding ligands, shift toward more intense frequencies, suggesting that the nitrogen atoms aren't working in coordination. The amide-I group's carbonyl oxygen participates in metal the ligand bonds, as suggested by the complexes' 14–66 cm^{-1} a negative shift in amide-I (ν C=O) frequencies when ligands have been compared. The coordination of the amide group via carbonyl oxygen is further confirmed by the amide II and III bands that arise from the ν (C-N) and δ (N-H) modes, respectively, shifting towards greater frequency ranges even though both modes are coupled. A decrease in the double-bonded characteristics of C=O as well as corresponding rise in the C-N multiplied bond characteristics could into account for these facts (14). Pyrimidine, or ring peak in the complexes to a ligand compared shows a 16–50 cm^{-1} a negative shifting, suggesting that pyrimidine nitrogen participates in bonding in complexes

Magnetic Susceptibility Measurements-

Bivalent copper compounds' susceptibility to magnet has been determined observed on room temperature as well. Certain complexes of copper usually show the spin only value of 1.73 BM, which is determined using the spin only a formula for the Cu (II) ion about an electronic configuration from d9. It shows up widely recognized that, for the single unpaired electron configuration of d9, its cupric ion shows a moment slightly greater than the spin only value if the magnetic dilution is sufficiently high. Ray and Sen (15) according to the moments at room temperature and, in some cases, at undetermined temperatures lower than room temperature for a number of common cupric complexes. They developed a correlation between the magnetic moments of 1.7-1.9 BM and the complex's reddish-yellow color on the one hand, and the magnetic moments of the magnetization moments of 1.7-1.9 BM were found to be linked with the complex's red-yellow colors, whilst the magnetic Moments of 1.9-2.2 BM had been discovered to be connected with the complex's green-blue color. The ligands' octahedral structures generate a 1.7–1.9 BM value. The greater moments which Ray and Sen reported have frequently been associated with extremely high Q_i values, which are the Weiss constant in the Curie-Weiss law up to 373°k. The ground state of the copper (II) ion forms a 2D spectroscopic state, that divides into an upper orbital triplet (2T2g) and a lower lying doublet (2Eg) by means of an octahedral crystalline field. The green-blue hues frequently observed in the cupric complexes are the result by transitions among the energy states 2Eg \rightarrow 2T2g.

Electronic Spectra-

In its a bivalent state, copper shows a configuration of [Ar] 3d⁹ and is an electronic arrangement of [Ar] (3d¹⁰) (4s¹). The spectrum of copper (II) complexes are identical to those of titanium (III), d¹ complexes, yet in their energy levels changed due to a d⁹ state is the complete similar of a d¹. Cu (II) complexes are highly complex spectra for absorption because of being susceptible for significant distortions. Excellent octahedral as well as tetrahedral complexes from copper (II) can be extremely rare, but a great number of complexes with unique donor ligands and fascinating stoichiometries have been generated by the element. Cu (II) yields a single orbitally degenerated and by tenfold spin liberated ion the ground term 2D. a splitting a 2D term using an octahedral or a further tetragonal crystal field (D_{4h} symmetry) occurs by each level in the octahedral symmetry a splitting further apart. be understood through examining the attempts made for splitting d-orbital orbits of the copper (II) ions in crystal fields that have different symmetry. (II) ion d-d transition (20) is mostly electric dipolar by nature and after Laporte spin multiplicity selection laws. The dx²-y² the orbitals of tetragonal Cu (II) could be expected. Forbidden transitions, because of electric dipole selection rules, among d-orbit in centrosymmetric molecules that are becomes permitted because of on vibronic coupling and a ligand field transition gain a few intensities. usually show up in the red spectral region (=600–700 nm), depending on the field energy of the coordinating ligand.

Antibacterial activity-

the Muller Hinton Agar medium was applied to investigate the compounds' antibacterial activity towards E. Coli, S. aureus, and B. subtilis. The results obtained suggest that every one of the complexes of metals are moderate activity as antibacterial agents toward these kinds of bacteria. Among those complexes, Cu(II) complexes have been experimentally seen to show the greatest understanding of segments and are particularly successful towards bacteria such as B. subtilis, S. aureus, and E. coli, respectively.

Conclusion-

The mode of coordination that occurs between the amides group's carbonyl oxygen as well as the pyridyl oxygen that surround the metallic place is shown by shifts in the distinct ir bands that of amide groups that contained lambda, the when complexation. Every single ligand complexes. has been determined that these amide group-containing ligands function as a bidentate the ligands with stoichiometry of two amide molecule of ligand and two exogenous the ligands each metal ion in the complexes, that use distorted octahedral geometry, according to the infrared spectra predicted a possibility from coordination through deprotonated or non-deprotonated. Complexes generated by the innovative green method are on par with those produced by conventional synthesis, and in many cases, they even yielded higher results.

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

S. N.	Complexes	Reactionperiod		Yield %		Elemental analysis Calculated (Found)%		
		C.M. hrs.	M.M. min.	C.M.	M.M.	C	H	N
1	[Cu-(Amide ligand) ₃]Cl ₂	5	2.00	40	50	54.47 (54.40)	3.71 (3.65)	17.33 (17.25)

Table- 1 Physico-chemical

Table-2 Magnetic moments and electronic Spectral data of ligand and Cu (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	[Cu-(Amide ligand) ₃]Cl ₂	(0.770) ^a	1.88	12642, 12836, 13020, 13227, 13422, 15619, 13661, 15698, 24952	² T _{2g} ← ² E _g ² B _{1g} → ² A _{1g}	Distorted Octahedral

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

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

SN	Complexes	ν _{N-H} (amide)	(ν _{C-O}) ^a	(ν _{C-N+δN-H}) ^b	(ν _{N-H+δC-N}) ^c	Pyrimi dinyl	ν _{M-N}	ν _{M-O}	ν _{M-cl}
1	Amide ligand	3382	1674	1410	1288	1621			
	[Cu-(Amide ligand) ₃]Cl ₂	3379	1620	1507	1345	1578	485	496	----

Table 4: Antimicrobial activity of synthesized compounds

S. No.	Compounds	Zone of inhibition (inmm)	Zone of inhibition (inmm)		
			<i>E. coli</i>	<i>S. aureus</i>	<i>B. subtilis</i>
	(100 ppm)				
3	Cu(Amide ligand)Cl ₂	C ₂	6.5	6.2	9.0

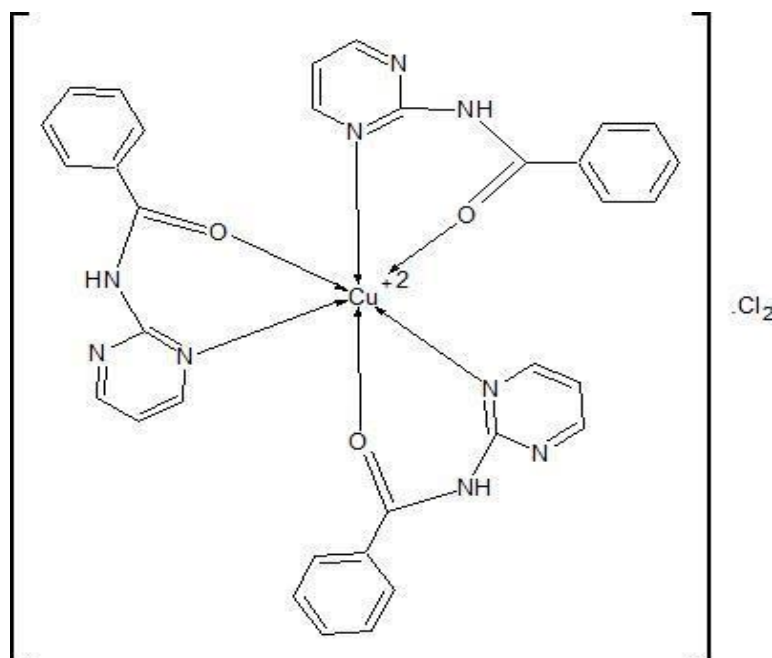


Fig. 1: Tentative Structure of the complexes Cu(II).

REFERENCES

- [1] Pecoraro V L, Li X, Baker M J, Butler W M, Bonadies J A, *Recueil Trav. Chim.* 1987, 106, 221.
- [2] Garg B S, Bhojak N, Sharma R K, Bist J S and Mittal S, *Talanta*, 1999 48 (1) 49-55.
- [3] Garg B S, Bhojak N, Nandan D, *Ind. J. Chem.*, 2005, 44A, 1504.
- [4] Solanki K., Sharma K., Soni M. and Bhojak N.,
- [5] Bhojak N, Gudasaria D D, Khiwani N & Jain R, *E-Journal of Chemistry*, 2007 4 (2) 232-237.
- [6] Singh B K, Bhojak N, & Prakash A, *E-Journal of Chemistry*, 2012 9(2) 532-544.
- [7] Ncioki M, Shin- Inchi S & Yoshiaki W, *Jpn. J.Appl.Phys*; 2008 47 4235.
- [8] Mohamed MM, El-Fiky SA, Soheir YM & Abeer AI, *Asian Journal Cell Biology*, 2008 3 (2) 51.
- [9] Fontaine L A, Sharon M & Julian M, *Archives of Biochemistry and Biophysics*, 2007 463 (2) 149.
- [10] Vishal D & Kaler Stephen G, *American Journal of Clinical Nutrition*, 2008 88, (3) 855.
- [11] Krupanidhi S, Arun S & Sanjeevi CB, *Indian J. Med. Research*, 2008 128 448.
- [12] Kabanos T A and Tsangaris J M, *J. Coord. Chem.*, 1984 13 89.
- [13] Nonoyama M and Yamasaki K, *Inorg. Chim. Acta*, 1973 7 (4) 676.
- [14] Barnes D J, Chapman R L, Stephen F S & Vagg R S, *Inorg. Chim. Acta*, 1981 51 155.
- [15] Ray P and Sen D N, *J. Indian Chem. Soc.*, 1948 25 473.
- [16] Polder D, *Physica*, 1942 9 709.
- [17] Figgis B N and Nyholm R S, *J. Chem. Soc. A* 1959 338.
- [18] Ferguson J, *Prog. Inorg. Chem.* 1970 12 159.
- [19] Sutton D, "Electronic Spectra of transition metal ions" Mc. Graw Hill, London, 1968.
- [20] Ballhausen CJ, "Introduction of Ligand Field Theory" Mc. Graw Hill, New York 1962.
- [21] Procter LM, Hathway BJ, and Nicholls P, *J. Chem. Soc., A* 1968 1678.