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Preparation and Characterization of Some Transition Metal Complexes with Novel Azo-Schiff base Ligand Derived from 2-(E)-(1H-benzo[d]imidazole-2-ylideneamino)-5-((E)-benzylideneimino)phenol (BIADPI).

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ABSTRACT

A new series of transition metal complexes of Co(II), Ni(II), Cu(II), Zn(II), Cd(II) and Hg(II) were prepared from the novel azo-schiff base ligand (BIADPI) from by coupling reaction of benzimidazole diazonium chloride with 3-(benzylideneimino)phenol. They have been characterized by elemental analysis (C.H.N), magnetic susceptibility, molar conductance and spectral techniques such as FT-IR, ¹H-NMR, electronic spectra and mass spectrometry. The spectral studies of the complexes reveal that the azo-schiff base as a tridentate ligand coordination through the deprotonated phenolic oxygen, N₃ of benzimidazole ring and N₃ of azo group which is the farthest of benzimidazole molecule. The molecular structure of the complexes has been optimized by the spectral data and suggested tetrahedral geometry with sp³ hybridisation of Zn(II)-complex and octahedral geometry with sp³d² hybridization of other metal complexes. All complexes that non-electrolyte and non conductive species exist excepted the Co(III)-complex is 1:1 electrolyte.

Keywords: Azo-Schiff base, Benzimidazole, metal complexes, characterization, Hybridization.

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INTRODUCTION

Schiff base and their coordination complexes have gained importance recently because of their application such as biological activity, biochemical, analytical chemistry, anticancer, antibacterial and antifungal activities^(1,2). Transition metal complexes of Schiff base concerning interaction of metal ions with nitrogen and oxygen organic moieties have been of great interest for many years since they have become an effective biochemical and analytical reagents^(3,4). Aniline derivatives of imidazole, also called benzimidazole are reported to have parasitic and antiviral activities⁽⁵⁾. More literature survey regarding the benzimidazole derivatives focuses them as an important drug that selectively inhibits endothelial cell growth and suppresses angiogenesis *in vitro* and *in vivo*⁽⁶⁾. A considerable number of Schiff base complexes were used as more or less successful models of biological compounds⁽⁷⁾. Azo refers to a chemical compound that contains double nitrogen atoms with a double bond between them (-N=N-)⁽⁸⁾. This class of azo compounds possess active (π -acidic) azo imine (-N=N-C=N-), function for this reason a number of these azoimidazoles and their derivatives were prepared and their abilities as chelating ligands was investigated⁽⁹⁻¹²⁾. The aim of present work is to carry out the preparation, characterization and molecular structure of Co(II), Ni(II), Cu(II), Zn(II), Cd(II) and Hg(II) complexes with novel azo-Schiff base derived from 2(E)-(1H-benzo[d]imidazole-2-yl diazenyl)-5-((E)-benzylideneimino)phenol (BIADPI).

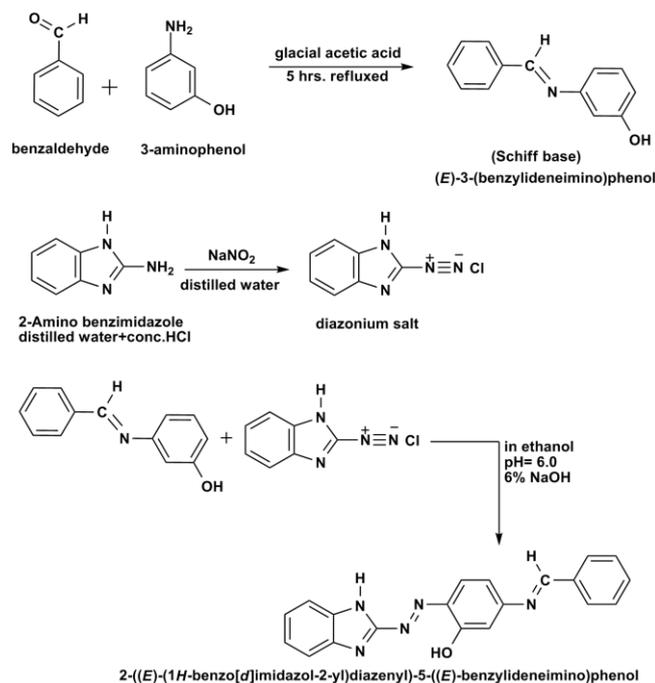
EXPERIMENTAL

Materials and measurements

All chemical which are of analar grade are purchased from Aldrich, BDH, Merck and Sigma. All the solvents used ethanol, methanol, dimethylsulfoxide and tetrahydrofuran are of AnalaR grade. The solvents were purified by distillation and double distilled water was used throughout the experiment. The infrared spectra of the ligand (BIADPI) and their metal complexes were run as KBr discs in the range (4000-400) cm^{-1} on Shimadzu 8400 FTIR spectrophotometer. Element analysis (C, H, N) were performed by using a Euro EA elemental analyzer. ¹H NMR spectrum of ligand was determined in CDCl_3 (internal standard TMS) on Bruker spectrophotometer (Tarbiat Modarres University, Iran). Mass spectrum of ligand was obtained using Agilent Technologies 5975C at 70 eV and MSD energy using a direct insertion probe (Acq method low energy) at temperature 90-110 °C (Tarbiat Modarres University, Iran). The magnetic susceptibility was measured on a MSB-Auto magnetic susceptibility balance. Electrical conductivity measurements of the chelate complexes were recorded at room temperature in DMF (10^{-3} M) using a 31 A digital conductivity meter. Electronic spectra in absolute ethanol (10^{-3} M) solution were recorded by using Shimadzu UV-vis. 1700 spectrophotometer 21-1885-0166. The metal contents of the complexes were measured by using atomic absorption by Shimadzu AA-160. The pH measurement was carried out using a Philips PW 9421 pH meter (± 0.001) and the melting point was determined on a Electro thermal melting point 9300 was used to measure the melting points of the ligand and their complexes. Experiments and preparation of solutions and washing all glass were using distilled water twice in doubly distilled water.

Preparation of novel azo-schiff base ligand (BIADPI)

The novel azo-schiff base ligand (BIADPI) was prepared by condensation of benzaldehyde (3.41 gm; 0.01 mole) with 3-amino phenol (1.09 gm; 0.01 mole) in 30 ml ethanol in the presence of 5 drops of glacial acetic acid as a catalyst and the mixture was refluxed for 5 hours at 60 °C. The resultant solution was cooled at room temperature. The dark yellow solid of 3-(benzylidene amino)phenol was formed which was filtered and recrystallized in absolute ethanol. Yield 87%; m.p. = 149 °C. Azo compound was prepared by the diazotization coupling reaction using procedure described for arylazo-imidazole dyes⁽¹³⁾. With some modification Scheme (1). 2-Amino benzimidazole (1.33 gm, 0.01 mole) was dissolved in mixture 25 ml distilled water and 5 ml of concentrated hydrochloric acid and cooled to 0-5 °C. The solution was diazotized at 0-5 °C with (0.75 gm; 0.01 mole) sodium nitrate dissolved in 25 ml distilled water was added drop wise to solution of 2-amino benzimidazole and stirring continuously at 0-5 °C and left to stand 30 min. This diazonium solution was added to (1.97 gm; 0.01 mole) of 3-(benzylidene amino)phenol dissolved in 100 ml ethanol and 30 ml of 6% sodium hydroxide. The mixture was stirred continuously for 2 hours at 0-5 °C in ice-bath and allowed to stand overnight. The precipitate was filtered and washed with distilled water and ethanol solution to remove the excess of unreacted substances and recrystallized from ethanol and dried in oven at 50 °C for several hours. The purity was confirmed by the elemental analysis and TLC techniques. Yield; 79%; m.p. = 160 °C.



Scheme (1);-preparation of novel azo-schiffbaes ligand (BIADPI)

Preparation of metal complexes

To an ethanolic solution of azo-schiffbaes ligand (BIADPI) an ethanolic solution of the Co(II), Ni(II) and Cu(II) hydrated metal chloride and anhydrous Zn(II), Cd(II) and Hg(II) chloride was added in a molar ratio [1:2] excepted Zn(II)-complex [1:1]. The mixture was refluxed for about 40 minutes. The mixture was cooled in ice bath. The obtained solid precipitate was collected by filtration, washed with distilled water and washed with 10 ml hot ethanol to remove any traces of the unreacted materials and dried in vacuum. Table-1 shows the collected physical properties and analytical data for the prepared azo-schiff base ligand and their complexes.

Table(1): physical properties and elemental analysis for novel azo-schiff base ligand (BIADPI) and their metal complexes .

Compound	m.p °C	Color	Yield (%)	Molecular formula (Mol.Wt)	Found (Calc.) %			
					C	H	N	M
LH=ligand	160	Yellow	79	C₂₀H₁₅N₅O (341.37)	70.19 (70.37)	4.49 (4.43)	20.59 (20.51)	—
[Co(L) ₂].Cl.H ₂ O	187	Purple bluish	58	C₄₀H₃₀N₁₀O₃ClCo (793.13)	60.68 (60.57)	3.74 (3.81)	17.54 (17.66)	7.26 (7.43)
[Ni(L) ₂].H ₂ O	193	Red	63	C₄₀H₃₀N₁₀O₃Ni (757.43)	63.25 (63.43)	3.93 (3.99)	18.31 (18.49)	7.56 (7.75)
[Cu(L) ₂].H ₂ O	177	Purple bluish	81	C₄₀H₃₀N₁₀O₃Cu (762.29)	62.91 (63.03)	3.88 (3.97)	18.25 (18.37)	8.03 (8.34)
[Zn(L)Cl].H ₂ O	184	purple	67	C₂₀H₁₆N₅O₂ClZn (459.22)	52.42 (52.31)	3.43 (3.51)	15.12 (15.25)	14.06 (14.24)
[Cd(L) ₂]	221	Purple	52	C₄₀H₂₈N₁₀O₂Cd (793.14)	60.66 (60.57)	3.51 (3.56)	17.80 (17.66)	14.38 (14.17)
[Hg(L) ₂]	206	Dark purple	76	C₄₀H₂₈N₁₀O₂Hg (881.32)	54.33 (54.51)	3.13 (3.20)	16.02 (15.89)	—

LH=(BIADPI)

RESULTS AND DISCUSSION

Characterization of azo-schiffbase ligand and their complexes

The new azo-schiffbase ligand (BIADPI) is yellow crystals but the prepared complexes of this ligand were crystalline and different colour depending on the metal ion. The ligand and their complexes are stable in air at room temperature and soluble in DMF, DMSO, methanol, ethanol and acetone but insoluble in water. On the basis of analytical data the metal complexes are found [1:2] metal:ligand excepted Zn(II)-complex [1:1] M:L. The analytical data and spectroscopic data for the newly prepared metal complexes are in good agreement with proposed molecular formula that ligand is behaving as tridentate in all prepared complexes^(14,15).

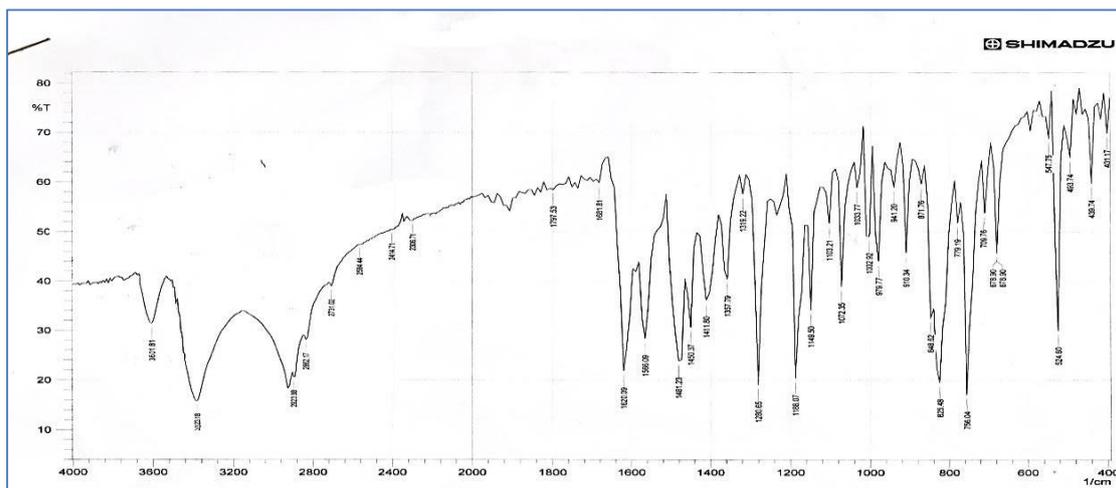
Infrared spectra of novel azo-schiff base and their metal complexes

The infrared spectral data of azo-schiff base (BIADPT) and their metal chelate complexes were listed in table 2. IR spectrum of free ligand show medium band around 3323 cm^{-1} which can be attributed to $\nu(\text{N-H})$ stretching vibration of benzimidazol moiety^(4,16). This band remains in the same region in ligand and in solid chelate complexes spectra. Thus the remaining of the hydrogen of (N-H) group indicates non involvement in coordination of the ligand to the metal ions^(11,17). Medium intensity band at the region around 3650 cm^{-1} is assignable to phenolic group whose negative shift in metal complexes indicated metal coordination with phenolic oxygen. Strong intensity band in the range of 1620 cm^{-1} due to $\nu(\text{C=N})$ in the novel azo-schiff base ligand. This band was shifted about $(1605-1589)\text{ cm}^{-1}$ in metal complexes, indicating the imine nitrogen atom (N3) in benzimidazole ring coordination to metal ions^(18,19). The azo-schiff base spectrum displays the azo ($-\text{N=N}-$) group at 1481 cm^{-1} , this group is changing to lower frequency at $(1452-1434)\text{ cm}^{-1}$ suggests its participation in bonding with metal ions⁽²⁰⁾. New bands at $(516-583)\text{ cm}^{-1}$ which are not present in the free ligand (BIADI) are attributed to $\nu(\text{M-N})$ vibration. The appearance of weak intensity bands in spectra of metal complexes in the region of $(447-424)\text{ cm}^{-1}$ assignable due to $\nu(\text{M-O})$ vibration, also indicated the metal oxygen binding to form the chelate complexes⁽²¹⁾. IR spectra data lead to suggest that the novel azo-schiff base behaves as tridentate chelating agent coordination through the nitrogen atom (N3) of azo group nearest to phenol ring, phenolic oxygen and nitrogen (N3) atom of benzimidazole ring to give two-five membered chelate ring. Representative examples for these spectra are given in figures 1, 2 and 3.

Table (2);-Selected IR data(cm^{-1})for novel azo –Schiff base ligand (BIADPI)and their metal complexes

Compound	$\nu(\text{O-H})$	$\nu(\text{N-H})$	$\nu(\text{C=N})$ benzimid.	$\nu(\text{N=N})$	$\nu(\text{C=C})$	$\nu(\text{C-N=N-})$	$\nu(\text{C-N})$ Benzimid.	$\nu(\text{M-N})$	$\nu(\text{M-O})$
LH=ligand (BIADPI)	3601m.br.	3323m.br.	1620s.	1481m.	1288s.	1180s.	1072m.	-----	-----
[Co(L) ₂].Cl.H ₂ O	3420m.br.	3302w.br.	1593s.	1433s.	1254s.	1165s.	1042m.	561m.	431w.
[Ni(L) ₂].H ₂ O	3398m.br.	3286m.br.	1582s.	1468s.	1265s.	1154.	1052m.	557m.	429w.
[Cu(L) ₂].H ₂ O	3409w.	3293w.br.	1589s.	1434s.	1242s.	1196m.	1002m.	583m.	424w.
[Zn(L)Cl].H ₂ O	3401m.br.	3283m.br.	1609m.	1446m.	1271s.	1179m.	1062m.	572m.	438w.
[Cd(L) ₂]	-----	3272w.br.	1576m.	1472m.	1249s.	1168m.	1016m.	549m.	451w.
[Hg(L) ₂]	-----	3279w.sh.	1602m.	1458m.	1285s.	1180s.	1034m.	516w.	447w.

W=weak , S=stronge , m= medium, br=broad



Figure(1):-IR spectrum of the ligand (BIADPI).

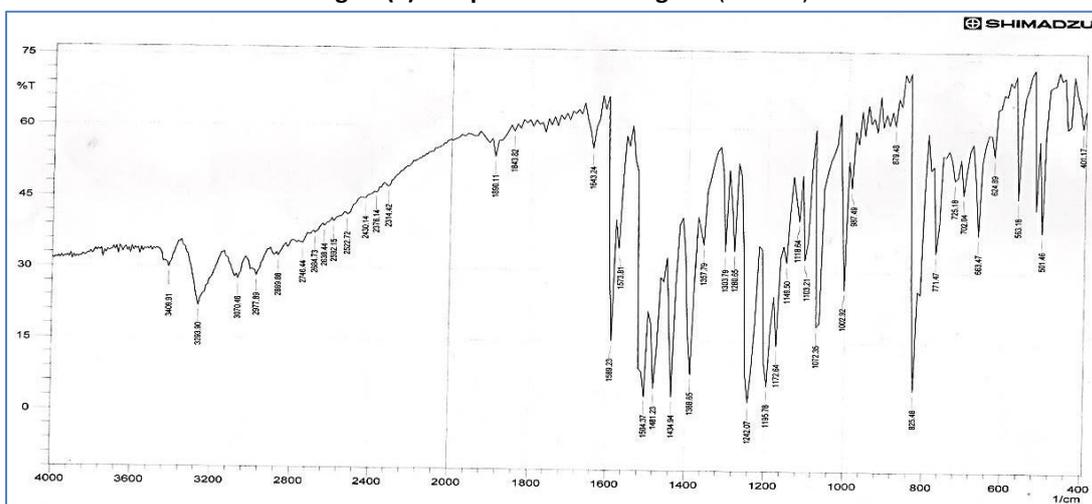


Figure (2):-IR spectrum of the $[Cu(L)_2] \cdot H_2O$ complex

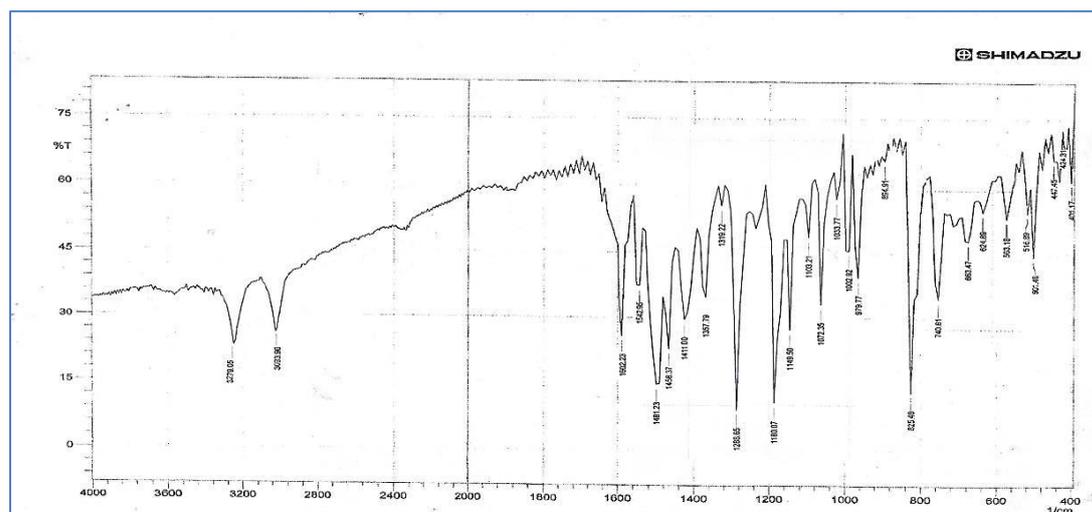
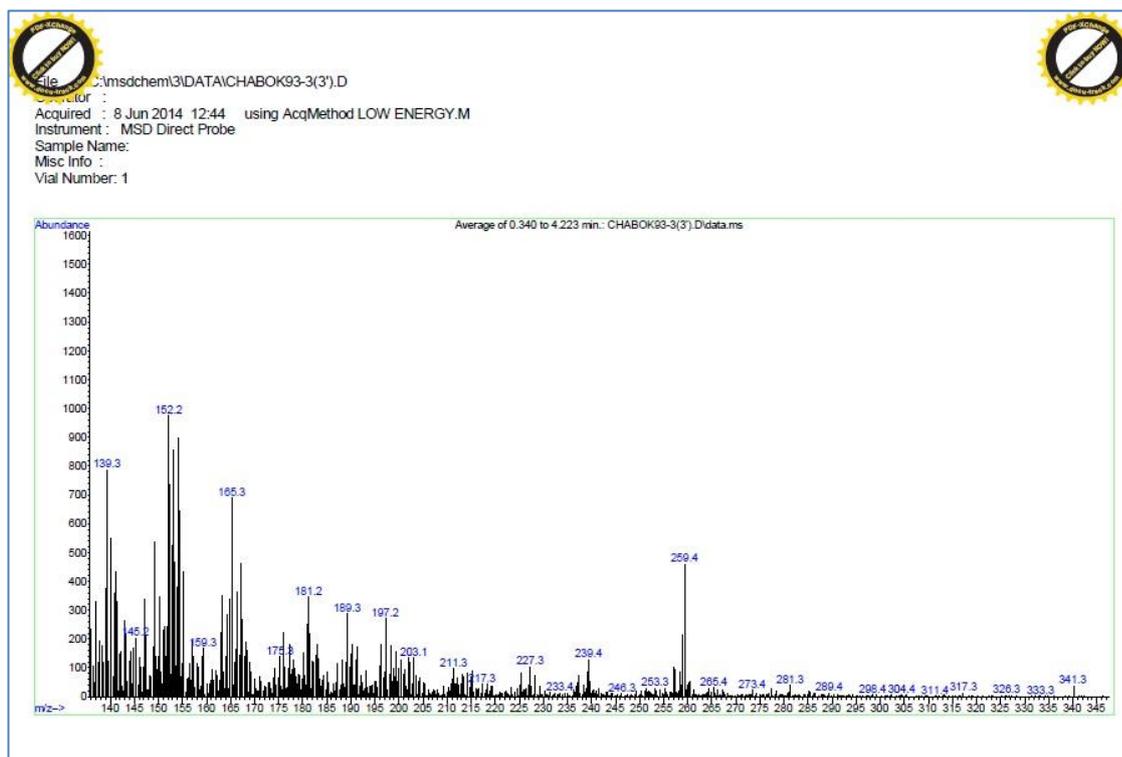


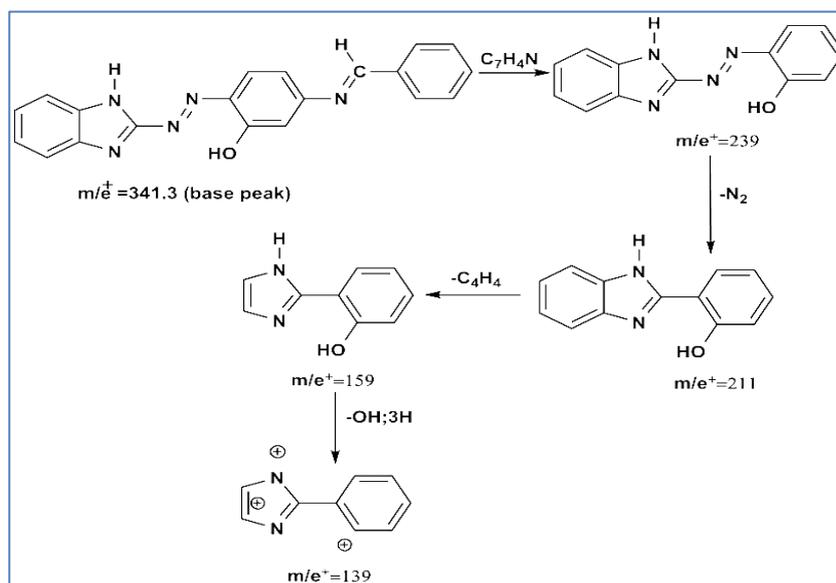
Figure (3):-IR spectrum of the $[Hg(L)_2]$ complex

Mass spectrum of the novel azoschiffbase ligand (BIADPI)

The mass spectral fragmentations of azo-schiffbase ligand (BIADPI) shown in scheme-2 and figure 4. The base peak of azo-schiff base ligand at $m/e^+ = 342.30$ is attributed to the original molecular weight of the ligand (341.37) under investigation. The peak at $m/e^+ = 239$ is analogous to the loss of phenyl and azomethine (NCH) group. The loss of two nitrogen atoms (azo group) gives a peak at $m/e^+ = 211$. The peak at $m/e^+ = 159$ is due to the loss of C_4H_4 . The same spectrum shows a peak at $m/e^+ = 139$ corresponding to the loss of hydroxyl group and three hydrogen atoms from the imidazole ring^(15,22).



Figure(4): Mass spectrum of azo-schiff base ligand (BIADPI)



Scheme(2):- Mass spectrum fragmentainoof azo-schiff base ligand(BIADPI)
¹H-NMR spectrum of azoschiff base ligand(BIADPI).

The ¹H-NMR spectrum of the azoschiff base ligand figure(5) was measured using in CDCl₃ as a solvent. The azoschiff base spectral results show adblate peaks at δ=6.51-6.54 ppm attributed to phenol ring. The triblate peaks at δ =7.27-7.28 ppm attributed to the phenyl ring. The single peaks at δ =6.77 ppm and 6.78 ppm due to the NH and OH groups in ligand respectively. Also the same spectrum display signal at δ=7.58 ppm which are assigned to the phenyl ring of benzimidazole. The azoschiff base ligand show single peak at δ=8.57 ppm which is assigned to the presence of protons of azomethine group^(23,24). The singal peak at 1.26 ppm due to the existence of CDCl₃ solvent.

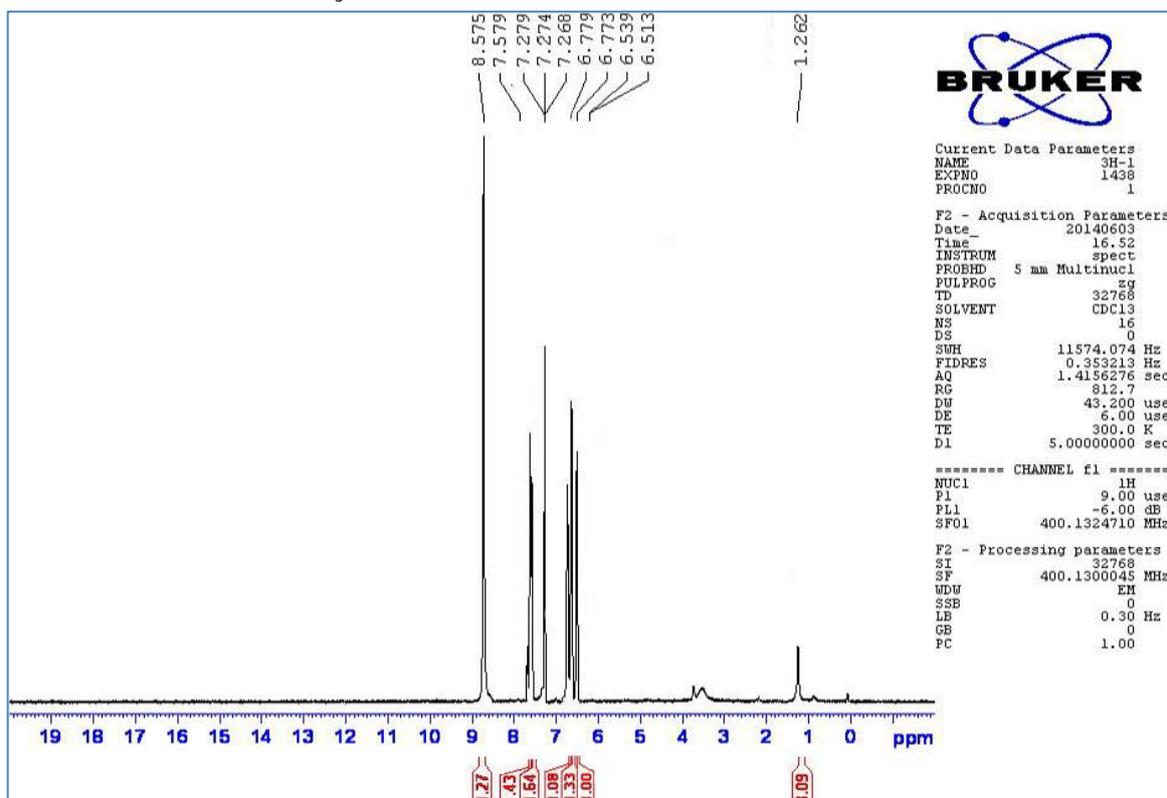


Figure (5): ¹H-NMR spectrum fragmentaino of azo-schiff base ligand (BIADPI)

Metal:Ligand Ratio

The metal :ligand ratios of chelates complexes were determined by the method of molar ratio at wavelength of maximum absorption (λ_{max}). The azoschiff base ligand (BIADPI) was found to form [1:2] M:L chelates with metal ions except of Zn(II)-complex was found [1:1] under studies these result are in a greement with values reported for some azoschiff base complexes^(25,26).

Electronic spectra and magnetic measurements

The electronic spectral data and magnetic moments of the ligand (BIADPI) and their metal complexes are presented in table-3 and figures 6,7,8, and 9. The electronic absorption spectra were recored in absolute ethanol solution in the range 200-1100nm. The electronic spectrum of free azoschiff base showed three bands around 249 nm(40161cm^{-1}), 326 nm(30675cm^{-1}) and 450 nm(22222cm^{-1}) characteristic of $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transition⁽²⁷⁾. In the metal chelate complexes, this band at 450 nm is shifted to a longer wave length with increasing in tensity. This shift may be attributed to the donation of the ione pair of electrons of nitrogen of benzimidazole molecule(N3) and ione pair of nitrogen atom azo group N₃ which is the nearest phenolic ring to metal ion.

The electronic spectrum of Co (III)-Complex show three absorption bands around at 901 nm(11098 cm^{-1}), 598nm(16722 cm^{-1}) and 482nm(20746 cm^{-1})there are assigned to ${}^1A_{2g} \rightarrow {}^1T_{2g}(u_1)$, ${}^1A_{2g} \rightarrow {}^1T_{1g(F)}(u_2)$ and ${}^1A_{2g} \rightarrow {}^1T_{1g(P)}(u_3)$ transitions respectively.The magnetic moment of this complexeshas been found to be a diamagnetic the low spin behavior indicats that Co(III) is oxidized to Co(II) because of complexation with ligand (BIAPDI).The change of the oxidation state agrees with earlier observation that the aquoues solution of Co(II)salt are spontaneously oxidized to Co(III) in the presence of strong ligand such as azoschiff base drived from benzimidazolylazo compound^(28,29) which may be suggests an argular octahedral geometry ($t_{2g}^6 e_g^0$)and hybrdization d^2sp^3 .

The electronic spectrum of Ni(II)-complex has a $d^8(t_{2g}^6 e_g^2)$ configuration haveing the following orgel diagram three bands are predicted in their electronic spectra,in this complex found three bands were observed ,the first one is very weak and broad at 910 nm(10989 cm^{-1})attributed to ${}^3A_{2g(F)} \rightarrow {}^3T_{2g}(u_1)$ transition and the second band was strong and broad at 491 nm(20366 cm^{-1}), due to ${}^3A_{2g} \rightarrow {}^3T_{1g(F)}(u_2)$ transition while the third band detected at 410 nm(24390 cm^{-1}) assigned to ${}^3A_{2g} \rightarrow {}^3T_{1g(P)}(u_3)$ transitions^(30,31).The large variation in the magnetic moment values (2.9-3.4 B.M) for high spin Nickel (II)-complex 2.83 B.M depends on the magnitude of the orbital contribution.The magnetic moment value is 3.28 B.M, in the present work because of presence two unpaired electrons which may be suggest a high spin,a regular octahedral geometry and hybrdization sp^3d^2 ^(10,22,32).

Forthe Cu(II)-complex has a $d^9(t_{2g}^6 e_g^3)$ configuration having the following absorption broad band found at 589 nm(16977 cm^{-1}) which may assigned to ${}^2E_g \rightarrow {}^2T_{2g}$ transtion corresponding to a distorted octahedral geometry around the Cu(II) ion^(33,34).The magnetic moment value of Cu(II)-complexequal 1.78 B.M, due to presene one electron unpaired which may be suggest an distorted octahedral structure (Z-in or Z-out) and hybrdization sp^3d^2 ⁽³⁵⁾.

The electronic spectra of Zn(II),Cd(II) and Hg(II)-complexes do not show any d-d transition because they are saturated with electrons (d^{10}).Theaborption bands at 536 nm(18656 cm^{-1}), 528 nm(18939 cm^{-1}) and 575 nm(17391 cm^{-1}) these are assigned to a charge transfer(M \rightarrow L,CT)transition to Zn(II),Cd(II) and Hg(II)-complexes respectively.The magnetic moment value of this complexesdiamagnetic consistent d^{10} configuration($t_{2g}^6 e_g^4$)($\mu_{\text{eff}}=0.00\text{B.M}$) and a octahedralgeomterywith hybridization sp^3d^2 ⁽³⁶⁾of Cd(II) and Hg(II) complexes,but Zn(II)-complex istetrahedral geometry and hybridization is sp^3 ⁽³⁶⁾.

Molar conductance

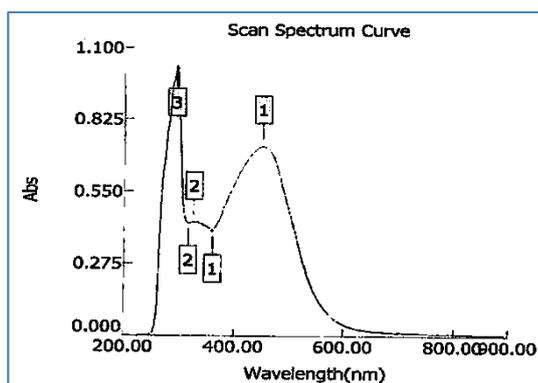
Table(3):- Electronic Spectra magnetic moments, molar conductance, geometry and hybridization

Complexes	λ_{max} (nm)	Absorption bands (cm^{-1})	Transition	μ_{eff} (B.M)	Moler Conductivity ($\text{S.cm}^2.\text{mol}^{-1}$)	Geometry	Hybrdization
LH=ligand (BIAPDI)	249	4016	$\pi \rightarrow \pi^*$	-----	-----	-----	-----
	326	30675	$\pi \rightarrow \pi^*$				
	450	22222	$n \rightarrow \pi^*$				
[Co(L) ₂] Cl.H ₂ O	901	11098	${}^1A_{2g} \rightarrow {}^1T_{2g}(u_1)$	dia	38.14	Octahedral (regular)	d^2sp^3 (low spin)
	598	16722	${}^1A_{2g} \rightarrow {}^1T_{1g(F)}(u_2)$				
	482	20746	${}^1A_{2g} \rightarrow {}^1T_{1g(P)}(u_3)$				
[Ni(L) ₂].H ₂ O	910	10989	${}^3A_{2g} \rightarrow {}^3T_{2g(F)}(u_1)$	3.28	9.27	Octahedral (regular)	sp^3d^2 (high spin)
	491	20366	${}^3A_{2g} \rightarrow {}^3T_{1g(F)}(u_2)$				
	410	24390	${}^3A_{2g} \rightarrow {}^3T_{1g(P)}(u_3)$				
[Cu(L) ₂].H ₂ O	589	16722	${}^2E_g \rightarrow {}^2T_{2g}$	1.78	12.36	Octahedral distorted (Z-in or Z-out)	sp^3d^2
[Zn(L)Cl].H ₂ O	536	18656	M \rightarrow L,CT	dia	10.48	tetrahedral	sp^3
[Cd(L) ₂]	528	18939	M \rightarrow L,CT	dia	8.52	Octahedral (regular)	sp^3d^2
[Hg(L) ₂]	575	17391	M \rightarrow L,CT	dia	10.37	Octahedral (regular)	sp^3d^2

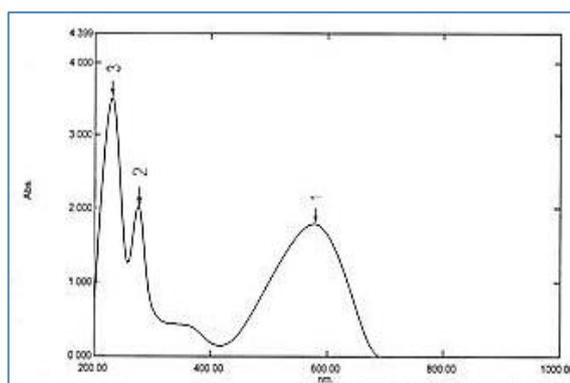
L=(BIADPI)

The molar conductance value of all chelate complexes prepared in this work showed ranged between (12.36-8.52) S.mole⁻¹.cm² in DMSO solvent (10⁻³M) at room temperature, these values indicating non-electrolyte and no conductive species exist of Ni(II),Cu(II),Zn(II),Cd(II) and Hg(II) complexes indicating the non electrolyte nature and the chloride ion is located inside the coordination sphere and is directly involved in coordination with the metal ion center⁽³⁷⁾. While the molar conductance of Co(III)-complex equal 38.14 S.mol⁻¹.cm² indicate the electrolytic nature (1:1) electrolyte of this complex furthermore the chloride ion is located outside the coordination sphere⁽³⁸⁾.

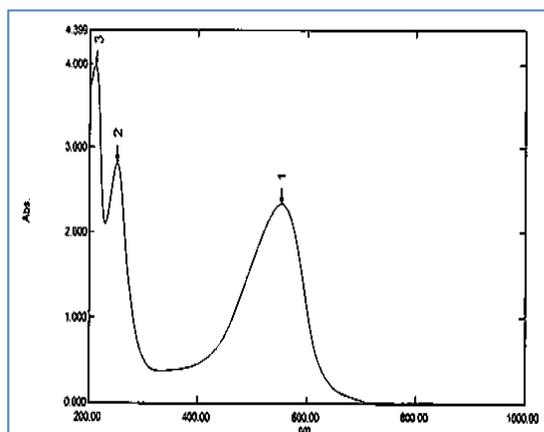
According to there results and discussed through different techniques suggest below the proposed structural formula of chelate complexes prepared and shown in figures 10 and 11 and this results are given in table-3



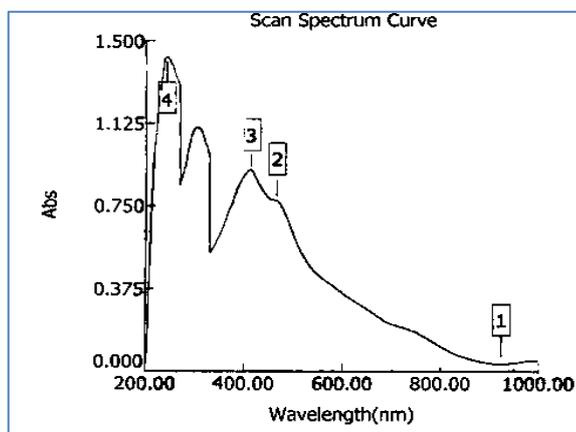
Figure(6):- The absorption spectrum of ligand(BIADPI). Cu(II) - complex



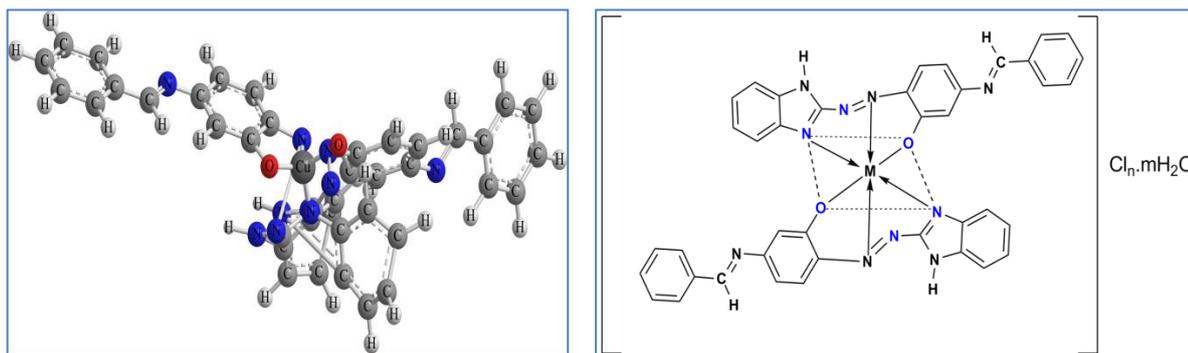
Figure(7):- The absorption spectrum of Cu(II) - complex



Figure(8):- The absorption spectrum of Hg(II) - complex Ni(II) – complex



Figure(9):- The absorption spectrum of Ni(II) – complex



When $M = \text{Co(III)}$, $n=1, m=1$

When $M = \text{Ni(II)}$ and Cu(II) , $n=0, m=1$

When $M = \text{Cd(II)}$ and Hg(II) , $n=0, m=0$

Figure (10):- The proposed structural formula of Co(III) , Ni(II) , Cu(II) , Cd(II) and Hg(II) complexes.

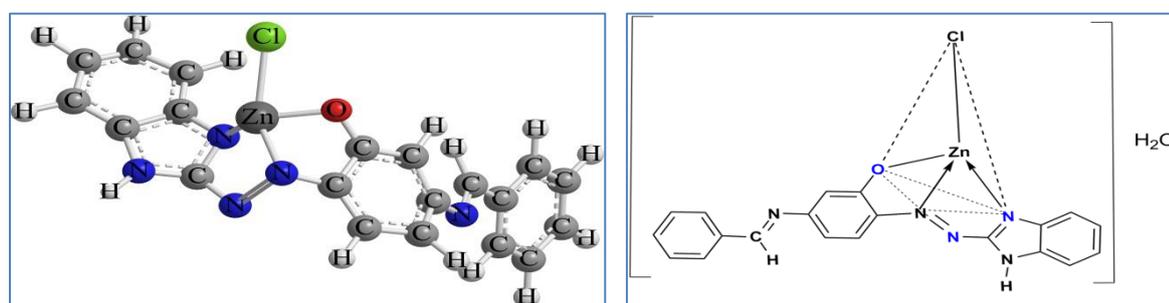
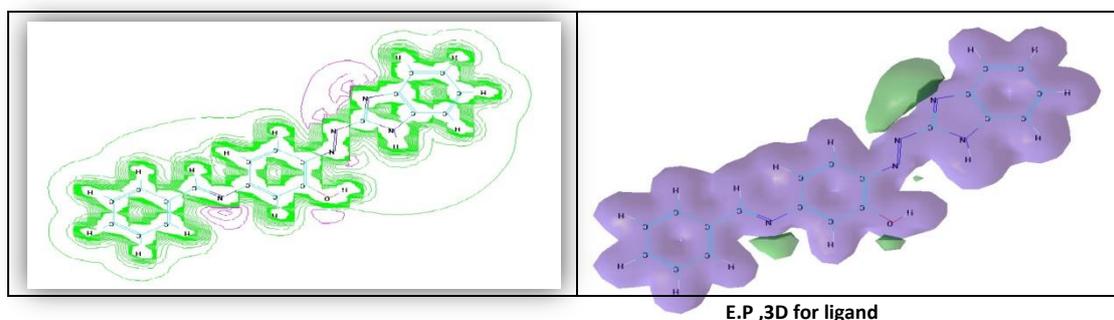
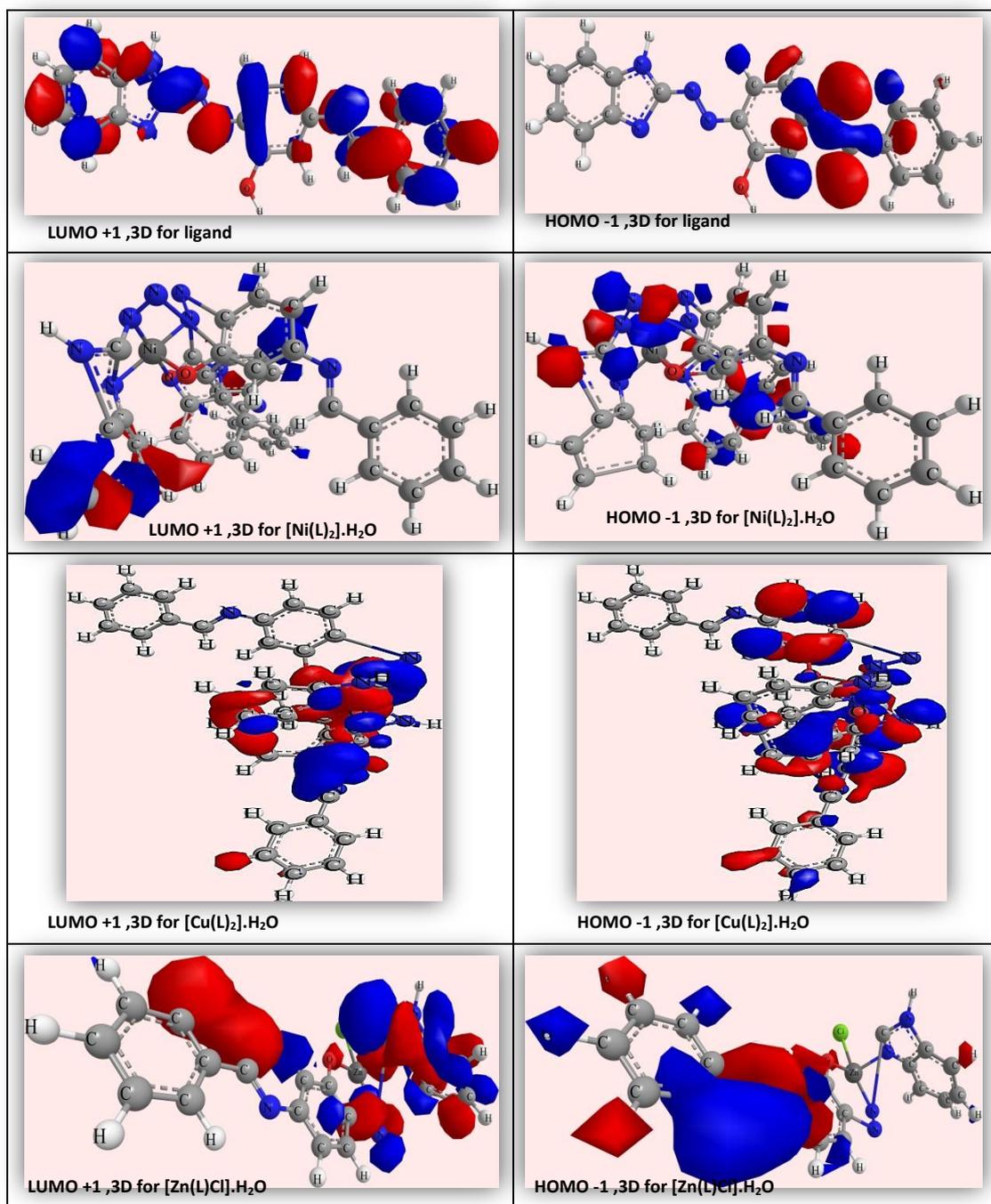


Figure (11):- The proposed structural formula Zn(II) complex.

Electrostatic potential(E.P) and frontier molecular orbital

Further investigations on the reactive sites of prepared ligand was carried out through the electrostatic potentials calculations governed by electron distribution. The electrostatic potential describes the interaction of energy of the molecular system with a positive point charge of the ligand were plotted as two dimensions and three dimensions contours to investigate the reactive sites of the molecular (BIADPI). The electrostatic potential of ligand show that the oxygen and three nitrogen atoms more reactive than other atoms. Also one can interpret the stereochemistry and rates of many reactions involving soft electrophiles and nucleophiles in terms of the properties of frontier orbital (HOMO and LUMO) overlap between HOMO and LUMO is a governing factor in many reactions. The HOMO and LUMO value were plotted as three dimensions counter to get more information about these molecules. The results show that the LUMO of transition metal ion prefers to react with HOMO of donor atoms in the prepared ligand and complexes, Figure 12.





Figure(12):- LUMO,HOMO and electrostatic potential as 2&3D counters for ligand(BIADPI)and some complexes

CONCLUSION

In this paper we have reported the preparation of novel azo-schiff base ligand derived from benzimidazole and 3-(benzylidene amino)phenol (schiff base).The ligand (BIADPI) and their complexes were characterized by spectral and analytical data.Based on these data on octahedral geometry has been assigned to Co(III),Ni(II),Cu(II),Cd(II) and Hg(II)-complexes but tetrahedral geometry forZn(II)-complex.Theazoschiff base ligand behaves as a tridentate agent coordination through the position of phenolic oxgen,nitrogen of azo group N₃ which is the farthest of benzimidazole ring and nitrogen of imidazole ring N₃ to form two five memberd metal ring.All complexes not effect by air ,light and amoisture suggesting high stability.The molar conductance measurmnts suggest the presence of chlorid ion inside the coordination sphere for Ni(II),Cu(II),Zn(II),Cd(II) and Hg(II)-complexes exceptionCo(III)-complex the presence of anion chlorid outside the coordination sphere.

REFERENCES

- [1] Rai B.K., J. India council Chem. 25(2), 137-141, (2008).
- [2] Nagajothi A., Kiruthika A., Chitra S. and Parameswarik, Rese. J. Chem. Sci; 3(2), 35-43, (2013).
- [3] M.B. Halli, R.S. Malipatil, R.B. Sumathi and K. Shivakumer, Derpharmacialett, 5(4), 182-188, (2013).
- [4] Narendrak. and parashuram M., Archives of Applied Sci, Rese., 5(50), 191-197, (2013).
- [5] M. Maru and M.K. Shah, J. Chemical and Pharmaceutical Research, 1638-1643, (2012).
- [6] S.A. Galal, A.S. Abdelsamie, M.L. Rodriguez and Hoda. El. Diwani, European J. Chem., 1(2), 67-72, (2010).
- [7] A. Prakash, B.K. Singh, N. Bhojak and D. Adhikari, Spectrochim. Acta A; 76(3-4), 356, (2010).
- [8] M.I. Bruce and B.L. Goodall: "The Chemistry of HydrizoAzo and Azoxy Groups", Patai, S, Ed: wiley: London, 1975: Part 1; chapter 9.
- [9] A. Bawa and S. Kumar; India J. Chem., 48B, 142, (2009).
- [10] Khalid J. AL-Adilee, Khamis A. and Zainab M., Asian J. Chem., 25(18), 10475-10481, (2013).
- [11] Khalid J. AL-Adilee, Asian J. Chem., 24, 5597, (2012).
- [12] A. N. AL-Shareefi, S. H. Kadhim and W. A. Jawad J. Applicable Chem; 2(3), 438-446, (2013).
- [13] S. Shibata, M. Furkawa and R. Nakashima, Anal. Chem. Acta. 81, 131-137, (1976).
- [14] M. Nikpassand, L. Zare and S. Sharafi, Oriental J. Chem., 29(3), 1041-1046, (2013).
- [15] M. Elajaily, Fatmal., Ramadan A. and Etal; J. Chem. Pharm. Res: 5(12), 1141-1151, (2013).
- [16] F.M. Morad, S.F. Ben. Gweirif M. EL-ajaily, International J. of pharmaceutical and Chem. Sci., 2(3), 1639-1641, (2013).
- [17] O. Yamauchi, H. Tanka and T. Uno. Talanta, 15, 177, (1968).
- [18] M.S. Nair, D. Arich and R.S. Joseyphus, J. Saudi Chem. Soc., 16, 83-88, (2012).
- [19] X. Dony, Y. Li, Z. Li, Y. Cui, H. Zhu., J. Inorganic Biochemistry, 108, 22-29, (2012).
- [20] K. Krishnankutty, P. Sayudevi, M. B. Ummathur, J. Serbian Chem. Soc., 72, 1075, (2007).
- [21] A.A. Osowole and A.O. Daramola, Elixir Appl. Chem; 47, 8662-8666, (2012).
- [22] Khalid J. AL-Adilee and Dunya. Y. Fanfon, J. Chem. Chem. Eng. 6, 1016-1028, (2012).
- [23] Hassan A. Habeeb, Khalid J AL-Adilee and sudd A. Jaber, J. Chem. and Mater. Res., 6(8), 69-80, (2014).
- [24] Narendra Kumer and Para Shuram Mishra, Arch. Appl. Sci. Res. 5(5), 191-197, (2001).
- [25] A.K. Singh and U.N. Sharma; Asian J. Chem; 14, 1221, (2002).
- [26] I.H. Bukhari, M. Arif, J. Akbar and A.H. Khan; Pak. J. Biol. Sci; 8(4), 614, (2005).
- [27] Kalia S.B., Lumbak Kaushal G. and Sharma M., Ind. J. Chem; 46(A), 1233-1239, (2007).
- [28] Mangsup L., Siripaisarnpipat S., Chaichit N., Anal. Sci., 19, 1345-1353, (2003).
- [29] M.M. Mashaly, Z.H. Abd-Elwhabb and A.A. Faheimb, J. Chin. Chem. Chinese Chemical Soc., 51, 901-915, (2004).
- [30] Joan R. Gispert, "Coordination Chemistry" Wiley-VCH, New York, (2007).
- [31] Figgis, B.N., Hitchman, M.A., "Ligand field Theory and its applications", Wiley-VCH, New York, (2000).
- [32] J.D. Lee, Concisc Inorganic Chemistry, edn., 5, (2007).
- [33] D. Nicholas: "pergamon Texts in Inorganic Chemistry" Pergamon oxford 1st Ed; (1973).
- [34] S. Pal and C. Sinha; Proc. Indian Acad. Sci; 113(3), 173-181, (2001).
- [35] A.M. Khedr and H.M. Marwani, Int. J. Electro Chem. Sci; 7, 10074-10093, (2012).
- [36] R.A. Oatto, S. Yamal, "An elements of Magnetic Chemistry" 2nd Ed. East west press, New Delhi, 101, (1993).
- [37] Khalid J. AL-Adilee, Nat. J. Chem; 28, 585-602, (2007).
- [38] Jayaseelan P, Prasad S, Vendanayaki S. And Rajavel R., Int. J. Chem. environmental and pharma Res; 1(2), 80-88, (2010).