Synthesis and Identification of Some New Metal Complexes of Mixed Schiff Base Ligands

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Abstract: ***The free Schiff base ligand (HL_1) which was prepared mixed with the Schiff base ligand (HL_2).The product then was reacted with some transition metal salts: (Cu^{2+}, Ni^{2+}, Cd^{2+}, Mn^{2+}, $Zn^{2+}$and $Pd^{2+}$to get new transition metal complexes. The ligand which were prepared and their transition metal complexes where characterized by physic-chemical spectroscopic techniques such as: FT-IR, UV-Vis, (C.H.N) spectra, molar conductivity, magnetic moment, mass spectrometer techniques and microanalysis techniques. The results showed the formation and the high purity of the free Schiff base ligands and their metal complexes, indicating that they are in a good agreement with the theoretical values. The fragments of the prepared free Schiff base ligand where identified by mass spectrometer techniques. All analysis of ligands and their metal complexes where in good agreement with the theoretical values which indicated the purity of Schiff base ligands and their metal complexes. From the above data, the molecular structures for all the metal complexes where proposed to be octahedral except Capper and Palladium were square planar.***

Keywords: Synthesis, identification, transition metal complexes, Mixed ligand, Schiff base.

1. Introduction

The branch of inorganic chemistry that deals with the study of coordination compounds is called coordination chemistry (1). The concept of a metal complex has been originated by Alfred Werner who (in 1913) was awarded the first Nobel Prize in inorganic chemistry (2). Whereas the study of a range of coordination compounds is connected to the nature of metal and the ligand (3). In general, coordination compound is a metal surrounded by neutral molecules or ions called ligands. Ligands are Lewis bases they contain at least one unshared electrons. They are also called complexing agents. Metal ions have empty valance orbitals, they act as Lewis acids (4).

Schiff base In modern coordination chemistry, many different inorganic and organic compounds are used as ligands. But there are two most important classes of ligands in the modern coordination chemistry, namely, azomethines andoximes (5). On the other hand ligands, a metal surrounded by a cluster of ions or molecules are used for preparation of complex compounds named as Schiff's bases (6). Tetra-dentate Schiff's bases are well known for their coordination with various metal ions, forming stable compounds (7, 9). In general Schiff bases (azomethines) have been known since 1864 when Hugo Schiff reported the condensation of primary amines with carbonyl compounds. Now days, the research field dealing with Schiff base coordination chemistry has expanded enormously (10). The common imines are crystalline solids, which are feebly basic but at least some form insoluble salts with strong acids (11). On the other hand the color of the Schiff bases are due to the presence of this azomethine (>C=N) linkage and can vary by introducing other auxochromic group (12)

2. Experimental

A. Instrumentation

Melting point measurements were carried out at the laboratories of the College of Science for women, University of Baghdad, Ultraviolet- Visible Spectrophotomèter type (UV-160A Shimadzu) in the region 200-1100 nm The measurements were carried out at the laboratories of Ibn-Sina Company Baghdad, Iraq, FT.IR Spectra Infrared spectra of the prepared compounds were recorded as potassium bromide disc by using Shimadzu, (8400S) Fourier Transform Infrared Spectrophotometer in the range 4000-400 cm^{-1}. The spectra were carried out at the laboratories of In Ibn-Sina Company Baghdad, Iraq. Element (C.N.H) analysis, have been carried out in (Euro vector model EA3000, single V.3.O single. The measurements were carried out at College of Science, University of Babylon

Molar conductivity Electrical conductivity measurements of the complexes were recorded at (25 °C ± 2 °C) for (1×10^{-3}M) M solution of the samples in DMSO, using a Philips PW-digital conductivity meter. The measurements were carried out at College of Science for women, University of Baghdad, Magnetic measurements. The measurements were carried out at the laboratories of Al-Nahrain University, Baghdad, Iraq.

B. Synthesis of Compounds

1. Preparationof (Z) 4 (2hydroxybenzylideneamino) -1, 5-dimethyl-2-phenyl-1H-pyrazol-3 (2H) -one (L_1)

The Schiff base ligand was prepared by the condensation of the p-amino-2, 3-dimethyl-1-phenyl-3-pyrozoline-5-on (0.5 g, 0.0247 mol) with the ($0.26cm^3$, 0.0247 mol) salicylaldehyde in methanol $15cm^3$. The resulting mixture was then refluxed for 1h. The yellow solid was collected by filtration, dried at (40°C) for five hours and then recrystalized from absolute ethanol to give yellow needles, collected by filtration and then dried in oven for four hours at temperature (60°C), m.p (188-189 °C) and the yield (86 %).

2. Preparation of Schiff base ligand (2- (2- (2-hydroxy benzylideneamino) ethyl) isoindoline-1, 3-dione (L_2).

A Synthesis of 2- (2-aminoethyl) isoindoline-1, 3-dione: Isobenzofuran-1, 3-dione (0.148 g, 1 mole) was dissolved in absolute ethanol (15 cm^3) with stirring. 2-Aminoethanaminium (0.06 g, 1 mole) was dissolved in absolute ethanol (10 cm^3) and added to the isobenzofuran-1, 3-dione solution were mixed in 1:1 mole ratio. The mixture solution was heated under reflux at temperature (40°C) for (2 hours). During this period, a white precipitate was formed. The white solid was collected by filtration and then washed with ethanol (2 cm^3) and then dried in oven at temperature 50-70°C for two hours, and then kept in desiccator, m.p (123-125 $^{\circ}$C) & the yield (88 %)

2- (2-aminoethyl) isoindoline-1, 3-dione (0.19 g, 1 mole) was dissolved in absolute ethanol (15 cm^3) with stirring. Salicyaldehyde (0.122 g, 1 mole) was dissolved in absolute ethanol (5cm^3), and added to the 2- (2-aminoethyl) isoindoline-1, 3-dione solution were mixed in 1:1 mole ratio. The mixture was heated with stirring under reflux at temperature (40°C) for 3 hours. During this period the colorless solution turned to the yellow solid. The yellow solid was collected by filtration and then washed with absolute ethanol and then dried in oven for six hours at temperature (60°C) and then recrystallized from absolute ethanol. The yellow powder collected by filtration and then dried in oven for five hours at temperature (60°C), m.p (115-117 $^{\circ}$C) and the yield (87 %) The white solid was collected by filtration and then washed with ethanol (2 cm^3) and then dried in oven at temperature 50-70°C for two hours, and then kept in desiccator, m.p (123-125 $^{\circ}$C) & the yield (88 %)

3. Preparationof Cu^{2+} Complex

Schiff base ligand 4- (2-hydroxybenzylideneamino) -1, 5-dimethyl-2-phenyl-1H-pyrazol-3 (2H) -one (L$_1$) (1 g, 3.253 mmole) was dissolved in absolute ethanol (20 cm^3), Copper (II) chloride (0.437 g, 3.253 mmole) was dissolved in absolute ethanol (15cm^3) an ethanolic solution of (0.957 g, 3.253 mmole) (2- (2- (2-hydroxy benzylideneamino) ethyl) isoindoline-1, 3-dione (L$_2$) was added to the mixture in each case. the solution mixture was refluxed for 4 hours. The mixture was stirred and heated under reflux for two hours at temperature (50-70°C). During this period, the colour changed for all complexes. The precipitate was collected by filtration, washed with absolute ethanol (10cm^3), and then recrystallized from absolute ethanol. A dark-green were obtained, m.p. (244-246 °C), Yield: 77%.

A similar method as described in section (3) to prepare the other complexes.

3. Result and Dissection

FT-IR spectra

In table (1) The Infrared spectra of the both free Schiff base ligands were measured in the range (4000-400) cm^{-1}, using KBrpellts.

The infrared spectrum of the free Schiff base ligand, 2[2 (2hydroxylbenzylidehydeamino) ethyl] isoindoline-1, 3-dione (HL$_1$] appeared weak a broad band at (3433) cm^{-1} was attributed to the stretching vibration of (OH) because of the intra molecular hydrogen bonding (13).

The band at (3410) cm^{-1} stretching vibration (OH) of the free Schiff base ligand (HL$_2$), the same band appeared (3410) cm^{-1} in the palladium complex that means no coordinated the oxygen atom of phenolic group to the palladium complex.

The band at (2974) cm^{-1}, (2812) cm^{-1}, (1724) cm^{-1}, (1608) cm^{-1}and (1546) cm^{-1} were assigned to the stretching vibration of υ (C-H) aromatic, υ (C-H) aliphatic, υ (C=O), υ (C=N) and (C=C) respectively. The other bands at (1249) cm^{-1} was attributed to stretching vibration υ (C-C), 1072 cm^{-1} due to υ (C-O).

The infrared spectrum of the other free Schiff base ligand, 4-(2-hydroxybenzylidene amino) -1, 5-dimethyl-2-phenyl-1H-pyrazol-3 (2H) -one (HL$_2$). The weak broad absorption band at (3410) cm^{-1} due to the stretching vibration of (OH) due to intramolecular hydrogen bonding.The FT-IR spectra of the prepared complexes where compared with that of free ligands (HL$_1$) and (HL$_2$) in order to determine the coordination sites involved in complexation, that is mean the position of some guid bands in the spectrum of the free ligands where expected to change up on complexation.

The band at 3433cm^{-1}and 3410cm^{-1} of the free Schiff base ligands, (HL$_1$) and (HL$_2$) respectively are absent in the Ni (II), Cu (II), Mn (II), and Zn (II) complexes which is indicated the deprotonation of phenol proton prior to and indicated the coordination of the phenolic group with Nickel Copper, Manganese and Zinc ions. The bands at (3371-3402) cm^{-1} and medium sharp band appeared at (933) cm^{-1} and (964) cm^{-1} where assigned to the stretching vibration and rocking of (OH) of water which were indicated the presence of water molecules inside the coordination sphere of the Mn (II), Zn (II), and Cd (II) complexes respectively. The bands at (3394) cm^{-1} and (3367) cm^{-1} due to stretching vibration of hydrated water molecule of Cu (II) complex

The band at (1685) cm^{-1} which is belong to the carbonyl group of (HL$_2$) was shifted to lower frequency in the prepared complexes Nickel, manganese, Zinc and cadmium complexes, which is indicated to coordinated with the above metal ions (14), The bands of (C=N) in the free Schiff base ligands, (HL$_1$) and (HL$_2$) which are observed at (1608) cm^{-1} and (1627) cm^{-1} respectively were shifted to lower frequency in all the spectra of the prepared complexes, this indicates the participitationof the nitrogen atom of the azomethine group in coordination. The bands which are observed at rang (1492-1585) cm^{-1} assigned to the stretching vibration of (C=C) for all the spectra of metal complexes. The band at (3433) cm^{-1} in the free Schiff base ligand (HL$_1$) showed no changed in the spectrum at Cadmium complex, this indicated uncoordinated the oxygen of phenolic group of the Schiff base ligand (HL$_1$)

Table 1: FT-IR of free Schiff base ligands and their metal complexes in (cm^{-1})

Compounds	υ OH	υC-H ar	υC-H aliph	υ C=O	υC=C	υC=N	υC-O phen.	υM-N	υ M-O	Other bands
Schiff base (HL_1)	3433	2974 2812	2708 2576	1724	1516	1606	1072	540	478	
Schiff base (HL_2)	3414	2993 2954	2800 2634	1685	1558	1627	1080	543	493	-
[Mn (L_1) (L_2) H_2O]	3394	3055 3020	2935	1654	1539	1624 1597	1049 1029	551 505	466	Aqu 933 H_2O
[Ni (L_1) (L_2) H_2O]	3390	3059 3020	2935 2800	1654	1539	1620 1600	1033	551 505	408	**Aqu 933 H_2O**
[Cu (L_1) (L_2)]H_2O	3367	3043	2954	1701 1685	1581	1635 1600	1072	551	420	**3394 H_2O**
[Zn (L_1) (L_2) H_2O]	3460	3062	2939	1651	1543	1604	1041 1029	524 505	455 428	**Aqu 933 H_2O**
[Cd (HL_1) (L_2) Cl.H_2O]	-	3062 2993	2939	1651	1562	1597	1141	547	408	Aqu933 H_2O
[Pd (L_1) (HL_2) Cl]	-	3059	2993 2808	1685	1562	1654 1593	1072	551 505	420	-

Mass Spectrometer

The mass spectrum of the 2- (2-aminoethyl) isoindoline-1, 3-dione has been studied at temperature (210^0C). The main high resolution mass spectrometer of this compound is obtained at 210^0C which is appeared at very clear and higher relative abundance. The molecular ion peak was observed at m/z=190 (M) (relative abundance is 65%) for $C_{10}H_{10}O_2N_2$ which is in excellent agreement with the theoretical value. The other peaks are detected at (M/Z=194)) (relative abundance is 63%), corresponding to [M (190) + ($C_{10}H_{14}O_2N_2$)], [M (190) - ($C_8H_5O_2N_2$) and [M (165) - ($C_8H_7ON_2$)] respectively. The other peaks which is obtained from the fragmentation of $C_{10}H_{14}O_2N_2$ (M/Z=194) are detected at m/z=166 (relative abundance is 10%), 165 (relative abundance is 100%) and 147 (relative abundance is 10%). All the fragmentations can be shown in table (2) Figure (1) and scheme (1).

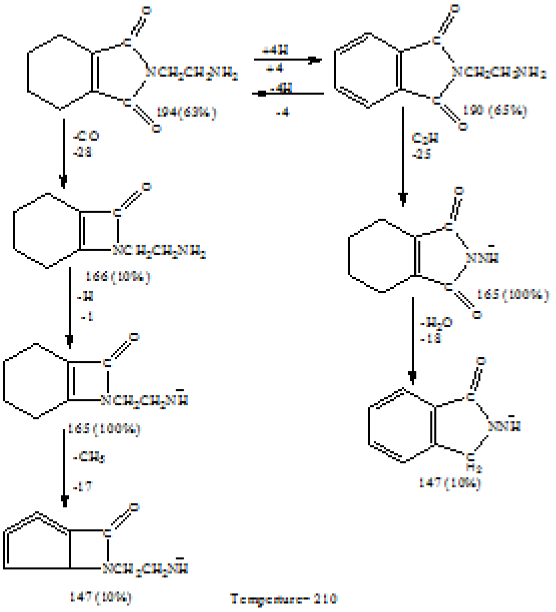
Table 2: The fragmentation pattern data for the 2- (2-aminoethyl) isoindoline-1, 3-dione at 210^0C Molecular ion

Molecular ion	Relative abundance	Assignment
190	65%	$C_{10}H_{10}O_2N_2$
165	100%	$C_8H_9O_2N_2$
147	10%	$C_8H_7ON_2$
194	63%	$C_{10}H_{14}O_2N_2$
194	63%	$C_{10}H_{14}O_2N_2$
166	10%	$C_9H_{10}ON_2$
165	100%	$C_9H_9ON_2$
147	10%	$C_8H_4ON_2$

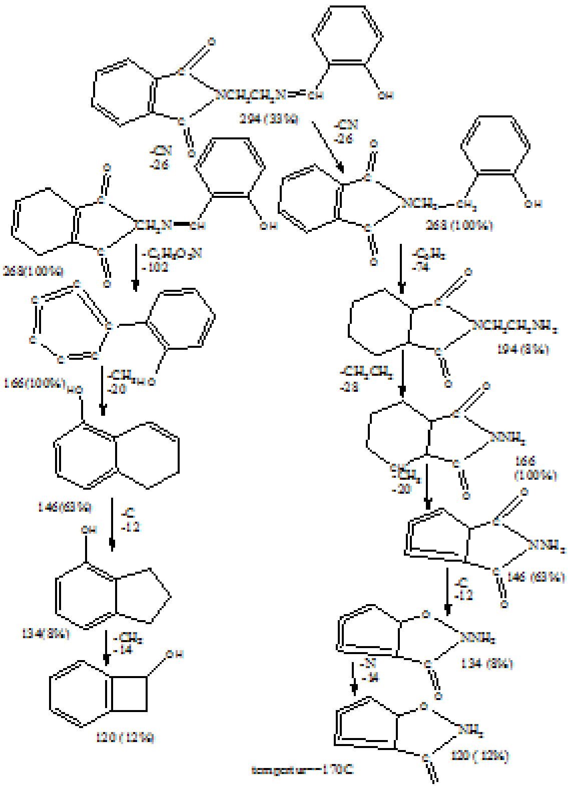
The main high resolution mass spectrometer of the free Schiff base ligand, 2-[2-hydroxybenzylideneamino) ethyl] isoindoline-1, 3-dione is carried out at temperature (170^0C) which is illustrated in figure (2), table (3) and Scheme (2). The molecular ion peak for the free Schiff base ligand was showed at m/z=294 (M) (relative abundance is 33%) for C_{17} $H_{14}O_3N_2$ 11which is in a good agreement with the theoretical value. The other molecular ion peaks are detected at m/z=268 (relative abundance is 100%), 194 (relative abundance is 8%), 166 (relative abundance is 100%), 146 (relative abundance is 63%), 134 (relative abundance is 134) and 120 (relative abundance is 12%) corresponding to[M (294) - ($C_{16}H_{14}O_3N$)], [M (268) -$C_{10}H_{14}O_2N_2$)], [M (194) - ($C_8H_{10}O_2N_2$)], [M (166) - ($C_7H_2O_2N_2$)], [M (146) - ($C_5H_2O_2N_2$)] and [M (134) - ($C_5H_2O_2N$)]. OR [M (294) - ($C_{16}H_{14}O_3N$)], [M (268) - ($C_{12}H_6O$)], [M (166) - ($C_{10}H_{10}O$)], [M (146) - ($C_9H_{10}O$)] and [M (134) - (C_8H_8O)].

Table 3: Fragmentation pattern data for the free Schiff base at temp.170^0C

Molecular ion m/z	*Relative abundance*	*Assignment*
294	33%	$C_{17}H_{14}O_3N_2$
268	100%	$C_{16}H_{14}O_3N$
194	8%	$C_{10}H_{14}O_2N_2$
166	100%	$C_8H_{10}O_2N_2$
146	63%	$C_7H_2O_2N_2$
134	8%	$C_6H_2O_2N_2$
120	12%	$C_6H_2O_2N$



Scheme (1) The fraqmentation pattern of 2- (2- amino ethy l) iso – indoline – 1, 3 – doine (Amic acid) at 210 C°



Scheme (2) The fragmentation pattern of Schiff base ligand (2- (2- (2-hydroxy benzylideneamino) ethyl) isoindoline-1, 3-dione at 170 C°

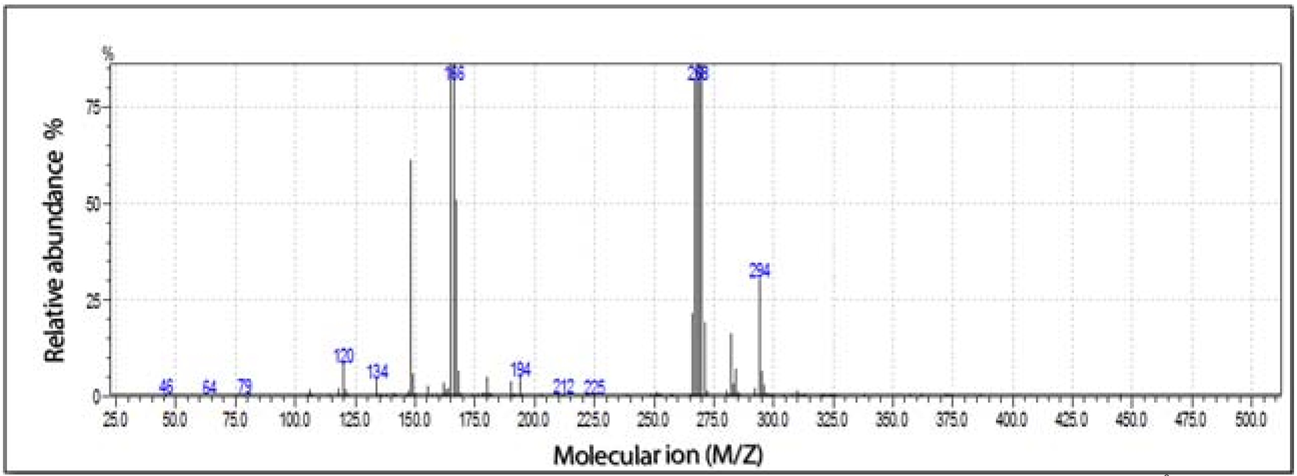


Figure 1: Mass spectrum of Schiff base from 2- (2- amino ethyl) iso – indoline – 1, 3 – doine at 210^0C °

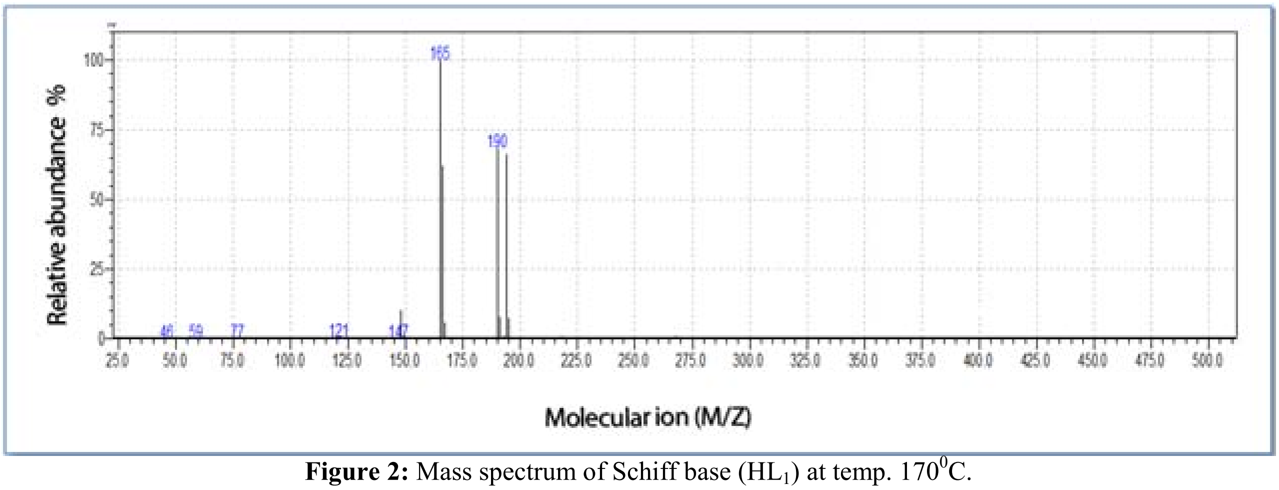


Figure 2: Mass spectrum of Schiff base (HL_1) at temp. 170^0C.

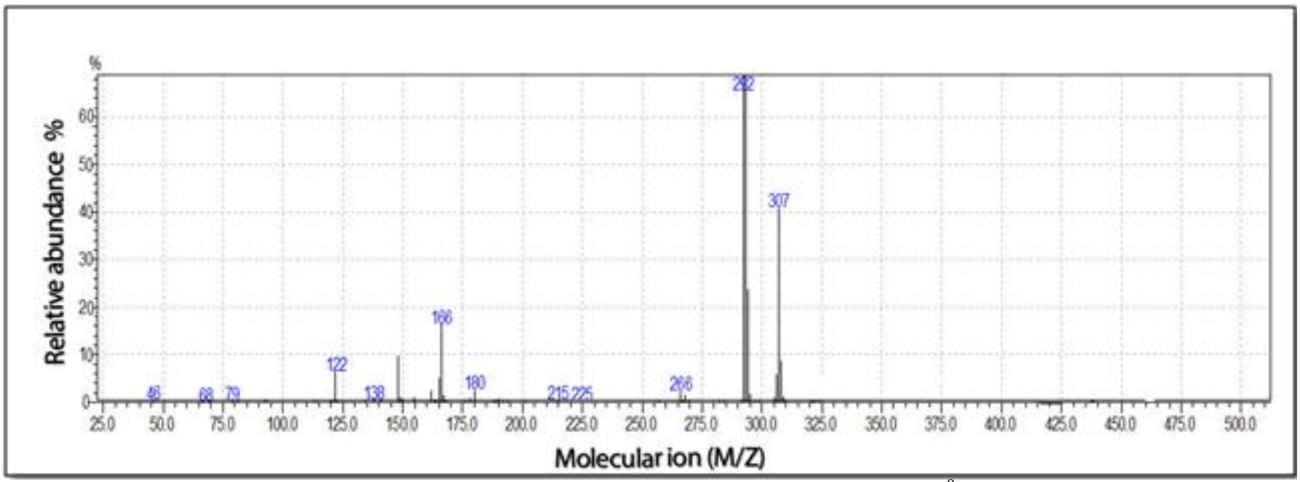


Figure 3: Mass spectrum of Schiff base (HL_2) from at210 ^{0}C.

Table 4: Some analytical & physical properties for the Schiff base ligands and their metalcomplexes.

Compounds	**M.w.t**	**Molecular formula**	**Color**	**Yield%**	**m.p$^{\circ}$C**	**Microanalysis (Calc.) Exp.**			**M % (Calc.) Exp**	**Cl%**	**SO_4 %**	**Molar Conductance (μs/cm^{-1})**	**μeff. (B.M.)**	**Ratio M/L**
						C %	**H %**	**N %**						
Schiff base (HL_1)	294.30	$C_{17}H_{14}N_2O_3$	Yellow	77	115-117	(69.34) 69.55	(4.76) 4.77	(9.52) 10.05	-	-	-	-	-	1:1:1
Schiff base (HL_2)		$C_{18}H_{17}N_3O_2$	Yellow	70	199-200	(70.36) 71.14	(5.54) 5.33	(13.68) 13.0	-	-	-	-	-	1:1:1
[pd (L_1) (HL_2) Cl]	741	$C_{35}H_{30}N_5O_5ClPd$	Yellwish-green	61	135-137	(56.68) 57.01	(4.05) 4.11	(9.45) 10.07	(14.3) 14.05	Pd4.72	-	19 Non - electrolyte	Zero	1:1:1
[Cd (HL_1) (L_2) Cl]	765	$C_{35}H_{31}N_5O_6ClCd$	Yellow	81	195-197	(54.9) 55.11	(4.18) 4.56	(9.15) 10.01	(14.64) 15.03	Cd4.57	-	12 Non-electrolyte	zero	1:1:1
[Mn (L_1) (L_2) Cl]	672	$C_{35}H_{31}N_5O_6Mn$	Dark-Brown	65	281-283	(62. 5) 63.03	(4.61) 5.00	(10.4) 10.51	(8.184) 8.4	Mns -	-	17 Non - electrolyte	5.05	1:1:1
[Zn (L_1) (L_2) (H_2O)]	682	$C_{35}H_{31}N_4O_6$ Zn	Off-white	78	135d	(61.58)	(4.45)	(10.26)	(9.33)	-	-	20 non-electrolyte	Zero	1:1:1
[Ni (L_1) (L_2) (H_2O)]	1675.7	$C_{35}H_{31}N_5O_6Ni$	Orange	77	192-194	(62.15) 63.16	(4.6) 5.03	(10.36) 10.58	(8.68) 9.04	- -	- -	20 Non-electrolyte	3.04	1:1:1
[Cu (L_1) (L_2)] H_2O	680.45	$C_{35}H_{31}N_5O_6$ Cu	Dark-green	77	290d	(61.72) 62.12	(4.55) 4.64	(10.3) 9.98	6.32 10.01	- -	- -	18 Non-electrolyte	1.61	1:1:1

Electronic absorption spectra of the 2- (2-aminoethyl) isoindoline-1, 3-dione and Schiff base ligands

The electronic absorption spectra in the ultraviolet and visible region of the spectrum are characterize by the presence of several sharp bands of relatively high intensity and high molar absorptive the weak broad absorption band which are appeared in the visible region of the spectrum with low absorption intensity and low molar extinction coefficient belong to the transition of the metal ions within the (d-d) electronic transition ($^{15).}$

The visible electronic spectra of the prepared metal complexes should lend themselves most easily to theoretical interpretation because of the presence of unpaired electrons in the d – orbital.

The color of the prepared transition metal complexes are different from the color of their metal salts and ligands, this is good indication of coordination of the central metal ion through the donor atoms of their ligands, therefore the color of the prepared transition metal showed different characterization and positions ($^{16-17).}$ electronic spectra of 2- (2- aminoethyl) isoindoline- 1, 3- Dione. The electronic spectra of 2- (2- Aminoethyl) isoindoline – 1, 3 – dione the free Schiff base ligands and their metal complexes were carried out in the range (200-1100) nm in dimethyl sulphoxide (DMSO) as solvent at room temperature.

The electronic spectrum of 2- (2-aminoethyl) isoindoline appeared one absorption band at (275nm) can be assigned to (π-π*) electronic transition of the carbonyl group (C=0) as shown in figure (4) $^{(18, 19).}$

The spectrum of the free Schiff base ligand (HL_1) showed two absorption bands, the first band at (266nm, 37593cm^{-1}) attributed to (π-π*) electronic transition, the second band at (316nm, 31645cm^{-1}) assigned to (n-π*) electronic transition of azomethine group as illustrated in figure (5).

The spectrum of the second free Schiff base ligand (HL_2) exhibited two absorption bands, the first band at (271nm, 36900cm^{-1}) due to (π-π*) electronic transition.while thesecond band at (344nm, 29069cm^{-1}) attributed to (n-π*) electronic transition of azomethine group as shown in figure (6) $^{(16, 17).}$

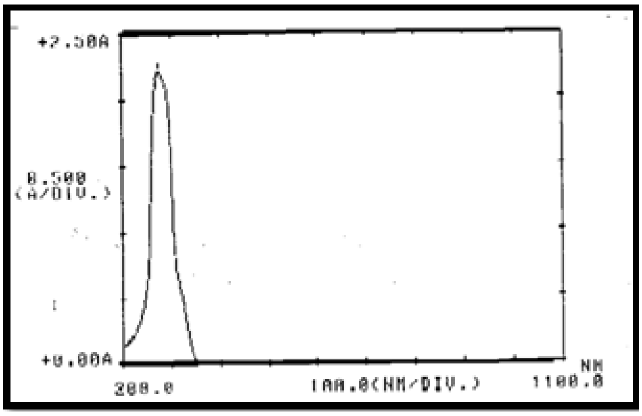


Figure 4: Electronic spectrum of 2- (2-aminoethyl) isoindoline

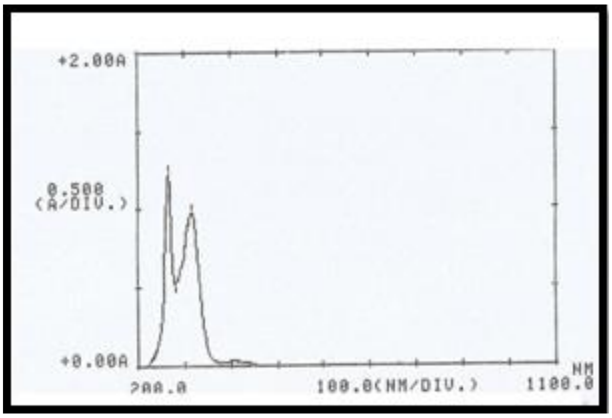


Figure 5: Electronic spectrum of (2- (2- (2-hydroxy benzylideneamino) ethyl) isoindoline-1, 3-dione (HL_1)

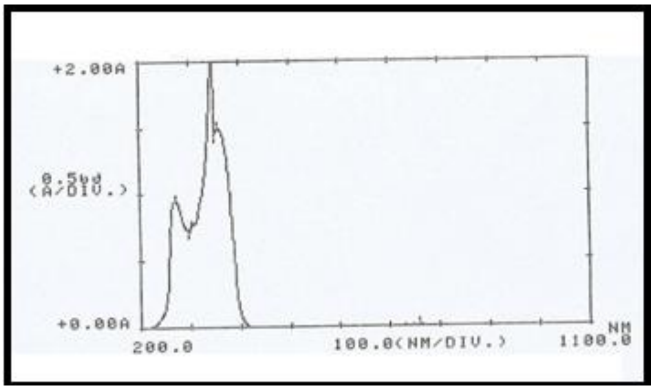


Figure 6: Electronic spectrum of4- (2-hydroxybenzylideneamino) -1, 5-dimethyl-2-phenyl-H-Pyrazole-3 (2H) -one (HL2)

Electronic spectra of the prepared metal complexes

The spectrum of the nickel complex, [Ni (L_1) (L_2) (H_2O)], in figure (7) exhibited five absorption bands, the first absorption band at (268nm, 37313cm^{-1}) attributed to (π-π*) electronic transition, the second absorption bands at (345nm, 28985cm^{-1}) attributed to (n-π*) electronic transition, the other three absorption bands appeared at (416nm, 24038cm^{-1}), (453nm, 22075cm^{-1}) and (763nm, 13698cm^{-1}) can be assigned to charge transfer (C.T.), (^3A_2g (F) →^3T_1g (p)) and (^3A_2g (F) →^3T_1g (F)) electronic transitions respectively, These electronic transitions of the complex are characterized to the octahedral geometry around the nickel ion, the value of magnetic effective is 3.04 B.M. which confirmed the suggested structure is octahedral geometry around to nicked ion ($^{20, 21).}$

The spectrum of copper complex, [Cu (L_1) (L_2)] H_2O, showed four absorption peak, the first peak, the first peak is high intensity and high molar extinction coefficient displayed at (272nm, 36764cm^{-1}) attributed to (π-π*) electronic, the second peak at (357nm, 28011cm^{-1}) assigned to (n-π*) electronic transition, the third peak at (492nm, 20408cm^{-1}) attributed to (d-d) transition type (^2B_1g→^1Eg) and the fourth peak appeared low intensity absorption and low molar extinction coefficient is observed at (998nm, 10020cm^{-1}) can be assigned (^2B_1g→^2A_2g) electronic transition. From these electronic transitions which is suggested the copper complex is octahedral geometry around the copper ion ($^{22, 23)}$ which is illustrated in figure (8).

The spectrum of manganese complex, [Mn (L_1) (L_2) H_2O], which is illustrated in figure (9) exhibited four absorption bands, the first second and third are high intensity absorption and high molar extinction coefficient are appeared at (274 nm, 36496cm^{-1}) and (345nm, 28985cm^{-1}) and (357nm, 28011cm^{-1}) assigned to (π-π*), (n-π*) and charge transfer (C.T.) with in (^6A_1g→^4A_1g, ^4E (g)) electronic transitions, we can suggested the manganese complex is octahedral geometry around the manganese ion ($^{24-27).}$

The spectra of Zinc and Cadmium complexes [Zn (L_1) (L_2) H2O], and [Cd (L_1) (L_2) (H_2O)] showed three absorption bands, the first bands, the first bands at (266nm, 37594 cm^{-1}), and (267nm, 37453cm^{-1}) due to (π-π*) the electronic transitions, the other absorption bands are high intensity absorption and high molar extinction coefficients appeared at (245nm, 28985 cm^{-1}) and (357 nm, 28011 cm^{-1}) attributed to (n-π*) and charge transfer (C.T.) electronic transitions respectively. The absence of the absorption bands in the visible range in the electronic spectra of Zinc, and Cadmium complexes indicated no (d-d) electronic transitions happened because of the electronic configuration of the above metal and d-system. The value of magnetic moment of these metal ion were found to be 0.0B.M (diamagnetic) which are in a goad agreement with theoretical values of the magnetic moment and form the corresponding electronic transition which are confirmed these complexes are octahedral around Zinc, and Cadmium ions ($^{28-30)}$ as shown in figure (10) (11).

The spectrum of Palladium complex, [pd (L_1) (L_2)]H_2O as shown in figure (12) gave absorption bands, the first sharp band appeared five at (265nm, 37736 cm^{-1}) attributed to (π-π*) electronic transition the second band at (357nm, 28011cm^{-1}) assigned to (n-π*) electronic transition the third absorption band is high intensity absorption and high molar extinction coefficient observed at (380nm, 26315cm^{-1}) due to the charge transfer (C.T.) and the four the absorption band is low intensity and low molar absorptivity appeared at (694, 14409 cm^{-1}) can be assigned to (^1A_1g ^1B_1g) electronic transition, the last absorption band at (794 nm, 12594 cm^{-1}) attributed to (^1A_1g ^1A_2g) electronic the magnetic value is 0.0B.M. (diamagnetic) which in a good agreement with the theoretical value. Know the value of magnetic effective and electronic transition indicated the palladium complex is square planar geometry around the Palladium ion (31-33)). The suggested geometry of the complexes was demonstrated at figures (13-18).

Table (5) the electronic spectra of 2-(2-aminoethyl)isiindoline-1,3-dione, free ligands and their metal complexes (conc. 1 x 10 $^{-3}$ mole / l).

Compound	λ		ABS	ɛ	Assignment	Suggested structure
	275	36363	2.220	2220	π – π*	
1- 2-(2- amino ethy l) ios – indoline – 1,3 – doine.	266	37593	0.740	740	π – π*	-
2- HL$_1$	216	31645	1.339	1339	n - π*	-
3- HL$_2$	271	36900	1.149	1149	π – π*	-
	344	29069	2.422	2422	n - π*	
[pd(L$_1$)(HL$_2$)Cl]	265 357 380 694 794	37736 28011 36315 14409 12594	1.096 1.278 1.180 0.032 0.015	1096 1278 1180 32 15	π – π* n - π* C.T. ^{1}A1g ^{1}B1g ^{1}A1g ^{1}A2g	Square planer
[Cu(L$_1$)(L$_2$)]H$_2$O	272 357 492 998	36764 28011 20325 10020	1.532 0.926 0.310 0.113	1532 926 310 113	π – π* n - π* C.T. ^{2}Big ^{2}Eg ^{2}Big ^{2}A2g	Square planer
[Cd(L$_1$) (L$_2$)]	266 345 357	37594 28985 28011	1.047 2.05 1.244	1047 2050 1244	π – π* n - π* C.T.	Octahedral
[Mn(L$_1$) (L$_2$)H$_2$O]	274 345 357 578	36496 28985 28011 17301	1.171 1.865 1.448 0.85	1171 1865 1448 850	π – π* n - π* C.T. ^{6}A1g (F) ^{4}A1g, ^{4}Eg (G) ^{6}A1g (F) ^{4}T2g (G)	Octahedral
[Zn(L$_1$) (L$_2$)H$_2$O]	367 345 357	37453 28985 28011	1.328 2.090 1.559	1328 2090 1559	π – π* n - π* C.T.	Octahedral
[Ni(L$_1$) (L$_2$)H$_2$O]	268 345 416 453 763	37313 28985 24038 22075 13106	1.492 1.996 0.326 0.184 0.003	1492 1996 326 184 3	π – π* n - π* C.T. ^{3}A2g (F) ^{3}T1g (P) ^{3}A2g (F) ^{3}T1g (F)	Octahedral

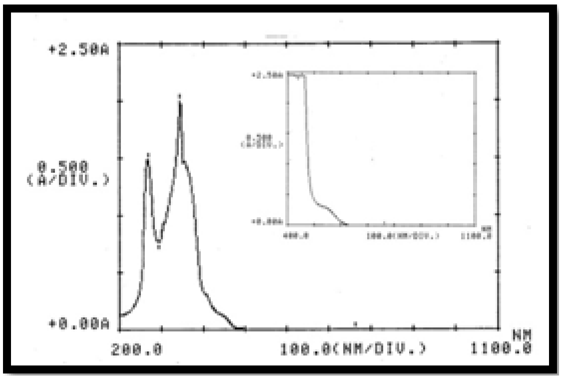


Figure 7: Electronic spectrum of, [Ni (L$_1$) (L$_2$) (H$_2$O)]complex

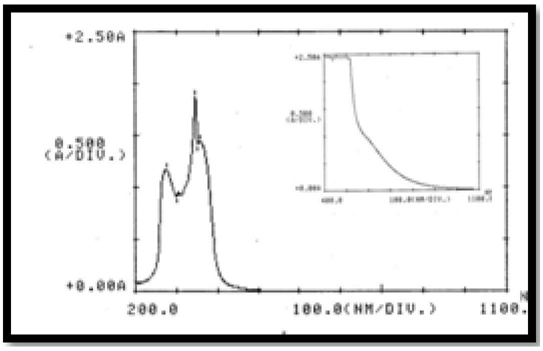


Figure 9: Electronic spectrum of[Mn (L$_1$) (L$_2$) H$_2$O] complex

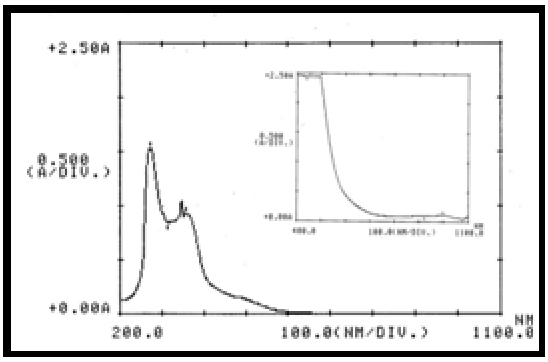


Figure 8: Electronic spectrum of [Cu (L$_1$) (L$_2$)] H$_2$O)]complex

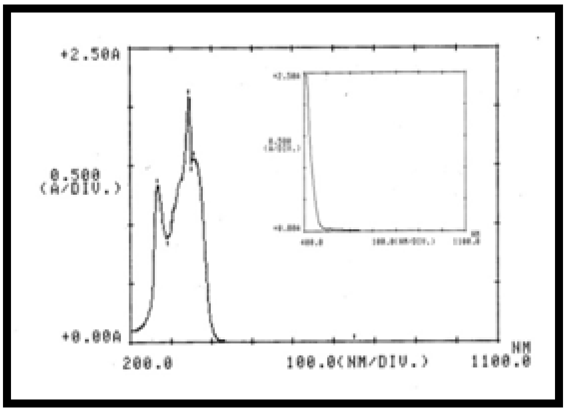


Figure 10: Electronic spectrum of [Zn (L_1) (L_2) H2O] complex

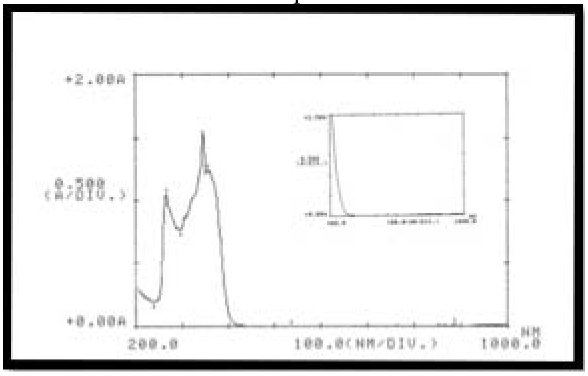


Figure 11: Electronic spectrum of[Cd (L1) (L2) (H2O)] complex

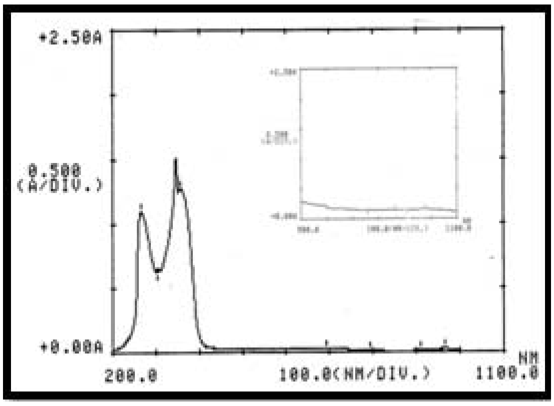


Figure 12: Electronic spectrum of [pd (L_1) (L_2)] H2O complex

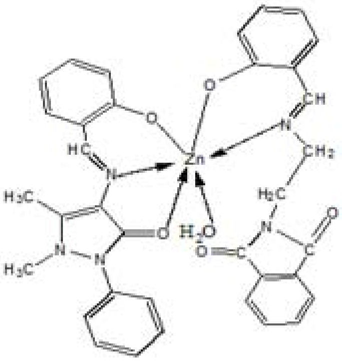


Figure 13: Suggested the structure of [Zn (L_1) (L_2) H_{2O}]

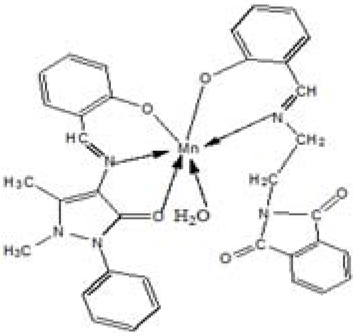


Figure 14: Suggested the structure of[Mn (L_1) (L_2) H_2O]

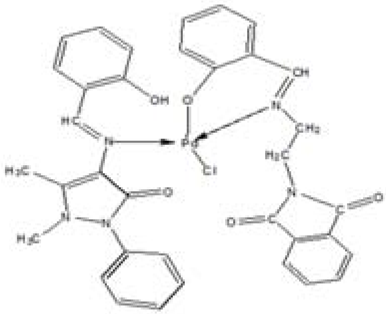


Figure 15: Suggested the structure of[pd (L_1) (HL_2) Cl]

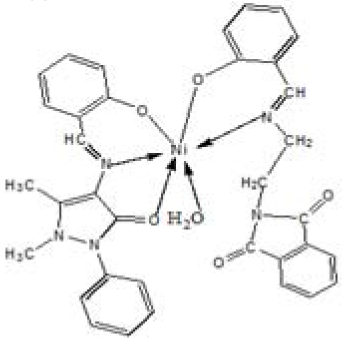


Figure 16: Suggested the structure of[Ni (L_1) (L_2) H_2O]

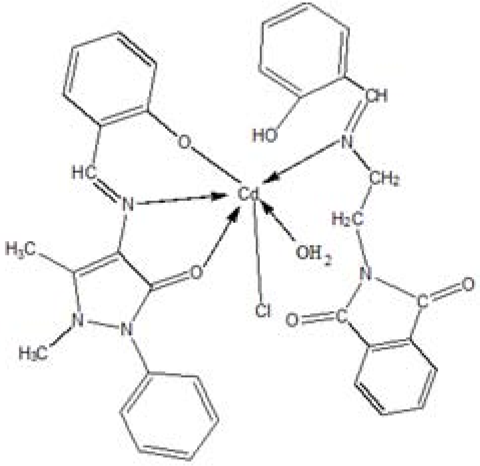


Figure 17: Suggested the structure of[Cd (HL_1) (L_2) $Cl.H_2O$]

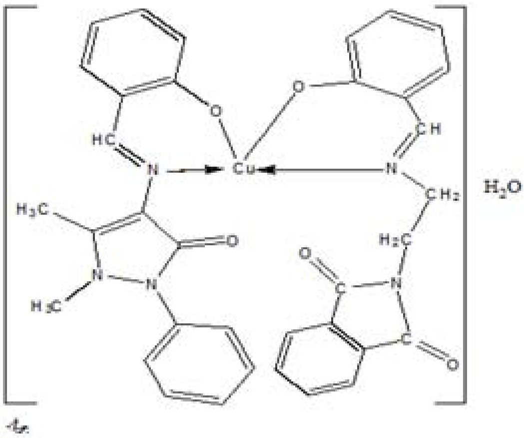


Figure 18: Suggested the structure of[Cu (L_1) (L_2)]H_2O]

4. Conclusion

1) From all the data of the infrared spectra of the metal complexes suggested that the metal ion coordinated to the Schiff base ligand through the oxygen atom of phenol

and the nitrogen atom of the azomethine groups respectively. According to the results characterization of the metal complexes by using different techniques UV-Vis, C.H.N., atomic absorption (A.A), magnetic moment and molar conductivity have been proposed geometric for complexes are octahedral for[Mn (L_1) (L_2) H_2O], [Ni (L_1) (L_2) H_2O], [Cd (HL_1) (L_2) Cl.H_2O] and[Zn (HL) $_2$].Cl_2, square planar for [pd (L_1) (HL_2) Cl] and [Cu (L_1) (L_2)]H_2O].

2) The molar conductivity measurements of the complexes were indicated all complexes are non- electrolytic nature.
3) The magnetic measurements were indicated that the above metal Cu^{2+}, Mn^{2+} and Ni complexes are paramagnetic, except the Pd^{2+}, Zn^{2+} and Cd^{2+} complexes are diamagnetic.

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