Research Journal of Chemical Sciences _____ ISSN 2231-606X
Vol. **5(5),** 52-55, May **(2015)** *Res. J. Chem. Sci.*

Synthesis and Characterization of Schiff base m-nitro aniline and their complexes

Muzammil K[1], Trivedi P[2] and Khetani DB[1]*
[1]Dept of Industrial Chemistry, St. Xavier's College, Ahmedabad, Gujarat, INDIA
[2]Dept of Chemistry, St. Xavier's College, Ahmedabad, Gujarat, INDIA

Available online at: www.isca.in, www.isca.me
Received 21st April 2014, revised 27th April 2015, accepted 15th May 2015

Abstract

Schiff bases and their metal complexes has been a subject of research for longer period of time and till date it is. Various researchers are aggressively focusing on synthesis of various schiff bases with different metal complexes and try to identify their unique properties. Such an attempt made here to identify the antimicrobial properties of m-nitro aniline schiff base and its two metal complex derivatives made up of copper and cobalt. Synthesis was confirmed by FTIR and antimicrobial activity was determined using E.coli and B.megaterium

Keywords: Schiff base, m-nitro aniline, metal complex, antimicrobial activity.

Introduction

Schiff base was invented by Hugo Schiff, which is named after him. Basically there are compounds with a functional group those posses a carbon-nitrogen double bond with the nitrogen atom connected to an aryl or alkyl group, not with hydrogen. In general sense schiff bases, could be represented as the general formula $R_1R_2C=NR_3$, where R is an organic side chain. Some of them are restricted to the secondary aldimines (like azomethines as the carbon is attached with a hydrogen atom) with the general formula RCH=NR'[1-3]. Carbon-nitrogen double bond provides a significant contribution in various progresses of chemical sciences. Schiff-base compounds have been potentially used as fine chemicals and medical substrates. Number of methods are been applied for synthesis of schiff base. In traditional method of synthesis also known as organic synthesis, which commonly involve the removal solvents from the reaction mixture or liquid extraction especially in the case of aprotic dipolar solvent with high boiling point, or product isolation through liquid-liquid extraction[1,4]. Microwave-assisted reactions have been intensively investigated as mentioned in previous study. Microwave methods have been popularly used in schiff base synthesis by organic synthesis as it has several benefits like better atom economy, environmental friendly, less hazardous, etc[5-8].

In general mechanism of synthesis of schiff base, an aromatic amine reacts with a carbonyl compound by nucleophilic addition. This forms a hemiaminal, followed by a dehydration to produce imines.

Schiff bases obtained from aromatic aldehydes and aromatic amines have a shown number of applications in many fields including pharmaceutical, life sciences and chemical science including inorganic and analytical chemistry[9-12].

The aim of this study was to make schiff bases of m-nitro aniline and their complexes, followed by characterization and antimicrobial activity determination of the schiff bases and metal complexes.

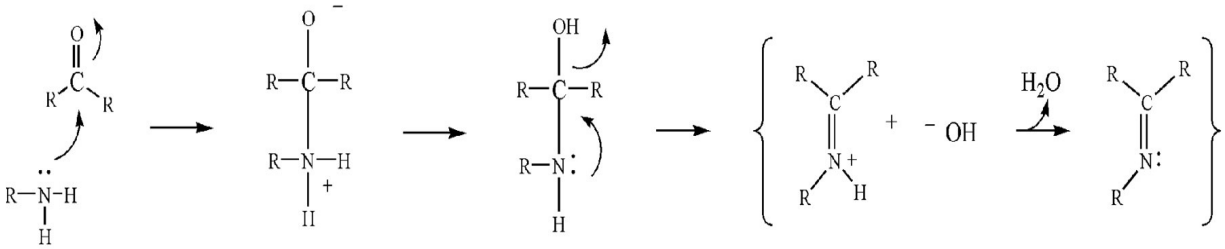

Figure-1
General reaction mechanism of schiff base

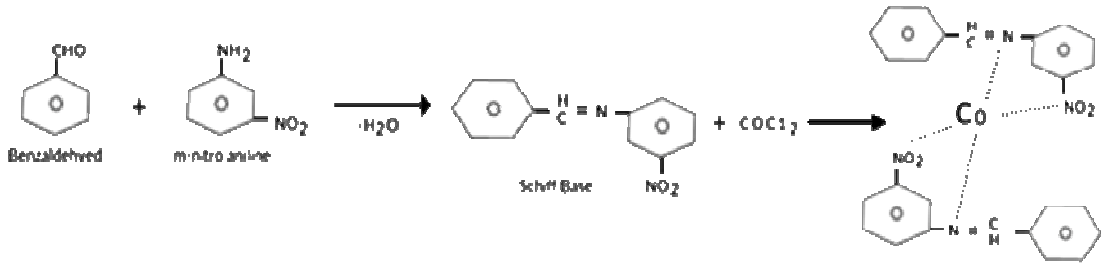

Figure-2
Reaction of Co complex with schiff base

Material and Methods

Synthesis of m-nitro aniline n-bezaldine Schiff base: Synthesis was started with 22.3 ml benzaldehyde, which was mixed with 15 ml ethanol. After this 22.7 gm of m-nitro aniline (0.02M) was added to this alcoholic solution. The whole mixture was stirred with addition of 2 to 3 drops NaOH solution. Mixture was allowed to reflux for 4 hours. After reflux cold water was added and solid yellow product was obtained. Product was filter and dried for further use.

Synthesis of metal complexes of Schiff Base: Cu and Co was used as metals for derivation of metal complexes. In the process 2.6 gram schiff base was dissolved in 15 ml ethanol. To this solution 0.02 mole of metal chloride solution were added. This mixture was allowed to stir and refluxed for 3 hours. The product was cooled washed with cool water. Obtained precipitates were then dried for further application.

FTIR Analysis: Fourier transforms infrared spectrophotometer (FT-IR) analysis of each schiff base and its metal complexes were done to confirm the formation of metal complexes.

Antimicrobial Activity: Antimicrobial activity was done by agar cup method. One gram positive and one gram negative microbe was selected for the study. For the assay, solutions with desired concentration of schiff base with metal complexes were incubated with plates containing microbes and zone of inhibition was observed after 24 hrs.

Results and Discussion

FTIR Analysis: Disappearances of carbonate and amine group peaks from IR spectrum indicated formation of metal complexes. Here when spectra of schiff base and its metal complexes were compared similar kind of observation was made. In the schiff base strong peaks of carbonate near 1723nm and amine near 3315nm were observed. Both of these peaks were absent in the IR spectra of metal complexes. In addition to that another peak was observed near 1630nm which is an indication of azomethene (CH=N). This reflects that amino acid and aldehydes which are the substrate for synthesis have been converted into ligands. i.e. m-nitro aniline n- benzaldene. Similar kinds of observation were made by many other researchers who have synthesized schiff bases using varieties of starting material[4,13]. In all the study a common effect was observed where peaks of carbonate and amine were disappeared upon addition of metal to the schiff base. Simultaneously new peaks were observed in the IR spectra depending on the schiff base and metal.

Antimicrobial Activity: Results of antimicrobial activity reflect that metal complex made up of Cu has more antimicrobial activity than Co complex. This is because copper can directly affect bacteria in two steps: first it will rupture the cell membrane by direct interaction and second it creates holes in the outer membrane, through which the cell loses vital nutrients and water, causing a general weakening of the cell and slow death of cell[14]. Cobalt is not that much effective as copper.

Table-1
Antimicrobial activity of metal complexes of schiff base

Schiff Base and Metal Complex	**Zone of inhibition (in mm)**	
	E.Coli	B. megaterium
Ethanol	-	12 ± 1
$CuCl_2$	18 ± 2	15 ± 2
$CoCl_2$	14 ± 1	15 ± 1
Ampliculin Sodium	19 ± 2	15 ± 1

Conclusion

Based on overall study it was concluded that metal complexes of schiff bases are more efficient antimicrobial agent than its native form. However the antimicrobial potentiality is of metal complex is highly dependent in the metal ion used for formation of metal complex.

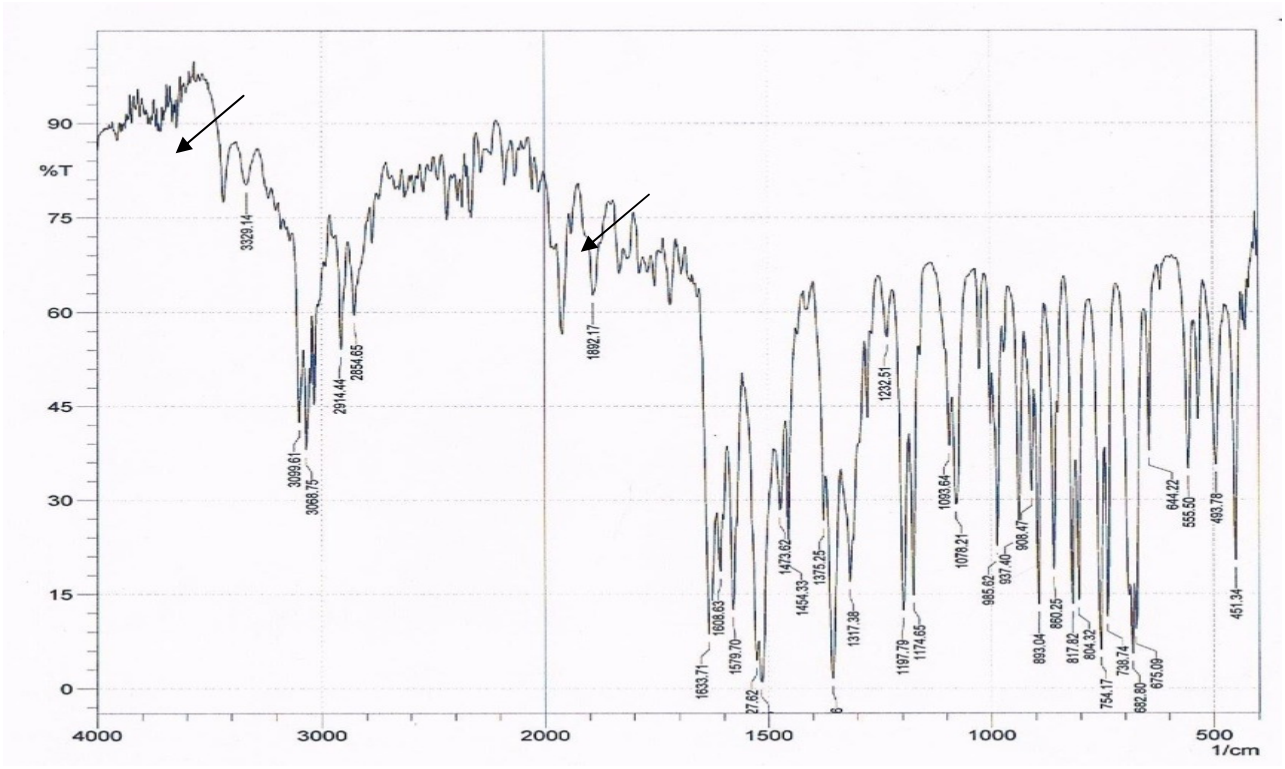

Figure-3
FTIR spectra of schiff base

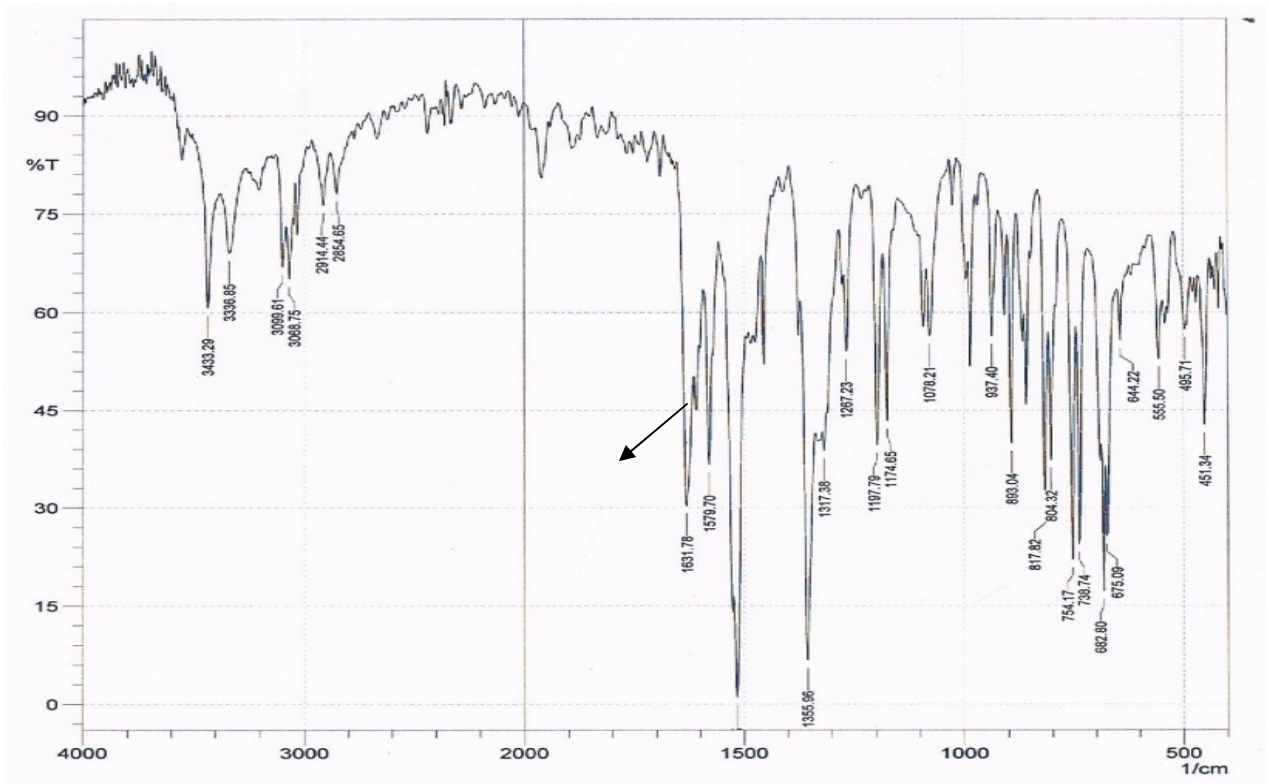

Figure-4
FTIR spectra of $CoCl_2$ complex with schiff base

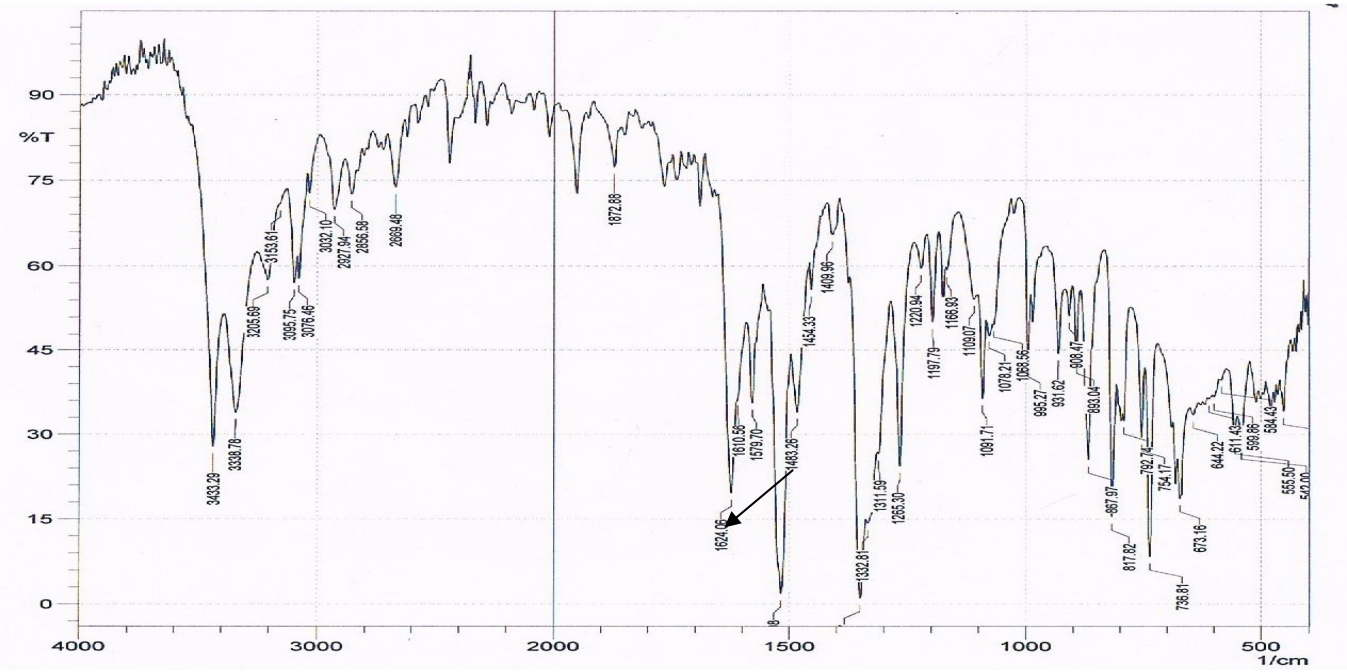

Figure-5
FTIR spectra of $CuCl_2$ complex with schiff base

References

1. Anand P., Patil V.M., Sharma V.K., Khosa R.L. and Masand N., Schiff bases : A Review on Biological Insights Biological activities of Schiff bases, *Int. J. Drug Des. Discov.*, **3,** 851–866 **(2012)**

2. Yang Z. and Sun P., Compare of three ways of synthesis of simple Schiff base., *Molbank*, 12–14 **(2006)**

3. Savalia R.V, Patel A.P., Trivedi P.T., Gohel H.R. and Khetani D.B., Rapid and Economic Synthesis of Schiff Base of Salicylaldehyde by Microwave Irradiation., *Res. J. Chem. Sci.*, **3,** 97–99 **(2013)**

4. Kumar N. and Sharma P., Synthesis of New Schiff-Base Complexes and Their Applications, *Int. J. Appl. Res. study*, **2,** 1–6 **(2013)**

5. Somani R. *et al.*, Optimization of Microwave Assisted synthesis of some Schiff ' s bases, *Int. J. ChemTech Res.*, **2,** 172–179 **(2010)**

6. Kulshrestha A. and Baluja S., Microwave Promoted Synthesis of Some Schiff Bases, *Sch. Res. Libr.* **2,** 221–224 **(2010)**

7. Mohanambal D. and S A.A., Synthesis , Characterization and Antimicrobial activity of some novel schiff Base 3d Transition Metal Complexes Derived from Dihydropyrimidinone and 4- Aminoantipyrine, *Res. J. Chem. Sci.*, **4,** 11–17 **(2014)**

8. Girgaonkar, M. V and Shirodkar, S. G. Synthesis, characterization and Biological studies of Cu (II) and Ni (II) complexes with New Bidentate Shiff's base ligands as 4-hydroxy-3-(1-(acrylimino)ethyl)chromen-2-one. *Res. J. Chem. Sci.* **1,** 110–116 **(2012)**

9. Bader, N. R. applications of schiff ' s bases chelates in quantitative analysis : a review *RASAYAN J. Chem.* **3,** 660–670 **(2010).**

10. Satyanarayana, V. S. V, Sreevani, P., Sivakumar, A. and Vijayakumar, V. Synthesis and antimicrobial activity of new Schiff bases containing coumarin moiety and their spectral characterization. *Arkivoc* **2008,** 221–233 **(2008).**

11. Patel, V., Trivedi, P., Gohel, H. and Khetani, D. Synthesis and Characterization of Schiff Base of p - chloro aniline and their Metal Complexes and their evaluation for Antibacterial Activity. *Int. J. Adv. Pharmacy, Biol. Chem.* **3,** 999–1003 **(2014).**

12. Ashraf, M. A., Mahmood, K., Wajid, A., Maah, M. J. and Yusoff, I. Synthesis , Characterization and Biological Activity of Schiff Bases. *Int. Conf. Chem. adn Chem. Process* **10,** 1–7 **(2011).**

13. Vaqas, M. *et al.* Salicylaldehyde Salicyloylhydrazone-A short Review. *Sci. Int.* **25,** 85–89 **(2013).**

14. Hidron, A. I., Kourbatova, E. V and Halvosa, J. S. The Science behind Antimicrobial Copper. *CID* 159–166 **(2005)**