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# Synthesis of [2-(Benzylidene amino)Ethanesulfonic Acid ] and It's Coordination with Co (II) ,Ni (II),Cu (II) , Zn (II)and Hg (II)

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## Abstract

**Condensation of 2-aminoethane sulfonic acid(Taurine) and benzaldehyde in sodium hydroxide ethanolic solution gave the Schiff base [2-(benzylidene amino) ethanesulfonic acid(L)] . This base particularly bind to metal ions Co (II) ,Ni (II),Cu (II) , Zn (II)and Hg (II) in 2:1 molar ratio via the N atom lone pair and oxygen atom of sulfonic acid (the most active positions) as a neutral bidentate ligand to form complexes of general formula $[ML_2.2H_2O]Cl_2$. Characterization of these complexes were octahedral geometry as information obtained from IR and UV spectra and molar conductivity measurements.**

## Keyword

2-aminoethane sulfonic acid(Taurine) ; Schiff base; metal ions Co (II) ,Ni (II),Cu (II) , Zn (II)and Hg (II) complexes .

# تحضير[2-(بنزليدين أمين) إيثان حامض السلفونيك] وتناسقه مع الكوبالت والنيكل والنحاس

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## الخلاصة

**تكاثف 2- إيثان أمين حامض السلفونيك (التايورين) و البنزالديهايد في محلول هيدروكسيد الصوديوم الايثانولى أعطى قاعدة الشيف 2-(بنزليدين أمين) إيثان حامض السلفونيك (L)]، ومن ثم تناسق هذه القاعدة مع الكوبالت والنيكل والنحاس والزنك و الزئبق و بنسبة مولارية 2:1عن طريق ذرة نتروجين الايمين و ذرة أوكسجين حامض السلفونيل(الموقعين الأكثر فعالية) كليكاندات ثنائية السن لإعطاء المعقدات ذات الصيغة $[ML_2.2H_2O]Cl_2$ تكون فيها هذه الفلزات سداسية التناسق كما يشير لذلك تحليل محاليل هذه المعقدات من حيث دراسة أطيافها في الأشعة تحت الحمراء وفوق البنفسجية ،إضافة إلى التوصيلية الكهربائية المولارية.**

## الكلمات الدالة

**[2-(بنزليدين أمين) إيثان حامض السلفونيك]، قواعد شيف، معقدات ايونات الفلز Co (II Ni (II),Cu (II) , Zn (II)and Hg (II).**

## Introduction

The biological activity attached to the Taurine nucleus [1-9] provided a great deal of interest in the nucleophilic addition of its terminal amino group to the carbonyl carbon of aromatic aldehydes forming Schiff bases of biological interest such as bacteriostatic, herbicidal and antifungal activity[10]. Duo to its flexibility and selectivity as well as sensitivity towards the central metal atom it was of interest to coordinate this base with different metal salts to get biologically active complexes[11-12].

Thus, and as a part of a continuous program directed toward the synthesis of important biological active compounds[13-15], it became of interested to investigate preparative routes to synthesis of Schiff base L(Scheme1)derived from the reaction of benzaldehyde and Taurine and to study it's complexation with metals Hg (II), Cu (II), Ni (II), Co (II) and Zn (II)

## Experimental

All melting points were determined on a Gallen Kamp and Electrothermal 1A9300 Digital-Series (1998) apparatus and were uncorrected. IR Spectra were recorded on Unicam SP 2000 Spectrometer at a range (200-4000 $cm^{-1}$) using KBr discs. Electronic spectra were recorded on a Shimadzu UV/Vis Spectrophotometer UV- 160 for 10 $^{-3}$M solution of the complexes in ethanol at ambient temperature (25 $^{O}$C) .

### Synthesis of Schiff base[2-(benzylidene amino) ethanesulfonic acid](L)[16] :

2-Ethaneaminosulfonic acid (Taurine) and benzaldehyde (1 : 1 molar ratio)were dissolved in Sodium hydroxide ethanolic solution. The resulting reaction mixture was refluxed for two hours. The solid precipitate was poured into water and acidified to neutral, filtered, washed with distilled water dried, recrystallised from ethanol to give a yellow crystals of (L).Physical properties and spectra data were listed in Table (1) and (2) respectively.

### Synthesis of complexes(1-5)[17]:

Sodium hydroxide ethanolic solution of Schiff base [2-(benzylidene amino) ethanesulfonic acid](L) (2.13g,10 mM) was mixed with metal (II) chloride (5 mM) in absolute ethanol (10 ml) solution keeping ligand-metal ratio 2 : 1.

The mixture was then refluxed for two hours on a water bath till the complex precipitated out. The solid product was filtered, washed with distilled water and dried in vacuo. Physical properties and spectra data and molar conductivities of dissolvable complexes were listed in Tables (1) and (2) respectively.

**Table (1):Physical properties, molar conductivities of dissolvable and spectra data of the complexes (1-5)**

| Complex No | Structure Color | M.P. $^{o}$C | UV/Vis λmax nm | Molar Conductivity $Cm^2$ $ohm^{-1}Mol^{-1}$ |
|---|---|---|---|---|
| Ligand(L) | $C_6H_5$-CH =$N(CH_2)_2SO_2OH$ Yellow | 294 | 245<br>292 | ---------- |
| 1 | $[Cu(L)_2H_2O]$ $Cl_2$ Green | 218 | 312 | 140 |
| 2 | $[Co(L)_2H_2O]$ $Cl_2$ Brown | 290 | 320<br>370<br>390 | 130 |
| 3 | $[Ni(L)_2H_2O]$ $Cl_2$ Greenish Blue | 285 | 301<br>350<br>392 | 170 |
| 4 | $[Zn(L)_2 H_2O]$ $Cl_2$ White | 165-170 | Insoluble | Insoluble |
| 5 | $[Hg(L)_2H_2O]$ $Cl_2$ White | 288 dec. | Insoluble | Insoluble |

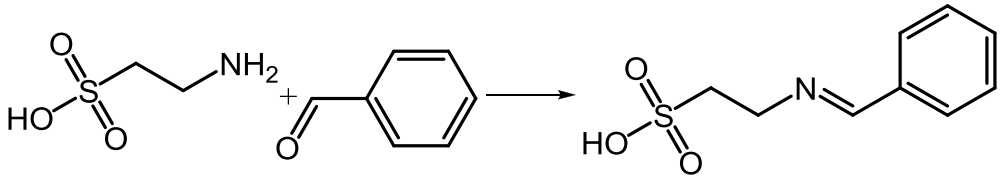
**Table (2): IR spectra of ligand and complexes(1-5)**

| Selected IR bands ($cm^{-1}$) | | | | | | |
|---|---|---|---|---|---|---|
| Complexe no | M-O | M-N | M-$OH_2$ | Pr | Pw | (C=N) |
| L | --- | -------- | ---------- | ---------- | ---- | 1640s |
| 1 | 520 | 450 | 440 | 880 | 530 | 1602s |
| 2 | 560 | 400 | 430 | 870 | 580 | 1618m |
| 3 | 550 | 420 | 410 | 740 | 630 | 1622 w |
| 4 | 540 | 530 | 430 | 820 | 560 | 1634br |
| 5 | 560 | 570 | 450 | 850 | 540 | 1633w |

br : broad, vs : very strong, s : sharp, m : medium, w : weak

## Results and Discussion

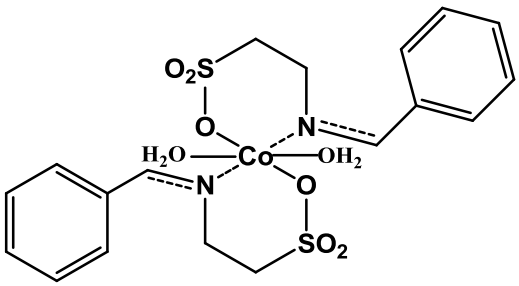
The information obtained from IR and UV spectra and molar conductivity measurements along with some physical properties of the complexes were summarized in table 1 and (2) respectively. The ligand L was synthesized by Scheme (1).




taurine benzaldehyde L = (Schiff baes) 2-(benzylideneamino) ethanesulfonic acid

**Scheme(1)**

This ligand on interaction with Co (II) ,Ni (II),Cu (II) , Zn (II)and Hg (II), in 2:1 molar ratio, yields complexes corresponding to the general formula $[ML_2.\ 2H_2O]Cl_2$ Scheme(2).




**Scheme ( 2 )**

The high molar conductance values of the complexes revealed their electrolytic nature. Characterization of these complexes were octahedral geometry.

IR Spectrum Table(2) of the free ligand was compared with the spectra of the metal complexes. In the spectrum of the free ligand, the sharp band at 1640 $cm^{-1}$ can be assigned to the νC=N vibration. In the complexes, this band was found at the lower values. The lowering of the νC=N frequency in the complexes, indicates the coordination of the azomethine nitrogen atom at the metallic ion[18-19].

In addition, all IR spectra belonging to the Co (II) ,Ni (II),Cu (II) , Zn (II)and Hg (II) complexes confirming the existence of water molecules in the structure of the crystalline lattice [20].

Table (2) ,the UV spectra of Schiff base in ethanolic solution was 245nm and 290 nm due to the electronic transition $\pi\rightarrow\pi^*$ in phenyl ring, $\pi\rightarrow\pi^*$ and $n\rightarrow\pi^*$ transitions in C = N group, respectively. On complexation, a blue shift(301-392 nm ) was observed due to the polarization in the C = N caused by the metal-ligand electronic interaction during the chelation [20] .

## Conclusions

The coordination chemistry of a Schiff base ligand, obtained from the condensation of 2-aminoethane sulfonic acid(Taurine) and benzaldehyde in sodium hydroxide ethanolic solution, was described. Co (II) ,Ni (II),Cu (II) , Zn (II)and Hg (II )complexes have been synthesized using the above Schiff base ligand and characterized on the basis of molar conductivity and spectral data.

The Schiff base coordinates through N atom lone pair and oxygen atom of sulfonic acid (the most active positions) to the metal ion and acts as a neutral bidentate ligand to form complexes of general formula $[ML_2.\ 2H_2O]Cl_2$ in 2:1 molar ratio. All the complexes exhibit octahedral geometry.

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