Impact Factor – 6.625 E-ISSN – 2348-7143

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

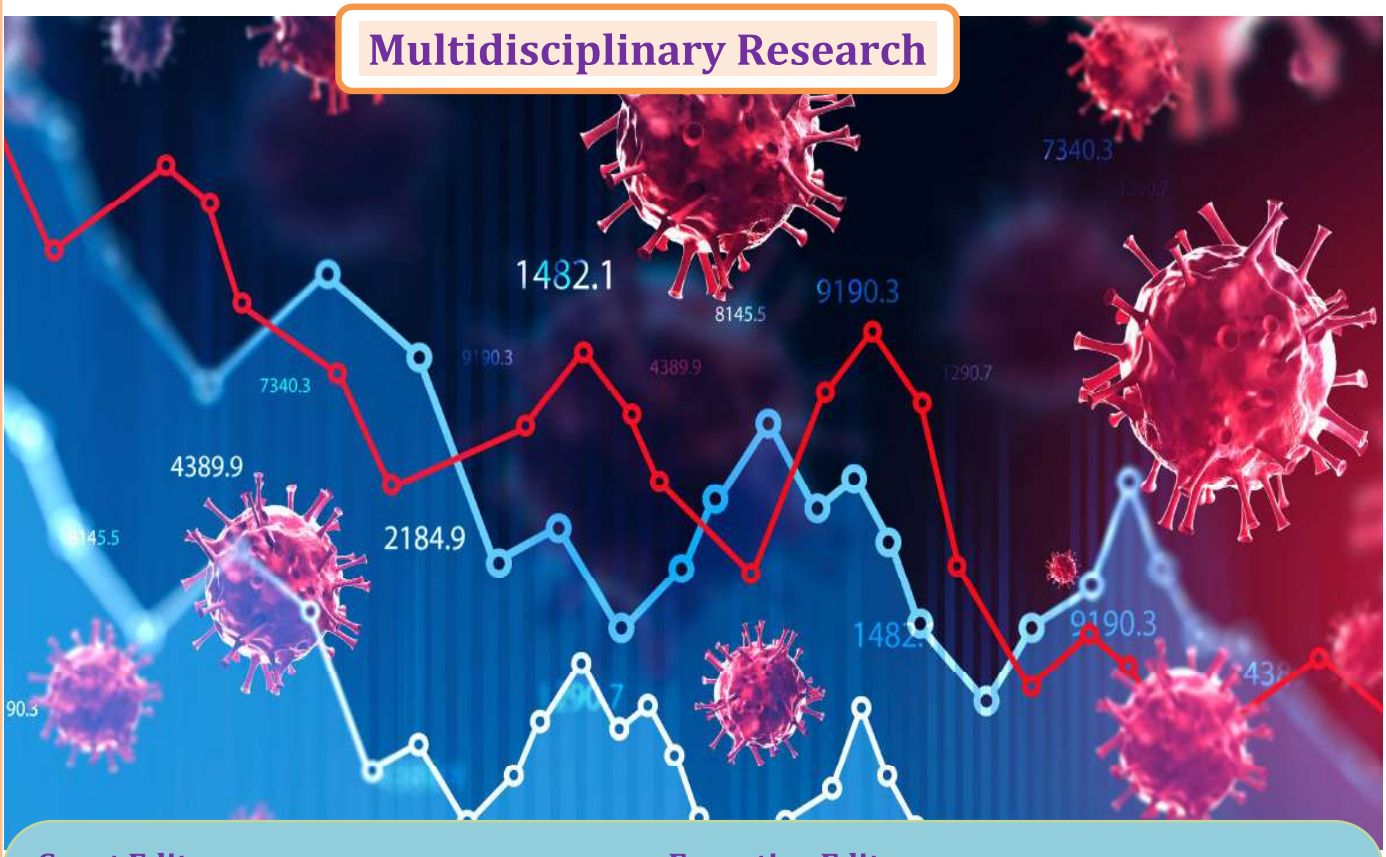
RESEARCH JOURNEY

International E-Research Journal

PEER REFREED & INDEXED JOURNAL

December 2020 Special Issue 256 (C)

Multidisciplinary Research



This Journal is indexed in :
- Scientific Journal Impact Factor (SJIF)
- Cosmoc Impact Factor (CIF)
- Global Impact Factor (GIF)
- International Impact Factor Services (IIFS)

For Details Visit To : www.researchjourney.net

SWATIDHAN PUBLICATIONS

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION

Impact Factor – 6.625 **E-ISSN – 2348-7143**

INTERNATIONAL RESEARCH FELLOWS ASSOCIATION'S

RESEARCH JOURNEY

International E-Research Journal

PEER REFREED & INDEXED JOURNAL

December 2020 Special Issue 256 (C)

Multidisciplinary Research

Our Editors have reviewed papers with experts' committee, and they have checked the papers on their level best to stop furtive literature. Except it, the respective authors of the papers are responsible for originality of the papers and intensive thoughts in the papers. Nobody can republish these papers without pre-permission of the publisher.

- Chief & Executive Editor

SWATIDHAN INTERNATIONAL PUBLICATIONS
For Details Visit To : www.researchjourney.net

*Cover Photo (Source) : Internet

 Price : Rs. 1000/-

INDEX

'RESEARCH JOURNEY' International E- Research Journal
Impact Factor - (SJIF) – 6.625 (2019),
Special Issue -256 (C) : Multidisciplinary Research
Peer Reviewed Journal
E-ISSN : 2348-7143
Dec. 2020

Synthesis and Characterization of Ni (II) and Mn (II) Metal Complexes of Novel Schiff's Base Ligand

Vrushali S. Gavhane[1], Anjali. S. Rajbhoj[2], Suresh T. Gaikwad[3] *
[1]R. B. Attal Arts, Science and Commerce College, Georai. Dist. Beed.
[2,3]Dept. of Chemistry, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
*Email.ID- drvrushaligavhane@gmail.com

Abstract:

The synthetic, spectroscopic and biological studies of Ni(II) Mn(II) metal complexes of N-4-dipropyl thiosemicarbazide with salicylaldehyde is carried out and structures of Schiff's base ligand and their metal complexes have been done on the basis of spectroscopic data such as UV, IR, solution conductivity, magnetic susceptibility measurements and biological analysis. Electrical conductivity data shows non-electrolytic nature of the complexes, while biological analysis shows convenient activity against bacteria which is compared with standard drug ciprofloxacin. On the basis of above studies this schiffs base ligand was suggested to be coordinated to each metal ion by thione sulfur, azomethine nitrogen and phenolic oxygen to form mononuclear complexes in which the Schiff's base behaves as tridentate ligand.

Keywords: Thiosemicarbazones, biological activity.

Introduction:

The synthesis and structural investigations of Thiosemicarbazone and their metal complexes are of considerable centre of attention because of their potentially beneficial pharmacological properties and wide variety in order to mode of bonding and stereochemistry.[1-3] Schiffs bases such as thiosemicarbazones are versatile and most widely studied sulfur and nitrogen consisting ligand.[4-5] Out of that they used widely because they are important sulfur containing ligands in last two decades.[6-9] They are important in coordination chemistry because they have numerous range of biological properties which depends on the parent aldehyde or ketone including antitumor, antibacterial, antifungal [10-13] as well as other physicochemical properties. [14-15] It is observed that several metal ions enhance and modify the biological activities of thiosemicarbazones. Much attention has been given towards the chemistry of transition metals [16-20] in different coordination sphere. In view of this transition metal complexes of this Thiosemicarbazone with N, S and O donor atoms have been found to be effective catalysts in oxidation reaction. [21]

In the present work has been done to investigate the ligation behaviour of Thiosemicarbazone with Ni and Mn metal.

Materials and Methods:

All the chemicals used were AR grade and obtained from commercial source.

Synthesis of Schiff's Base Ligand:

The Schiff's base (E)-1-(2-hydroxybenzylidene)-4-dipropyl Thiosemicarbazone prepared according to the previously reported method. [22-23]

Synthesis of Metal Complexes

Hot ethanolic solution of metal salt (0.01mmol) mixed with (0.02mmol) solution of (E)-1-(2-hydroxybenzylidene)-4-dipropyl Thiosemicarbazone and refluxed it for three hours. After reflux reaction mixture was kept at room temperature for 3-4 hours.

Results and Discussion:

Electronic Spectra:

UV spectra of Thiosemicarbazone ligand in DMF showed two-three maxima observed due to $\pi \rightarrow \pi^*$ transition of phenyl ring are observed at 286 nm, then $n \rightarrow \pi^*$ transitions of imine function of Thiosemicarbazone moiety are observed in the range of 329 nm [24-25] The Ni (II) complex shows band at 768nm due to $^3A_{1g} \rightarrow {}^3T_{1g}$ transition in octahedral geometry and in Mn (II) complex band at 470-840nm due to spin forbidden.

IR Spectra:

The binding mode of the ligand to metal ions was further elucidated by analysis of the IR spectra (Table.1) of the ligand and its metal complexes formation. A study and comparison of IR spectra of free ligand and its metal complexes shows that Schiff's base behaves as monobasic tridentate ligand and the metal ion is coordinated through the deprotonated oxygen atom of the phenolic, nitrogen atom of the azomethine and sulfur atom of the thio-keto group.

The disappearance of the absorption bands associated with the stretching ν (OH) of the phenolic group in the spectra of metal complexes indicates a loss of phenolic proton on complexation and form metal-oxygen bond, while band at 2980cm^{-1} region in the free ligand have been assigned to ν (N-H) vibrations.The strong band observed at 870 cm^{-1} in spectra of ligand is mainly due to stretching vibrations of (C=S) is shifted to th lower frequency and occurred at 850-820 cm^{-1} indicating coordination through thione sulfur to metal atom. The new bands observed in the region of 560-350 cm^{-1} are tentatively assigned to ν (M-O), ν (M-N), ν (M-S) stretching bands respectively. [26]

Table 1: FTIR Spectral data of ligand and its metal complexes in (cm^{-1})

Ligand/complex	ν (-OH)	ν (N-H)	ν (C=N)	ν (C=S)	ν (C-O)	M-S	M-N	M-O
LA	3240	2980	1560	1270,870	1176	-	-	-
Ni (II)	-	-	1595	1280,850	1206	440	590	490
Mn (II)	-	-	1590	1291,820	1200	458	581	510

Table 2: Electronic spectral data solution conductivity and magnetic succeptibity measurements of metal complexes.

Compound	μ_{eff} in BM	Solution Conductivity	UV Bands
LA	Diamagnetic	-	286, 329 $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$
Ni (II)	2.85	14	768, 670 dd transition
Mn(II)	5.78	28	470, 840 spin forbidden

Antibacterial Activity of Ligand and its Metal Complexes

Most of the researchers were interested to find out the biological and medicinal properties of transition metal complexes of thiosemicarabzones. Thomas and parameshwaran [27] studied the antitumour activities of transition metal chelates of thiosemicarabzones. The synthesized schiffs base LA and its metal complexes were evaluated for antibacterial activity against S. aureus and B. substilis.

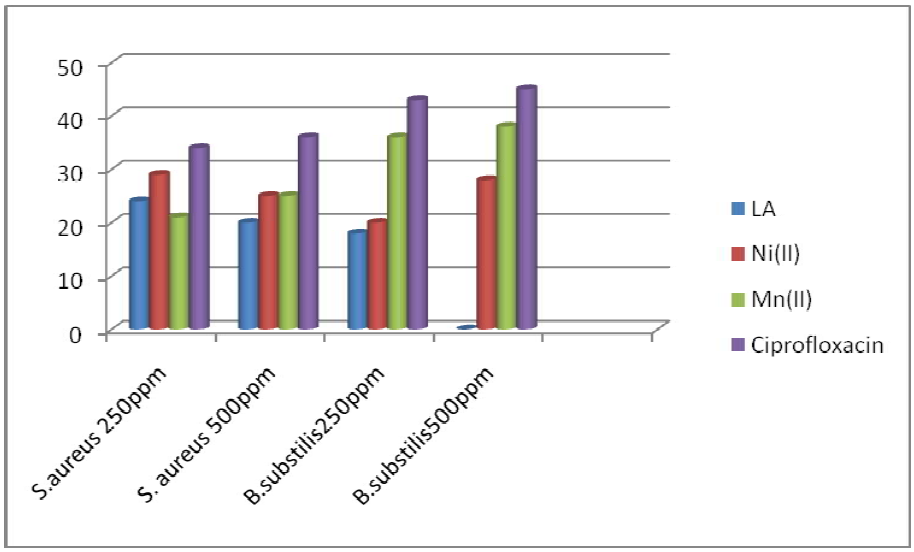
The results of the antimicrobial screening are presented in Table.3 Generally it is observed that the thio-keto schiffs bas LA and its metal complexes were found to be biologically active. However remarkable antibacterial activity was shown for the metal complexes which is

due to it contain S and N atom. It is revealed that metal complexes have enhanced biological activity than parent Schiffs base.

Table. 3 Antibacterial activities of ligand and its metal complexes

Ligand/Complex	Staphylococcus aureus		Bacillus substilis	
	250ppm	500ppm	250ppm	500ppm
LA	24	20	18	00
Ni(II)	29	25	20	28
Mn(II)	21	25	36	38
Ciprofloxacin	34	36	43	45

Fig. Comparative study of antibacterial activity of Ligand and its metal complexes.



Conclusion:

The Ni(II) and Mn(II) metal complexes of Thiosemicarbazone ligand were studied by UV, IR, Magnetic susceptibility and Solution conductivity shows that metal ion coordinated to ligand by phenolic oxygen, azomethine nitrogen and thione sulfur group. UV spectra shows presence of dd and spin forbidden transitions, magnetic moment values suggest octahedral geometry and solution conductivity shows these metal complexes are nonelectrolyte in nature. Antibacterial activity of metal complexes is enhanced than schiffs base ligand.

Acknowledgement:

The authors are grateful to the Head, Department of Chemistry, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad for providing laboratory facility.

Reference:

1. Mishra D, Naskar S, M G B, Chattopadhyay S.K, Inorg. Chim Acta 2006; 359: 585-592.
2. Casas J. S, Garcia-Tasende MS, Sordo, Coord. Chem. Rev. 2000; 209: 197-261.
3. Padhye S, Kauffman GF, Coord Chem Rev 1985; 63: 127-160.
4. Pal I, Basuli F, Bhattacharya S, Coord.modes, Proc Indian Acad Sci; Chem Sci 2002; 114; 255-268.

5. Belicchi Ferrari M, Capacchi S, Pelosi G et al. Inorg Chim Acta 1999; 286; 134-141.
6. Dutta s, Basuli F, Peng S. M, Lee G. H, Bhattacharya S, New J chem 2002; 26; 1607-1612.
7. El-Sawaf A. K, West D. X, El-saied F.A, El-Bahnasawy R. M, Trans. Metal Chem 1998; 23; 649-655.
8. Purohit S, Koley A. P, Prasad L. S, Manoharan P. T, Ghosh S, Inorg Chem 1989; 28; 3735-3742.
9. West D. X, Swearingen K, Valdes-Martinez J et al, Polyhedron 1999; 18;2919-2929.
10. Afrasiabi Z, Sinn E, Chen J. et al. Inorg. Chim Acta 2004; 57; 271-278.
11. Kovala-Demertzi D, Miller J. R, Kourkomelis N, Hadjikakou S. K, Demertziz MA, Polyhedron 1999; 18; 1005-1013.
12. Singh N.N, Singh S. B, Ind J. Chem 2001; 40; 1070-1075.
13. Agarwal R. K, Singh L, Sharma D. K, Bioinorganic Chem Appl. 2006, Article ID 59509, 10 pages.
14. Garcia-Tojal, Lezama L, Pizarro JL, Insausti M, Arriortua MI, Rojo T, Polyhedron 1999; 18; 3703-3711.
15. Labisbal E, Haslow K. D, Sousa-Pedrares A, Valdes-Martine J, Hernandez-Ortega S, West D. X., Polyhedron 2003; 22; 2831-2837.
16. Chattopadhyay S.K, Ghosh S.A, Inorg. Chim Acta 1987; 12; 299-301.
17. Mukkanti K, Singh R. P, Trans Metal Chem 1987; 12; 299-301.
18. Sinha P. K, Chakravarty J, Bhattacharya S, Polyhedron 1997; 16; 81-87.
19. Chakravarty J, Bhattacaharya S., Polyhedron 1994; 13; 2671-2678.
20. Chattopadhyay S. K., Hossain M, Ghosh S, Guha A. K, Trans Metal Chem., 1990; 15; 473-477.
21. Jayabalkrishnan C, Karvembu R, Natarajan K, Synthesis React. Inorg. Metal-Organ Nano-Metal Chem 2002, 32; 1099-1113.
22. Salah S. Ind. Eng. Chem Res 2001; 40; 37-39.
23. Saha G. C, Khayax K, Islam Md R, Choudhury Md. SK. Ind. J. Chem 1992; 31; 547-550.
24. R. P. John, A. Shreekanth, M. R. P. Kurup, A. Usman, A. R. Ibrahim, H. K. Fun, Spectrochim. Acta, 59 A, (2003) 1349.
25. D. X. West, I. S. Billeh, J. P. Jasinski, J. M. Jasinski, R. J. Butcher, Trans Met. Chem., 23, (1998), 209.
26. Manolov L, Raleva S, Genova P, Savov A, Froloshka L, Dundarova D, Radka Argirova R, Bioinorg Chem Appl 2006; 71983.
27. Thomas J, Parameshwaran G, Asian J. Chem 2002; 14: 1354-1364.