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Synthesis, Characterization, and Antibacterial Activity Studies of Mn (II) Complex with Schiff base

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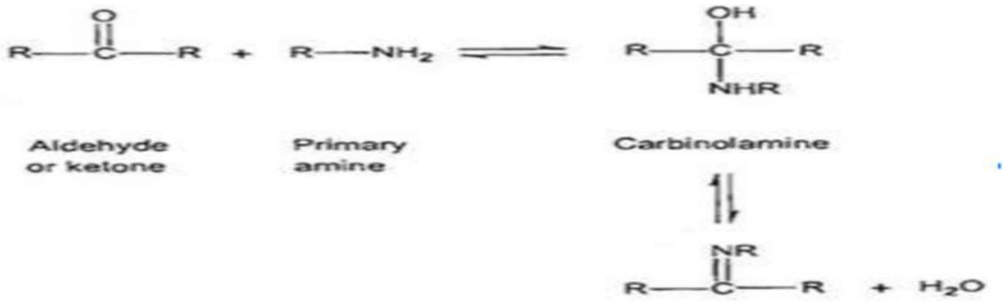
Abstract:
This study synthesized and characterized the transition metal chelates of Mn (II) with Schiff base. Elemental analysis data showed that the isolated chelates are in a 1:1 [M: L] ratio. The molar conductance values revealed that the chelates are non-electrolytes in nature. The results of magnetic moment measurements demonstrated that the chelates of Mn (II) have unpaired electrons. The infrared spectral data displayed the main coordination sites of Salicylaldimine towards Mn (ll) ions. The electronic spectrum results of the Schiff base ligand and its chelates suggest that the Mn (II) has an octahedral structure. This study paper summarizes the synthesis via the traditional method of the Schiff base and its metal complex. The antibacterial function of the Schiff base's metal complex has also been discussed. Using H1 NMR and elemental analysis, the compound's structure was reported. The obtained Schiff bases have been evaluated against bacteria such as E. coli and S. aureus.

Keywords: **Schiff base complex – Manganese (II) synthesis – Antibacterial activity – Octahedral structure**

Introduction

Schiff bases compounds are contain azomethine group (-HC=N-), and were first reported by Hugo Schiff in 1864 [1]. These compounds are also known as anils, imines or azomethines. It is usually formed by condensation of ketone or an aldehyde with primary amine [2]. Schiff bases are the most widely used organic compounds. They have been shown to exhibit abroad range of biological activities, including antifungal, antibacterial, and antimalarial, ant proliferative, anti-inflammatory, antiviral, and antipyretic properties. this study summarizes the synthesis and the biological activities of Schiff bases and them chelates [3] A research paper revealed comparative study between antimicrobial activity of metal complex of ligand and simple ligand by testing it against gram positive bacteria *Staphylococcus Aureus*. Metal complex of Schiff base obtained from salicyl-aldehyde and 1, 2-phenylenediamine with the bivalent transition metals Zn and Cu was characterized and tested. It was concluded from the experiment that the metal complex of the salicylaldehyde ligand shows more activity than the salicylaldehyde ligand [8]. A Schiff base formed by 2- Hydroxy-6penta-decylbenzaldehyde and 6-bromo-3- chloro1-benzo-thiophene-2-carboxy-licacidhydrazide was synthesized and tested anti-fungal and anti-bacterial activity against *B. subtilis* and *S. aureus* [9]. [5]. Schiff bases and their metal chelates play an important role in the development of coordination chemistry resulting an enormous number of publications, has been studied extensively, and have gained much importance recently due to their chelating ability, antimicrobial, anti-inflammatory activities and anticorrosion [6-9]. Schiff bases used in the fields of industry, medicine, and organic synthesis, analytical inorganic chemistry, they used in optical and electrochemical sensors, transition metal complexes are used in dyes industry for food, leathers, and wood [10,11] tetra dentate Schiff bases ligand with a N_2O_2 donor atom set are well known to coordinate with various metal ions, and this has attracted the interest of many authors. Chelates of Schiff base ligands studied for their oxidative catalysis [12].



Scheme 1 formation reaction of Schiff base

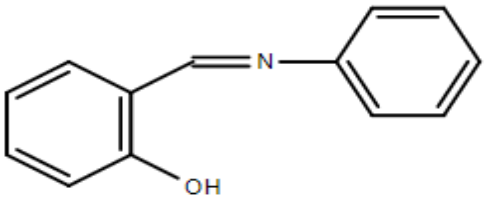
Materials

Al the chemicals used in this study were of analar grade (BDH, Aldrich) including salseldehyde , anilne, ethanol diethyl ether and diethyl formamide.

Synthesis of Schiff base L

The Schiff base was synthesized by adding (1.22ml, 0.01mol salseldehayed) dropwise to (0.92ml, 0.01 mol) in 50 ml of absolute ethanol. The reaction mixture was refluxed for three hours. Then the product obtained was allowed to cool at room temperature, filtered and recrystallized from ethanol, and then dried under vacuum to get pale yellow precipitate (yield 80 %). The Schiff base formation can be explained as shown in scheme

Scheme 1. Synthesis of Schiff base L/Reaction condition: salseldehyde (1.22ml, 0.01mol), aniline (0.92ml, 0.01mol), absolute ethanol (50 ml)



Scheme2 Schiff base L1

Synthesis of Schiff bases complex with Mn (II):

The Schiff bases L chelate under investigation were synthesized by adding Salicylaldimine (1.84g ,0.01 mole) in absolute ethanol. The reaction mixtures were heated under reflux for3 hours. The chelates were faltered of recrystallized from ethanol and finally kept in a desiccator over silica gel.

Antibacterial activity:

The antibacterial performance of the prepared compound was examined by a well diffusion assay method. For quality purpose, Std. strains *S. aureus* ATCC 25923 and *E. coli* ATCC 25922 were used. Nutrient agar medium was prepared and autoclaved for the well diffusion assay. The inoculum of 150 µl of each bacterium was spread with a swab on the plate of culture media/ nutrient agar.

Wt. of sample in gram= M. wt x VmI/1000

Wt of sample in gram = M.wt x 0.1 x1ml /1000

Results and discussions

The reaction between the salseldehyde and aniline yields one product (scheme 1)

Table 1 some physical properties of the Schiff bases L and its chelate with Mn (II):

Compound/chalets	M.Wt	M.P	color	^(µs)	BM
L1(C13H10ON)	184	60	orange	-	-
L3Mn.Cl2	277	300<	Green	11	1.89

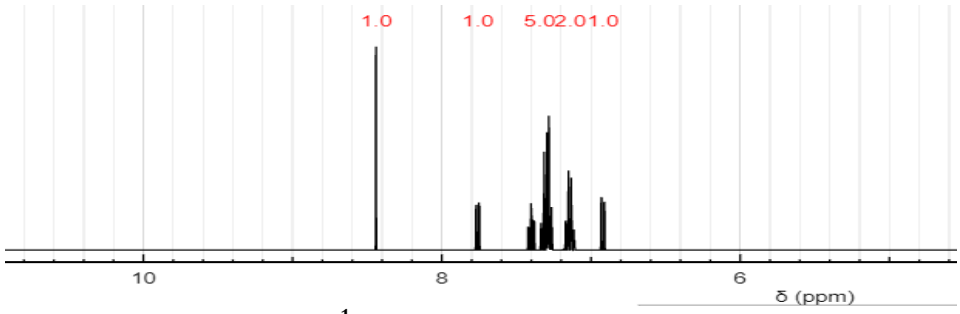


Figure1. H^1 NMR spectrum of Schiff base

Proton nuclear magnetic resonance spectrum of L

The H^1 – NMR spectrum recorded in d_6- DMSO solvent on a jeol-90 Fourier transform (200 MHZ). Shows some singlet signals (Figure3) 8.2 ppm assigned to isomethene proton, 6.9 to 7.9 ppm, assignable to the protons of two phenyl ring with C= and OH, phenyl ring in downfield and phenyl ring bond with =N bond

Infrared spectra of Schiff base and its complex:

The IR spectra of the ligands and its chelates with Mn^{2+}, were recorded in the solid state in the rang 400-4000 cm^{-1} using kBr disk on Perkin –Elmer 1430 ratio recording infrared spectrophotometer (Figures 7-10). The IR spectral data are present in Tabl 2. A verification of the structures of metal chelates can be easily

achieved by comparing the IR spectrum of the free ligand with those chelates [25].

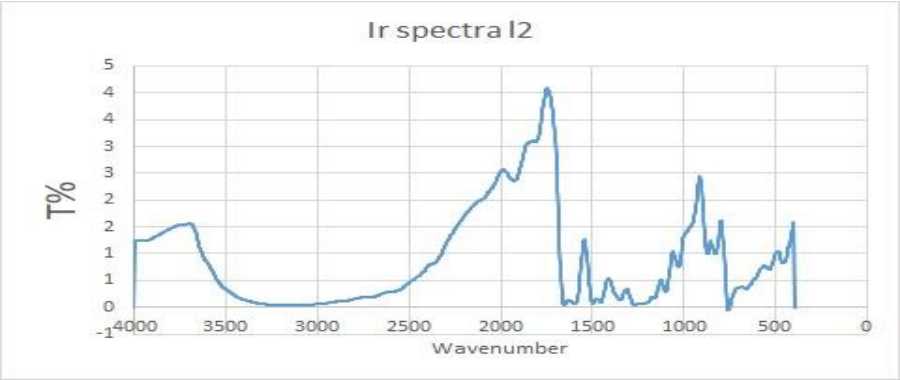


Figure2IR spectrum of Schiff base

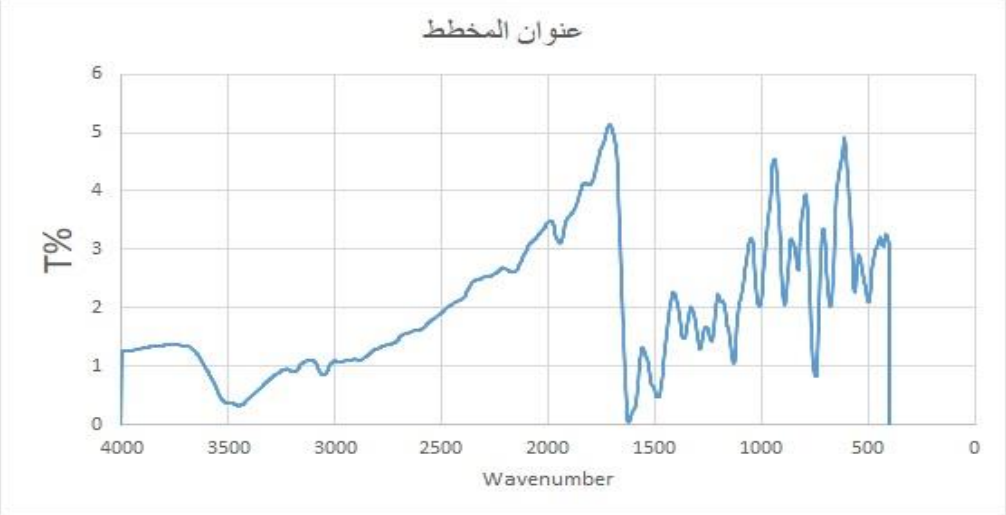


Figure2. IR spectrum of the complex

The IR spectrum of the Schiff base display five bands the first is broad beak 3000-3500 assigned to OH group,and sharp beak at 1600 which assigned isometine-C=N group and weak band at 1600 which indicate phenyl (phenyl ring), and CH (stretching vibration) groups respectively [26], Also one strong band at 1609 cm^{-1} due to C=N and a band at 1507 cm^{-1} bending vibration in figure 2 IR spectrum revealed broad bands at range of 3500 cm^{-1} that attributed to stretching vibration OH of coordinated water molecules banding with chelates formation [27].The. New bands observed at 597-623 cm^{-1} and at 549-715 cm^{-1} which could be attributed to υ(M-O) and υ(M-O) vibrations[29,30]. When a Sciff bases ligand is coordinated to metal ion at least one additional atom introduced into the ligand

vibrating system. It is thus expected that bond lengths, angles interacting forces within the ligand would be altered even at least slightly.

Antibacterial activity results

The ligand and its synthesized chelates were screened for their possible antibacterial activities against three types of bacteria The ligand and it chelates showed moderate to good *Staphylococci* Antibacterial activities were performed by cup plate method. Inhibition zone were recorded by measuring the diameter of inhibition zone in mm at the end of 24 h [31]. At room temperature, the results of antibacterial study are tabulated in The widest inhibition zone was formed around *EColi* of the complexes of Mn (II), with Schiff from salseldehyde with aniline

Table3. Antbacterial activeity results (mm) for the Schiff base and its complexes.

Compouds	Zone of inhibition (mm)	
	E.Coli	Staphylococci
Dmso(negative standred)	0	0
L1(C13H10ON)	14	20
L1Mn. Cl2 2H2O	13	20
Amoxicillin (positive stander)	33	35

CONCLUSION

Schiff bases are highly versatile members of coordination compounds. They show various physiological and chemical properties along with active biological activity The complex of Schiff base with metal ion has various applications such as antiviral, antitumor, antipyretic or anti-inflammatory agents. Many on going researches are focused on the chemotherapeutic activity of these complexes. In this research copper complex of Schiff base was prepared from salicylaldehyde and aniline using a conventional method. activity against *E. coli.* and *S. aureus.* Further, many modified compounds can be formed using this method and lead to development of drugs for cancer.

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