

Synthesis and characterization of VO(II), Cr(III), Mn(II), Fe(II), Zn(II), Cd(II), Hg(II) and UO₂(VI) complexes with ligands containing (ONO) and (ON) donor set atoms

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Abstract:

A new Schiff base o-hydroxybenzylidene-1-phenyl-2,3-dimethyl-4-amino-3-pyrazolin-5-on (HL) ,have been prepared and characterization.(HL) has been used as a chelating ligand to prepare a number of metal complexes VO(II) ,Cr(III) ,Mn(II),Fe(II),Hg(II) and UO₂(II) .and mixed ligands complexes have been prepared between o-hydroxybenzylidene-1-phenyl-2,3-dimethyl-4-amino-3-pyrazolin-5-on and 8- hydroxy quinoline with VO(II),Zn(II),Cd(II), Hg(II) and UO₂(II) the prepared complexes were isolated and characterized by (FT-IR)and (UV-Vis) spectroscopy. Elemental analysis (C.H.N) Chloride contents, Flame atomic absorption technique. in addition to magnetic susceptibility and conductivity measurement. Molar ratio measurement in solution gave comparable results with those obtained from solid state study.

Introduction

Metal complexes of Schiff bases have played a central role in the development of coordination chemistry ⁽¹⁾ Schiff base ligands from salicylaldehyde and chiral amines have been widely applied in enantioselective cyclopropanation of styrene's ⁽²⁻⁵⁾ a symmetric a ziridination of olefins ⁽⁶⁾, enantioselective epoxidation ⁽⁷⁻¹⁰⁾ enantioselective ring opening of epoxides ⁽¹¹⁾. Schiff base of salicylaldehyde and its complexes have a variety of applications including anti-bacterial ⁽¹²⁾ anti-fungal ,toxicological studies ⁽¹³⁾anti tumor activities ⁽¹⁴⁾ and strong anti cancer activity ⁽¹⁵⁾.transition metal complexes of Co(II),Ni(II),Cu(II) and Zn(II) with Schiff base ligand derived from the condensation of salicylaldehyde with P-Amino-2,3-dimethyl-1-phenyl-3-pyrazolin-5-on synthesized ⁽¹⁶⁾. The chlorinated species of 8- hydroxy quinoline has been proved as anti-bacterial and fungal agents ⁽¹⁷⁾.derivatives of Cu

with 8- hydroxy quinoline are anti-fouling agents ⁽¹⁸⁾ .Mixed ligand transition metal complexes of Mn(II),Fe(II),Co(II),Ni(II) and Cu(II) ions with Schiff base ligand derived from the condensation of salicylaldehyde with P-Amino-2,3-dimethyl-1-phenyl-3-pyrazolin-5-on and 8- hydroxy quinoline⁽¹⁹⁾. In this paper we presented here synthesis and characterization of some new complexes with two ligands Schiff bases (HL) and 8-hydroxy quinoline (Q) of the general formula:[M(L)₂] (M=VO⁺²,Cr⁺³ Mn⁺²,Fe⁺²,Hg⁺² and UO₂⁺²) and [M(L)(Q)] (M= VO⁺², Zn⁺²,Cd⁺²,Hg⁺² and UO₂⁺²). These complexes have been studied by (FT-IR) and (U.V-Vis) spectroscopy. Elemental (C, H and N) analysis, Chloride contents Flame atomic absorption techniques, in addition to magnetic susceptibility and conductivity measurements.

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Experimental:**Material and instrumentation**

Metal salts ($\text{VOSO}_4 \cdot \text{H}_2\text{O}$, $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$, $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$, FeCl_2 , $\text{CdCl}_2 \cdot 2\frac{1}{2}\text{H}_2\text{O}$, $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$, HgCl_2 , $\text{UO}_2(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$) were obtained from Riedel – Dehaenage in high purity, salicylaldehyde, P-Amino-2,3-dimethyl-1-phenyl-3-pyrazolin-5-on, 8- hydroxy quinoline, ethanol, methanol and dimethyl foramide from B.D.H.

Physical measurements and analysis

Elemental (C, H and N) analysis were carried out on a Perkin-Elmer automatic equipment model 240.B of the department of chemistry, faculty of science, Azerbaijan University of Tabriz, Iran. The Chloride contents of complexes were determined by potentiometric titration method using (686-Titro processor-665. Dosimat Metrohn Swiss). Melting point was recorded on Gallen Kamp melting point apparatus and were uncorrected FT-IR spectra were recorded as CsI discs using FT-IR.3800 Shimadzu in the range of $(4000-200\text{cm}^{-1})$. Electronic spectra were obtained using UV-160 shimadzu spectrophotometer at room temperature (10^{-3}M) in DMF. Conductivity was measured by capacitor analyzer and in DMF solution ($1 \times 10^{-3}\text{M}$) at room temperature. Magnetic susceptibility measurements were obtained at 25C^0 by Balance magnetic susceptibility model MSB-MK₁. The metals percent in the complexes were determined by using the Hitachi Atomic Absorption.

Preparation of the Schiff base (HL):

The Schiff base ligand was prepared by the condensation of the P-amino-2,3-dimethyl-1-phenyl-3-pyrazolin-5-on (0.5g, 2.47mmol) with the (0.26ml, 2.47mmol) salicylaldehyde in methanol (15ml). The resulting mixture was then refluxed for (1h). The yellow precipitate formed was filtered and

recrystallized from absolute ethanol to give yellow needles ⁽¹⁶⁾.

General method for preparation of the Complexes [1-6]:

To the methanol and KOH. solution of (2m mole) of the ligand (HL) (0.612g) an 15ml methanol solution of (1mmole) of the metal salt [$\text{VOSO}_4 \cdot \text{H}_2\text{O}$ (0.181g), $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ (0.266g), $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ (0.197g), FeCl_2 (0.126g), HgCl_2 (0.271g), and $\text{UO}_2(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ (0.424g)] was added drop wise with continuous stirring. The mixture was stirred further for (1-1.5)h at 50C^0 . The precipitated solid was then filtered off.

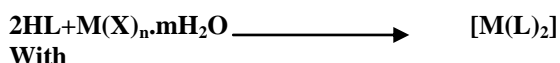
General method for preparation of the Complexes [7-11]:

To the methanol solution of (1m mole) of the meta salts [$\text{VOSO}_4 \cdot \text{H}_2\text{O}$ (0.181g), $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ (0.219g), $\text{CdCl}_2 \cdot 2\frac{1}{2}\text{H}_2\text{O}$ (0.228g), HgCl_2 (0.271) and $\text{UO}_2(\text{CH}_3\text{CO})_2 \cdot 2\text{H}_2\text{O}$ (0.424g)] an methanol and KOH solution of ligand (HL) (0.306g, 1m.mole) was added followed by the solution of ligand (Q) (0.145g, 1m.mole), dissolved in methanol KOH. The reaction mixture was stirred further for (1-2)h.. The required product was shortly precipitated at room temperature. The precipitates were filtered off, washed with (1.1) (ethanol: water) crystallized from ethanol and dried at (60C^0). The table (1) shows the physical properties of the prepared Complexes.

Results and Discussion:

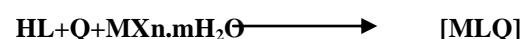
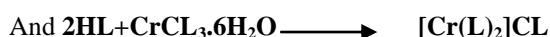
The Schiff base ligand (HL), on interaction with metal ion salts yields complexes corresponding to the general formula $[\text{M}(\text{L})_2]$ (with $\text{M}=\text{VO}, \text{Mn}, \text{Fe}, \text{Hg}$ and UO_2) and $[\text{Cr}(\text{L})_2]\text{Cl}$. The mix ligand (HL) and 8- hydroxy quinoline on reaction with to the general formula $[\text{MLQ}]$ (with $\text{M}=\text{VO}(\text{II}), \text{Zn}(\text{II}), \text{Cd}(\text{II}), \text{Hg}(\text{II})$ and $\text{UO}_2(\text{II})$). The ligand (HL) claiting with metal ion $\text{VO}(\text{II}), \text{Zn}(\text{II}), \text{Cd}(\text{II}), \text{Hg}(\text{II})$ and

U(VI)) to the bidentate but with metal ion Cr(III), Mn(II) and Fe(II), to the tridentate. The complexes were prepared by the general reaction show in below:



With

M	VO(II)	Mn(II)	Fe(II)	Hg(II)	UO ₂ (II)
X	SO ₄	CL	CL	CL	CH ₃ COO
n	1	2	2	2	2
m	1	4	-	-	2



With

M	VO(II)	Zn(II)	Cd(II)	Hg(II)	UO ₂ (II)
X	SO ₄	CL	CL	CL	CH ₃ COO
n	1	2	2	2	2
m	1	2	2 1/2	-	2

I.R Spectra:

The (IR) spectrum for Schiff base (HL) ligand (Fig 2a) ,displayed band at (1600)cm⁻¹ due to the ν(C=N) stretching frequency for the azomethine group^(16,20-23), the strong band at (1654)cm⁻¹ belong to ν(C=O). The weak band at (3465)cm⁻¹ is attributed to the ν(O-H)^(20,22,24,25)

In the (IR) spectrum of 8-hydroxy quinoline (Q) ligand (Fig 2b) displayed bands at (3213)cm⁻¹ and (1500)cm⁻¹ attributed to the ν(O-H) and ν(C-N)⁽²⁶⁻²⁸⁾. Table 1 presents the most important IR spectral bands of the ligand (HL) and (Q) with all the metal complexes

The IR spectra bands of [VO(L)₂], [Hg(L)₂], [UO₂(L)₂], [VO(L)(Q)], [Zn(L)(Q)], [Cd(L)(Q)], [Hg(L)(Q)], and [UO₂(L)(Q)] complexes at range (1590-1587)cm⁻¹ is characteristic for the ν(C=N), show shifting to the lower frequencies by (13-10)cm⁻¹ in comparison with ligand Schiff base (HL). but with ligand 8-hydroxy quinoline (Q) the shifting was between (21-42)cm⁻¹ to the higher frequencies which indicated the coordination of ligands with metal ions through the nitrogen atoms in their

azomethine and quinoline structure^(16,19,21,22,25,28-30) and the another bands appeared. in the range (1110-1250) Cm⁻¹ belong to the ν(C-O) was shifted to the lower frequencies by (15-155) Cm⁻¹ and (-2-138) Cm⁻¹ in Comparison with ligands (HL) and (Q) respectively and did not appeared bond belong to the ν(O-H) in Comparison with ligands (HL) disappearing of band for ν(OH) vibration in the specter of Complexes indicating Coordination of phenolic oxygen with metal ions^(16,19,25,30-33)

The IR spectra bands of complexes at (1654)cm⁻¹ for the carbonyl group did not shift, suggesting that this oxygen atom of the carbonyl group is not coordination to the metal ion^(21,22,25,29,30)

The IR spectrum bands of [VO(L)₂] and [VO(L)(Q)] complexes at (956) Cm⁻¹ and (964) Cm⁻¹ respectively, due to (V=O) and the complexes [UO₂(L)₂] and [UO₂(L)(Q)] show a strong absorption band in the 895 Cm⁻¹ and 900 Cm⁻¹ respectively, due to (O=U=O)^(31,32,34,35).

It is suggested they are bidentate complexes from that the oxygen atom of this phenolic group and the nitrogen atom of the azomethine group are coordination to the metal ion (Fig 1 b)

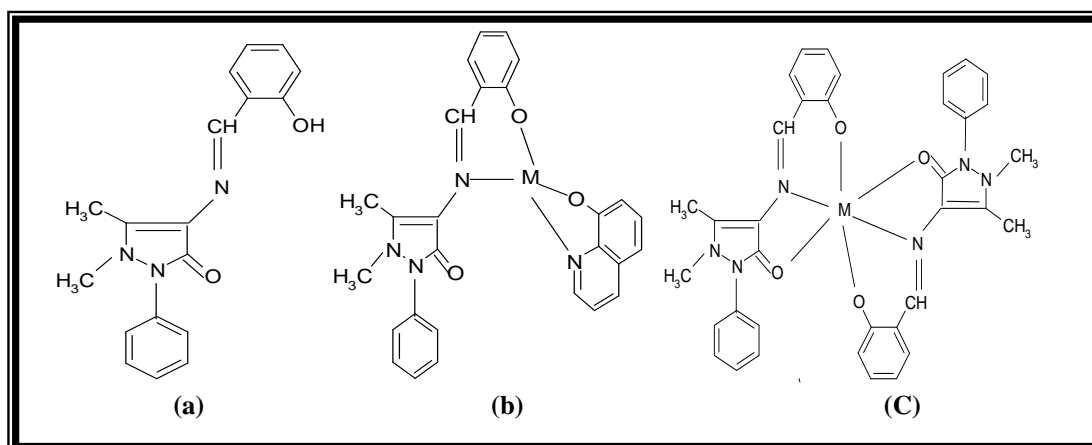
The IR spectra bands of [Cr(L)₂]Cl, [Mn(L)₂] and [Fe(L)₂] complexes at ((1589)cm⁻¹, (1588)cm⁻¹ and (1590)cm⁻¹ attributed to the ν(C=N), show shifting to the lower frequencies in comparison with Schiff base ligand (HL) to the higher frequencies which indicated the coordination of ligand with metal ions through the nitrogen atoms in their azomethine structure^(16,19,21,22,29) and the another bands appeared. in the (1198)Cm⁻¹, (1200) Cm⁻¹ and (1203) Cm⁻¹ attributed to the ν(C-O) was shifted to the lower frequencies in Comparison with ligand (HL) respectively and did not appeared bond belong to the ν(O-H) in Comparison with ligands (HL) disappearing of band for ν(OH) vibration in the specter of Complexes indicating Coordination of

phenolic oxygen with metal ions^(16,19,25) and the another bands appeared. in the (1589) Cm^{-1} , (158) Cm^{-1} and (1590) Cm^{-1} belong to the $\nu(\text{C}=\text{O})$ was shifted to the lower frequencies in Comparison with ligands (HL) respectively the specter of Complexes indicating Coordination of oxygen atom in their carbonyl structure with metal ions^(16,25,31-33)

It is suggested they are tridentate complexes from that the oxygen atom of

this phenolic group and carbonyl group the nitrogen atom of the azomethine group are coordination to the metal ion (Fig1 c)

The IR spectrum of prepared complexes showed weak bands in the range (385-456) Cm^{-1} and (475-541) Cm^{-1} was attributed to the $\nu(\text{M}-\text{O})$ and $\nu(\text{M}-\text{N})$ respectively^(16,19,21,23,25,29-31,33,34)

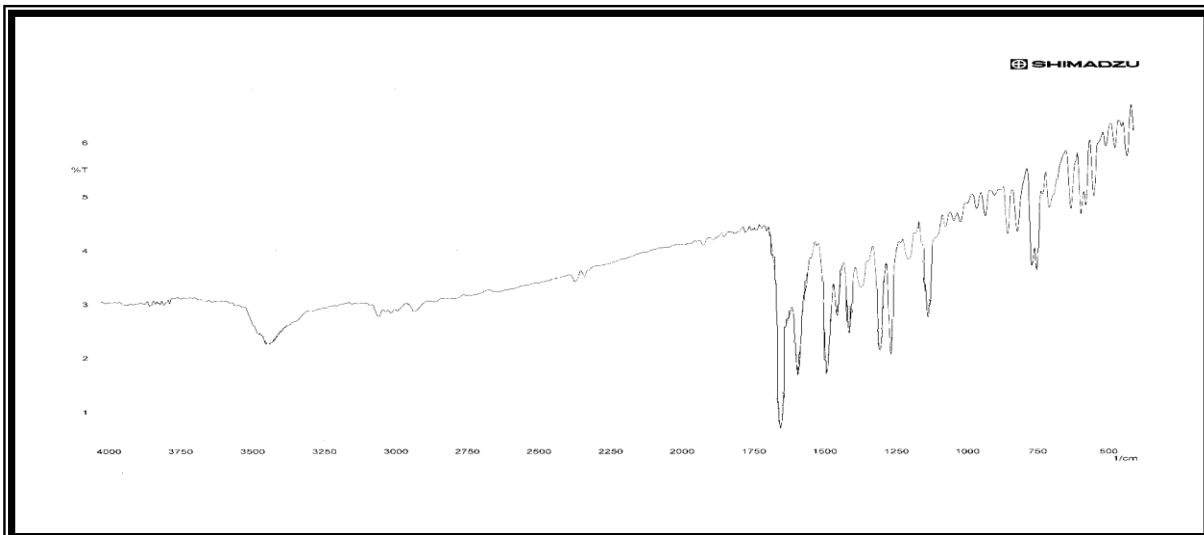


(Fig 1)The suggests Structure (a) Ligand(HL) Schiff base ,(b) $[\text{M}(\text{L})(\text{Q})]$ complexes with $(\text{M}=\text{Zn}(\text{II}), \text{Cd}(\text{II}) \text{ and } \text{Hg}(\text{II}))$, (c) $[\text{M}(\text{L})_2]$ complexes $(\text{M}=\text{Mn}(\text{II}) \text{ and } \text{Fe}(\text{II}))$

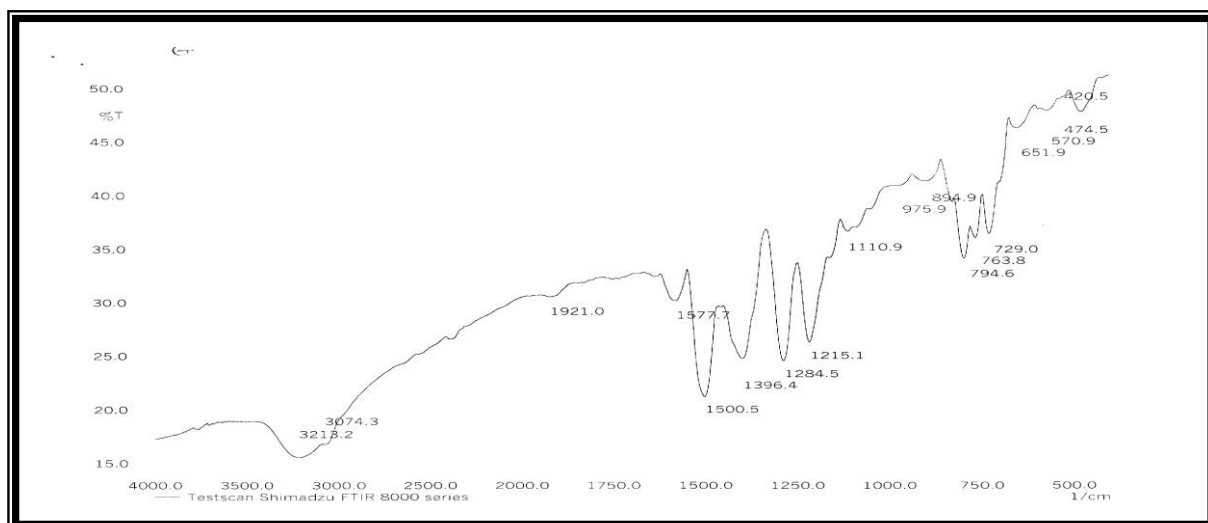
Table (1) the characteristic bands of Infrared spectra of the ligand and their complexes

Comp	$\nu(\text{O}-\text{H})$	$\nu(\text{C}-\text{H})_{\text{ar}}$	$\nu(\text{C}-\text{H})_{\text{al}}$	$\nu(\text{C}=\text{O})$	$\nu(\text{C}=\text{N})$	$\nu(\text{C}=\text{C})$	$\nu(\text{C}-\text{N})$	$\nu(\text{C}-\text{O})$	$\nu(\text{M}-\text{O})$	$\nu(\text{M}-\text{N})$
Q	3213 b	3074 sho	- -	- -	- -	1500 v.s	1500 s	1248 s	- -	- -
L	3465 w	3055 w	2950 w	1660 v.s	1605 s	1490 s		1265 s	- -	
$[\text{VO}(\text{L})_2]$	-	3062 sho	2931 w	1652 s	1593 sho	1488 s		1141 m	425 w	475 w
$[\text{Cr}(\text{L})_2]\text{Cl}$	-	3050 w	2939 w	1642 v.s	1589 sho	1496 s		1198 m	420 w	510 w
$[\text{Mn}(\text{L})_2]$	-	3055 w	2939 w	1645 v.s	1588 sho	1492 s		1200 m	408 w	503 w
$[\text{Fe}(\text{L})_2]$	-	3055 v.w	2939 w	1648 vs	1590 sho	1496 m		1203 w	400 w	480 w
$[\text{Hg}(\text{L})_2]$	-	3043 v.w	2943 w	1653 v.s	1590 sho	1495 m		1250 w	412 w	512 w
$[\text{UO}_2(\text{L})_2]$	-	3062 v.w	2939 w	1654 v.s	1592 sho	1495 m		1203 w	385 w	532 w
$[\text{VO}(\text{L})(\text{Q})]$	-	3055 v.w	2940 w	1652 v.s	1594 sho	1496 m	1465 sho	1110 w	402 w	501 w
$[\text{Zn}(\text{L})(\text{Q})]$	-	3061 v.w	2919 w	1655 v.s	1590 sho	1487 m	1479 sho	1215 w	412 w	523 w
$[\text{Cd}(\text{L})(\text{Q})]$	-	3043 v.w	2945 w	1652 v.s	1587 sho	1485 m	1476 sho	1200 w	430 w	541 w
$[\text{Hg}(\text{L})(\text{Q})]$	-	3076 v.w	2934 w	1651 v.s	1594 sho	1499 m	1477 sho	1231 w	387 w	516 w
$[\text{UO}_2(\text{L})(\text{Q})]$	-	3062 w	2939 w	1650 w	1596 sho	1535 w	1458 sho	1203 w	385 vw	532 w

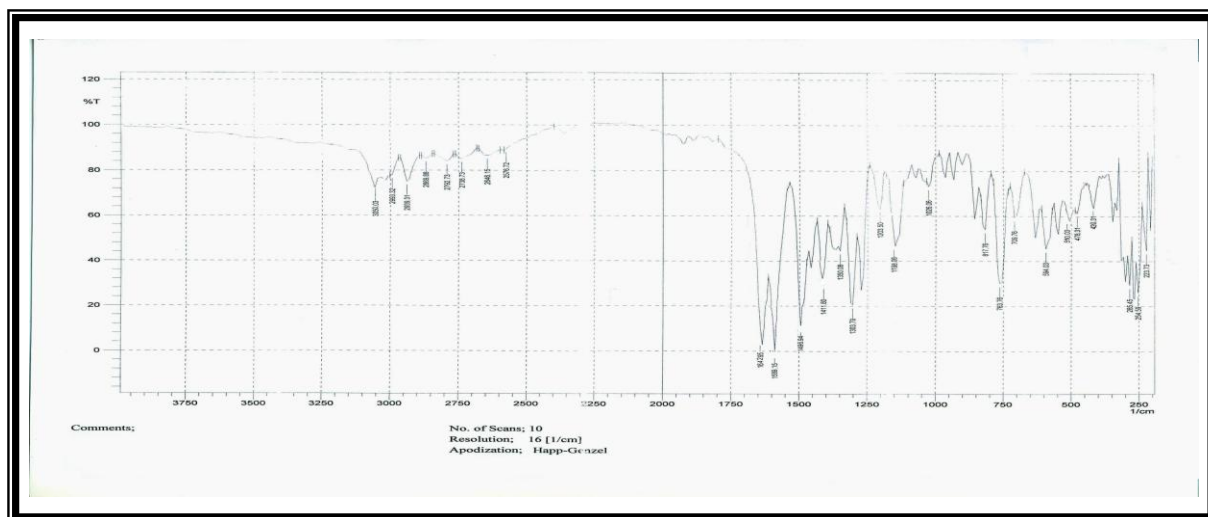
S=strong, m=medium, w=weak, sho=shoulder, v=very, b=broad



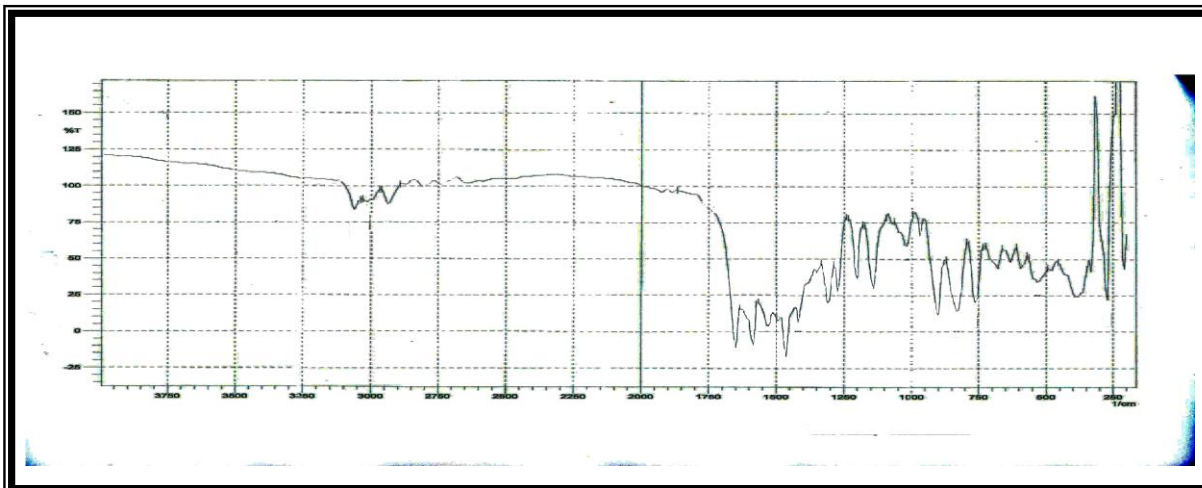
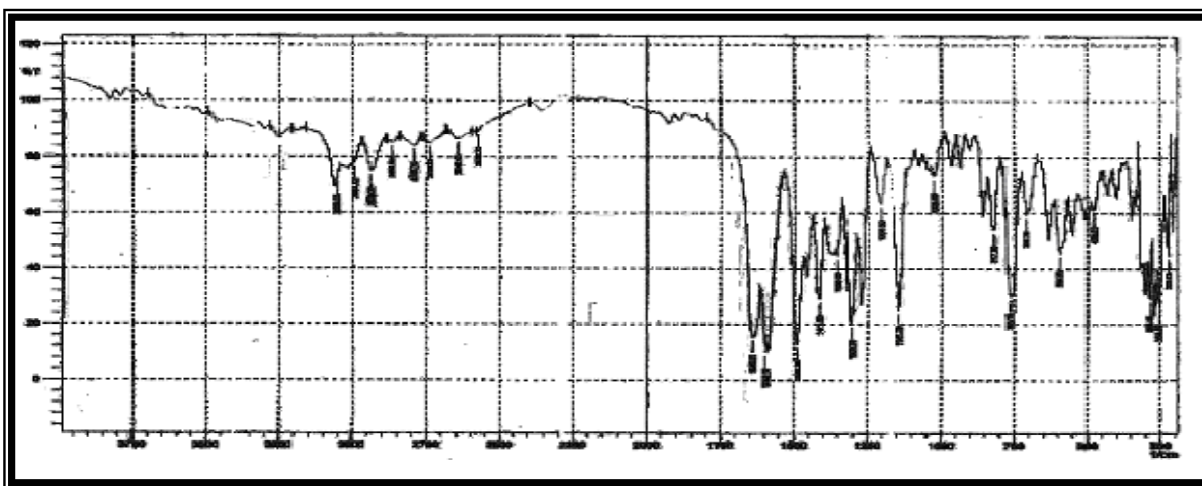
(Fig 2a) IR spectrum *o*-hydroxybenzylidene-1-phenyl-2,3-dimethyl-4-amino-3-pyrazolin-5-on (HL)



(Fig 2b) IR spectrum 8-hydroxy quinoline (Q)



(Fig 2c) IR spectrum $[Cr(L)_2]Cl$ complex

(Fig 2d) IR spectrum [VO(L)₂] complex(Fig 2e) IR spectrum [UO₂(L)₂] complex

Electronic Spectra

The (UV-Vis) spectrum for the free ligand schiff base (HL) show a strong bands at (256)nm was attributed to ($\pi \longrightarrow \pi^*$) and another at (340)nm and (362)nm due to ($n \longrightarrow \pi^*$)⁽²⁹⁾. The UV-Vis) spectrum 8- hydroxyl quinoline show absorption bands at (294)nm and (307)nm respectively due to ($\pi \longrightarrow \pi^*$) and another bands of (372)nm belongs to ($n \longrightarrow \pi^*$)⁽²⁷⁾

The electronic spectra data of the complexes are summarized in (Table 2). The (UV-Vis) spectra of the complexes displayed absorptions at range (272-290)nm and (344-350)nm attributed due to the ligand field^(16,19,27,36,37). and anther bands are observed at range (350-376)nm

assigned to the charge transfer (C.T)^(16,36-38)

In[VO(L)₂] and [VO(L)(Q)] complexes the peaks (642)nm and (573)nm are attributed to (d-d) electronic transition type (${}^2B_2 \longrightarrow {}^2A_1$) and (${}^2B_2 \longrightarrow {}^2E_g$) respectively .suggesting an square pyramid of geometry^(31,32,36-40)

The (UV-Vis) spectra of the [Cr(L)₂]Cl complexes showed peaks at (425)nm and (510)nm attributed to (d-d) transition types ${}^4A_{2g}(F) \xrightarrow{v_3} {}^4T_{1(P)}$, ${}^4A_{2g}(F) \xrightarrow{v_2} {}^4T_{1(F)}$ and ${}^4A_{2g}(F) \xrightarrow{v_1} {}^4T_{2(F)}$ respectively .suggesting an octahedral of geometry^(36-38,41). and (UV-Vis) spectra of the [Mn(L)₂]complex showed one broad band is observed at (505)nm due to ${}^6A_{1g} \longrightarrow {}^4T_{1(g)(G)}$ and ${}^6A_{1g} \longrightarrow {}^4T_{1g(D)}$ electronic transition, suggesting an Octahedral

**Table (2): U.V-Visible Spectra of free Ligand and their Complexes (10^{-3} M in DMF and Magnetic susceptibility measurements
Diam= Dia magnetic**

CompNo.	λ_{\max} nm	ABS	Wave number Cm^{-1}	ϵ_{\max} ($\text{L.mol}^{-1}.\text{Cm}^{-1}$)	Transitions & Remarks	$\mu_{\text{eff}}(\text{B.M})$	Suggested structure
HL	256 340 362	2.632 4.458 2.354	39062.5 29411.764 27624.306	2632 4458 2358	$\pi \longrightarrow \pi^*$ $n \longrightarrow \pi^*$ $n \longrightarrow \pi^*$		
Q	294 307 391	2.500 1.370 0.037	34013.605 32573.289 25575.447	2500 1370 37	$\pi \longrightarrow \pi^*$ $n \longrightarrow \pi^*$ $n \longrightarrow \pi^*$		
[VO(L) ₂]	275 344 370 642	0.975 2.158 1.157 0.043	36363.6 29069.7 27027 15576.3	975 2158 1157 43	Ligand field Ligand field C.T New band ${}^2B_2 \longrightarrow {}^2A_1$ ${}^2B_2 \longrightarrow {}^2E_g$	1.71	Square Pyramidal
[Cr(L) ₂]Cl	275 344 357 425 510	1.313 1.891 0.891 0.560 0.068	36363.6 29069.7 28011.2 23529.7 19607.8	1313 1891 891 560 68	Ligand field Ligand field C.T New band ${}^4A_{2g(F)} \longrightarrow T_{1P}$ ${}^4A_{2g(F)} \longrightarrow T_{1F}$ ${}^4A_{2g(F)} \longrightarrow T_{2F}$	3.126	Octahedral
[Mn(L) ₂]	279 344 368 505	0.863 1.785 1.062 0.083	35842.2 29669.7 27173.9 19801.9	863 1785 1062 83	Ligand field Ligand field C.T New band ${}^6A_{1g} \longrightarrow {}^4T_{1(g)(G)}$ ${}^6A_{1g} \longrightarrow {}^4T_{1g(D)}$	1.05	Octahedral
[Fe(L) ₂]	275 344 371 460	1.018 2.116 1.171 0.187	36363.6 29069.7 26954.1 21739.1	1018 2116 1171 187	Ligand field Ligand field C.T New band ${}^5T_{2g(D)} \longrightarrow {}^3E_{g(D)}$	5.231	Octahedral
[Hg(L) ₂]	274 344 369	0.908 1.99 1.175	36496.3 29069.7 27100.2	908 1990 1175	Ligand field Ligand field C.T New band	Diam	Tetrahedral
[UO ₂ (L) ₂]	290 350 373	1.580 2.48 1.412	34482.75 28571.42 26809.65	1580 2480 1412	Ligand field Ligand field C.T New band	Diam	Octahedral
[VO(L)(Q)]	274 344 374 573	1.376 2.408 1.270 0.153	36496.3 29069.7 26737.9 17452	1376 2408 1270 153	Ligand field Ligand field C.T New band ${}^2B_2 \longrightarrow {}^2A_1$ ${}^2B_2 \longrightarrow {}^2E_g$	1.71	Square Pyramidal
[Zn(L)(Q)]	274 344 359	1.081 2.067 0.760	36496.3 29069.7 27855.1	1081 2067 760	Ligand field Ligand field C.T New band	Diam	Tetrahedral
[Cd(L)(Q)]	273 344 358	1.068 2.001 0.624	36630 29069.7 27932.9	1068 2001 624	Ligand field Ligand field C.T New band	Diam	Tetrahedral
[Hg(L)(Q)]	272 344 361	1.299 2.284 0.799	36764.7 29069.7 27700.8	1299 2284 799	Ligand field Ligand field C.T New band	Diam	Tetrahedral
[UO ₂ (L)(Q)]	274 344 376	1.382 2.401 1.303	6496.3 29069.7 26595.7	1382 2401 1303	Ligand field Ligand field C.T New band	Diam	Octahedral

of geometry ^(32,33,36,37). In [Fe(L)₂] complex the peak (460)nm is attributed to (d-d) electronic transition type ${}^5T_{2g(D)}$ ${}^5E_{g(D)}$ respectively, suggesting an Octahedral of geometry ^(33,36-38)

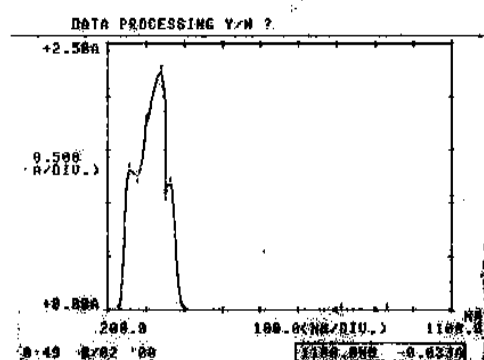


Fig (3a) U.V-Visible Spectra of (HL)

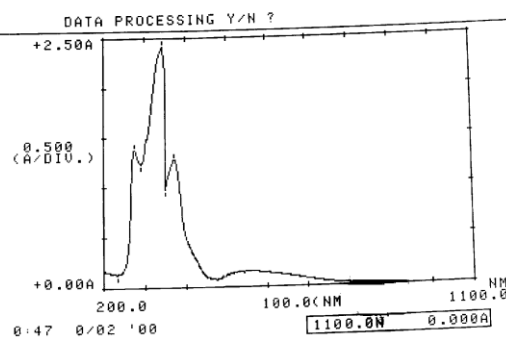
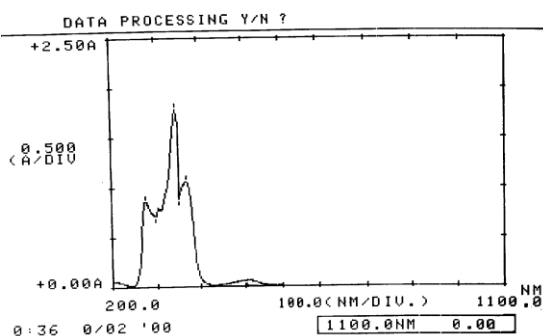
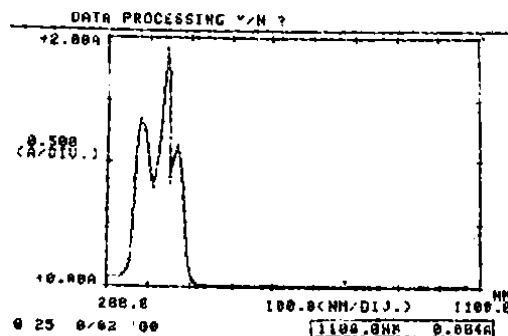
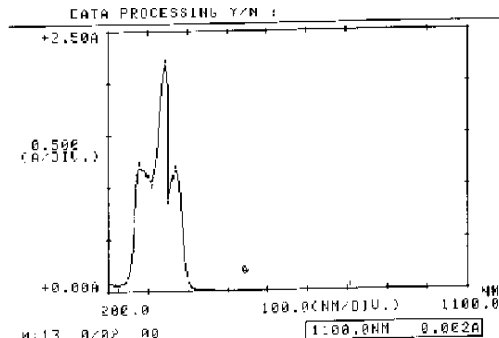
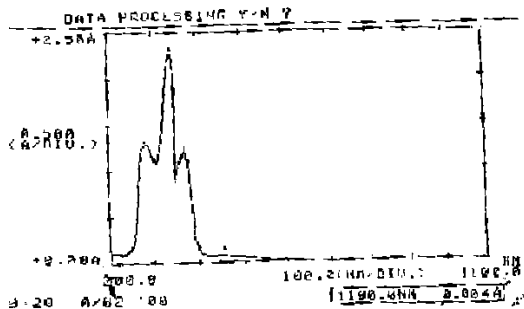
Fig (3b) U.V-Visible Spectra of [VO(L)₂]Fig (3c) U.V-Visible Spectra of [Mn(L)₂]Fig (3d) U.V-Visible Spectra of [UO₂(L)₂]

Fig (3e) U.V-Visible Spectra of [Cd(L)(Q)]

Fig (3f) U.V-Visible Spectra of [Fe(L)₂]

Molar conductance value of the Cr(III) complex is $(87.412) \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$. The Cr(III) complex is electrolytic (1:1)⁽⁴¹⁾ or shows a certain degree of conductivity the another complexes did not show electrolytic properties $(9.6-27.564) \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$.^(42,43)

Magnetic susceptibility measurements:

The magnetic moment value of VO(II) complexes is (1.71 BM) which suggests a square pyramidal geometry^(31,32) around the metals ion. The magnetic moment of

Cr(III), Mn(II) and Fe(II) complexes (3.126) BM, (1.05) BM and Diamagnetic and these CFSE = $(-12Dq, -20Dq \text{ and } -24Dq)$ which suggests the high spin six-coordinated Octahedral arrangement^(32,33,41) of ligand molecules around the metals ion. The Zn(II), Cd(II) and Hg(II) complexes is found to be diamagnetic which suggests the Tetrahedral geometry^(19,26,44) around the metals ion. The UO₂(II) complexes is found to be diamagnetic which suggests the Octahedral

geometry^(34,35). The physical properties and data of the Ligands (HL) and (Q) with their metal Complexes are given in (Table 3) Complex formation in solution:-

Complexes of (HL) with metal ions were studied in solution using methanol as a solvent, in order to determine the ratio of [M : (HL)], (M=VO, Cr, Mn, Fe, Hg,

and UO₂) in the complex following (Molar ratio methods). A series of solutions were prepared having a constant concentration (10⁻³) of the metal ion and (0.25-4×10⁻³) (HL). The analytical data show that the metal to ligand ratio is (1:2) they are soluble in common organic solvents

Table (3): Physical Characteristics and analytical data for (HL), (Q) and its metal complexes

CompNo.	Suggested formula For isolated precipitate	Color	Melting Point C	Yield %	C,H,N,Cl and Metal Analyses, Found (calcd) (%)					M:L In DMF	Molar conductivity ohm ⁻¹ cm ² mol ⁻¹
					C	H	N	Cl	Metal		
HL	-	Light Yellow	189	85	69.81 (70.34)	6 (5.52)	13.1 (13.67)	-	-	-	4.47
Q	-	White	73	-				-	-	-	12.258
1	[VO(L) ₂]	Yellow green	212d	60	62.01 (63.746)	4.121 (4.721)	11.435 (12.395)	Nil	7.091 (7.525)	1:2	23.121
2	[Cr(L) ₂]Cl	Brown	210d	83	62.11 (61.919)	4.21 (4.586)	10.68 (12.039)	4.76 (5.08)	6.526 (7.381)	1:2	87.412
3	[Mn(L) ₂]	Brown	194d	72	63.98 (64.993)	5.87 (4.814)	12.897 (12.637)	Nil	7.421 (8.124)	1:2	14.05
4	[Fe(L) ₂]	Dark brown	194d	78	65.11 (64.896)	6.001 (4.807)	11.83 (12.618)	Nil	7.23 (8.262)	1:2	9.6
5	[Hg(L) ₂]	Light orange	223d	78	52.657 (53.288)	4.56 (3.947)	10.087 (10.36)	Nil	23.12 (24.67)	1:2	25.121
6	[UO ₂ (L) ₂]	Orange	208d	67	47.879 (49.053)	4 (3.633)	9.98 (9.538)	Nil	-	1:2	17.987
7	[VO(L)(Q)]	Violet	216d	68	63.01 (62.682)	5.087 (4.252)	10.076 (10.824)	Nil	9.028 (9.854)		27.564
8	[Zn(L)(Q)]	Yellow green	263d	74	63.654 (62.718)	5 (4.269)	11.021 (10.866)	Nil	11.87 (12.631)		23.21
9	[Cd(L)(Q)]	Yellow	230d	88	56.654 (57.562)	4.87 (4.086)	10.32 (9.949)	Nil	20.939 (19.971)		21.112
10	[Hg(L)(Q)]	Dark Green	212d	90	48.03 (49.82)	4.142 (3.382)	9.32 (8.61)	Nil	32.068 (30.753)		21.98
11	[UO ₂ (L)(Q)]	Dark orange	250d	74	45.546 (44.978)	3.12 (3.054)	7.121 (7.774)	Nil	-		22.487

(d*) = Decomposition Q=8- hydroxy quinoline,

HL= *O*-hydroxybenzylidene-1-phenyl-2, 3-dimethyl-4-amino-3-pyrazolin-5-on

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تحضير وتشخيص معقدات الفندايل (II)، الكروم(III)، المنغنيز(II)، الحديد(II)، الزئبق(II) واليورانييل (II) مع ليكاندات حاوية على (ONO) و (ON) كمجاميع واهبة

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الخلاصة

تحضير قاعدة شف الجديدة اورثو- هايدروكسي بنزلدابين-1-فنييل-2,3- ثنائي مثل -4-امينو-3- بايروزولين -5- أون (HL) وتشخيصها . تم استخدام (HL) كاليكاند لتحضير عدد من المعقدات الجديدة مع ايونات عناصر الفندايل (II)، الكروم(III)، المنغنيز(II)، الحديد(II)، الزئبق(II) واليورانييل (II) . كما استخدم 8-هايدروكسي كوينولين (Q) مع اليكاند (HL) لتحضير معقدات حاوية على مزيج من الليكاندات مع ايونات عناصر الفندايل (II)، الخارصين(II)، الكاديوم (II)، الزئبق(II) ، اليورانييل (II) . تم عزل المعقدات وتشخيصها باستخدام طيف الأشعة تحت الحمراء وطيف الأشعة فوق البنفسجية-المرئية كذلك استخدمت في التشخيص تحليل العناصر (C.H.N) و محتوى الكلورو تقنية الامتصاص الذري أللهبي للعناصر إضافة إلى قياسات الحساسية المغناطيسية والتوصيلية الكهربائية . تم قياس النسبة المولية للفلز مع (HL) في المحلول وقد اعطت نتائج مطابقة مع التي تم الحصول عليها في الحالة الصلبة.