A STUDY ON BIVALENT METAL CHELATES: WITH A REFERENCE OF SCHIFF BASES

Shobha Chauhan[1], Dr. Manjul Mishra[2*]

Abstract

The elemental analysis, molar conductance measurements, infrared and electronic spectra of certain novel chelates of Mn(II), Co(II), Cu(II), and Cr(III) ions with Schiff base generated from salicylaldehyde and thiourea have been examined. The elemental analysis results revealed that a 1:1 [M:L] ratio has formed. The molar conductance values obtained, demonstrated that all of the chelates are non-electrolytic. The chelation behavior, which occurs through the nitrogen and oxygen atoms of the ligand, was shown by the infrared spectrum data. The electronic absorption spectral data displayed the existence of $\pi-\pi*$, n-$\pi*$ (HC≡N) transitions and the expected geometrical structures. By testing the effects of these Schiff base ligands on five species of bacteria in vitro, it has been found that Mn(II) chelate was very effective, Co(II) chelate had moderate effect and no effect of Cu(II) chelate was found on these bacteria. The effects of Mn (II) and Co(II) chelates increased with higher concentrations.

Keywords: Bivalent Metal chelates, Electronic Spectra, Infrared Spectra**,** Schiff bases, Molar Conductance, Schiff base ligands.

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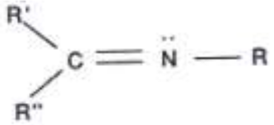
1. INTRODUCTION

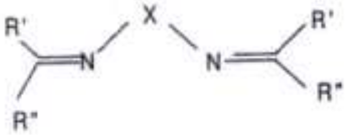
Reactions in olefins hydrogenation and in amino ranges, as well as their photochromic characteristics and capacity to complex other deadly metals, have all been studied extensively for their interesting and vital qualities. Chelation of Schiff bases uses the metal particles' strong attraction to their solid complexes in their development. In coordination chemistry, ligands of the Schiff base family are crucial. It was assumed that coordination would play a major role in the formation of chemistry, but this was not the case.[1]

Schiff base containing azomethine bunches with possible binding ability has been considered in the last few years because of their biocidal capabilities.

Substance blends comprising two fold carbon-nitrogen as practical gatherings, where the nitrogen molecule is linked to the alkyl or aryl gathering (R) but not hydrogen, are known as Schiff bases. Azomethine is a synonym for Schiff base. Hugo Schiff name has been given to the generic form of these compounds:



Where R is an alkyl or phenyl group that forms a stable Schiff base imines. They can sort out metal particles by using the imines nitrogen and another grouping, which is usually linked to aldehyde. Schiff bases are still synthesized by chemists, and active Schiff base ligands with well-designed structures are today designated as "privileged ligands." The Schiff connected bases are accompanied by a framework that has several functional groups that may be altered as necessary,



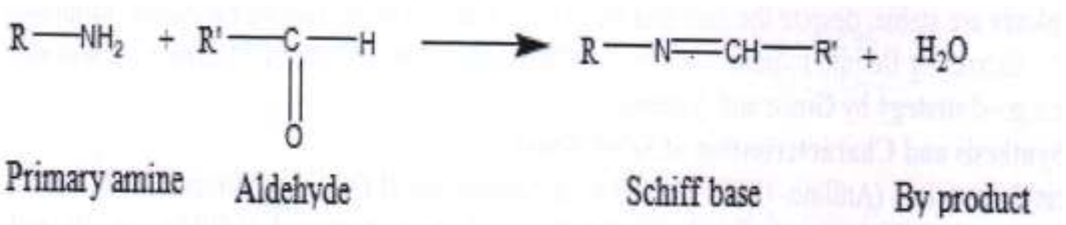
Where R'' = phenyl or substituted phenyl, R' = H or alkyl group, X = alkyl or aryl group.

The addition of metals to Schiff bases can regulate a large variety of helpful synergistic transformations in certain oxidation states, which, in my opinion, opens up a world of possibilities.

Sulfur, nitrogen, or selenium can replace the oxygen Iota's in Schiff bases, which often contain NO or N_2O_2-contributor sets. As a chelating agent, Schiff bases have been widely used in the pharmaceutical industry, but their application for analytical purposes has been limited due to two major drawbacks: their inability to dissolve in water and their tendency to breakdown in acidic solutions. Based on Schiff base, this family may be separated into symmetric and asymmetric subgroups. However, hydrazones are the best examples of asymmetric Schiff's bases since they are both even and asymmetric.[2]

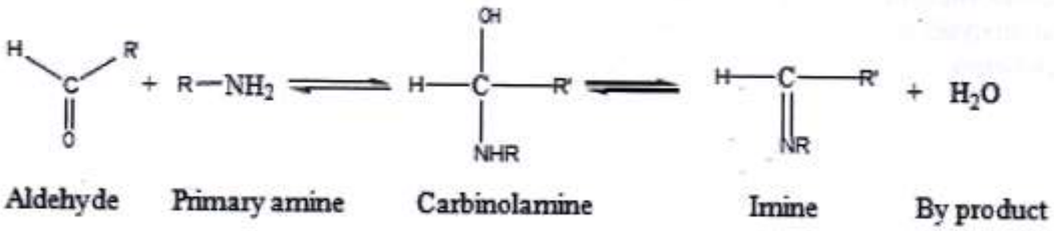
1.1 Schiff Base

Schiff bases are condensation products of primary amines with carbonyl compounds and they were first reported by Hugo Schiff in 1864. The common structural feature of these compounds is the azomethine group with a general formula RN=CH-R', where R and R' are alkyl, aryl, cyclo alkyl or heterocyclic groups which may be variously substituted. These compounds are also known as anils, imines or azomethines.



Scheme 1.1 Process of condensation of aldehyde and primary amine

Schiff bases that do not include alkyl substituents are significantly more stable than those with alkyl substitutes. While aliphatic aldehydes are often unstable and rapidly polymerizable, aromatic aldehydes are more stable and successful conjugation and polymerization are more long-lasting. Schiff base production from aldehydes or ketones is an acid or base-catalyzed process that can be reversed by heating.[3]



Scheme 1.2 Process of formation of Schiff base with Carbinolamine intermediate

Separation of the product or elimination of water, or sometimes both, is used to bring the formation to a close. Aqueous acid or base can hydrolyze several Schiff bases back to their aldehydes, ketones, and amines, depending on the base or acid used. The process by which Schiff bases are formed is yet another variant on the topic of carbonyl group nucleophilic addition. N-nitroso amine is used as a nucleophile here. The amine interacts with the aldehyde or ketone in the first stage of the process to produce carbinolamine, an unstable addition product. Acid or base-catalyzed routes are used to remove water from carbinolamine. Carbinolamine undergoes acid-catalyzed dehydration because it is an alcohol. Schiff base production is catalysed by acids because dehydration of the carbinolamine is often the rate-determining step. However, because amines are basic chemicals, the acid concentration should not be excessive. The production of carbinolamine is prevented if the amine is protonated and rendered non-nucleophilic. Since many Schiff bases are best synthesized at a somewhat acidic pH, this is the preferred method[4].

1.2 The Stability of Schiff Base Complexes

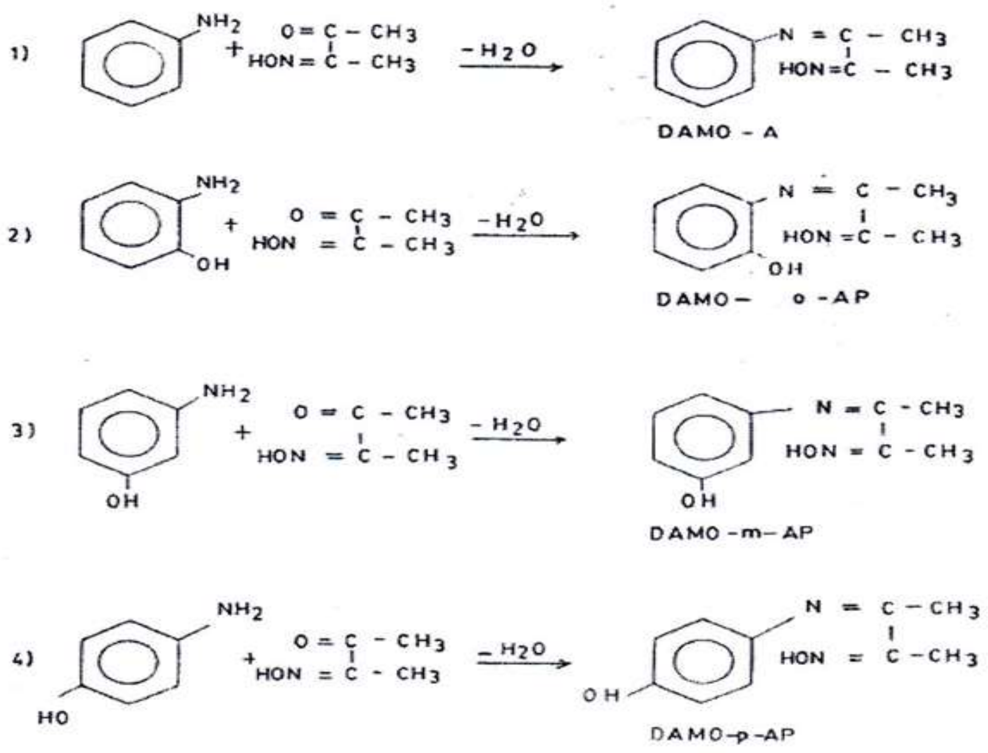
At 25° C., Lane and Kandathil initially explored the acid dissociation constants for three kinds of schiff bases chemically comparable to 8-hydroxylquinoline in 50 percent (v/v) dioxane-water at 25° C. and the stabilities of these ligands with Cu, Ni, and Cd using the Calvin Bjerrum potentiometric method. For the basicities of ligands, electron donating and hydrogen bonding have been cited as possible explanations, respectively. It has been found that the 4-hydroxy-benzimidazole formation constants are higher than those of the corresponding 8-hydroxyquinoline chelates, but that the ligands with the metal ions studied have lower formation constants than those of the 4- hydroxyquinoline chelates. This is because of the unfavorable steric factors. They found that the stability constants for the metal chelates of Schiff bases rise as the basicity of the ligand increases. The acid dissociation pK values of numerous 13-ketoimines, as well as the formation constants of Cu(II), Be(II), UO (II), Ni(II), Co(II), Zn(II), and Mn(II), have been published by Martin D.F. Janusonis and Martin (II). The Block and McIntyre approach may be used to make metal chelates using certain of these Schiff bases. For the metals investigated, the N-phenyl-keto amine derivatives based on an acetylacetones skeleton were found to be somewhat more stable than the simple ac-ac complexes (log Kj=10.8 compared to log = 9.55) (II). A similar level of stability is seen in the beryllium-copper complex (log Kj = 10.9,log = 10.5 for Be, compared to log = 10.8,log=10.5 for Be+, compared to log=10.8,log Kj = 10.9 for Cu). Ligands are neither powerful nor weak, but are equivalent in complexing capacity to salicyl aldehydes and acetyl acetones respectively. β-ketoamine complexes are stable, despite the idea that Be is only weakly complexed with a ligand comprising O and N. Extracting Be into toluene with the N-nBu-salicyldimine and the N-Et derivative was shown to be a good strategy by Green and Alexander.[5]

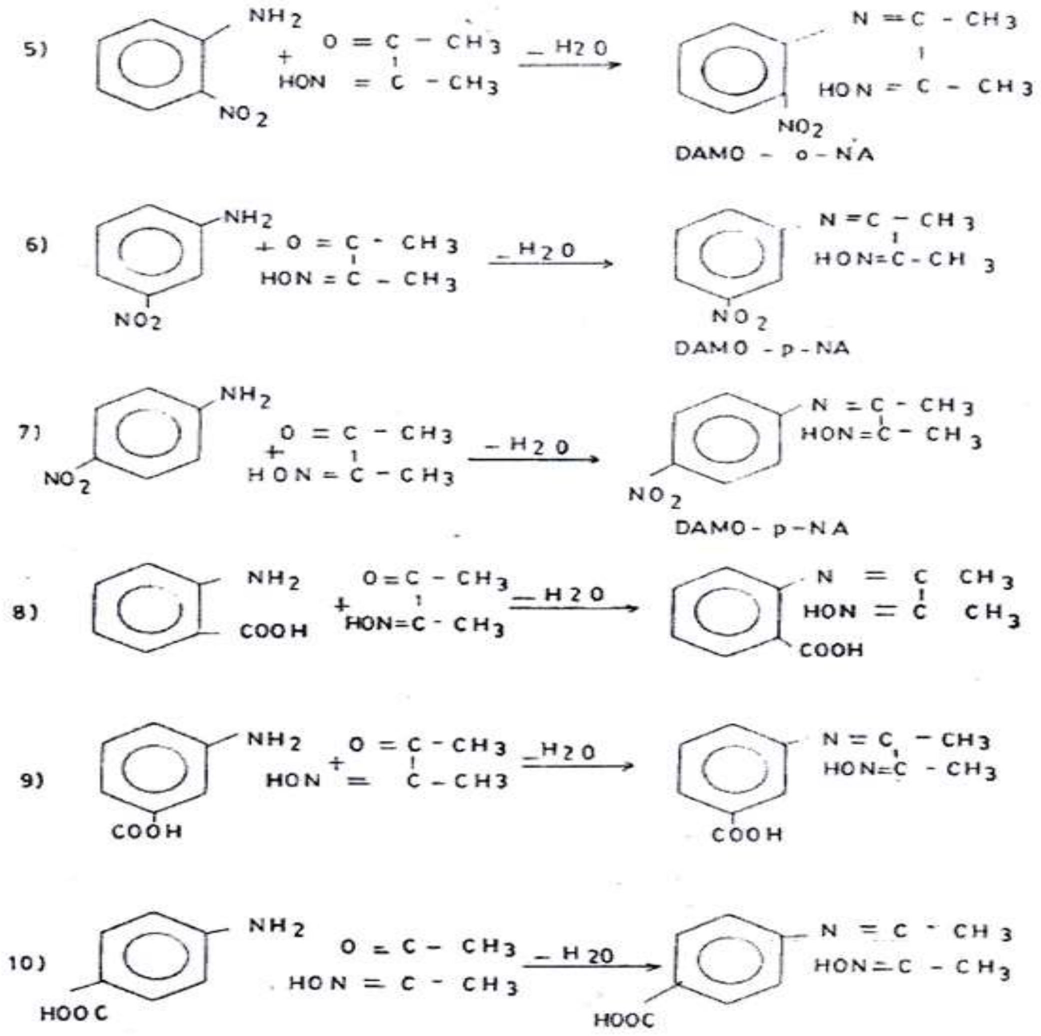
1.3 Synthesis and Characterization of Schiff Bases

Diacetylmonoxime (Aniline, (BDH)), LOBA, m-Nitroaniline (LOBA), p-Nitroaniline (LOBA), o--Aminophenol (LOBA), m-Aminophenol (LOBA) and p-Arninophenol (LOBA) are all aniline derivatives (LOBA) 0-Amino benzoic acid was utilised directly; it was followed by m--Aminobenzoic acid and p- Aminobenzoic acid.[6]

Synthesis of Schiff base

Standard literature approach was used to produce the Schiff bases. It took three hours for one mole of diacetyl mono-oxime and one mole of an amine to be dissolved in anhydrous alcohol. Concentration and cooling were performed on the solution. Crystallized and re-crystallized alcohol was used to dry the product under vacuum after the solid product was removed from the mixture. The melting point and elemental analyses of all schiff bases proved their purity. The reactions of various schiffbases used are given below[7].





2. REVIEW OF LITERATURE

Mansoor S. S. (2014)reported different coordination modalities of the Schiff base [5-methy1-11-1- pyrazole-3-carboxylic acid(1-pyridin-2-yl-ethylidene)-hydrazide] towards Mn(II), Co(II), Cd(II), Zn(II) and Cu(II) complexes and also analyzed their photoluminescence characteristics. The ligand and the Mn(II), Co(II) and Cu(II) complexes were found to be fluorescent quiet, however the Zn(II) and Cd(II) complexes showed chelation increased fluorescence.[8]

Shebl M., Seleem H.S. (2010) reported the synthesis of Mn(II), Co(II), Ni(H), Cu(II) and Pd(II) ligands from semicarbazide and modified -benzopyronone (2010) Through the use of the tube dilution technique, the Schiff base and metal chelates were tested for antibacterial and antifungal activity against two bacterial strains (Staphylococcus aureus and Staphylococcus abony) and one fungus strain (Candida albicans). A. Golcu and coworkers reported synthesis, stability constants and potentiometric analyses of Cd(II) and Cu(II) metal complexes of the Schiff bases, 4-[(4- bromophenylimino)-methyl] -benzene-1,2,3-triol, 4-[(3,5-di-tert-butyl-4-hydroxy- phenylimino)-methyl] -benzene, 3-(p-tolylimino-methyl) (p-tolylimino-methyl) -benzene-1,2-diol, 3-[(4- bromophenylimino)-methyl] -benzene-1,2-diol, 3-[(4-bromo-phenylimino)-methyl] - benzene-1,2-diol and 4-[(3,5-di-tert-butyl-4-hydroxy-phenylimino)-methyl] -benzene-1,3-diol. Elemental analysis, FT-IR, UV-Vis, 1H and 13C NMR, mass spectra, magnetic susceptibility, and conductance investigations were performed on the ligands and their metal complexes. The agar-well diffusion method was used to test the antibacterial activity of the ligands and metal complexes against one bacterium and one fungus. A non-significant link was found between the intense chemiluminescence response in dimethylsulfoxide (DMSO) solution and the Schiff base complexes of cadmium.[9]

Sujamol, M.S., (2009)These complexes of copper and nickel were made with the ligand 1-Tetralone

Thiosemicarbazone and studied for their elemental composition, magnetic moments, IR, electronic, and EPR spectrum properties. R. solanacearum bacterium and B. cinere fungus were shown to be resistant to both the ligand and the Cu(II) and Ni(II) complexes. Synthesis and characterization of Schiff base condensates derived from 5-substituted-2-hydroxybenzaldehyde and benzenamine by R. Zhu and coworkers have been published in the Journal of Organic Chemistry. These copper complexes were also tested for their ability to block protein tyrosine phosphates. The results show that the inhibition and selectivity against various PTPs are influenced by the ligand structure as well as the core metals[10].

E.S. Aazam, A.F. EL Husseiny (2012)This study examined eighteen structurally related Schiff base derivatives, which belong to the salicylidenebenzylamine and 2-hydroxy-l-naphthylidenebenzylamine families, for their ability to inhibit pathogens, as well as for their antibacterial and antifungal properties, in order to explain the biological data trend. The —OH and — SH group medications have been shown to be more active than their non-OH and non-SH group counterparts[11].

Taha Z. A., AjlouniA. M., Al-Hassan K. A., (2011) reportedthe synthesis of the 5,6-diphenyl-1,2,4-triazine moiety-containing pyrazolo[3,4-d]pyrimidine and the pyrazolo[3,4-b]pyridine derivatives and found that the inclusion of pyrazole and 1,2,4-triazine moiety increased the biological characteristics of the compounds[12].

According to Safaa et al. (2011),Schiff base produced from 2-thiophene carboxaldehyde and aminobenzoic acid has been studied in comparison to the ligands Cu, Fe, Zn, Ni, and Co. To test their antibacterial properties,these chemicals were tested against bacterial and fungal species. Inhibition of E. coli and Candida species by Fe, Cu, and Zn complexes had a modest inhibition zone[13].For example, Ceyhan et al. (2011)conducted extensive research on the Schiff base ligands (HL1 and HL2 produced from 2,6-ditertbutyl-4-hydroxy aniline and two carbonic compounds, 2,6- diformy1-4 isopropyl phenol and 2,6-diformyl-4 tertbutadyl phenol) and their metal complexes. There were Gram-positive and Gram-negative bacteria, including C. xerosis, B. brevis (B. megaterium), B. cereus (S aureus), M. smegmatis (M),S. aureus (E), M luteus andE, faecal (E), as well as Y. enterocolitica (K. pneumoniae), E. coli (E), and S. cerevisiae (S) (as Gram-negative bacteria)[14.]

3. OBJECTIVE

- To study the biological activity of a ligand that can be enhanced on chelation with suitable metal.
- To study the antibacterial activities of ligand and metal complexes
- To prepare new Schiff bases having donor ligands using the derivatives of amino acids.

4. METHODOLOGY

4.1 Research Design

The chemicals were of both category AR / GR. Pharmaceuticals obtained were pure samples of the drug. Methanol, acetone, and deionized double distilled water were used as solvents.

4.2 Sampling Design

1. Schiff base Preparation

Equimolar solution of pure drug and salicylaldehyde in methanol water mixture (1:1) were separately dissolved and refluxed for four hours, and kept for one day. Pale yellow xipamide Schiff base (XM-SA) crystals were formed in the reaction mixture, filtered and thoroughly washed with 50 percent methanol, dried over vacuum and weighed. Schiff base melting point was recorded.

2. Antibacterial Activity

The channel paper circle technique screened above combined mixes and ligands (Schiff base) against microscopic organisms of Escherichia coli at various fixations using supplement agar as a medium. Disinfected 5 mm wide channel paper was absorbed from different test focus arrangements and kept on agar plates for supplementation. Those slabs will be brooded for boors at 350C.

4.3 Analysis of Data

1. Analytical methods

CH_2Cl_2(2 ml), Diphenyl (71°C), NH_2Phenylamine GdL 1 $(NO_3)_2H_2O].NO_3/H_2O_2$ N,N Diphenyl-diazene [GdLl $(NO_3)2H_2O]NO_3/H_2O_2$ CH_2Cl_2 (2ml), 30°C was used as a naphthalene-calibrated solvent. Approximately 10 mg of diphenyl was added to 100 mg of the complex to determine its depression at the melting point. The weight of the molecules as determined using the equation,

2. Infrared Spectra

It would have been possible to record the infrared spectra of all the complexes and ligands on an infrared spectrophotometer, such as the Perkin-Elmer 577 (4000-400 cm-1) double-beams or the Perkin-Elmer 783.

Statement of the Research Problem

Given their interesting biological properties, such as anticancer and antibacterial, synthetic drugs such as Schiff bases and their metal complexes are important.

Therefore Schiff bases were synthesized via a condensation reaction of type [2+2]. Insufficient work on Bivalent Metal chelates against Schiff bases has been found from literature. Furthermore, these experiments will be carried out to predict the complexes as future pharmaceutical drugs.

5. RESULT AND ANALYSIS

Experimental

Stability constants of metal-ligand complexes can be determined using the Bjerrum-Calvin pH titration method as modified by Irving and Rossotti. A similar method has been employed in this article by the author to investigate Schiff base equilibria.

Materials and Their Purification

- **Water**

Throughout the research, distilled water was utilized that had been redistilled over alkaline potassium permanganate and heated to remove all carbon dioxide. This water, which had a pH of 6.5, was kept in a polythene container until it was needed.

- **Ethanol**

Drying the ethanol was done over newly calcined quicklime and two distillations were performed. An airtight container was used to hold the ethanol.

Preparation of Solutions

- Sodium hydroxide
- Sodium perchlorate
- Perchloric acid
- Metal perchlorate solution

Instrumentation

- pH meter and accessories
- Standardization of the pH meter
- Correction of pH meter reading
- Thermostat

Plan of the Present Work

Complex formation in solution is an important area of study for this research work since it helps us identify and characterize the species in solution and the equilibria in which they exist. Various Schiff bases have been synthesized in a methodical manner. Literature available on ligands is largely inadequate. Hence the proposed study was undertaken.

It was determined that several bivalent metal ions may create schiff bases at different temperatures, and that the formation constants of the following compounds were studied.

1. DAMO-A
2. DAMO-o-AP

Cu(II), Ni(II), Co(I1), Zn(II), and Mn(II) formation constants have been calculated. These ligands and their complexes are extremely important from a theoretical, structural, analytical, and biological perspective due to the variety of bonding sites on the molecules and their availability.

Symbols used for the Different Quantities Measured in Titrations

pH: The pH meter readings by using correction factor.

N': Concentration of NaOH in moles per litre.
V°: Total volume of the solution taken in the vessel before titration .
t: Temperature in ° C at which titrations were carried out
μ:Ionic strength of the solution expressed in moles per litre.
E°: Initial concentration of free HCIO4, in the titrating solution expressed in moles per litre.
T°L: Initial concentration of ligand in the titrating solution expressed in moles per litre.
T°M: Initial concentrations of metal ion in the titrating solution expressed in moles per litre.

Table 1: DAMO-A used as a ligand [L]N'=0.98 M t=30° C ti=0.1 M V°=40 ml V=0.02 M T°L=0.0025M Medium=50% v/v Ethanol-water A= HCLO4 T9M=0.001M

NaOH Volume (ml)	A pH	A+L pH	A+L+Cu++ pH	A+L+Nr+ pH	A+L+Co++ pH	A+L+Zn++ pH	A+L+Mn++ pH
0.00	1.98	2.00 CL	2.00 DG	2.00 CL	2.01CL	2.01 CL	2.00 CL
0.20	2.09	2.10	2.10	2.10	2.11	2.11	2.10
0.40	2.25	2.43	2.42	2.43	2.43	2.43	2.43
0.60	2.53	2.80	2.80	2.80	2.80	2.8	2.80

0.62	2.57	2.85	2.85	2.85	2.85	2.85	2.86
0.64	2.63	2.88	2.88	2.88	2.88	2.88	2.88
0.66	2.68	3.01	2.98	3.01	3.01	3.01	30
0.68	2.75	3.05	3.05	3.05	3.05	3.05	3.05
0.70	2.80	3.11	3.10	3.10	3.11	3.11	3.11 FB
0.72	2.87	3.25	3.20	3.22	3.25	3.25	3.25
0.74	3.00	3.40	3.27	3.35	3.40	3.40	3.40
0.76	3.14	3.58	3.40	3.50	3.58	3.5H	3.58
0.78	3.34	3.90	3.55	3.72 FP	3.86	3.90	3.90
0.80	3.65	4.55	3.70	3.98	4.75	4.35	4.55 DB
0.82	10.00	8.51Y	3.91	4.28	4.75	4.9B Y	5.70
0.84	11.18	9.52	4.17	4.68	5.20	5.76	6.72 P
0.86	11.48	10.16	4.22	5.10	5.81	6.45	7.16
0.88	11.74	10.57	5.01	5.71	6.42	6.98	7.56
0.90	11.90	10.92					
0.92	11.99	11.14					
0.94	12.10	11.36					
0.96	12.17	11.55					
0.98	12.23	11.70					
1.00	12.27	11.85					
1.02	12.32	11.95					
1.04	12.37	12.03					
1.06	12.41	12.12					
1.08	12.45	12.17					
1.10	12.49	12.20					
1.12	12.53	12.22					
1.14	12.58	12.24					

CL= Colourless F= Faint. G= Green. Y= Yellow. P= Pink. B= Brown

Table 2: DAMO-A used as a ligand [L]N'=0.98 M t=40° C 11=0.1 M V°=40 ml E°=0.02 M T°L=0.0025M Medium=50% v/v Ethanol-water A= HCLO4 T°M=0.001M

NaOH Volume (m1)	A pH	A+L pH	A+L+Cu' pH	A+L+Ni++ pH	A+L+Co++ pH	A+L+Zn' pH	A+L+Mn++ pH
0.00	2.05	2'07CL	2.07 CL	2.07 CL	2.07 CL	2.07 CL	2.07 CL
0.20	2.15	2.18	2.18	2.18	2.18	2.18	2.18
0.40	2.26	2.28	2.28	2.28	2.28	2.28	2.28
0.60	2.55	2.76	2.76	2.76	2.76	2.76	2.76
0.62	2.60	2.83	2.83	2.83	2.83	2.83	2.83
0.64	2.65	2.92	2.92	2.92	2.92	2.92	2.91
0.66	2.71	3.03	. 2.98	3.03	3.02	3.02	3.03
0.68	2.77	3.12	3.10	3.12	3.11	3.11	3.11 FB
0.70	2.85	3.25	3.20	3.25	3.25	3.25	3.25
0.72	2.95	3.35	3.30	3.35	3.35	3.35	3.35
0.74	3.07	3.48	3.40	3.42	3.48	3.48	3.40
0.76	3.24	3.62	3.50	3.55	3.62	3.62	3.62
0.78	3.45	3.91	3.68	3.75	3.85	3.91	3.91 DB
0.80	3.95	4.55	3.75	4.02	4.20	4.30	4.55
0.82	9.81	8.61	4.01 FG	4.35	4.65	4.95	6.75
0.84	10.82	9.39	4.24	4.72	5.35	5.80	8.77
0.86	11.16	9.91	4.62	5.25	6.01	6.60	7.23
0.88	11.41	10.32	5.08	5.80	6.52	7.03	7.57
0.90	11.57	10.63	ppt.	ppt.	ppt.	ppt.	ppt.
0.92	11.69	10.88					

0.94	11.78	11.10					
0.96	11.87	11.28					
0.98	11.95	11.43					
1.00	12.01	11.55					
1.02	12.05	11.68					
1.04	12.09	11.77					
1.06	12.14	11.85					
1.08	12.18	11.96					
1.10	12.21	12.01					

CL = Colourless, F= Faint, G= Green, Y= Yellow, P= Pink, B= Brown

Table 3: DAMO-A used as a ligand [L]N'=0.98 M t=50° C 11=0.1 M V°=40 ml E°=0.02 M T°L=0.0025MMedium=50% v/v Ethanol-water A= HCLO4 T°M=0.001M

NaOH **Volume (ml)**	**A pH**	**A+L pH**	**A+L+Cu++ pH**	**A+L+Ni++ pH**	**A+L+Co++ pH**	**A+L+Zn++ pH**	**A+L+Mn++ pH**
0.00	2.15	2.17 CL	2.17 CL	2.17 CL	2.17 CL	2.18 CL	2.17 CL
0.20	2.25	2.28	2.27	2.28	2.27	2.28	2.27
0.40	2.38	2.42	2.42	2.42	2.42	2.42	2.42
0.60	2.66	2.81	2.80	2.81	2.80	2.81	2.81
0.62	2.69	2.90	2.83	2.90	2.91	2.90	2.9
0.64	2.72	2.97	2.93	2.97	2.96	2.97	2.97
0.66	2.78	3.06	3.05	3.06	3.05	3.05	3.05
0.68	2.84	3.12	3.10	3.12	3.12	3.12	3.12
0.70	2.91	3.22	3.20	3.22	3.22	3.22	3.22
0.72	2.99	3.35	3.25	3.35	3.34	3.34	3.35
0.74	3.14	3.49	3.38	3.45	3.49	3.49	3.49
0.76	3.29	3.70	3.50	3.60	3.70	3.70	3.70
0.78	3.58	4.01	3.65	3.78	3.92	4.01	4.01 DB
0.80	4.06	4. 56 Y	3.85	4.02	4.22	4.45	4.55
0.82	9.75	8.40	4.02FG	4.33	4.71	5.06	5.65
0.84	10.72	9.16	4.26	4.72	5.36	5.92	6.61 P
0.86	11.06	9.70	4.62	5.23	5.93	6.53	7.17
0.88	11.26	10.16	5.03	5.65	6.37	6.97	7.56
0.90	11.42	10.46	ppt.	6.06	6.76	7.30	7.83
0.92	11.52	10.71		ppt.	ppt.	Ppt.	ppt.
0.94	11.60	10.92					
0.96	11.68	11.12					
0.98	11.74	11.27					
1.00	11.80	11.38					
1.02	11.86	11.49					
1.04	11.91	11.57					
1.06	11.96	11.62					
1.08	12.00	11.70					
1.10	12.04	11.75					

CL = Colourless, F = Faint, G = Green, Y = Yellow, P = Pink, B=Brown

Table 4: DAMO-o-AP used as a ligand [L]N'=0.98 M t=30° C μ=0.1 M V°=40 ml E°=0.02 M T°L=0.0025MMedium=50% v/v Ethanol-water A= HClO4 T°M=0.001M

Na OH Volume (ml)	**A PH**	**A+L pH**	**A+L+C u' pH**	**A+L+Ni** H-**pH**	**A+L+Co** +-I-**pH**	**A+L+Zn+ +pH**	**A+L+Mn** 4-+**pH**	**NaOH Volume (ml)**
0.00	1.85	2.00 FY	2.00 FY	2.00 FY	2.00 FY	2.01 FY	2.01 FY	2.01FY
0.20	2.00	2.10	2.10	2.10	2.11	2.10	2.10	1.10
0.40	2.15	2.30	2.30	2.30	2.30	2.31	2.31	1.20
0.60	2.52	2.78	2.70	2.78	2.78	2.78	2.78	1.22
0.62	2.55	2.81	2.75	2.81	2.81	2.81	2.8	1.24

0.64	2.57	2.91	2.80	2.90	2.91	2.90	2.91	1.26
0.66	2-.60	2.96	2.85	2.94	2.96	2.96	2.96	1.28
0.68	2.68	3.10	2.95	3.02	3.10	3.10	3.11	12.54
0.70	2.70	3.25	3.03	3.12	3.20	3.25	3.25	12.5G
0.72	2.88	3.45	3.12	3.25	3.35	3.45	3.45	12.58
0.74	2.11	3.70	3.22	3.42	3.55	3.65	3.70	12.59
0.76	3.13	4.00	3.37	3.62	3.75	3.90	4.00	12.61
0.78	3.13	4.45	3.54	3.82	4.05	4.22	4.30	12.6.2
0.80	4.10	5.05	3.72	4.10	4.42	4.65	5.05	12.15
0.82	10.35	8.45	3.90	4.37 FG	4.93 FB	5.30	5.85 FB	12.2
0.84	11.07	9.20	4.12 G	4.80	5.45	6.00	6.60	12.25
0.86	11.38	9.75	4.43	5.20	5.85	6.48 Y	7.05	12.32
0.88	11.62	10.15	5.00	5.60	6.22	6.90	7.45	12.37
0.90	11. 80	10.40	Ppt	Ppt	ppt.	7.22	7.73	12.45
0.92	11.95	10.62				Ppt	ppt	ppt
0.94	12.05	10.87 DY						
0.96	12.12	11.00						
0.98	12.2	11.15						
1.00	12.25	11.3						
1.02	12.30	11.45						
1.04	12.32	11.55						
1.06	12.36	11.68						
1.08	12.40	11.73						
1.10	12.45	11.88						
1.12	12.49	11.96						
1.14	12.51	12.05						

C L = Colourless, F = Faint, G = Green, Y = Yellow, P = Pink, B = Brown

Table 5: DAMO-o-AP used as a ligand [L]N'=0.98 M t=40° C p=0.1 M V°=40 ml r=0.02 M T°L=0.0025M Medium=50% v/v Ethanol-water A= HCLat T°MA:).001M

VolOuName H (m1)	**A pH**	**A+L pH**	**A+L+Ce+ pH**	**A+L+Ne+ pH**	**A+L+Co++ pH**	**A+L+Zn++ - pH**	**A+L+Mn++ pH**
0.00	1.80	1.85 FY	1.85 FG	1.85 FY	1.85 FY	1.86 FY	1.87 FY
0.20	1.90	2.00	2.00	2.00	2.01	2.01	2.01
0.40	2.27	2.35	2.35	2.35	2.35	2.35	2.35
0.60	2.55	2.87	2.80	2.87	2.87	2.87	2.87
0.62	2.59	2.90	2.87	2.90	2.90	2.90	2.90
0.64	2.63	2.97	2.89	2.97	2.96	2.97	2.97
0.66	2.68	3.05	2.96	3.05	3.05	3.04	3.04
0.68	2.74	3.18	3.03	3.15	3.18	3.17	3.18
0.70	2.82	3.33	3.15	3.27	3.33	3.33	3.33
0.72	2.90	3.50	3.25	3.40	3.50	3.50	3.50
0.74	3.05	3.70	3.35	3.55	3.70	3.70	3.70
0.76	3.21	3.98	3.55	3.75	3.90	3.98	3.98
0.78	3.48	4.45	3.71	4.00	4.15	4.35	4.45
0.80	4.24	5.50	3.88	4.25 FG	4.55 FB	4.95	5.25
0.82	9.52	8.25	4.09	4.53	5.07	5.55	6.06 FB
0.84	10.70	9.10	4.27 G	4.93	5.70	6.27	6.80
0.86	11.07	9.50	4.60	5.15	6.20	6.75	7.25
0.88	11.30	9.85	ppt.	5.80	6.60	7.05	7.60
0.90	11.48	10.10		ppt.	ppt.	ppt.	ppt.
0.92	11.60	10.30					
0.94	11.70	10.48					
0.96	11.80	10.65					

0.98	11.88	10.80					
1.00	11.95	10.95 DY					
1.02	12.00	11.07					
1.04	12.03	11.18					
1.06	12.06	11.30					
1.08	12.10	11.40					
1.10	12.15	11.50					
1.12	12.18	11.60					
1.14	12.20	11.70					
1.16	12.22	11.78					
1.18	12.25	11.83					
1.20	12.27	11.90					
1.22	12.30	11.95					
1.24	12.35	12.00					
1.26	12.37	12.05					
1.28	12.40	12.08					

C L = Colourless, F = Faint, G = Green, Y = Yellow, P = Pink, B = Brown

Table 6: DAMO-o-AP used as a ligand [L]N'=0.98 M t=50° CM V°=40 ml E°=0.02 M T°L=0.0025M Medium=50% v/v Ethanol-water A= HCLO4 T°M=0.001M

NaOH Volume (m1)	A pH	A+L pH	A+L+Cu++ pH	A+L+Ni++ pH	A+L+Co++ pH	A+L+Zn++ pH	A+L+Mn++ pH
0.00	1.91	2.01 FY	2.01 FY	2.01 FY	2.01 FY	2.01 FY	2.01 FY
0.20	2.25	2.35	2.35	2.35	2.34	2.35	2.36
0.40	2.55	2.87	2.87	2.87	2.88	2.88	2.87
0.60	2.65	2.98	2.90	2.98	2.98	2.98	2.98
0.62	2.67	3.00	2.93	3.00	3.00	3.00	3.00
0.64	2.70	3.04	2.98	3.04	3.04	3.03	3.03
0.66	2.75	3.08	3.03	3.08	3.07	3.08	3.08
0.68	2.80	3.20	3.08	3.20	3.20	3.20	3.20
0.70	2.90	3.30	3.12	3.25	3.30	3.30	3.30
0.72	3.01	3.42	3.30	3.35	3.42	3.42	3.42
0.74	3.16	3.60	3.43	3.50	3.60	3.60	3.60
0.76	3.31	3.90	3.58	3.70	3.90	3.90	3.90
0.78	3.56	4.25	3.76	4.00	4.15	4.25	4.25
0.80	4.25	5.05	3.97	4.30 FG	4.60	4.75	4.98 FB
0.82	9.70	8.02	4.20 G	4.65	5.1 FB	5.50 Y	6.05
0.84	**10.1**1	8'95 FY	4.45	5.05	5.75	6.26	6.90
0.86	11.90	9.38	4.79	5.50	6.30	6.70	7.36
0.88	11.17	9.70	5.20	5.95	6.70	7.22	7.72
0.90	11.33	9.90	ppt.	6.30	7.05	7.42	8.00
0.92	11.45	10.18		6.58	ppt.	ppt.	8.20
0.94	11.52	10.37		ppt.			ppt.
0.96	11.60	10.55					
0.98	11.68	10.70					
1.00	11.70	10.87					
1.02	11.78	11 DY					
1.04	11.82	11.10					
1.06	11.86	11.20					
1.08	11.90	11.30					
1.10	11.95	11.37					
1.12	11.97	11.45					
1.14	12.00	11.52					
1.16	12.02	11.60					
1.18	12.04	11.65					
1.20	12.06	11.73					
1.22	12.08	11.80					
1.24	12.10	11.85					

1.26	12.121	11.92					
1.28	12.15	11.98					

C L = Colourless, F = Faint, G = Green, Y = Yellow, P = Pink, B = Brown

RESULTS

Tables 1 to 6 show the results of all schiff bases' experiments. For the research of the creation of Cu, Ni, Co, Zn, and Mn complexes, the reagents have been utilised Coloration of the ligand solution in acidic media is colourless or dim yellow, but the colour increases when alkali is added. To conclude, complexations occur with the majority of ligands when tested with the metal ions listed above. Each and every one of the different coloured metal ions results in a different coloured complex species. When alkali is added to solutions containing Ni, Co, or Mn, the initially colourless solution becomes light green, pale pink, or pale brown. The precipitate is a rich green colour because of the copper. *Zn..*, results in a yellow colour. Data from the pH titration experiment are shown in Tables 1 to 6 of this study.

6. CONCLUSION

As atomic number increases, so do the stability constants of the first transition series divalent metal ions. A rise in the second ionization potential increases the stability constants. As electro negativity rises, so does the stability of complexes in the first transition series. The stability constants rise as the ionic radius decreases. All the ligands show the following stability order of the metal complexes. Cu(II)>Ni(II) >Co(II) >Zn(II)>Mn(II) .As the temperature rises, the stability constants of the proton and the metal ligands decreases. In order to create the most stable complexes and the strongest metal ligand interactions, all Schiff bases have large negative values of H.

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REFERENCES

1. Ajlouni A. M., Taha Z. A, Al Momani W., Hijazi A. K, & Mohammad Ebqa'ai, (2012) "Synthesis, characterisation, biological activities, and luminescent properties of lanthanide complexes with N,NO-bis(2-hydroxy-l-naphthylidene)-1,6-hexadiimine", Inorg. Chim. Acta, Vol. 388, pp. 120-126.
2. Mohammed A. S., Omer, Liu J.C., Deng W. T. A., & Jin N. Z. (2014) "Syntheses, crystal structures and antioxidant properties of four complexes derived- from a new Schiff base ligand(N1E,N2E)-N1,N2-bis(1-(pyrazin-2-yDethylidene)ethane-1,2diamine",Polyhedron Vol.69, pp. 10-14.
3. Manish P., Brahmbhattl , Jabali J., Vora2 , Pravin B. &Prajapatil, (2010) 3d-transition metal chelates of schiff base ligand: synthesis, catalysis and antibacterial study kuntal n. Prajapatil*, reserch general of life Science, bioinformatics, pharmaceutical and chemical sciences www.rjlbpcs.com
4. Chioma F., Sunday N. 0. & Anthony C. E. (2014) medical and pharmaceutical chemistry. P (141-252)
5. Jadhav S. M., Shelke V. A., Shankarwar S.G., MundeA. S. and ChondhekarT. K., "Synthesis, spectral, thermal, potentiometric and antimicrobial studies of transition metal complexes of tridentate ligand", J. Saudi. Chem. Soc., Vol.18, pp.27-34, 2011.
6. Omer, Jia-Cheng Liu, Wen-Ting Deng A, and Neng-Zhi Jin, "Syntheses, crystal structures and antioxidant properties of four complexes derived from a new Schiff base ligand (N1E,N2E)-N1,N2-bis(1-(pyrazin-2-yl)ethylidene)ethane-1,2diamine", Polyhedron Vol.69, pp. 10-14, 2014.
7. Kulkarni A., Patil S. A. & Badami P. S., (2009). "Synthesis, characterisation, DNA cleavage and in vitro antimicrobial studies of La(I11),__Th(IV) and VO(IV) complexes with Schiff bases of coumarin derivatives", Europ. J. Med. Chem., Vol. 44, pp. 2904-2912.
8. Mansoor S. S. and Shafi S. S.„ "Oxidation of aniline and some para- substituted anilines by benzimidazolium fluorochromate in aqueous acetic acid medium — A kinetic and mechanistic study", Arabian J. Chem., Vol. 7, pp. 171-176, 2014.
9. Shebl M., Seleem H.S. and El-Shetary B.A., 2010. "Ligational behavior of thiosemicarbazone, semicarbazone and thiocarbohydrazone ligands towards VO(IV), Ce(III), Th(IV) and UO2(VI) ions: synthesis, structural characterisation and biological studies", Spectrochim. Acta A, Vol.75, pp. 428-433.
10. Sujamol, M.S., "Synthesis, spectroscopic characterisation and thermal studies of some

lanthanide(III) nitrate complexes with a hydrazoderivative of 4- aminoantipyrine". J. Rare Earths, Vol.27, No.5, pp. 705-708, 2009.

11. E.S. Aazam, A.F. EL Husseiny and H.M. Al-Amri., "Synthesis and photoluminescent properties of a Schiff-base ligand and its mononuclear Zn(II), Cd(II), Cu(II), Ni(II) and Pd(II) metal complexes", Arab. J. Chem., Vol.5, pp. 45-53, 2012.
12. Taha Z. A., AjlouniA. M., Al-Hassan K. A., HijaziA. K. andFaiqA. B., "Synthesis, characterisation, biological activity and fluorescence properties of bis-(salicylaldehyde)-1,3- propylenediimine Schiff base ligand and its lanthanide complexes", Spectrochimica Acta A. Vol.81, pp. 317-323, 2011.
13. Safaa Eldin H. Etaiwa, Dina M. Abd El-Aziza, Eman H. Abd El- Zaherb and Elham A. Ali, "Synthesis, spectral, antimicrobial and antitumor assessment of Schiff base derived from 2- aminobenzothiazole and its transition metal complexes", Spectrochim. Acta A., Vol.79, pp. 1331-1337, 2011.
14. Ceyhana G., Cumali C., ElikbUrus S., Demirtas I., Mahfuz Elmastas and Turner M. (2011) "Antioxidant, electrochemical, thermal, antimicrobial and alkane oxidation properties of tridentate Schiff base ligands and their metal complexes", Spectrochim. Acta A, Vol.81, pp. 184-198.