

Spectrophotometric Complexation Study of Cu²⁺ Metal Ion with Schiff Base Ligand

¹ S. M. Chavan*¹, J. S. Jadhao¹, N.V Rathod², M.S.More², P.J. Sakhare², A. B. Patil¹

1. Department of Chemistry Phulsing Naik College Pusad-445216

2. Department of Chemistry R. A. Arts, Shri. M. K. Commerce & Shri. S. R. Rathi Science Mahavidyalaya, Washim-444505

S. M. Chavan

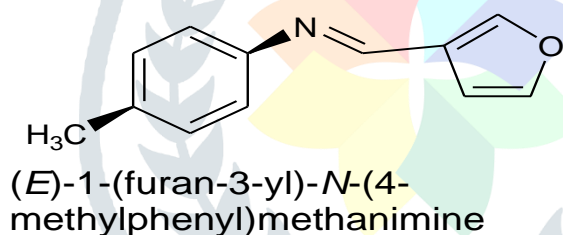
Department of Chemistry.

Abstract: T Schiff base Ligand Schiff base was used for complexation study with Cu²⁺ metal ions. The analytical data confirmed the 1:1 stoichiometry between complexes. Vibrational study in the solid state of ligand and its new copper (II) complexes was performed by IR spectroscopy, UV spectral techniques.

I. INTRODUCTION

Owing to various potential features of Cu(II) metal ion in various fields, the research in complexation study of nitrogen donar ligand is become a part of interest of researchers [1–4]. Compound of copper (II) metal ion with Schiff base ligand are well known for their biological role and fluorescence properties [5]. Metal complexes of Schiff bases synthesized from salicylaldehydes and various aromatic amines have been reported [6, 7].

The present study deals with spectrophotometric complexation study of copper (II) metal ion with Schiff base ligand. The spectral property of ligand and its complex, metal to ligand stoichiometry and effect of pH on complexation, vibrational spectra also studied.



Experimental

All the chemicals and solvents were of AR grade. Metal salts were purchased from SD Fine Chemical Mumbai, The UV visible spectra were recorded on a Single Beam UV-Visible spectrophotometer on Bio era spectrometer range 200-800 nm India. IR spectra were recorded on Shimadzu spectrometer in 4000-200 cm⁻¹ range using KBr pellet. The Schiff base was prepared according to literature published elsewhere. The spectrum of an ethanolic solution of the ligand (5×10⁻⁴ M) and copper nitrate in water by adding some conc. nitric acid (5×10⁻⁵ M) were used for titration.

Result and Discussion:

UV-Visible Study of ligand and its complex:

From the Fig.1 it was observed that the ligand shows the maximum absorbance at 450 nm. Which is responsible for n-π*. Upon addition of metal ion solution there is slight decrease in absorbance suggest the complexation, this may be due to heavy metal ion effect.

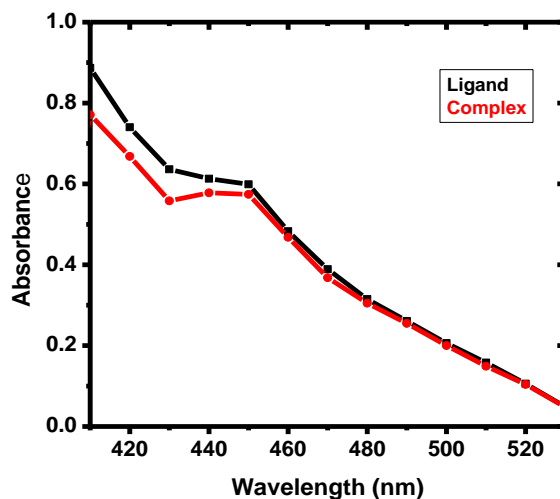


Fig.1. UV-Visible spectra of ligand and its complex

Metal to ligand stoichiometry:

The Jobs method is used to determine the stoichiometry of complex, solutions of Schiff base and metal ion Cu^{2+} were mixed in same mole ratios keeping the same of SB and metal ion concentration constant and the absorbance were measured at 340 nm of wavelength. The plot of absorbance versus mole fractions is shown in Fig. 2. The maximum absorption was observed for the mole ratio of 0.5 therefore it indicates the reaction Stoichiometry between SB and Cu^{2+} is 1:1.

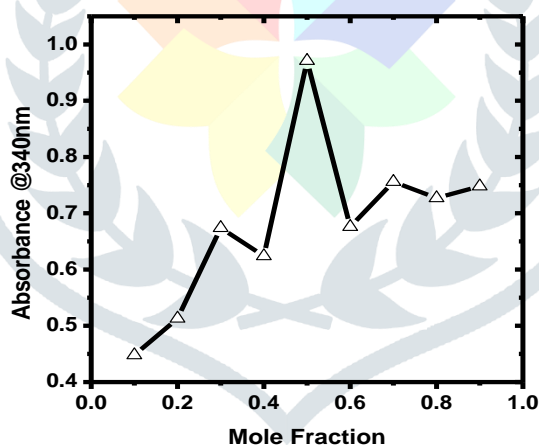


Fig. 2. Jobs plot of Complex for the stoichiometry

Effect of pH on Complexation:

The effect of pH on complexation has been studied for the SB and copper ion by varying the pH from 1 to 10. From the graph it is clear that the effect of at acidic condition i.e. pH-1 complex formation is maximum. However, with increasing the pH decreases the absorbance and therefore pH-1 is suitable for the complex formation and used for further condition.

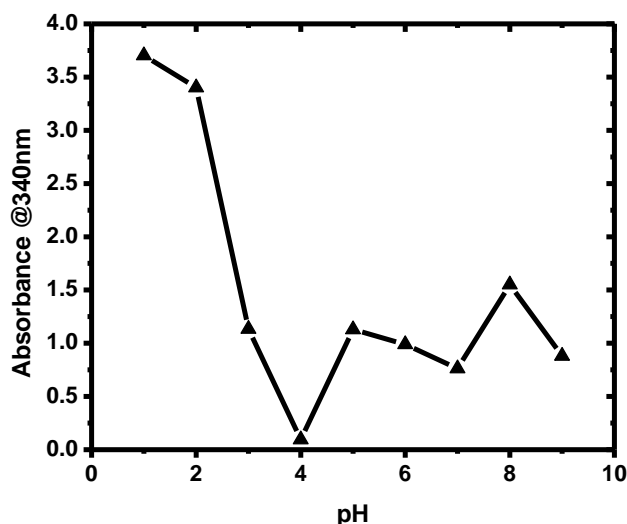


Fig.3. of pH on Cu²⁺ Effect on complexion

IR Study of ligand and its complex:

FTIR spectroscopic analysis of SB and its complex with Cu²⁺ was studied in order to know the interaction between the species. Fig. shows that 1687.71cm⁻¹ is attributed due to C=N in the ligand was decreased up to 1622cm⁻¹. 2952cm⁻¹ is due to C-H bending of ligand is also shifted up to 2922cm⁻¹.

Conclusions:

In summary, we have undertaken the study of complex of Schiff Base with Cu²⁺ metal investigated their binding behaviors using UV-Visible Spectroscopies Study. 4-Methyfurfulaldine is synthesized and an attempt has been made to understand its complexation behavior with Cu(II) metal ions. The effect of pH on complexation, stoichiometry of complex 1:1, IR study helps to understand complexation among the Cu²⁺ and Schiff Base.

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REFERENCES

- [1] Kramer R 1998 Angew. Chem. Int. Ed. 37 772.
- [2] Gaggelli E, Kozlowski H, Valensin D and Valensin G 2006 Chem. Rev. 106 1995.
- [3] Chetana P R, Srinatha B S, Somashekar M N and Policegoudra R S 2016 J. Mol. Struct. 352 1106. Rama I and Selvameena R 2015 J. Chem. Sci. 127 671.