

Synthesis and characterization of a Schiff Base Zn (II) Complexes using 2-formylpyridine and para-toluidine

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Abstract : A series of Zn (II) complexes of the type [Zn (SB) X₂] with a Schiff base obtained by Schiff base condensation of 2- formylpyridine and Para-toluidine was synthesized and characterized on the basis of elemental analysis spectral studies and conductivity measurements. The Schiff base SB behaves as a neutral bidentate chelating ligand using azomethinic nitrogen and pyridinyl nitrogen for coordination. An octahedral structure has been proposed for the complexes. Complexes are diamagnetic and have low conductivity.

(Keywords : Zn (II) complexes, Schiff base ligand, spectral and magnetic studies)

Introduction

A rejuvenated interest has been developed for Zn (II) Schiff base complexes in recent past due to applications of Zn (II) complexes as chemosensors¹⁻¹⁰. In continuation of our earlier work^{5,10} in the field, a series of octahedral Zn (II) complexes of the type [Zn (SB)₂ X₂] is reported where X = Cl⁻, Br⁻, NO₃⁻; SB = Schiff Base derived from condensation of 2- formylpyridine and Para toluidine. Zinc with zero crystal field stabilization energy has been found to form complexes showing octahedral, tetrahedral as well as square planar geometry.

Experimental

All the reagents, Zn (II) salts, Para-toluidine, 2-formylpyridine, ethanol, acetone,

DMSO etc. were purchased commercially and used without any further purification.

Dilute ethanolic solutions of Zn (II) salts, 2- formylpyridine and Para-toluidine were refluxed together for 2 hrs to get the compounds after cooling and slow evaporation overnight solid products thus obtained were filtered, washed, dried, and analyzed as [Zn (SB)₂X₂]. Analytical data are presented in Table – I and IR spectral data in Table – II respectively.

Results and Discussion

I.R.Spectra of pyridin - 2- al, para-toluidine, (pyridin -2-yl) (4-methylanilino) methanimine and metal complexes (table - 2) on comparison provides evidence in favor of Schiff base condensation of (pyridin -2-al) with 4 methylaniline to give the ligand PTSB. The evidence for coordination of azomethinic as well as pyridyl nitrogen to the metal ions comes from disappearance of $\nu_{C=O}$ (1700cm⁻¹) from spectra of pyridin - 2- al, ν_{N-H} (3000 cm⁻¹) from the spectra of 4- methylaniline. Appearance of a new band in the spectra of PTSB due to $\nu_{C=N}$ (1648cm⁻¹) and shift of this $\nu_{C=N}$ (1612-1624 cm⁻¹) to lower region in the spectra of [Zn(SB)₂X₂] along with appearance of a new band in the far I.R. region due to ν_{M-N} (460-485cm⁻¹) gave further support to the fact that coordination of the ligand takes place with the metal ions through pyridyl nitrogen and azomethinic nitrogen.

Table – I
Analytical Data of Ligand in Complexes

Compounds	Elemental % Found (Calculated)				
	Zn %	C %	H %	N %	X%
SB C ₁₃ H ₁₂ N ₂	-	78.12 (78.78)	6.01 (6.12)	14.11 (14.28)	-
[Zn (SB) ₂ Cl ₂]	12.15 (12.37)	58.78 (59.05)	4.53 (4.54)	10.47 (10.59)	13.18 (13.43)
[Zn (SB) ₂ Br ₂]	10.53 (10.59)	50.12 (50.53)	3.86 (3.88)	8.98 (9.07)	25.59 (25.91)
[Zn(SB) ₂ (NO ₃) ₂]	11.08 (11.24)	53.18 (53.66)	4.12 (4.13)	14.22 (14.44)	-

Table – II IR Spectral Data of Compounds (cm⁻¹)

Compounds	$\nu_{\text{N-H}}$	$\nu_{\text{C=O}}$	$\nu_{\text{C=N}}$	$\nu_{\text{Zn-N}}$
2-Formylpyridine	—	1700	—	—
Para-toluidine	3015	—	—	—
SB	—	—	1640	—
[Zn (SB) ₂ Cl ₂]	—	—	1606	612
[Zn (SB) ₂ Br ₂]	—	—	1608	615
[Zn (SB) ₂ (NO ₃) ₂]	—	—	1612	618

on the basis of above discussions an octahedral structure has been proposed for the complexes [Zn(SB)₂ X₂] fig. 1.

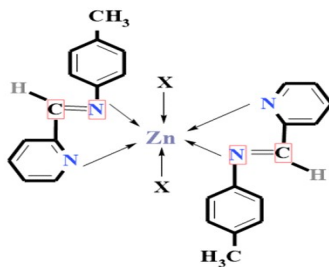


Fig. 1 X= Cl, Br, NO₃⁻

Electronic and fluorescence properties of the ligands and complexes :

The ligand in methanol medium shows three absorption band maxima at 207, 259 and 379 nm with a shoulder at 396 nm arising due to $\pi - \pi^*$ transitions. On excitation at 207 nm and 259 nm same emission spectrum with λ_{ex} at 294 nm is obtained. Interesting for 379 nm excitation, emission occurs at 441 nm. The UV – vis spectrum

of zinc complexes in methanol shows four bands at 306, 362, 468, and 553 nm.

The bands at 306 nm and 362 nm are ligands centered arising due to intra-ligand charge transfer, whereas, 468 and 553 nm bands are due to LMCT. On excitation separately at 468 nm and 553 nm the same fluorescence spectrum is obtained with emitted band maxima at 632 nm.

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