

Synthesis, Characterization and Biological Activity of Iron (II) Complexes with a Chelating Bidentate Schiff Base Complexes Derived From 2- Acetyl Pyridine and m-Toluidine

¹Avinash Patil and ²Priyanka

1. +2 Teacher, Mukherjee Seminary, Muzaffarpur, (Bihar) India
2. S.N.S. College Muzaffarpur, (Bihar) India

Abstract

A series of square planar complexes of Iron (II) of type $[\text{Fe}(\text{MASB})_2]\text{X}_2$ have been obtained where $\text{X} = \text{Cl}^-, \text{Br}^-, \text{NO}_3^-$. In the present case MASB is Schiff base reagent derived from 2-Acetyl pyridine and meta- toluidine in equimolar proportion. The characterization of the ligand as well as Iron (II) complexes has been done on the basis of elemental analysis, conductivity and magnetic susceptibility measurement. I.R. Spectra has been decided on the basis of mode of bonding. Square planar stereochemistry has been proposed on the basis of electronic spectra and magnetic moment data. The ligand has been found to act as a bidentate chelating ligand utilizing both the Nitrogens (pyridineyl & azomethanic) for coordination.

Key Words: Fe (II) complexes, Schiff base ligands, spectroscopic studies

INTRODUCTION:

Schiff bases ligands and their complexes have attracted worldwide attention¹⁻¹⁴ due to pharmaceutical importance consequently. A series of three Fe (II) complexes of the type $[\text{Fe}(\text{MASB})_2]\text{X}_2$ is being reported in the present communications.

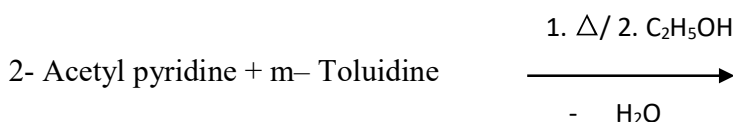
EXPERIMENTAL:

MATERIALS:

Reagents 2-Acetylpyridine, m-Toluidine and ferrous Chloride / Bromide / Nitrate were commercially purchased and used without further purification.

PREPARATION OF THE LIGANDS (MASB):

Mixture of 2-Acetyl pyridine and m-Toluidine were refluxed in ethanolic solution in equimolar proportion for 2 hrs. The reaction can be represented as shown below:



PREPARATION OF THE COMPLEX:

Complexes were prepared by mixing ethanolic solution of Fe (II) X_2 ($\text{X} = \text{Cl}^-, \text{Br}^-, \text{NO}_3^-$) and ligand (MASB) in molar ratio (1:1). The reactions were carried out in

slightly alkaline medium. The precipitate formed were washed with ethanol, dried and analyzed. Analytical table are presented in Table – I. The reaction can be represented as shown below:-

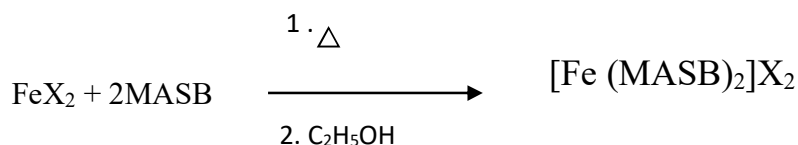


Table – I

Analytical Data and Color of Ligand in Complexes

Compounds	Formula	Percentage of element found (cal)					
		C	H	N	Fe	Cl	Br
MASB	C ₁₃ H ₁₂ N ₂	79.57 (78.7)	6.12 (6.04)	14.29 (14.02)	–	–	–
[Fe (MASB) ₂]Cl ₂	FeC ₁₃ H ₁₂ N ₂ Cl ₂	48.29 (48.2)	3.72 (3.02)	8.67 (8.23)	17.34 (17.03)	21.98 (21.76)	–
[Fe (MASB) ₂]Br ₂	FeC ₁₃ H ₁₂ N ₂ Br ₂	37.86 (37.4)	2.91 (2.06)	6.79 (6.02)	13.59 (13.4)	–	38.83 (38.778)
[Fe (MASB) ₂] NO ₃	FeC ₁₃ H ₁₂ N ₄ O ₆	41.48 (41.4)	3.19 (3.01)	14.89 (14.07)	14.89 (14.72)	–	–

Table – II

I.R.SPECTRAL DATA (cm⁻¹)

Compound	ν _{C=O}	ν _{N-H}	ν _{C=N}	ν _{Fe-N}
2-Acetylpyridine	1700	–	–	–
3- Methylaniline	–	3015	–	–
MASB	–	–	1438	–
[Fe (MASB ₂)]Cl ₂	–	–	1605	1618
[Fe (MASB) ₂]Br ₂	–	–	1640	620
[Fe (MASB) ₂] (NO ₃) ₂	–	–	1615	622

RESULTS AND DISCUSSION:

I R spectra of 2- Acetyl pyridine, meta- Toluidine Schiff base ligand (MASB) and IRON (II) complexes (shown in Table - II) on compression provides evidence in favour of Schiff base condensation of 2- Acetyl pyridine with 3-methylaniline to give the ligand MASB. The evidence for coordination of azomethanic as well as pyridine nitrogen to Fe (II) ion comes from the disappearance of

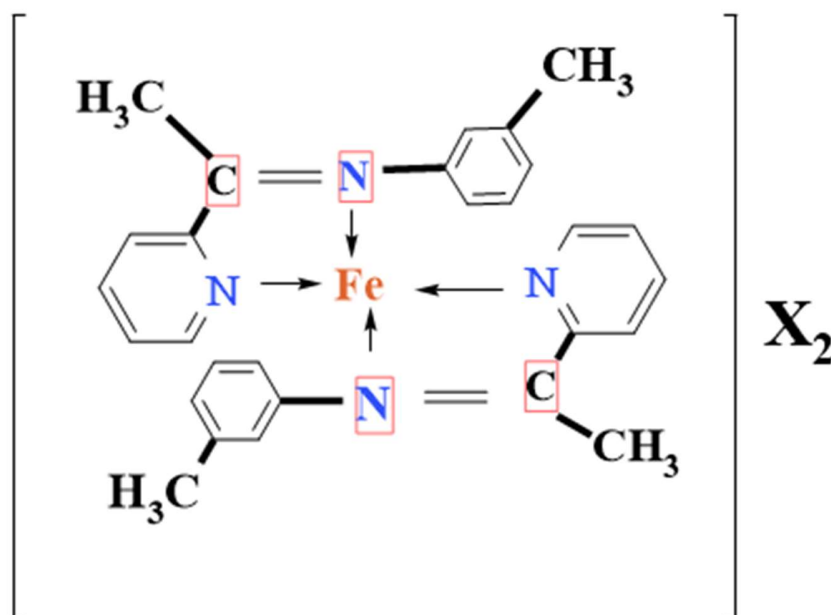
carbonyl frequency at 1700cm⁻¹ from the spectra of 2- Acetylpyridine and ν_{N-H} at 3050 cm⁻¹ from the spectra of 3-methylaniline.

A new band assignable to ν_{C=N} at 1640 cm⁻¹ in the spectra of MASB support the Schiff base condensation. This band has been shifted to lower region in the spectra of complexes and disappear in the region 1605- 1615 cm⁻¹. Appearance of new band

in far I.R region at 600 cm^{-1} can be attributed to $\nu_{\text{Fe-N}}$.

The molar conductivity of the complexes has been found in the range $140\text{--}160\text{ S cm}^2\text{mol}^{-1}$ suggest 1:2 type of

electrolyte for the complexes. Complexes have been found to be diamagnetic. On the basis of above discussion square planar structure has been proposed (fig.1) for the complexes. Electronic spectra also support this proposition.



BIOLOGICAL IMPORTANCE:

The free Schiff base ligand and its metal complexes were screened against microorganism (staphylococcus, aureus, E.coli and pseudomonas acxiginosa) to access their potential as an anti-microbial agent by disc diffusion method. It is found that metal complexes have higher antimicrobial activity against Gram negative species only compared with free ligands. Hence complexation increases the antimicrobial activity. Such increased

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activity of the metal complexes can also be explained on the basis of chelation theory. According to this the chelation reduces the polarity of the metal atom mainly because of the partial sharing of its positive charge with donor group and possible π - electron delocalization over the whole ring. This increases the lipophilic character of the metal chelate system which favours its permission through lipid layer of the cell membranes.

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