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STUDIES ON NEW SCHIFF-BASE COMPLEXES WITH THEIR APPLICATIONS

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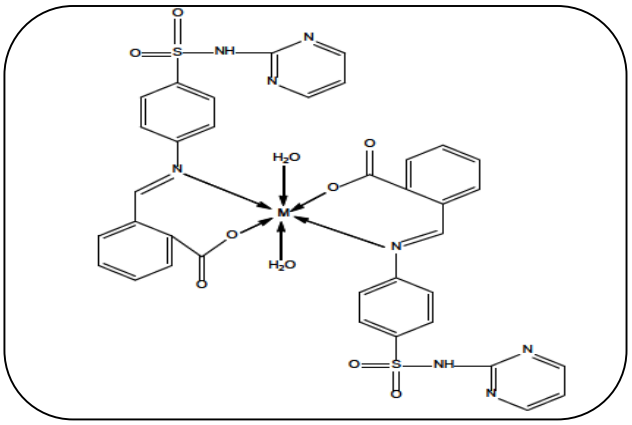
ABSTRACT
Application of shiff bases and their metal complexes as catalysts, in various biological system, polymer and dyes have been presented. .Their use in birth control and food packages. This shiff bases show the antimicrobial activities, antifungal activities, antiviral activities.

KEYWORDS: *Schiff base, Catalysts, Biological activities, Metal complexes .*

INTRODUCTION

Schiff bases were reported to possess antibacterial, antifungal, antiviral, anti HIV, antiprotozoal, and anthelmintic activities1. They also exhibit significant anticonvulsant activity, apart from other pharmacological properties2. The study of aromatic substances having a molecular structure with π-bonds in chains is an active research area in the field of conducting substances3, 4, and also metal complexes play an assential role in agriculture, pharmaceutical and industrial chemistry Ligands a metal surround by a cluster of ions or molecules, is used for prepration of complex compounds named as Shiff bases.5 Schiff bases are the compounds containing azimethine group (-HC=N-). They are condensation products of ketones or aldehydes with primary amines and were first reported by Hugo Schiff in 1864. Formation of Schiff base generally takes place under acid or base catalysis or with heat. The common Schiff bases are crystalline solids, which are feebly basic but at least some form insoluble salts with strong acids. Today,Schiff bases are used as intermediates for the synthesis of amino acids or as ligands for preparation of metal complexes having a series of different structures. A Schiff base behaves as a flexidentate ligand and commonly coordinates through the O atom of the deprotonated phenolic group and the N atom of azomethine group.



Schiff base ligands have significant importance in chemistry; especially in the development of Schiff base complexes, because Schiff base ligands are potentially capable of forming stable complexes with metal ions6. Many Schiff base complexes show excellent catalytic activity in various reactions at high temperature (>100 °C) and in the presence of moisture. Over the past few years, there have been many reports on their applications in homogeneous and heterogeneous catalysis, hence the need for a review article highlighting the catalytic activity of Schiff base complexes realized7,8.

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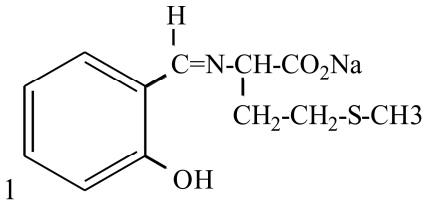
Schiff bases have been used extensively as ligands in the field of coordination chemistry, some of the reasons are that the intramolecular hydrogen bonds between the (O) and the (N) atoms which play an important role in the formation of metal complexes and that Schiff base compounds show photochromism and thermochromism in the solid state by proton transfer from the hydroxyl (O) to the imine (N) atoms9.

Formation of New Schiff base:-



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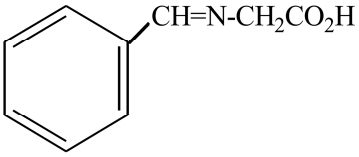

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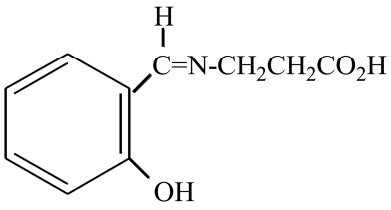

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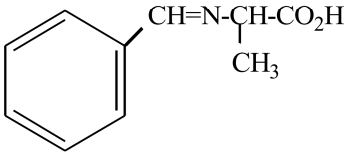

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Table- Physical data for Schiff bases:

S.No	Name	M.p & B.p (^{O}C)	Color	IR bands cm^{-1}		
				OH	C=O	C=N
1	Salicylidene glycine	180	Yellow	3443.62(b)	-	1618
2	Salicylidene ß–alanine	120	Faint yellow	3424.33(b)	1637.89 (s)	1612.17(s)
3	Benzylidene glycine	195	Milky	3423.82(b)	16644.75(s)	1597.43(s)
4	Benzylidene DL-alanine	110	Faint orange	3393.22(b)	1745.51 (m)	1594.01(s)

Synthesis of Schiff bases:-

Synthesis of salicylidene glycine (1) and salicylidene ß-alanine (2):-

In a 50 ml conical flask, prepare a separate 10-2 mole solutions by dissolving (1.2g) of salicylaldehyde, (0.75g) of glycine, (0.89g) of DL- alanine, (0.89g) of ß-alanine, and (0.4g) of sodium hydroxide, in 15 ml of ethanol. To prepare any Schiff bases stated, mix the salicylaldehyde solution with the proper amino acid solution and the mixture is stirred. By gradual addition, adds the sodium hydroxide solution to each mixture during a period of 30 minutes. The final mixture is left for about 15 minutes, filtered, washed with cold ethanol and dried. Pure products have m.p's of 180C , 195C (decomp.) and 120C for Schiff bases 1-3 respectively .

Synthesis of benzylidene glycine (3) and benzylidene DL-alanine (4):-

In 50 ml round bottom flask attached with a reflux condenser, mix 1.06 g of benzaldehyde, (0.75g) of glycine or (0.89g) of DL-alanine and (0.4g) of sodium hydroxide. Add 20 ml of ethanol to each mixture and the final mixture is refluxed for 3 hours for benzylidene glycine or 2 hours for benzylidene DL- alanine. The mixture is cooled and filtered. Products are washed with cold ethanol and dried. Pure products have a melting points of 195C (decomp.) and 110C for Schiff bases (3) and (4) respectively.

Instrumental: -

The melting points of solid Schiff bases are measured by electro thermal m.p apparatus model BÜCHI 510. The IR spectra for liquid or solids Schiff bases are measured by a computerized FTIR, Bruker model Tensor 27.

Catalyst:

Aromatic shiff bases or their metal complexes catalyze reactions on oxygenation10,11 hydroysis12, electro-reduction13 and decomposition14. Some copper complexes, Derived with amino acids, enhance (10-50mints times) hydrolysis rate12, more than simple copper (II) ion. Synthetic iron (II) Schiff base complexes exhibits catalytic activity towards electron-reduction of oxygen15.

Biological Activities of Schiff Bases:-

Antimicrobial activities: Schiff base derived from furylgloxyl and p-toludine show antibacterial activitiy against Esherichia coli,. Some heterocyclic Schiff base 16-18 can act as a antibacterial agent. Isatin derived Schiff base 19, 20 posses anti-HIV activity and anti-bacterial activity. Schiff bases (banzimidazole21, toluidinones22, quin-azolinones23, furaldehyde24, thiazole25, 26 pyrimidine27, indole28, show antibacterial activity.

Schiff base29-31 with thiophene carboxaldehyde and aminobenzoic acid show anti-bacterial activity. Lysine based Schiff bases and their complexes 32 with La, Co, Fe, show bacteriostatic activity to B. subtilis, E.coli and S. aureus. Zn (II), Cd (II), Ni (II) and Cu (II) complexes with furfural and semicarbazide33, and with furfurylidene diamine 34 Shiff bases show antibacterial activities. Organo-silicon (IV) complexes 35 with bidentate Schiff bases, organo-lead (IV) complexes 36 with nitrogen donar legands of sulpha drugs posses antibacterial activities.

Antifungal activities:

Benzothiazole Schiff bases37posses effective antifungal activity. Schiff bases and their metal complexes 38 formed between furan or furylglycoxal with various amines show antifunagal activity against Helminthsorium gramineum (causing stripe disease in barely) Syncephalostrum racemosus (causing fruit rot in tomato).

Antiviral activities:

Schiff base of gossypol 39 show high antiviral activity. Flourination 40 on aldehyde part of shiff base enhances insectoacracidal activity. Schiff bases (thiadiazole derivatives with salicylaldehyde) and their metal complexes 41 with Mo (IV) show insecticidal activities against bollworn and promote cell survival rate of mung bean spouts.

Applications of Schiff bases:-

Effect of N-salicyladehyde amino glucose (SG) Schiff base complex 120 with Cu (II) and Zn (II) inhibit synthesis of O2 markedly, inhibitory effect of Cu (SG) was more than that of Zn (SG) . Complexes Cu (SG) and Co (SG) combines with salman sperm DNA. Tetradentate Schiff base and its metal complexes with Mn (II), Ni (II), Cu (II), and Zn (II) show miscellaneous effect on membrane in amylose production.

Some Schiff bases 42 posses' simple harmonic generation activity. Amino Schiff base forms chelates with Cu (II) and Fe (II) and acts as a thrombin inhibitor43. Carnosine and anserine act as effective trans-glycating agent in decomposition of aldose-derived Schiff basses 44

RESULTS AND DISCUSSION: -

Schiff bases show failure synthesis from salicylaldehyde or benzaldehyde with some amino acids, by the usual classical synthetic method,45 this is because Schiff base have reversible nature of synthesized Schiff bases reaction. It had previously used a several catalysts 45, 46-48 to overcome on such problem, but now there is way to use sodium hydroxide catalyst for the first time during synthesis of Schiff bases, which is highly accepted as a catalyst and kinetic49 point of view.

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