



## Synthesis and Characterization of Boron and 2-Aminophenol Schiff Base Ligands with Their Cu(II) and Pt(IV) Complexes and Evaluation as Antimicrobial Agents

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<http://dx.doi.org/10.13005/ojc/330532>

(Received: Feb 15, 2017; Accepted: April 01, 2017)

### ABSTRACT

Synthesis, Characterization and biological study of two Schiff base ligands derived from 2-aminophenol and 4-bromoacetophenone (1:1) ( $L_1$ ) and boron Schiff base which was derived from  $L_1$  and sodium borohydride (1:1) ( $L_2$ ). Cu(II) and Pt(IV) complexes of the Schiff base ligands were synthesized. The prepared compounds have been investigated by molar conductivity, elemental analysis, FTIR,  $^1H$ ,  $^{13}C$ NMR, thermal analysis, UV-Vis, as well as atomic absorption and magnetic susceptibility. The biological study of the ligands and their metal complexes were carried out against *E-coli*, *Staphylococcus aureus*, as bacteria species, *Candida* and *My crosporium Canisas* fungi.

**Keywords:** Schiff base, 2-aminophenol, complexes and antimicrobial agents.

### INTRODUCTION

The Schiff bases have a wide range of uses and applications because these compounds have excellent properties such as structural similarities with biological molecules, simple preparation methods with flexibility<sup>1</sup>, biological activity as antiviral, antileukemic, antibacterial, enzymatic reaction inhibitors and biocidal which is essential for plant growth regulators.<sup>2</sup>

Boron compounds have been well known since ancient times where used to prepare hard glasses and glazes. Today the uses of boron compounds expended to include semiconductors, hard materials and antitumor medicine.<sup>3,4,5</sup>

Boron is an electron deficient which possess four valance orbitals and only three electrons, boron tendency to fill the vacant orbital and this promote the electron acceptor behavior and lead to increase the stability of imine group (C=N) of boron Schiff base, therefore the organoborane compounds are more stable than organometallic compounds<sup>6</sup>. Boron Schiff bases have many applications such as catalyst<sup>7</sup>, determination of enantiopurity of chiral amino alcohols<sup>8</sup>, photoelectronic application<sup>[6,9]</sup> and nutraceutical industry<sup>10</sup>.

In this paper we report the synthesis, structural characterization and biological evaluation of two Schiff base ligands, 2-aminophenol Schiff

base ( $L_1$ ) and boron Schiff base ( $L_2$ ) with their Cu(II) and Pt(IV) complexes.

## EXPERIMENTAL

### Material and Instruments

All chemicals used were of analytical reagent grade. Melting points were determined by using Gallenkamp melting point apparatus. Thermal analysis (TG and DTG) were performed by using METTLER TA4000 SYSTEM for  $L_1$  and METTLER TOLEDO for  $L_2$ . The spectra of  $^1\text{H}$  and  $^{13}\text{C}$  NMR were recorded on (Bruker NMR spectrometer 400 MHz Avance III 400). The electronic spectra of all prepared compounds were recorded on (shimadzu 1800-UV spectrophotometer) in DMSO. FTIR were carried out in the range (400-4000)  $\text{cm}^{-1}$  using KBr disk for the ligands and CsI disk in the range (250-4000)  $\text{cm}^{-1}$  for metal complexes by using shimadzu 8400s spectrophotometer. Elemental microanalysis were carried out by (C,H,N,S Elemental Analyzer C,H,N,S-932). Metal contents were determined by using (Nov AA 350 spectrophotometer). Magnetic susceptibility measurements were performed at room temperature by using (Auto Magnetic Susceptibility Balance Model Sherwood Scientific). Molar conductivity were measured in DMSO at room temperature by using Hunts Capacitor Trade Mark British made. Chloride contents were determined by using Mohr's method.

## METHODS

### Synthesis of 2-((1-(4-bromophenyl)ethylidene)amino)phenol ( $L_1$ ).

This ligand has been prepared in our previous work<sup>11</sup>.

### Synthesis of 2-borane((1-(4-bromophenyl)ethylidene)amino)phenol ( $L_2$ )

A hot solution of Schiff base ( $L_1$ ) (0.173 gm, 0.59 m mol) in 60 ml tetrahydrofurane (THF) was added gradually to a boiled suspension of sodium borohydride (0.045 gm, 1.19 m mol) in 10 ml Tetrahydrofuran. The mixture was heated under reflux for 16 h. with stirring and the color of solution changed from green to brown. The brown product was obtained by concentrated the reaction mixture and then a little amount of n-hexane was added, washed several times with n-hexane and dried in air.

### Synthesis of Cu(II) Complexes $C_1$ and $C_3$

To a hot solution of  $L_1$  (0.1 g m, 0.2128 mmol) in a mixture of methanol:acetone (2:1) was added a methanolic solution of  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  (0.0181 gm, 0.1064 m mol) for  $C_1$  complex. The mixture was heated under reflux for four hours. Dark brown precipitate was obtained after evaporating part of the solvent and adding ether. Washed several times with ether and dried. The preparation method of copper complex ( $C_3$ ) was similar to that of ( $C_1$ ), using  $L_2$  (0.0713 g, 0.2034 mmol) with  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  (0.0173 g, 0.1017 mmol).

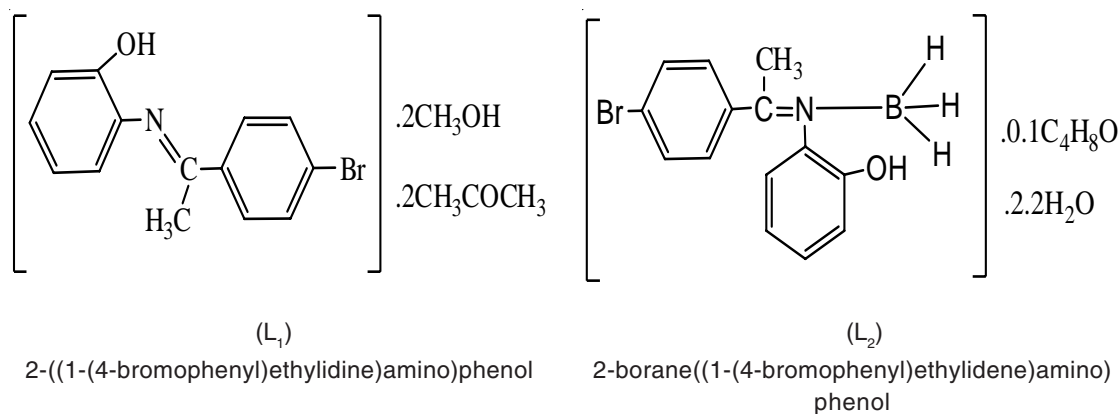


Fig.1. The structures of synthesized ligands  $L_1$  and  $L_2$ .

### Synthesis of Platinum Complexes C<sub>2</sub> and C<sub>4</sub>

The preparation methods of Platinum complexes were similar to that of (C<sub>1</sub>), using L<sub>1</sub> or L<sub>2</sub> 0.1g (0.2128 and 0.2852 mmol) respectively and K<sub>2</sub>PtCl<sub>6</sub> (0.0517 g, 0.1064 m mol) in 6 ml DMSO for C<sub>2</sub> and (0.0693 g, 0.1426 m mol) in 24 ml DMSO for C<sub>4</sub> respectively.

## RESULTS AND DISCUSSION

The physical and analytical data Table. 1 are agreement with suggested structures of studied compounds.

### IR spectra

The data of IR spectra of studied ligands and their metal complexes are listed in Table. 2 and the spectra of L<sub>1</sub> and L<sub>2</sub> are shown in Fig. 2. The peaks appeared at (3420-3452) cm<sup>-1</sup> were attributed to lattice water while the coordinated water was exhibited peaks at observed at (3379, 651) and (3406, 756) cm<sup>-1</sup>.<sup>12,13,14</sup> The spectra of L<sub>1</sub>,

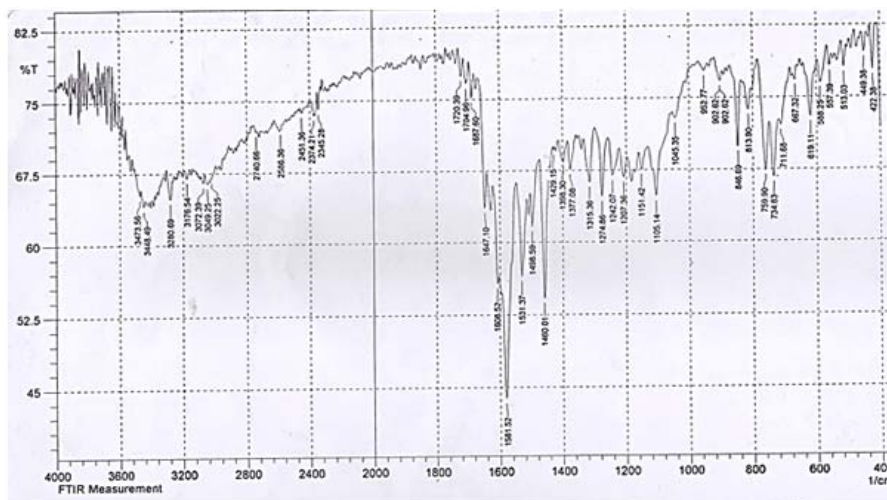
L<sub>2</sub>, C<sub>1</sub> and C<sub>2</sub> were exhibited strong peaks at (3400-3520) cm<sup>-1</sup> which were assigned to stretching vibration of OH group, this band was shifted to lower frequency in the spectrum of C<sub>2</sub> complex at 3400 cm<sup>-1</sup> as a result of complexation<sup>13,15,16</sup> and disappeared in spectra of C<sub>3</sub> and C<sub>4</sub> because of the binding of metal ions with oxygen atom of OH group. The band appeared at 2340 cm<sup>-1</sup> in spectra of L<sub>2</sub>, C<sub>3</sub> and C<sub>4</sub> assigned to vibrational mode of B-H.<sup>12</sup> The band at 1415 cm<sup>-1</sup> in spectrum of L<sub>2</sub> was attributed to the stretching vibration of B-N, this band not changed in spectra of C<sub>3</sub> and C<sub>4</sub> complexes.<sup>12</sup> The azomethine group (C=N) exhibited peak at 1581 cm<sup>-1</sup> for L<sub>1</sub> while this peak shifted to lower frequency at 1562 cm<sup>-1</sup> for L<sub>2</sub> and this due to binding of BH<sub>3</sub> with nitrogen atom of C=N. The spectrum of metal complex C<sub>2</sub> showed shifted to lower frequency in this peak at 1577 cm<sup>-1</sup> comparison with L<sub>1</sub> and the spectrum of C<sub>1</sub> exhibited change in profile of C=N peak, this due to the binding between N atom and metal ions<sup>16,17</sup>. Peaks that noticed at range 304-491 cm<sup>-1</sup> were assigned to stretching vibration of M-Cl, M-O and M-N<sup>13,14,18</sup>.

**Table. 1 : Physical properties and analytical data for two ligands and their metal complexes.**

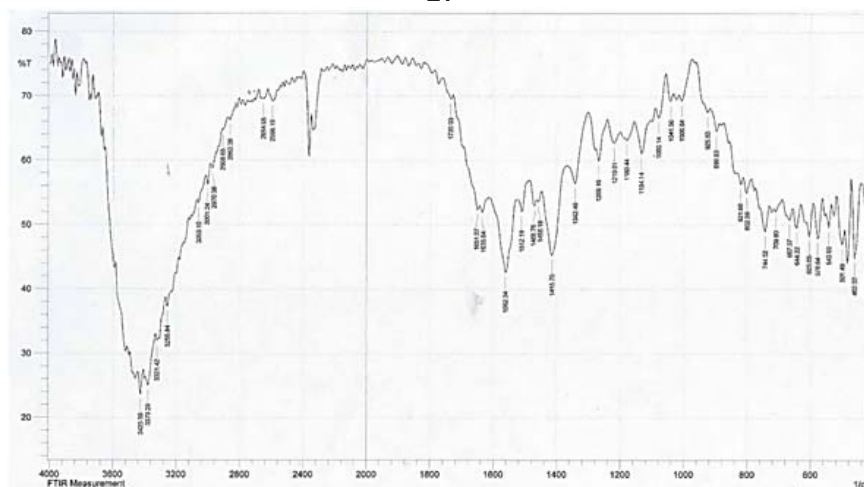
Symbol	Color	Yield%	m.p °C	CHN analysis Found(calc.)			M% Found(calc.)	Cl% Found(calc.)
				C%	H%	N%		
L <sub>1</sub>	Golden-brown	21.9	134-137	56.27 (56.18)	5.95 (6.80)	4.34 (2.97)	-	-
L <sub>2</sub>	Brown	57.2	>240	48.30 (49.29)	5.04 (5.76)	4.93 (3.99)	-	-
C <sub>1</sub>	Dark brown	48.3	>360	52.53 (51.92)	3.57 (3.70)	3.82 (4.32)	10.88 (9.87)	2.6 (2.7)
C <sub>2</sub>	Dark brown	39.2	>360	24.42 (23.43)	2.55 (3.06)	1.59 (1.95)	-	2.8 (4.5)
C <sub>3</sub>	Dark brown	93.7	>360	32.70 (33.79)	4.09 (4.94)	1.89 (2.81)	4.82 (5.63)	7.4 (7.1)
C <sub>4</sub>	Dark brown	92.9	>360	21 (21.92)	3.19 (4.17)	1.79 (1.82)	-	-

**Table. 2 : IR Spectra of two ligands and their metal complexes.**

compound	vO-H	vB-H	vB-N	vC=N	H2O lattice (coordinate)	vM-O	vM-N	vM-Cl
L1	3448	-	-	1581	-	-	-	-
C1	3440	-	-	1583	-	-	387	312
C2	3400	-	-	1577	3420	500	435	318
L2	3520	2340	1415	1562	3425	-	-	-
C3	-	2340	1413	1566	3452 (3406,756)	441	-	304
C4	-	2340	1415	1565	3448 (3379,651)	491	-	329



L1



L2

Fig. 2. The IR spectra of Ligands L<sub>1</sub> and L<sub>2</sub>.

**<sup>1</sup>H NMR Spectra**

The data of <sup>1</sup>H NMR are listed in Table. 3 and the NMR spectra in DMSO of L<sub>1</sub> and L<sub>2</sub> are shown in Fig. 3. The spectra of two ligands showed chemical shift at 8.9 and 8.5 ppm for L<sub>1</sub> and L<sub>2</sub> respectively and this due to OH proton<sup>14</sup>. The multiple peaks observed at the range δ(6.3-6.8) ppm referred to aromatic protons<sup>19</sup>. The spectrum of L<sub>1</sub> exhibited a peak at δ(1.9 ppm) which assigned to CH<sub>3</sub> protons and acetone (CH<sub>3</sub>)<sup>14,16</sup>. Chemical shifts of methanolic CH<sub>3</sub> protons and the dissolved water in DMSO appeared at δ(3.3 ppm)<sup>16</sup>. The weak band appeared at δ(4.3 ppm) is due to methanolic OH proton<sup>16</sup>. The spectrum of L<sub>2</sub> exhibited peak at δ(1 ppm) which was referred to CH<sub>3</sub> protons<sup>14,16</sup>. The peak observed at (δ 1.65 ppm) attributed to

THF protons (mark:16), while the broad peak appeared at δ(3.4 ppm) due to protons of THF (mark:17), BH, H<sub>2</sub>O and dissolved water in DMSO.<sup>12,14,16,20</sup> Strong peak appeared at δ(2.5 ppm) was assigned to residual DMSO<sup>12,14</sup>.

**<sup>13</sup>C NMR Spectra**

The data of <sup>13</sup>C NMR are listed in Table. 4. The ligands spectra in DMSO exhibited multiple peaks at range δ(114-125.2) ppm which due to aromatic carbon<sup>14</sup>. The single peaks observed at δ(130.4, 125 ppm) for L<sub>1</sub> and L<sub>2</sub> respectively attributed to chemical shift of C-N (mark:1)<sup>21</sup>. The peak at δ(132.6 and 132.5 ppm) for L<sub>1</sub> and L<sub>2</sub> respectively due to carbon of C-Br<sup>16</sup>. Chemical shift of phenolic carbon (mark:2) appeared at δ(144 and

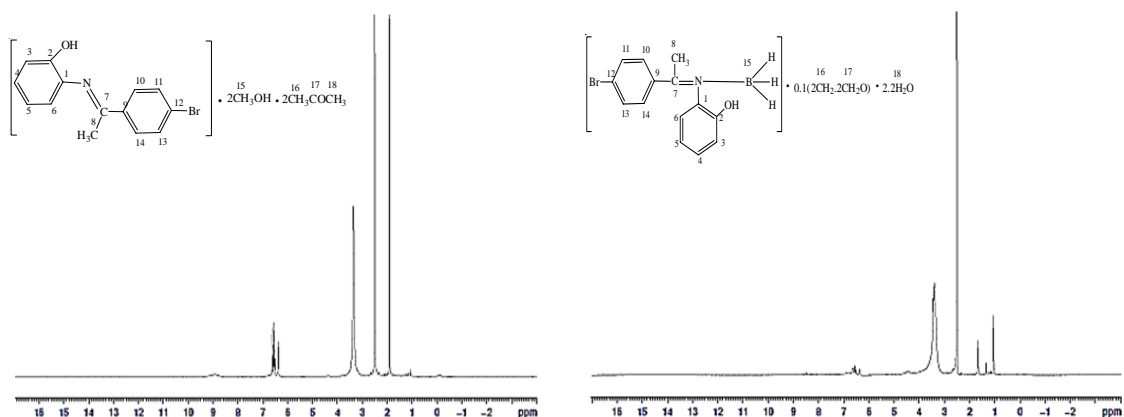
144.1 ppm) for  $L_1$  and  $L_2$  respectively<sup>16</sup>. The azomethine carbon showed chemical shift at  $\delta$ (172 and 166.1 ppm) for  $L_1$  and  $L_2$  respectively<sup>14</sup>. The spectrum of  $L_1$  exhibited peak at  $\delta$ (20 ppm) which due to  $CH_3$  carbon,<sup>14</sup> while the peak at  $\delta$ (34 ppm) was attributed to  $CH_3$  of acetone<sup>16</sup>. The methanolic carbon exhibited chemical shift at  $\delta$ (49 ppm) and the carbon of acetone (mark:17) showed chemical shift at  $\delta$ (204 ppm)<sup>16</sup>. The spectrum of  $L_2$  showed another peaks, the peak appeared at  $\delta$ (18 ppm) which assigned to methyl group carbon<sup>14</sup>. The carbons of THF (mark:16) showed a peak at  $\delta$ (24.5 ppm), while the carbons (mark:17) exhibited peak at  $\delta$ (68.3 ppm)<sup>16</sup>. The peak appeared at  $\delta$ (40 ppm) was attributed to chemical shift of DMSO<sup>16</sup>.

### Thermal Analysis TG and DTG

TG and DTG data of studied ligands are listed in Table. 5 and their thermograms are showed in Fig. 4. The first step for each ligand involved loss of solvents and water molecules because of their low boiling points at temperature range (33.7-172.3°C) and (20.6-85°C) for  $L_1$  and  $L_2$  respectively. The thermogram of  $L_1$  showed the decomposition of  $L_1$  through four steps at temperature range (33.7-601.3°C) without residue, while the decomposition of  $L_2$  carried out through four steps at temperature range (20.6-650 °C) with residue and this means the  $L_2$  is more stable than  $L_1$ .<sup>22,23,24</sup>

**Table. 3 : Chemical shifts for  $^1H$ NMR of  $L_1$  and  $L_2$ .**

$L_1$			$L_2$		
Chemical shifts $\delta$ (ppm)	Mark	Assignments in DMSO	Chemical shifts $\delta$ (ppm)	Mark	Assignments in DMSO
1.9,9H,s	8,16,18	$CH_3$ protons and $CH_3$ in acetone protons	1,3H,s	8	$CH_3$ protons
3.3,3H,s	15	Methanolic $CH_3$ protons and dissolved water in DMSO	1.65,4H,s	16	2( $CH_2$ ) of THF
4.3,1H,s	15	Methanolic OH proton	3.4,9H,s	15,17,18	BH, $H_2O$ ,2( $CH_2$ ) of THF and dissolved water in DMSO
6.3-6.6,8H,m	3-6 10,11,13,14	Aromatic protons	6.3-6.8,8H,m	3-6 10,11,13,14	Aromatic protons
8.9,1H,s	2	O-H proton	8.5,1H,s	2	O-H proton



**Fig. 3.  $^1H$ NMR spectra of  $L_1$  and  $L_2$ .**

**Table. 4 : Chemical shifts (ppm) for  $^{13}\text{C}$ NMR of  $\text{L}_1$  and  $\text{L}_2$ .**

$\text{L}_1$			$\text{L}_2$		
Chemical shifts $\delta$ (ppm)	Mark	Assignment in DMSO	Chemical shifts $\delta$ (ppm)	Mark	Assignment in DMSO
20	8	Carbon of methyl group	18	8	Carbon of methyl group
34	16,18	Carbon of acetone	24.5	16	2(CH <sub>2</sub> ) of THF
49	15	Methanolic carbon	68.3	17	2(CH <sub>2</sub> ) of THF
114-125.2	3-6 9-14	Aromatic carbons	114.5-120.5	3-6 9,10,11,13,14	Aromatic carbon
130.4	1	Carbon of amine	125	1	Carbon of amine
132.6	12	Carbon of bromine	132.5	12	Carbon of bromine
144	2	Phenolic carbon	144.1	2	Phenolic carbon
172	7	Carbon of azomethine	166.1	7	Carbon of azomethine
204	17	Carbon of acetone			

**Table. 5 : Thermal decomposition of  $\text{L}_1$  and  $\text{L}_2$ .**

Compound	Steps	Temp. range of Decomposition °C	Peak temp. at DTG °C	% weight loss Found (calc.)
$\text{L}_1$	2 CH <sub>3</sub> OH	33.7-172.3	146.3	38.83 (40.00)
$\text{C}_6\text{H}_{12}\text{NOBr}.2\text{CH}_3\text{OH}$ $.2\text{CH}_3\text{COCH}_3$ M.wt= 469.9	2 CH <sub>3</sub> COCH <sub>3</sub> 8 H C <sub>6</sub> Br + C <sub>6</sub> C	172.3-280.7 280.7-354.3	207.0 324.0	46.48 (47.64) 3.17 (2.55)
	CH <sub>3</sub> + N + OH 0.1C <sub>4</sub> H <sub>4</sub> O 2.2H <sub>2</sub> O	354.3-601.3	458.3	11.53 (9.78)
$\text{L}_2$		20.6-85	88.0	12.30(13.35)
$\text{C}_{14}\text{H}_{15}\text{NOBr}.0.1\text{C}_4\text{H}_8\text{O}$ $.2.2\text{H}_2\text{O}$ wt= 350.52	Br BH <sub>3</sub> +CH <sub>3</sub> +OH C <sub>6</sub> H <sub>4</sub> C <sub>6</sub> H <sub>4</sub> CN(residue)	85-170 170-320 320-446 446-650	178.0 323.0 480.0 -	21.53(22.79) 13.73(13.07) 22.13(21.68) 30.30(29.09)

#### Electronic spectra, Magnetic Moments and Molar Conductivity

The data of UV-Vis spectra of  $\text{L}_1$ ,  $\text{L}_2$  and their metal complexes in DMSO are listed in Table. 6. The spectra of ligands Fig. 5 showed the intense band at 40650 and 41493  $\text{cm}^{-1}$  for  $\text{L}_1$  and  $\text{L}_2$  respectively due to  $\pi \rightarrow \pi^*$  transition and weak intensity band at 23980 and 19758  $\text{cm}^{-1}$  of  $\text{L}_1$  and  $\text{L}_2$  respectively which referred to  $n \rightarrow \pi^*$  transition. The copper and platinum complexes of  $\text{L}_1$  and  $\text{L}_2$

exhibited blue shift of ligand bands ( $\pi \rightarrow \pi^*$ ). The spectrum of copper complex ( $\text{C}_1$ ). Fig. 5 showed three bands at 15329, 19794 and 20976  $\text{cm}^{-1}$  which were assigned to  ${}^2\text{B}_1\text{g} \rightarrow {}^2\text{A}_1\text{g}$ ,  ${}^2\text{B}_1\text{g} \rightarrow {}^2\text{B}_2\text{g}$  and  ${}^2\text{B}_1\text{g} \rightarrow {}^2\text{E}_\text{g}$  transitions respectively of tetragonally distorted octahedral Cu(II) complexes.<sup>14</sup> A three absorption bands were observed in the spectrum of copper complex ( $\text{C}_3$ ) at 11030, 15480 and 19671  $\text{cm}^{-1}$  which attributed to  ${}^2\text{B}_1\text{g} \rightarrow {}^2\text{A}_1\text{g}$ ,  ${}^2\text{B}_1\text{g} \rightarrow {}^2\text{B}_2\text{g}$  and  ${}^2\text{B}_1\text{g} \rightarrow {}^2\text{E}_\text{g}$  transitions respectively, as well as the

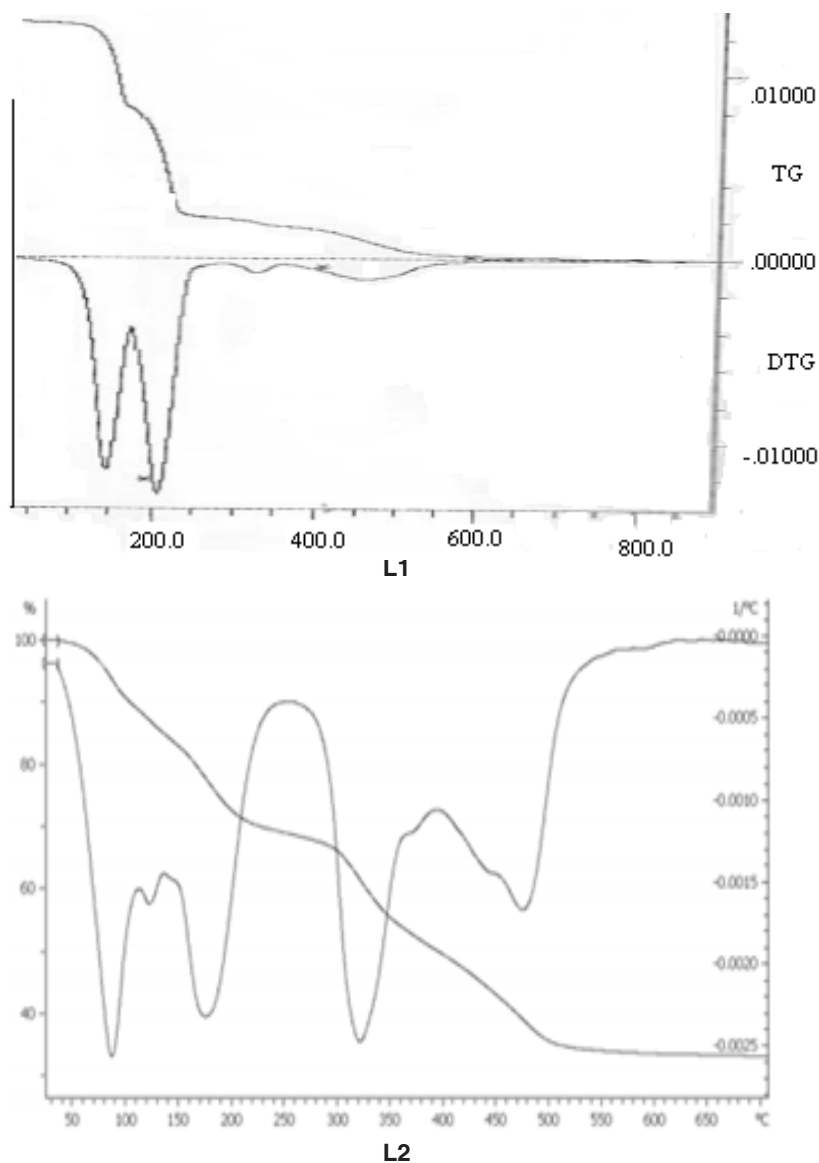


Fig .4. Thermograms of Ligands L<sub>1</sub> and L<sub>2</sub>.

absorption band at  $24154\text{ cm}^{-1}$  which were belong to charge transfer transition (C.T).<sup>13,14,25</sup> The magnetic moments of copper complexes C<sub>1</sub> and C<sub>3</sub> were  $\mu_{\text{eff}}=2.4$  and  $2.6\text{ B.M}$  of C<sub>1</sub> and C<sub>2</sub> respectively, these values due to octahedral geometry.<sup>26</sup> The spectrum of diamagnetic platinum complex C<sub>2</sub> showed bands at  $12195$ ,  $22935$  and  $29614\text{ cm}^{-1}$  which assigned to  $^1A_{1g}\rightarrow^3T_{1g}(\text{H})$ ,  $^1A_{1g}\rightarrow^3T_{2g}$  and  $^1A_{1g}\rightarrow^1T_{1g}(\text{C.T})$  transition respectively of octahedral platinum (IV) complexes.<sup>13,27,28</sup> Two absorption bands were observed in spectrum of Pt(IV) complex (C<sub>4</sub>). Fig. 5 at  $11035$  and  $21643\text{ cm}^{-1}$

<sup>1</sup> which were referred to  $^1A_{1g}\rightarrow^3T_{1g}(\text{H})$  and  $^1A_{1g}\rightarrow^3T_{2g}$  transitions respectively of octahedral platinum (IV) complexes<sup>13,27,28</sup>. The molar conductivity data in DMSO were  $0.033$ ,  $0.059$ ,  $0.121$  and  $0.163\text{ S. mol}^{-1}\text{ cm}^{-1}$  for C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub> and C<sub>4</sub> complexes respectively indicating the nonelectrolytic properties of complexes.<sup>29</sup> The suggested structures of complexes were shown in Figure. 6.

#### Biological Screening

The data of biological activity were listed in Table. 7. The studied compounds and starting

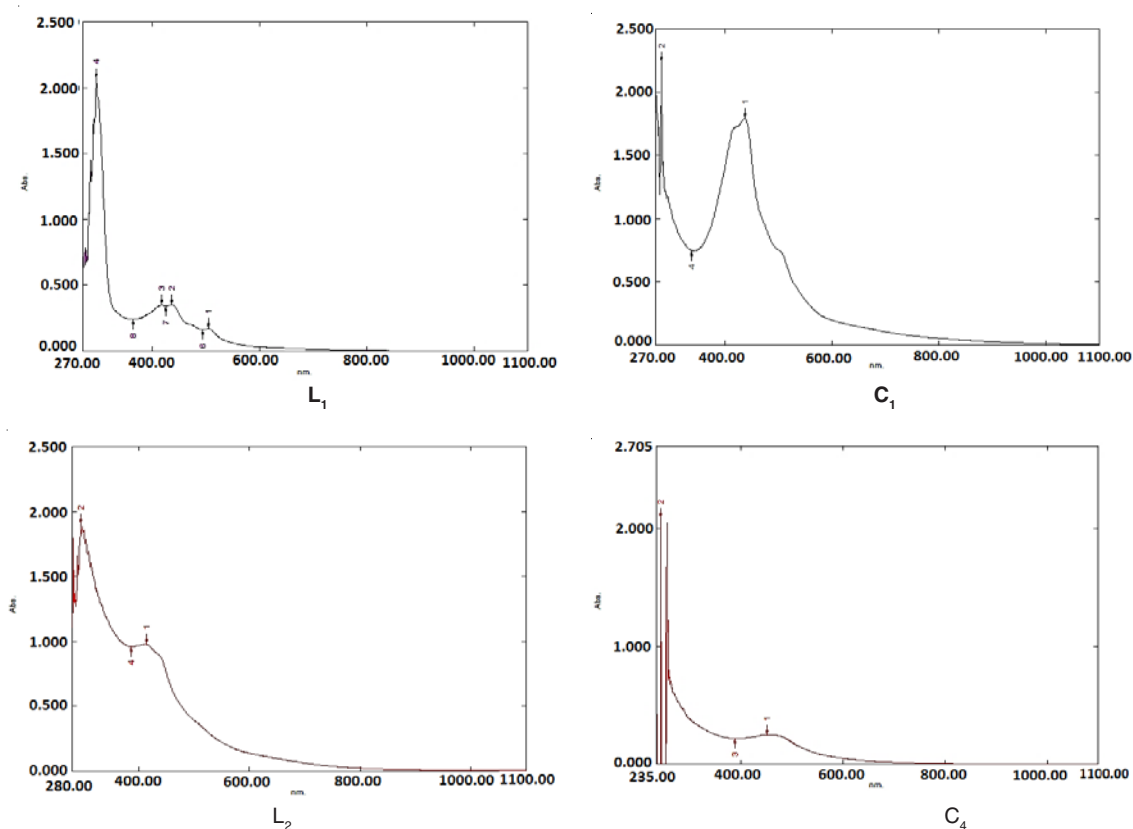


materials were tested as antibacterial and antifungal agents against Gram negative bacteria (*E-coli*), Gram positive bacteria (*Staphylococcus aureus*), *albicans* and (*Mycrosporium canis*). The

test was carried out by diffusion method for studied compounds in DMSO and concentration  $10^{-2}$  M. The tested compounds exhibited different activities against *Staphylococcus aureus*, *albicans* and *My*

**Table. 6: Electronic spectra, magnetic moment and molar conductance with suggested structures of  $L_1$  and  $L_2$  complexes**

Symbol	Band position $\text{cm}^{-1}$	Assignments	$\mu_{\text{eff.}}$ B.M	Molar Conductivity $\text{S.mol}^{-1} . \text{cm}^{-1}$	Suggested structures
$C_1$	$\nu_1$ 15329	${}^2B_1g \rightarrow {}^2A_1g^2$	2.4	0.0337	distorted octahedral
$\text{Cu(II)}$	$\nu_2$ 19794	${}^2B_1g \rightarrow {}^2B_2g$			
	$\nu_3$ 20976	$B_1g \rightarrow {}^2Eg(\text{C.T})$			
	$\nu_1$ 12195	${}^1A_1g \rightarrow {}^3T_1g(\text{H})$	diamagnetic	0.0591	octahedral
$\text{Pt(IV)}$	$\nu_2$ 22935	${}^1A_1g \rightarrow {}^3T_2g$			
$C_3$	$\nu_3$ 29614	${}^1A_1g \rightarrow {}^1T_1g(\text{C.T})$			
$\text{Cu(II)}$	$\nu_1$ 11030	${}^2B_1g \rightarrow {}^2A_1g$	2.6	0.121	distorted octahedral
	$\nu_2$ 15480	${}^2B_1g \rightarrow {}^2B_2g$			
	$\nu_3$ 19671	${}^2B_1g \rightarrow {}^2Eg$			
	$\nu_4$ 24154	$L \rightarrow M(\text{C.T})$			
$C_4$	$\nu_1$ 11035	${}^1A_1g \rightarrow {}^3T_1g(\text{H})$	diamagnetic	0.163	octahedral
$\text{Pt(IV)}$	$\nu_2$ 21643	${}^1A_1g \rightarrow {}^3T_2g$			



**Fig. 5. UV-VIS spectra of  $L_1$ ,  $L_2$ ,  $C_1$  and  $C_4$  complexes.**



*crosporium canis*, while these compounds were inactive against *E-coli*. The results have been

compared with three kinds of antibiotics cephalaxim, cefatoxim and ketoconazole.

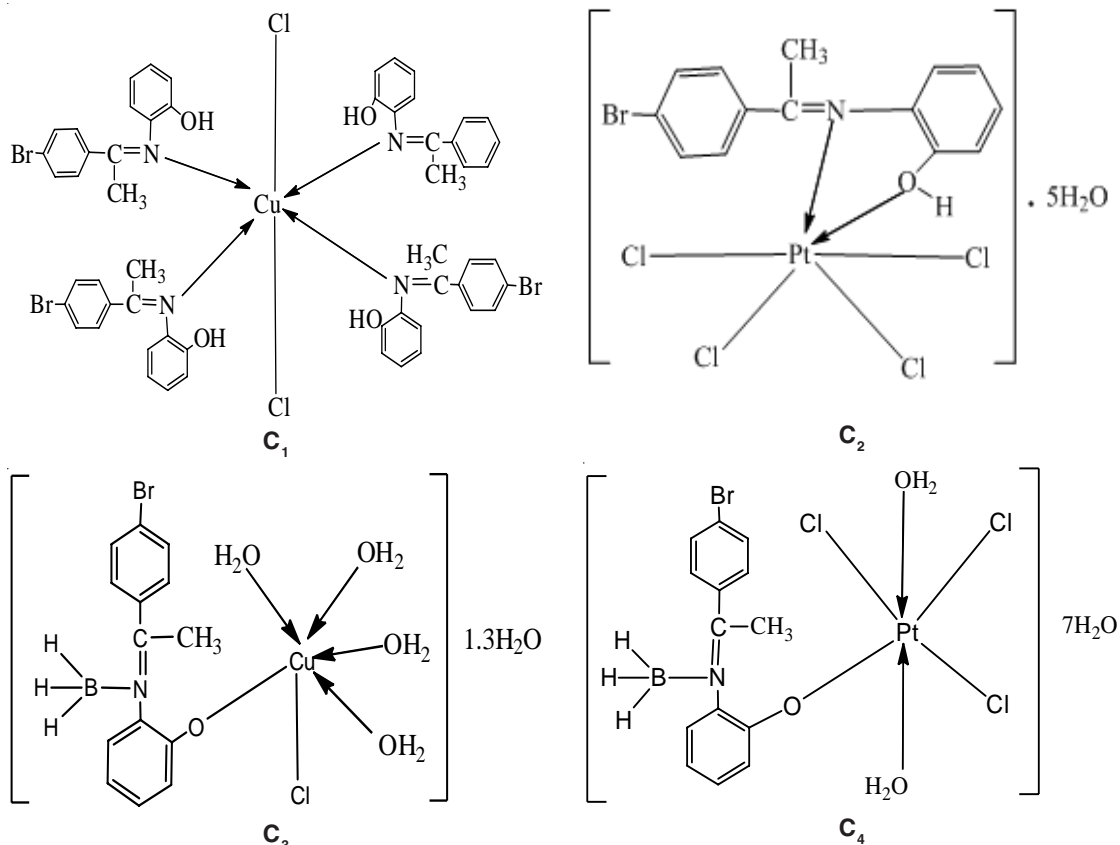


Fig. 6: The suggested structures of synthesized complexes.

Table. 7 : Antibacterial and antifungal activity of two ligands and their metal complexes.

Compounds	<i>Staphylococcus aureus</i> diameter mm	<i>E-coli</i> diameter mm	<i>Albicans</i> diameter mm	<i>Mycrosporium Canis</i> diameter (mm)
DMSO	zero	zero	zero	zero
2-aminophenol	36	zero	18	zero
bromoacetophenone	zero	zero	zero	zero
Sodium borohydride	zero	zero	zero	zero
L <sub>1</sub>	20	zero	12	15
L <sub>2</sub>	23	zero	12	zero
C <sub>1</sub>	32	zero	34	23
C <sub>2</sub>	20	zero	10	zero
C <sub>3</sub>	20	zero	15	13
C <sub>4</sub>	zero	zero	zero	zero
Cephalexim	25	zero	-	-
Cefatoxim	48	45	-	-
Ketoconazole	-	-	zero	20

### CONCLUSIONS

The new Schiff base ligand derived from 2-aminophenole with 4-bromoacetophenone (L1) and the Schiff base of boron (L2) with their metal complexes have been synthesized and characterized. The results showed that the coordination of L1 with Cu(II) and Pt(IV) through N atom as donor atom while the coordination of L2 with metal ions through O atom. The results of electronic spectra and magnetic susceptibility exhibited the octahedral geometry for Pt complexes and distorted octahedral for Cu complexes. The thermal analysis give a good characterization of L1 and L2 and showed that L2 is more stable than

L1. The synthesized compounds were studied as antibacterial and antifungal, the results showed a different activities against *Staphylococcus aureus*, *Candida* and *Mycrosporium Canis*, while inactive against *E-Coli*.

### ACKNOWLEDGMENT

The authors gratefully acknowledgment chemistry department laboratories in college of science / Baghdad University and college of science / Al-Mustansiriya University for supporting in the measurements of FTIR, UV-Vis spectra, melting point, conductivity and magnetic susceptibility.

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