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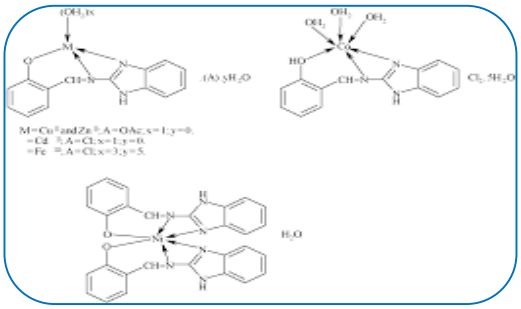
SYNTHESIS, PHYSICAL AND SPECTRAL CHARACTERIZATION OF DIVALENT ZINC COMPLEXES WITH SALICYALDEHYDE–2-AMINOBENZIMIDAZOLE, A SCHIFF BASE

Sandeep Sudhanshu
Lacturer In Chemistry, Senior Secondary Raj School, Darbhanga.

ABSTRACT



This paper presents a tridentate schiff base, 2-hydroxy benzaldehyde-2-amino bezimidazole. The complexes of divalent zinc. i.e Zn(II) cations have been prepared with the tridentate schiff base ligand. Tridentate ligands have some ability to stabilize metal complexes, with coordination taking place through the two nitrogen atoms and one 'O' atom as a donor sites. Schiff bases are considered very important class of organic ligands possessing wide application in many biological aspects. On the basis of characterization of the ligand and the complexes by usual physico-chemical methods, such as elemental analysis, Measurement of electrical conductance, I.R spectra, Mass Spectra, NMR spectra, all the complexes have been found to be non-electrolyte, tetrahedtal geometry. The pure compound, synthesized ligand and metal complexes were aimed for their antimicrobial activity.

KEYWORDS: *Tridentate, Schiff base ligand, Complex, Non-electrolyte, Tetrahedral geometry, Antimicrobial.*

INTRODUCTION

Today coordination Chemistry of metal complexes have facinated and inspired the chemists all over the world. Among the chelating ligand schiff base have attracted the attention of chemists due to the case of preparation and complexation. Metal complexes of schiff base have played a central role in the development of coordination Chemistry[1]. Schiff base complexes have been widely studied because they have anti - microbial, anti-cancer and herbicidal applications[2]. Chelating ligands containing“N”, "N" and "O" donor atoms show broad biological activity and are of special interest because of the ways in which they are bonded to the metal ions[3].Imfraved spectral data indicated the coordination between the ligand and the central metal ion through deprotonated phenolic "O", imidazole "N" of benzimidazole ring and a2o methine "N" atoms. An effective synthesis of schiff bases containing benzimidazole moiety, catslyzed by transition metal nitrates had been done[4]. Benzimydazole moiety is a fusion of benzene and imidazole ring system at the 4 and 5 positions of imidazole ring. They have properties both acids and bases. The benzimidazole moiety is useful for the development of novel medicinal compounds in pharmaceutical field.

MATERIAL AND METHODS:

Materials:

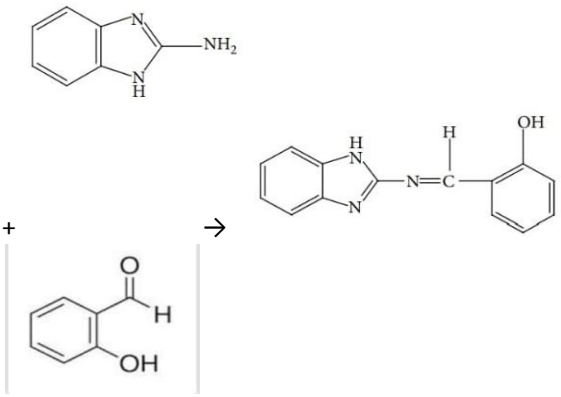
Each of chemicals used were of AR/GR grade. Metal salts of $ZNCl_2$ was of Merck chemicals. Solvents used were ethanol, acetone and DMF. The reagents used were of 2-hydroxy benzaldehyde and 2-aminobenzimidazole.

EXPERIMENTAL:

Synthesis of Schiff Base:

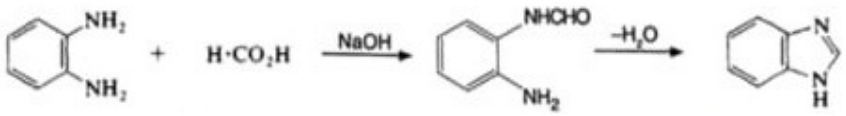
The schiff base was prepared by mixing equimolar amounts of 2- aminobenzimidazole and the aromatic aldehyde in ethanol. The mixture was refluxed for about 4 hrs. Concentration of the solution was done to reduce it to one-half of its original volume and kept for 4-5 days when deep yellow crystals were formed in the reaction mixture,which were filtered,washed thoroughly with the same solvent, and recrystallized with acetone. The yellow schiff base product obtained (m.p.142°C)produced in 54% yield was subjected to analysis

2-aminobenzimidazole



2-hydroxybenzaldehydeligand

Synthesis of 2-aminobenzimidazole:



Synthesis of the Complex:

For the synthesis of complex, ligand- metal ratio was determined by conductometric titration using monovariation method on systronics conductivity meter using dip type electrode. 20 mL of the ligand (0.01M) was dilute to 200mL using pure ethanol and titrated against ZnCl2(0.02M) solution prepared in the same solvant. Conductance was recorded after each addition of metal salt solution. Graph is plotted between corrected conductance and volume of metal salt added.

From the equivalence point in the graph, it has been concluded that the complex formation of the ligand with the metal takes place in the ratio 1:1(L:M). Conductometric titration supported 1:1 (L:M) ratio in the complex, which was further supported by Job's method of continuous variation as modified by Turner and Anderson.

0.02 M solution of ligand and 0.02 M metal salt solution were prepared separately in pure ethanol and mixed. Colour of the resulting solution was yellow green. The pH of the solution was raised to 7.5 by adding N/10 NaOH solution. This solution was refluxed for 4 hrs. and kept for four days when pale green coloured product was obtained. This product was then filtered, washed with the same solvant, dried over fused $CaCl_2$, weighed and subjected to analysis.

RESULT AND DISCUSSION:

The reaction in solution between the ligand and T.M cation may carried out by equation,

$$MX_n + nHL. \quad ML_n + nHX$$

Where, n=1 or 3, M= Zn(II) and x= corresponding anion of metal salt.

The stoichiometric ratio of metal complex were isolated. The ligand was found yellow in colour where as complex was pale green coloured. The complex was non-hygroscopic, insolvuable and stable solid at room temp. for long interval of time.

Physical Characterization:

The percentage composition of component elements in ligand as well as in complex were found as under; shown in table:

Ligand/ complex	M: L	Mol. Wt.	Elemental analysis found calcd.(%)				Colour (yield%)	M. Pt.(°C)	Scm^2mol^{-1}
			C	H	N	M			
[HI] $C_{14}H_{11}N_3O$	-	237.25	70.72 (70.71)	4.51 (4.52)	17.50 (17.51)	-	Yellow (63%)	141	-
$C_{14}H_{10}N_3OClZn$	1:1	337.09	50.70 (49.65)	2.32 (2.45)	14.35 (13.40)	19.54 (19.44)	Pale green (61%)	241 decomposition	18.0

The above factors their m.p. and colour reflected the molecular formula of the complex.[$Zn(C_{14}H_{10}N_{3O})Cl$]

I. R. Spectra:

The study of I.R spectra observed shown that absorption bond of C=N was shifted from 1020^{cm-1} to 1620^{cm-1}, which reflected the coordination of nitrogen with metal ion. The frequency of M-N, M-O and chelate ring were observed 500, 620 and 1299 respectively.

NMR Spectra:

HNMR spectral study exhibited the signal at 12.22 ppm as signal due to phenolic -OH group. In the ligand , the signal at 9.33 ppm as singlet due to proton of azomethine gr. Shows an unfield shifting of 1.13ppm and appeared at 10.35 ppm in the complex that reflected coordination of "N" of azomethine to metal (II) ion.

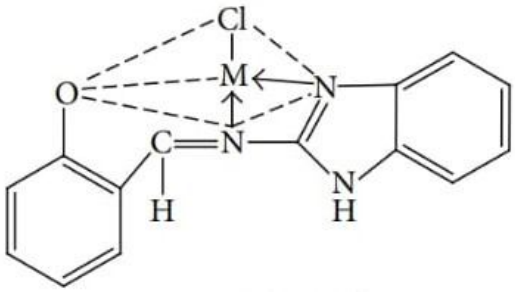
Mass Spectra:

The mass spectrum of Zn(II) complex exhibited that molecular ion peak at m/2, 336.23 due to $[Zn (L)]^+$ which showed the mono-meric nature of the complex.

Antimicrobial Study:

It has been observed that synthesized ligand as well as Zn(II) complex showed moderate good biological activity against all microbes. The inhibition zone for complex have been observed between 1.13 to 3.31 mm, which were more than that of ligand zone.

On the basis of above discussion it has been found that the proposed structure of the metal complex, like below:



(M = Zn)
Structure of the metal complex.

Thus it can be said that complexation or chelating rises the anti-microbial activity.

CONCLUSION:

This paper concludes the higher stability Zn (II) complex build up of tridentate Schiff base ligand. According to physico-chemical analyser it has been observed that schiff base and Zn(II) complex were of important biological role. The fragmental pattern and spectral studies of ligands as well as complex, confirmed and illustrated the proposed geometry of the complex. The aim and the objective of the study was to synthesize and evaluate the antimicrobial activity of Zn(II) complex.

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REFRENCES:

1. Y. Shibuya, K. Nabaui, M. Kindo et al. The Zn(II) complex with two ditentate schiff base ligand. The unique rearrangement that proceeds under alcohol vapour in the solid state to construct noninclusion structure," Chemistry letters, bol.37,no. 1, pp. 78-79, 2008.
2. B. J. Gargani and P.H. Parsania, Microwave irratiated and classical synthesis of symmetric double schiff bases of 1,1- bis(4-amino phenyl) cyclohexane and their physico-chemical charecterization". spectroscopy letters , vol.40, no.1, pp.97-117, 2007.
3. M. Thankamony and K. Mohan," synthesis spectral studies thermal decomposition kinetics reactivity and anti-bicterial activity of some lanthanide (III) nitrate complexes of 2- (N-indole -2-one) amino -3-carboxyethyl-4,5,6,7- tetrahydrobenzo (b) thiophene, Indian Journal of Chemistry A, vol.16,no.2, pp. 247-251, 2007.
4. A. Mobinikhaledi, N. Forughifar and M. Kalhor, synthesis charecterization, DNA binding and nuclear activity of binuclear copper (II) complexes of cuminaldehyde thiosemicarbazones". Turkish Journal of Chemistry, bol.34, pp.367-375, 2010.
5. S. O. Podunvac- Kuzmanovic, D.M. Cvetkovicand, and L.S. Vojinnovic ," synthesis charecterization and molecular structure of a new tetramericpalladium (II) complex containing schiff bases derived from AMTTO (AMTT=4-amino-6-methyl-1,2,4-triazine-thiome-5-one)," Original Scientific paper, APTEFF, vol.35, pp.1-288,2004.
6. S. Chandra and A. Kumar ," synthesis, characterization and Antimicrobial studies on metal complexes with a naphthofuran-thiosemicarbazide derivatives," Journal of the indian Chemical Society, vol.83, pp. 993, 2006

7. R. Nair, T. Kalyaria and S. Chanda ," anti-bicterial activity of some selected indian medicinal flora." Turkish Journal of Biology, vol. 29, pp. 41-47, 2005.
8. A. D. Kulkarni, S. A. Patil and P. S. Badami," SBO donor schiff bases and their Co(II), Ni(II) and Cu(II) complexes synthesis, characterization, electrochemical and Antimicrobial studies." Journal of Sulfur Chemistry, vol. 30, no. 2, pp. 145-159, 2009.
9. K. Singh, Dharmapal, and S. S. Dheman ," synthesis and characterization of Co(II), Ni(II) and Cu(II) complexes with O,N and S donor ligands," Journal of the Iranian Chemical Society, vol. 7, no. 1, 2010.
10. A. K. Singh, O. P. Pandey and S. K. Sengupta," synthesis, spectral characterization and biological activity of Zn(II) complexes with 3-substituted phenyl-4-amino-5-hydrazino-1,2,4 trazole schiff bases," Spectrochimica Acta - Part A: Molecular and Biomolecular spectroscopy, vol. 85, no. 1, pp. 1-6, 2012.
11. K. Shankar, R. Rohini, K. Shravankumar, P. M. Reddy, Y-P. Ho and V. Ravinder, " synthesis of tetraaza macrocyclic pdII complexes; antibicterial and catalytic studies," journal of the indian Chemical Society,vol. 86, no.2, pp. 153-161, 2009.