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Synthesis and characterization of novel Schiff's base Ni (II) and Fe(III) & its complexes with its anti-bacterial activity

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Abstract

Schiff's bases is synthesized from Salicylaldehyde and Ethylene-diamine. This Schiff's bases have been identified by infrared spectra and its melting point. Antibacterial activity of prepared Schiff's bases was also studied on the four types of bacteria, Gram positive Staphylococcus aureus and Corynebacterium diphtheriae while Gram negative Salmonella typhi and Escherichia coli. It was found that the Schiff's bases under study were considered inhibitors for bacterial growth with variation extent. The Schiff's base was synthesized & characterized by IR spectra. Its metal complexes with the metals Ni (II), Fe (III) were synthesized & characterized by the determination of mp. Based on the studies it has been proposed for all the synthesized complexes.

Keywords: Salicylaldehyde, Ethylene-diamine, Ethanol, Antibacterial activity.

Introduction

Compounds containing an Azomethine group (-CH=N-) are known as Schiff's bases. They are usually formed by condensation of a primary amine with a carbonyl compound. Schiff's bases of aromatic aldehydes having an effective conjugated system, are more stable while those of aliphatic aldehydes are relatively unstable and are readily polymerizable. In chemistry, Schiff's bases find a versatile use; some of them are the basic units in certain dyes, whereas, some are used as liquid crystals. In organic synthesis, Schiff's bases reactions are useful in making carbon – nitrogen bonds.

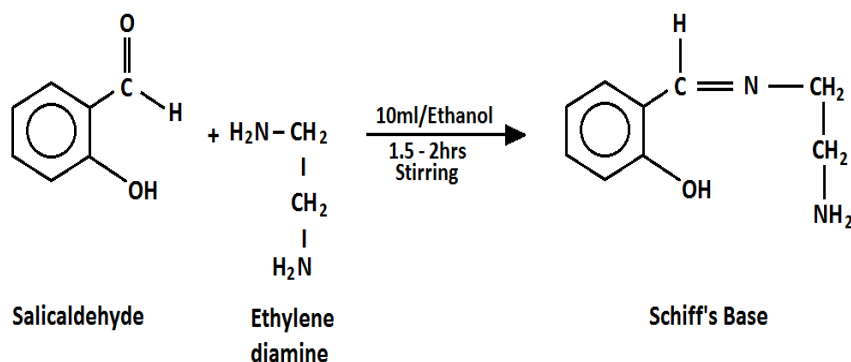
Experimental

Synthesis of Schiff's Base Ligand

Preparation of Schiff's Base

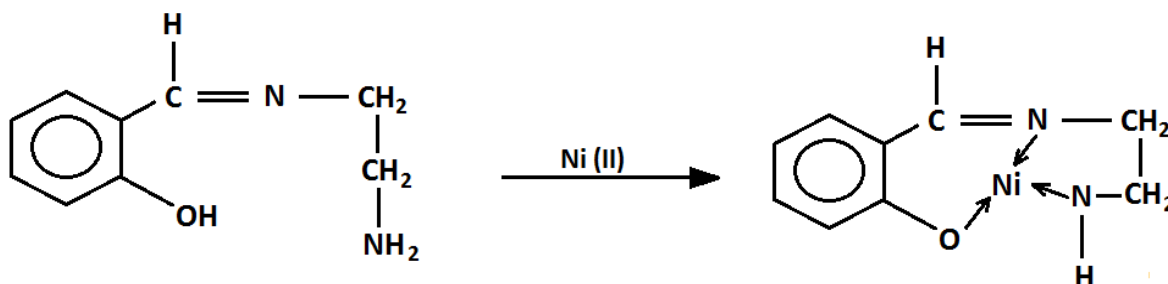
Taken Salicylaldehyde (0.4mm) with Ethylene-diamine (0.3mm) in ethanol and the reaction mixture stirred on hot plate for 2 hour. It was stirred and content of the flask was cooled. The mixture, the product was filtered under suction and washed with ethanol. The product obtained was yellow colour solid, were dried at room temperature and recrystallized with ethanol. Yield range 75-80%, Melting point 220 °C

Reaction



Synthesis of Ni (II) Complexes

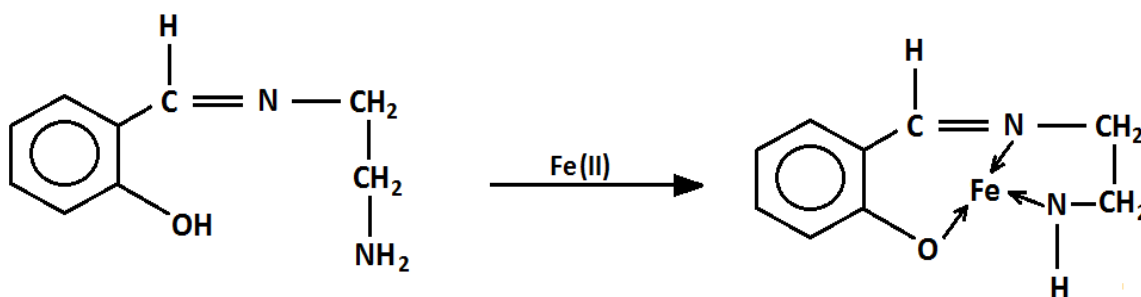
The Schiff's base complexes under investigation were synthesized by mixing the Schiff's base (0.1 mm) in hot ethanolic solution, with hot ethanolic solution of NiCl₂.6H₂O. The reaction mixture were refluxed in a waterbath for 5 hours and their volume were reduced to 70% of its original volume.



Schiff's Base

Synthesis of Fe (III) Complexes

The Schiff's base was taken in hot ethanol and treated with a hot ethanolic solution FeCl₃ anhydrous (2 gm). The yellow colour solution of ligand change to brown after mixing the solution. This reaction mixture was refluxed for 6 hours. And



Schiff's Base

Characterization of the Schiff's base

The newly synthesized ligands were characterized by IR, repeated MP's determination studies.

Antibacterial activity

The antibacterial activity of newly synthesized Schiff's base was conducted against Gram positive bacteria i.e Staphylococcus aureus, Corynebacterium diphtheriae and Gram negative bacteria i.e. Escherichia coli, Salmonella typhi by using DITCH PLATE TECHNIQUE. Septran tablet was employed as reference standard to compare the results. STERILE MUELLER HINTON AGAR was used for the screening methods.

The coloured product obtained were filtered by under suction, washed with ethanol. The product were recrystallized from ethanol. Their yields range from 50-55% the product obtained were coloured brown and melting point 385 °C.

Reaction

mixture of solution cooled, filtered by under suction. Crystalline solid was separated out on. Recrystallized from ethanol. The yield 55% and melting point 394 °C.

Reaction

Antimicrobial Activity

All the synthesized test compound were screened for their anti-bacterial activity by Ditch Plate Technique Using (Gram positive) organism Such as Staphylococcus aureus and Corynebacterium diphtheriae (Gram negative) Escherichia coli And Salmonella typhi. Media used is Sterile Mueller Hinton Agar and Inhibition condition is 37 °C For 24 Hours

Results were recorded as zone of inhibition as shown in table.

1. Growth on ditch

Sample Culture used	Amount added to ditch in gm	Escherichia coli	Salmonella typhi	Staphylococcus aureus	Corynebacteriu m diphtheriae	Conclusion
Positive control (Septran tablet)	0.05	No Growth on test culture	No Growth on test culture	No Growth on test culture	No Growth on test culture	Compound has antibacterial activity and is active against both gram positive as well as gram negative bacteria
	0.1	No Growth on test culture	No Growth on test culture	No Growth on test culture	No Growth on test culture	
Salicylaldehyde +Ethylene diamine	0.05	No Growth on test culture	No Growth on test culture	No Growth on test culture	No Growth on test culture	
	0.1	No Growth on test culture	No Growth on test culture	No Growth on test culture	No Growth on test culture	

2. Growth around ditch

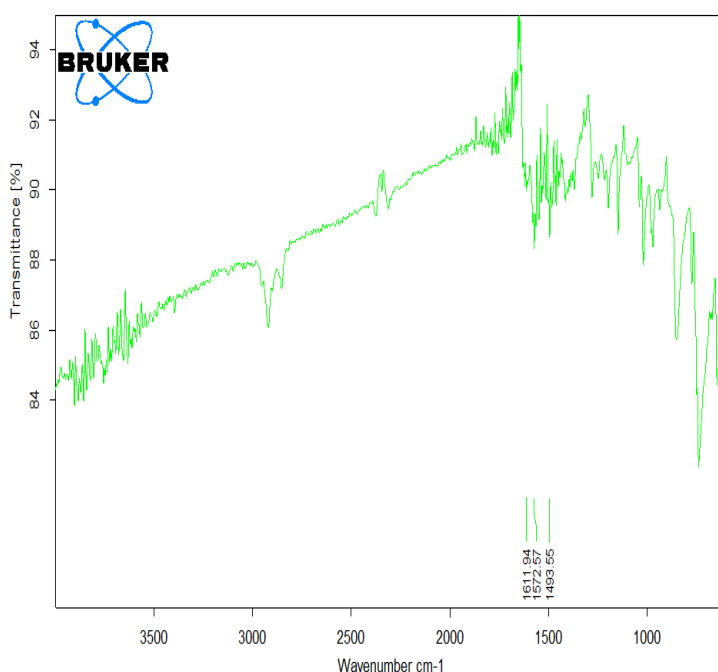
Sample Culture used	Amount added to ditch in gm	Escherichia coli	Salmonella typhi	Staphylococcus aureus	Corynebacterium diphtheriae	Conclusion
Positive control (Septran tablet)	0.05	No Growth on test culture	No Growth on test culture	No Growth on test culture	No Growth on test culture	Compound has antibacterial activity and is active against both gram positive and gram negative bacteria
	0.1	No Growth on test culture	No Growth on test culture	No Growth on test culture	No Growth on test culture	
Salicylaldehyde +Ethylene diamine	0.05	Growth on test culture	Growth on test culture	Growth on test culture	Growth on test culture	
	0.1	No Growth on test culture	No Growth on test culture	No Growth on test culture	No Growth on test culture	

Result and Discussion

1) Infrared spectra of the ligand

The infrared spectra of all the synthesized complexes were scanned in the 3000-600 cm^{-1} in KBr pellet at The IR spectra of the ligands were recorded for the identification of their donor sites and to compare the shifts in frequencies after their complexation with different metal ion. A partial listing of the IR spectra of the ligand and all the ligands exhibit following due to assignments.

- A medium sharp absorption band around at 3200-3100 cm^{-1} to N-H stretching vibration of NH_2 group of the ligand.
- A strong absorption band at 1600-1675 cm^{-1} is due to C=N (imine) stretching vibration.
- Aromatic C-H band at 3000-2900 cm^{-1} is due to delocalization.



Characterization of Schiff's base

Schiff's base synthesized has an antibacterial activity and is active against both Gram positive and Gram negative bacteria.

Conclusion

The synthesized Schiff's base were characterized on the basis of Melting point, IR. Also the complexes of synthesized ligand with stirring method is characterized on basis of melting point. This shows that good arrangement of literature values. Hence we clearly say that there is formation of Schiff's base from stirring method also.

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