

The Role of Schiff Bases in Dyes Techniques Applications: A Review

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ABSTRACT: The ketimine and aldimine are of such important products representing the Schiff bases synthesis protocols in the condensation of primary amine groups with aromatic containing compounds or substituted related compounds with carbonyl group of salicylaldehyde which represents the phenolic hydroxyl group as the most important part of salicylaldehyde. All can be synthesized and applied in different applications designed for to study the behaviour of such compounds. The complexes containing such Schiff bases can be synthesized by direct mixing of the Schiff base with metal ions in appropriate organic solvents using traditional refluxing techniques. Metal ions such as Ni(II) has been introduced to justify the coordination process of the Schiff base behaviour and metal complexes. The elucidation and the study of the resulted Schiff bases and their complexes compounds have been performed with several physical properties. The different physiochemical tools which have been applied in this studies are melting and boiling points, molar conductivity and infrared spectroscopy, in order only to confirm the chemical structures of the produced products and to justify the pathway of our goal to the dyes techniques in which the Schiff bases will become and play roles in this field. The measurements guide us with respect to the activity of the Schiff bases to apply them to dyes techniques as a goal for this research project programme. Very interesting results have been obtained. That encourages us to investigate in such applications as new tools for researchers to get deep far away from the classical experiments in doing successful chemistry to open wild point of views for the future of coordinate compounds.

Keywords: Ketimine; aldimine Schiff base; techniques; dyes and applications.

INTRODUCTION: Schiff bases can be directly synthesized by condensation of a primary amine with carbonyl compounds or indirect in which known as template effect and transamination. There are two points must be taking in considerations in the procedure to get the final products. First, most of researchers mix up and misleading between diazo and other azo product compounds in which every compound contains -C=N they call it Schiff bases. Second, in the synthesis, no account for the side reactions and products which may not fulfil the requirement of justification. All that leads to introduce the policy to deal with the condensation reaction between the carbonyl and amino groups to produce in particular Schiff bases moiety. Schiff bases are the imperative chelating ligands in metal coordination chemistry.¹⁻⁵

The Schiff bases derived from the refluxing of primary amines and carbonyl compounds which form stable azomethine containing compounds as well can form stable complexes with most of the metal ions in appropriate media. The reactivity of Schiff bases have been performed in different aspects such as the coordination with variety of transition metals, biological systems and in the dyes techniques. The reactivity of the Schiff base ligand increases after the complexation process. The azomethine linkage can be developed from the reactions of Schiff base which is useful for designing the mechanism of transamination and racemization reactions in biological systems. Thiosemicarbazones and their complexes have received considerable attention since; because of their pharmacological properties they have numerous applications, such as antibacterial and anticancer agents. Previously, the chemistry of Co(II), Ni(II) and Cu(II) complexes of the Schiff base derived from the reaction of salicylaldehyde and 2-aminobenzoic acid or 2aminophenol have been synthesized and investigated by using different physiochemical techniques. A square planar geometrical structure was proposed. As well 2-aminophenol and 2-aminobenzyl alcohol have been introduced as Schiff bases with salicylaldehyde and conducted for their coordination chemistry, dyes techniques and biological activities. The chemical structures are shown in Scheme 1. Ni(II) complexes with Schiff base obtained from the condensation of 1,3-propaneamine with salicylaldehyde and or salicylaldehyde derivatives in which the presence of nitrogen or oxygen sites of coordination play good role in chelation. Most of the synthesized Schiff bases can be conducted into coordination chemistry studies.⁶⁻⁹

The aim of this study is to synthesis and characterizes the geometrical structures of the complexes by using standard physiochemical tools and techniques, from where we will introduce the Schiff bases as justified compounds into dyes techniques.

Principle of the Schiff Bases and Complex Formation: The Schiff bases are compounds that containing azomethine group in the form of (-RC=N-R). The nitrogen atom connected to an aryl or alkyl group, and in general as ($R_1R_2C=NR_3$), where, R_1 , R_2 and R_3 are either aryl or alkyl group that makes the Schiff base a stable imine with no other groups might influence the condition of this site of Schiff bases. The Schiff base derived from an aniline, were R_3 is a phenyl or substituted phenyl, can be called anil, Schiff bases of aliphatic ketone/aldehyde are relatively unstable and are readily polymerizable while those of carbonyl with aromatic groups having an effective conjugation system make them more stable.^{6&7}

Acids/bases catalysts can be used for the synthesis of such bases through protonation of oxygen of carbonyl group or deprotonation of hydrogen from amino group of the compounds. The role of azomethine group mainly dominates and influences the reactivity of the Schiff bases as the most important part in the Schiff base body. The property gives the Schiff base the capability to be engaged in chelation and gives special chemical advantages to be introduced into coordination interaction with metals. Also can be introduced to many other applications such as dyes techniques, since they have the same principles. Schiff bases are generally di, tri or tetradentate ligands, because they have either free lone pair of electrons on nitrogen or oxygen or sulfur atoms with any unshared lone pair of electrons on the atoms adjacent to the azomethine group in order to form stable chelates with five or six members rings.849

The synthesized Schiff bases have been justified for further applications in order to show the ability of the coordination with different agents as we mentioned for dyes, metal ion uptake etc. Any transition metal ion can be conducted to perform such as test. Mainly we can use one of any metal from d-block elements such as Co(III) d⁶ and Ni(II) d⁸ systems are easier and stable complexes formation. The justified complexes of Ni(II) with Schiff bases derived from salicylaldehyde and semicarbazide, 2-aminobenzyle alcohol, 2-aminobenzoic acid, 2-nitroaniline or 3amino-1,2,4-Triazole have been synthesized and studied using different tools such as physical properties, as their solubility in different chemical solvents. IR and UV spectroscopy, the molar conductivity and magnetic properties are matter of our interest analyses to introduce the right factors of coordination. In the advanced applications of these Schiff bases are introduced to dyes techniques, to see the differences, the capability, the usefulness and the variations of results ¹⁰⁻¹³. The simplest condensation for the Schiff bases as:



Scheme 1: The reaction and the structures of Schiff bases that introduced in Dyes.

Background of the Synthetic Dyes: The first recorded synthetic dye compound was picric acid, which was produced in the interaction of indigo and nitric acid. W.H. Perkin, a British chemist, whilst working with Hofmann, discovered Mauveine, in 1856, and thereby started the "dyestuff revolution". However, he was not intentionally working towards preparing synthetic dyestuffs but towards quinine. Since then the significant dyes discovered were azo dyes in 1858 by Griess, alizarin red in 1868. Many thousands of synthetic dyes have been prepared quickly, Synthetic dyes replaced the traditional natural dyes. They cost less, they offered a vast range of new colors, color fastness and they imparted better properties to the dyed materials.¹⁴ Unlike most organic compounds, dyes posses color because:

- a) They absorb light in the visible spectrum (400-700 nm),
- b) They have at least one chromophore or a conjugated system.
- c) They exhibit resonance of electrons which has stabilizing force in organic or inorganic compounds.

When any one of these features is lacking from the molecular structure the color will be lost. In addition to chromophore, most dyes also contain group known as auxochromes (color helpers), examples of which are carboxylic acids, sulfonic acid, amino and hydroxyl group, Scheme 1. While, these are not responsible for color, their presence can shift the color of a colorant and they are most often used to influence dye solubility. A further notable contribution was made by Hewitt and Mitchell who first proposed in 1907 that conjugation is essential for the color of a dye molecule. In 1928, this concept was incorporated by Dilthey and Witzinger in their refinement of Witt's theory of chromophores and auxochromes. They recognized that the chromophore is commonly an electron-withdrawing group, that auxochromes are usually electron-releasing groups and that they are linked to one another through a conjugated system. In essence, the concept of the donor-acceptor chromogen was born. Dyes are classified according to origin, chemical structure or the mode of applications.¹⁵

Classification: most dyes are organic molecules and complex in nature. The synthesis of organic dyes began with azulene synthesis. Before that, colors were made from pigments. As a result, dyes can be classified as natural and synthetic, according to their sources of origin. Dyeing process is accomplished by dissolving or dispersing the colorant in a suitable solution (usually water) and bringing this system into contact with the material to be dyed. According to the process of dying, the dyes are classified as: acidic, basic, direct, reactive, vat, disperse, sulfur, mordant, azo and diazo dyes14&15 they divided according to chemical structure of their chromophore contents, such as:

- 1. Acridine dyes, derivatives of acridine >C=N-and >C=C.
- 2. Anthraquinone dyes, derivatives of anthraxquinone >C=O and >C=C.
- 3. Arylmethane dyes; Diarylmethane dyes, based on diphenyl methane.
- 4. Triarylmethane dyes, based on triphenyl methane.

5. Diazo based on -N=N- , and Azo dyes based on an imine -N=C (Schiff bases as azomethine group).

CHEMICALS AND MATERIALS: All chemicals used were of laboratory grade including: absolute ethanol, salicylaldehyde, Semicarbazide. HCl, 2aminobenzyl alcohol, 3-amino-1,2,4-Triazole, 2aminobenzoic acid and o-nitroanilline. As well; Ammonium hydroxide, hydrochloric acid. Aluminum ammonium sulphate (Alum) [Al(NH₄)(SO₄)₂.12H₂O], Tin Chloride [SnCl₂], Potassium dichromate [K₂Cr₂O₇], Copper(II) chloride [CuCl₂.2H₂O], Nickel(II) Chloride [NiCl₂.6H₂O], Iron(III) chloride [FeCl₃.6H₂O], and Iron(II) sulphate [FeSO₄.7H₂O] were used as mordants or as required.

Fabric Materials: Yarn fibers of wool, goat hair, cotton and nylon were used for each dyeing process, fiber samples were cut in to 4.5×2 cm strips for wool and goat hair and 4×5 cm for nylon and cotton.

Preparation of Schiff Bases: The Schiff base were prepared by adding 25ml of hot ethanolic solution of salicylaldehyde (1.22g, 0.01mol) to the same volume of ethanolic solution of (0.01mol) amine compound. The mixture was refluxed for 2hrs. Few drops of HCl may be needed to catalyze the reaction. The obtained precipitates collected by filtration through Buchner funnel, washed and recrystallized by hot ethanol and then dried at room temperature. The yields recorded as 62-85% and the quantitative of the used primary materials are shown in Table-1.

Table 1: Quantities of the used primary mate	ials.
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Compound	The name of material	The weight is equal 0.01 mol
Sal.	Salicyaldehyde	1.22g (1.1 ml)
Amino com- pound for L ¹	o-Nitroaniline	1.38g
Amino compound for L^2	2- Aminobenzoic acid	1.37g
Amino com- pound for L ³	o-Aminobenzyl alcohol	1.23g
Amino com- pound for L ⁴	3-Amino- 1,2,4Triazole	0.84g

Preparation of Ni(II) Schiff Bases Chelates: The Schiff base chelates with Ni(II) were prepared by mixing 25ml hot ethanolic solution of the Schiff base (0.005mol) with 25ml ethanolic solution of (0.005mol) of nickel chloride NiCl₂6H₂O. Few drops of ammonium hydroxide solution were added to catalyze the reaction. Reflux the mixture for 2-3hrs. Thus, the formed complexes was filtrated, collected, and then recrystallized by using hot ethanol and then dried at room temperature.¹⁰

Dyeing Procedures and Preparation Dyestuff: The dyestuff was extracted with boiling water by applying a bath liquor ratio of (2.5g, 500ml). 2.5g of Schiff bases dissolved in boiling distilled water and completed to total volume of 500ml of distilled water. The duration of the extraction was fixed at 60mins.

Dyeing without Mordant: Yarn samples (wool, goat hair, cotton, and nylon) were placed in a glass beaker of one liter capacity containing 500ml of dyestuff and boiled for 30 mins. The yarn samples were rinsed with distilled water and air dried.

Dyeing after Treatment with Mordants: Wool, goat hair, cotton and nylon samples were boiled with |(i.e. alum mordant) in distilled water (2.5g/500ml) for 20mins. Then the mordanted fiber and the dyeing bath solution were putted together in the dyeing beaker for 30mins. After dyeing, the unfixed dyestuff was removed by rinsing with water and then air dried. The same procedure was followed for the rest of mordants. From this point the results of dyeing by the Schiff bases (I, II, III, IV) with different mordants are summarized in the Tables 2-9.

Mordant	Wool (Color)	Wash Fastness	Light Fastness	Mordant	Goat hair (Color)	Wash fastness	Light Fastness
No-mordant	Brown	5	4-5	No-mordant	Greenish Yellow	5	5
SnCl ₂	Reddish yellow	4	4	SnCl ₂	Yellow	5	5
Alum	Reddish yellow	5	5	Alum	Reddish yellow	5	5
CrCl _{3.} 6H ₂ O	Yellow	5	5	CrCl ₃	Greenish yellow	4	5
NiCl ₂ .6H ₂ O	Greenish yellow	4	5	NiCl ₂	Greenish yellow	5	5
CuCl ₂ .2H ₂ O	Brown	5	5	CuCl ₂	Brown	5	5
$CuSO_4.7H_2O$	Yellowish brown	5	5	$CuSO_4$	Yellow	5	4-5
FeSO ₄ .7H ₂ O	Brown	5	5	FeSO ₄	Brown	4	5
FeCl ₃ .6H ₂ O	Brown	4	5	FeCl ₃	Brown	5	5
$K_2Cr_2O_7$	Yellow	4	4	$K_2Cr_2O_7$	Greenish yellow	5	5

Table 2: Wool and goat hair samples with Schiff base I with different mordants.

Mordant	Cotton (Color)	Wash Fastness	Light Fastness	Mordant	Nylon (Color)	Wash fastness	Light Fastness
No-mordant	Yellowish orange	5 5 No-mordant Greenish yellow		5	5		
SnCl ₂	Orange	5	4	SnCl ₂	Reddish yellow	5	4
Alum	Yellowish orange	5	5	Alum	Yellow	5	5
CrCl ₃ .6H ₂ O	Greenish yellow	4	5	CrCl ₃	Greenish yellow	5	5
NiCl ₂ .6H ₂ O	Yellowish orange	5	4-5	NiCl ₂	Yellowish orange	5	5
CuCl ₂ .2H ₂ O	Brown	5	5	CuCl ₂	Reddish yellow	5	5
CuSO ₄ .7H ₂ O	Yellowish orange	5	4	CuSO ₄	Yellow	5	4-5
FeSO ₄ .7H ₂ O	Yellowish red	5	5	FeSO ₄	Reddish yellow	4	5
FeCl ₃ .6H ₂ O	Brown	5	5	FeCl ₃	Brown	5	5
$K_2Cr_2O_7$	Reddish yellow	5	5	$K_2Cr_2O_7$	Greenish yellow	5	5

Table 4: Wool and goat hair samples in dyeing with Schiff base II with different mordants.

Mordant	Wool (Color)	Wash Fastness	Light Fastness	Mordant	Goat hair (Color)	Wash fastness	Light Fastness
No-mordant	Brownish grey	5	5 4-5 No-mordant Brownish grey		5	4-5	
SnCl ₂	Yellowish brown	4	5	SnCl ₂	Yellowish brown	5	4-5
Alum	Stain dark bronze	5	4	Alum	Brownish grey	5	5
CrCl ₃ .6H ₂ O	Brownish grey	4	5	CrCl ₃	Yellowish brown	5	5
NiCl ₂ .6H ₂ O	Olive green	5	5	NiCl ₂	Brownish grey	5	5
CuCl ₂ .2H ₂ O	Brownish grey	5	5	CuCl ₂	Olive green	5	5
CuSO ₄ .7H ₂ O	Olive green	5	4-5	CuSO ₄	Brownish olive	5	5
FeSO ₄ .7H ₂ O	Brownish olive	5	5	FeSO ₄	FeSO ₄ Brown		5
FeCl ₃ .6H ₂ O	Yellowish brown	5	5	FeCl ₃	FeCl ₃ Brownish olive		5
$K_2Cr_2O_7$	Brownish grey	5	5	$K_2Cr_2O_7$	Brownish olive	5	4

Mordant	Cotton (Color)	Wash Fastness	Light fastness	Mordant	Nylon (Color)	Wash fastness	Light Fastness
No-mordant	Olive green	5	5	No-mordant	Yellowish Brown	5	4-5
SnCl ₂	Brownish grey	5	4-5	SnCl ₂	Brownish Olive	5	4
Alum	Dark green	5	5	Alum	Brownish grey	5	5
CrCl ₃ .6H ₂ O	Yellowish brown	5	5	CrCl ₃	Brownish grey	5	5
NiCl ₂ .6H ₂ O	Brownish grey	5	4-5	NiCl ₂	Brownish grey	5	5
CuCl ₂ .2H ₂ O	Yellowish brown	5	5	CuCl ₂	Brownish Olive	5	5
CuSO ₄ .7H ₂ O	Olive green	5	4-5	CuSO ₄	Brownish grey	5	5
FeSO ₄ .7H ₂ O	Olive green	4	5	FeSO ₄	Brownish olive		4-5
FeCl ₃ .6H ₂ O	Leather brown	5	5	FeCl ₃	FeCl ₃ Brownish olive		5
$K_2Cr_2O_7$	Brownish grey	5	4	$K_2Cr_2O_7$	Yellowish brown	5	5

 Table 5: Cotton and Nylon samples in dyeing with Schiff base II with different mordants.

Table 6: Wool and goat hair samples in dyeing with Schiff base III with different mordants.

Mordant	Wool (Color)	Wash Fastness	Light fastness	Mordant	Goat hair (Color)	Wash fastness	Light Fastness
No-mordant	Pale yellow	4-5	5	No-mordant	Pale yellow	-	-
SnCl ₂	Beige yellow	5	5	SnCl ₂	Beige yellow	5	5
Alum	Cream	5	5	Alum	Cream	5	4-5
CrCl ₃ .6H ₂ O	Brown	5	4-5	CrCl ₃ Brownish olive		5	5
NiCl ₂ .6H ₂ O	Lemon yellow	5	5	NiCl ₂	NiCl ₂ Lemon yellow		5
CuCl ₂ .2H ₂ O	Lime green	5	5	CuCl ₂	Lime green	5	5
CuSO ₄ .7H ₂ O	Yellowish brown	5	5	CuSO ₄	CuSO ₄ Yellowish brown		4-5
FeSO ₄ .7H ₂ O	Pale brown	5	5	FeSO ₄	Pale brown	5	4-5
FeCl ₃ .6H ₂ O	Beige brown	5	5	FeCl ₃	Beige brown	5	5
$K_2Cr_2O_7$	Olive green	5	5	$K_2Cr_2O_7$	Olive green	5	5

Table 7: Cotton and Nylon samples in dyeing with Schiff base III with different mordants.

Mordant	Cotton (Color)	Wash Fastness	Light fastness	Mordant	Nylon (Color)	Wash fastness	Light Fastness
No-mordant	Sand	5	4-5	No-mordant Yellowish brown		5	5
SnCl ₂	Gold	5	4	SnCl ₂	Yellow	5	4-5
Alum	Olive green	5	5	Alum	Brownish olive	5	5
CrCl ₃ .6H ₂ O	Brownish grey	5	5	CrCl ₃	Brownish olive	5	4
NiCl ₂ .6H ₂ O	Brownish grey	5	5	NiCl ₂	Brownish olive	5	5
CuCl ₂ .2H ₂ O	Olive green	5	5	CuCl ₂	Brown	5	5
CuSO ₄ .7H ₂ O	Olive green	5	5	$CuSO_4$	Brownish grey	5	4-5
FeSO ₄ .7H ₂ O	Sand	5	5	$FeSO_4$	Green yellow	5	5
FeCl ₃ .6H ₂ O	Brown	5	4	FeCl ₃	Olive green	5	5
$K_2Cr_2O_7$	Orange	5	4-5	$K_2Cr_2O_7$	Deer yellow	5	5

Table 8: Wool and goat hair samples in dyeing with Schiff base IV with different mordants.

Mordant	Wool (Color)	Wash fastness	Light fastness	Mordant	Goat hair (Color)	Wash fastness	Light Fastness
No-mordant	Yellowish brown	5	4	No-mordant	Gloss black	5	5
SnCl ₂	Yellowish orange	5	4-5	SnCl ₂	Stain Dark Bronze	5	4
Alum	Olive green	5	5	Alum	Stain black	4	5
CrCl ₃ .6H ₂ O	Yellowish brown	5	5	CrCl ₃	Gloss black	5	5
NiCl ₂ .6H ₂ O	Brownish grey	4	5	NiCl ₂	Stain Dark Bronze	5	4-5
CuCl ₂ .2H ₂ O	Brownish olive	5	4-5	CuCl ₂	Gloss black	5	5
CuSO ₄ .7H ₂ O	Brownish grey	5	5	CuSO ₄	Gloss black	5	4-5
FeSO ₄ .7H ₂ O	Leather brown	4	5	FeSO ₄	Stain Dark Bronze	5	5
FeCl ₃ .6H ₂ O	Brown	5	5	FeCl ₃	Stain Dark Bronze	5	5
$K_2Cr_2O_7$	Brownish olive	5	4-5	$K_2Cr_2O_7$	Gloss black	5	4

Mordant	Cotton (Color)	Wash fastness	Light fastness	Mordant	Nylon (Color)	Wash fastness	Light Fastness
No-mordant	Olive green	5	5	No-mordant	Olive green	5	4-5
SnCl ₂	Reddish yellow	5	4-5	SnCl ₂	Olive green	5	4
Alum	Brownish olive	5	5	Alum	Yellowish brown	5	5
CrCl ₃ .6H ₂ O	Brownish olive	5	5	CrCl ₃	Brownish olive	5	5
NiCl ₂ .6H ₂ O	Yellowish Brown	4	4-5	NiCl ₂	Yellowish brown	5	4-5
CuCl ₂ .2H ₂ O	Brown	5	4	CuCl ₂	Brownish grey	5	5
CuSO ₄ .7H ₂ O	Brownish grey	5	4-5	CuSO ₄	Brownish grey	5	4-5
FeSO ₄ .7H ₂ O	Brownish grey	5	5	FeSO ₄	Brownish grey	5	5
FeCl ₃ .6H ₂ O	Yellowish orange	5	5	FeCl ₃	Orange	5	5
$K_2Cr_2O_7$	Brown	5	4	$K_2Cr_2O_7$	Brown	5	4

Table 9: Cotton and Nylon samples in dyeing with Schiff base IV with different mordants.

Methods of Color Assessments: The color change and fastness properties of the dyed samples were determined using Standard Blue Scale(SBS) or Hue Scale Indication Chart(HSIC) at the end of the text.

RESULTS AND DISCUSSION: The synthesized Schiff bases and their chelates have been introduced and subjected to physical examinations, such as transformation changes (melting and boiling points), as well the solubility in different solvents has been done and shown in Table-10. The expected molecular weights, colors and the melting points have been recorded for justification of the building up results.

Due to the chelate nature of the IR spectra of the Schiff bases and their chelates with variety of intensities, sometime difficult to assign all the bands attempts, however, it can be made to assign some of the important vibrational stretching bands on the basis of the reports available in the literature. The infrared spectral of the ligands and their Ni(II) chelates are listed in Table-11.

Table 10: Chemical and Physical properties of the starting materials, ligands and the complexes.

			Solubility							
Compounds		Color	H ₂ O	MeOH	EtOH	Et ₂ O	THF	DMSO	CHCl ₃	CCl ₃
Salicyldehyde	1	White	-	+	+	+	-	+	+	+
2-Aminoaniline	2	Brown	+	+	+	+	+	+	+	-
2-Aminobenzoic acid	3	Grey	-	+	+	+	+	+	+	-
2-Aminobenzyl alco- hol	4	Grey	+/ 🛆	+	+	+	+	+	+	+
3-amino-1,2,3- Triazole	5	White	+	+	+	+	+	+	+	+
Semicarbazide hydro- chloride	6	White	+	+	-	-	+	+	+	+
$Ni^{2+} + L^{1,2}$	Comp.1	Brown	-	-	-	-	+	+	+	-
$Ni^{2+} + L^{1,3}$	Comp.2	Yellowish-green	-	-	-	-	+	+	-	-
$Ni^{2+} + L^{1,4}$	Comp.3	Yellowish-green	-	-	-	-	-	+	-	-
$Ni^{2+} + L^{1,5}$	Comp.4	Green	-	+	+	-	+	+	-	-
$Ni^{2+} + L^{1,6}$	Comp.5	Blue	-	+	-	-	+	+	+	-

Comp.=chelate, L= azo compound (from aldehyde + amino compound) nickel salt formula= NiCl₂.H₂O

 Table 11: Observed data of Infrared and electronic spectral of products.

Ligand	υ Ο-Η	υN-H	υ C-O	υH ₂ O	υC=N	υM-N	υ Μ-Ο
Schiff base L ¹	-	-	-	3455	1619	-	-
Schiff base L ²	-	-	_{Carboxyl} 1692	3455	1619	-	-
Schiff base L ³	1380	-	-	3231	1564	-	-
Schiff base L ⁴	-	-	-	3455	1564	-	-
Schiff base L ⁵	-	-	-	3455	-	-	-

The spectra of chelates exhibited bands in the range of 3408-3487cm⁻¹analogous to the presence of water molecules as hydrated and coordinated. Meanwhile, the same spectra showed bands in the range of 1597- 1600 cm^{-1} assigning to v(HC=N) vibration, the shifting of these bands to low frequency comparing to the Schiff base (L^x) confirmed the engagement of this azomethine group in chelation through nitrogen atoms. The other coordination sites of which can take a part in coordination are oxygen, nitrogen groups or other parts of the Schiff base. The strong evidence of sharing of these groups can be seen in the position of the bands at the spectra. New bands in the range of 641-748 and 441-537 cm^{-1} which are not exist in the free ligands (Schiff bases) are due to v(M-O) and v(M-N) vibrations and the appearance of these bands supported involvement of O/N atoms of hydroxyl and azomethine.9-18

Despite the overall structural similarity of the Schiff bases, the type of the engagement of the functional groups and the metal ions in bonding, facilitate the type of the reactions that required for the chemistry of staining or dyeing. The directionality in the chelation justifies the sites, the important parts and the groups which can work in bonding processes. The best sites of chelation are the oxygen or nitrogen carrying groups rather than the azomethine group itself, as long as the appropriate position of these groups provided.¹³

The different in the sites and properties of the functional groups, give the Schiff bases advantages to be a remarkable body and a good agents for the assigned them in the purposes of dyeing. As the difference of hydroxyl groups work in certain field, such as biological activities, as well as amino groups and they are work in other fields from which we assign the chemistry of dyes techniques from the capability of Schiff bases in coordination in biological systems and the orientation to be carry out for the importance in this application propose the objectives of our work to use synthetic dyes in dyeing applications, to assess the color fastness to wash and sun light and to work on dyeing (wool, goat hair, nylon, and cotton) with four Schiff bases and to investigate the effect of mordents' type on the dyeing process.

As well we justify the washing of dyed and un-dyed fabric samples in contact were agitated in soap solution (5ml/100ml) for 20 mins at 40°C, Figures 7-10. After rinsing and dyeing, the change in color of the dyed sampled and the bleeding to the white fabric (cotton or silk or satin) was determined visually and the test shown in the figures 7, 8, 9, 10. The changes were graded with marks (1= poor - 5=excellent). Moreover light fastness to sun daylight test is used to determine if a textile changes color or if the color is

destroyed by the action of daylight. The samples of the dyed fibers are exposed to daylight under standard conditions, including protection from rain, along with eight dyed wool standards according to BS.EN.ISO.105.B02. Change in color of the dyed samples related to standard scale of blue dying were assessed in the normal way visually by giving grade marks (1= poor - 8= excellent) figures 1-9.¹⁴⁻¹⁶



Figure 1: Type of the used yarn fibers.



Figure 2: Hand washing of Schiff base I dyed sample.



Figure 3: Hand washing of Schiff base II dyed samples.



Figure 4: Hand washing of Schiff base III dyed samples.



Figure 5: Hand washing of Schiff base IV dyed samples.



Figure 6: Dyed wool sampled of Schiff bases I,II,III and IV with metal mordants, prepared Light fastness test.



Figure 7: Dyed cotton sampled of Schiff base I, II, III and IV with metal mordants, prepared Light fastness test.



Figure 8: Dyed nylon sampled of Schiff base I, II, III and IV with metal mordants, prepared Light fastness test.



Figure 9: Dyed goat hair sampled of Schiff bases I, II, III and IV with metal mordants, prepared Light fastness test.

CONCLUSION: We can conclude that the Schiff bases introduced to be important parts to play a role in dyes techniques. The variation of transition metal ions chelates give sharp explanation to in the properties management of the dyes to be used in all yarn fibers and hair. The Schiff bases advantages to be a remarkable body and good agents to be assigned them in the purposes of dyeing techniques.

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