



International Journal of ChemTech Research CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555 Vol.11 No.01, pp 216-227, 2018

# "Synthesis, Characterization And Electrochemical Investigation of [16]-Membered Dioxa Diaza Napthaldehyde Based Macrocyclic Ligand and its Complexes of Co(III), Ni(II), Cu(II) and Zn(II) Perchlorate IONS"

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Abstract : An hitherto new unreported [16]-membered dioxadiazanapthaldehyde based macrocyclic ligand (L) 2,11-dioxa-23,30-diaza heptacyclo [30.4.0.0 4, 9.0 12, 21. 0 14, 19. 0 24, 29. 0 34, 39]-tetraconta-12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40pentadecaene, has been synthesized by two different synthetic routes each involving two step. 2-Hydroxy-1-Napthaldehyde in the presence of potassium carbonate was treated with  $\alpha, \alpha'$ -dibromo-o-xylene to yield the dial derivative(I). The dial derivative (I) was further made to undergo Schiff base condensation with 1,2-diaminobenzene to yield the bright yellow macrocycle (L) in good yield. In the second method the Schiff base condensed product Napthaloph was synthesized and allowed to undergo Williamson's condensation with  $\alpha, \alpha'$ ligand (L). dibromo-o-xylene to yield the The neutral sixteen membered tetradentatedioxadiaza ligand(L) readily complexes with Co(III), Ni(II), Cu(II) and Zn(II) perchlorate salts in 1:1 mole ratio to yield complexes of formulae  $[Co(L)X_2]ClO_4$ ,  $[Ni(L)X_2]$ ,  $[Cu(L)X]ClO_4$ ,  $(X = Cl^{-}, Br^{-} and NO_3^{-})$ . The complexes were also synthesized by the metal template method. The yield of the template procedure was found to be greater than the nontemplate method. The ligand and the complexes were characterized by elemental analysis, electronic spectroscopy, IR, Conductivity measurements, <sup>1</sup>HNMR, FAB-MS and Cyclic voltammetry studies. The [16]-membered tetradentatedioxadiazamacrocycle (L) was found to accommodate Co(III), Ni(II), Cu(II) and Zn(II) ions with ease due to the presence of flexible alkyl groups. Further studies with the inner-transition metal ions will be highly informative in understanding the coordinating capabilities of lanthanides and actinides. Keywords : Schiff Base Ligand, Co(III), Ni(II) Cu(II) and Zn(II) complexes, 2-hydroxy-1-naphthaldehyde,  $\alpha, \alpha$ '-dibromo-o-xylene.

# Introduction

The design, synthesis and electrochemical investigation of macrocyclic complexes<sup>i</sup>initially have lured many a scientist owing to their significance in serving as biological mimics<sup>ii,iii</sup>. The synthetic macrocyclic complexes mimic some natural occurring macrocyclic complexes<sup>iv</sup> resemblance with natural macrocyclic like metalloproteins, porphyrins and cobalamine<sup>v,vi</sup>. The transition metal macrocyclic complexes are active part of metaloenzyme proteins and coenzymes like haemoglophin, myoglobin<sup>vii,viii</sup>. Identification and realization of the

applications of macrocyclic ligands and their transition and inner-transition metal complexes as base transfer catalyst and in biological probe studies<sup>ix</sup> have opened up new avenues of exploring their potency in various other fields recently the Napthaldehyde based Schiff bases are gaining significance due to their sequestrating properties towards transition metals<sup>x,xi</sup>. The presence of azomethine group has been reported to possess remarkable antibacterial, antifungal, anticancer and antimalarial activities<sup>xii,xiii</sup>. In order to understand the involvement of azomethine groups in the above said properties, we have reported the synthesis and spectral characterization of hitherto unreported new 16-memberednapthaldehyde based dioxadiazatetradentate macrocyclic ligand (L) and its Co(III), Ni(II), Cu(II) and Zn perchlorate complexes.

# Experimental

## **Materials and Methods**

All the chemicals used in this study were of Analar grade. Metal salts were purchased from Merck and were used as such as received. Elemental analysis carried out on Elementarvario EL III-Germany.<sup>1</sup>H NMR spectrum was recorded used to Bruker model 4276. FT IR spectra recorded on Perkin Elmer on KBr pellets in the range of 4000 to  $400 \text{ cm}^{-1}$ . The electronic spectrum recorded on Lambda 35 in the range of 200 to 800 nm using  $10^{-3}$ M concentration solution in DMF. NMR spectrum was recorded using Bruker model 4276. The new dialdehyde was synthesis from 2-hydroxyl-1-napthaldehyde and  $\alpha$ ,  $\alpha$ -dibromo-o-xylene in basic medium using potassium carbonate under reported procedure<sup>xiv</sup>.

# Synthesis of [16]-membered [N<sub>2</sub>O<sub>2</sub>]macrocyclic ligand (L1)

# Synthesis of dialdehyde

To a solution of (1.72 g, 10 mmol) of 2-hydroxy-1-naphthaldehyde in 15 mL of acetonitrile was added (1.38g, 10 mmol) of K<sub>2</sub>CO<sub>3</sub> and the resulting solution was stirred for an hour under thermostat condition at 60°C wherein a bright yellow coloured solution was obtained. To this stirring solution was added a solution of (1.32 g, 5 mmol) of  $\alpha, \alpha'$ -dibromo-o-xylene in 5 mL of acetonitrile in one lot. The resulting pale yellow coloured solution decolorized and the subsequent addition of 20 mL of cold water yielded a spongy white dialdehyde. The spongy product was filtered, dried over fused calcium chloride under vacuum. Yield is 73%, m.pt 165°C. Anal.Cal. (C<sub>30</sub>H<sub>22</sub>O<sub>4</sub>), C(80.70%), H(4.97%), O(14.33%). Found: C(80.67), H(4.95), O(13.99). IR (KBr Pellet) v(C=O) 1664 cm<sup>-1</sup>, v(C=C)<sub>aro</sub> 1575 cm<sup>-1</sup>, v(C-O) 1237cm<sup>-1</sup>. The synthesis of the dialdehydeis depicted in **Scheme.1**.





#### Synthesis of macrocyclic ligand (L1)

To an ethanolic solution of the dialdehyde (4.16 g, 10 mmol) in 10 mL of ethanol was added 1,2diamino benzene (1.08 g, 10 mmol) in 10 mL of ethanol under drop wise condition gradually over 30 minutes using a dropping funnel. The resulting pale yellow turbid solution was refluxed for 4 hours wherein a clear bright yellow solution was obtained, on standing the solution to room temperature bright yellow colored product separated out. Yield: 88%, m.pt:177°C. Anal.Cal. ( $C_{36}H_{26}N_2O_2$ ), C(83.37), H(5.05), N(5.40), O(6.17). Found: C(83.34), H(5.02), N(5.27), O(5.84). IR (KBr Pellet) v(C=N) 1611cm<sup>-1</sup>, v(C=C)<sub>aro</sub>v1488cm<sup>-1</sup>, v(C-O) 1213cm<sup>-1</sup>. The synthesis of the overall ligand (L) is depicted in **Scheme-2**.

## Synthesis of [16]-membered [N<sub>2</sub>O<sub>2</sub>] macrocyclic complexes

General procedure for the synthesis of [16]-membered macrocyclic complexes of ligand (L)

To a refluxing solution of a ligand (L) (10 mmol) in 20 mL of absolute alcohol was added an equivalent mole ratio of the corresponding perchlorate salts  $M(ClO_4)$   $6H_2O$  (10 mmol) where in (M= Co, Ni, Cu and Zn). To this refluxing metal perchlorate solution of the ligand (L) was added the corresponding axial mono anionic ligand X in appropriate mole ratio, (X= Br, Cl and NO<sub>3</sub>) on continuing the reflux for 5hours yielded macrocyclic complexes in good yield. The complexes of varying coloured and nature were isolated from the mother liquor owing to the sparingly soluble nature. The complexes were filtered and washed repeatedly with diethyl ether and dried over anhydrous CaCl<sub>2</sub> under vacuum condition. No further purification was carried out as the micro crystalline colored complexes separated readily, in pure condition. The Scheme-3 depicted the nature of bonding exhibited by the ligand (L).



# **Result and Discussion**

#### Synthesis and Characterization of the ligand(L):

The dioxadiazanapthaldehyde based tetradentatemacrocyclic was synthesized by two different methods. The first method involves the Schiff's base condensation of the napthaldehyde and o-phenylenediammine in 2:1 mole ratio in acetonitrile, to yield the Schiff's base condensed product (Napthaloph). The azomethine derivative was further reacted with  $\alpha, \alpha'$ -dibromo-o-xylene under Williamsons condensation in 1:1 mole ratio to yield the 16-membered N<sub>2</sub>O<sub>2</sub>macrocyclic ligand (**L**). The second method involves the Williamsons' condensation reaction of napthaldehyde and  $\alpha, \alpha'$ - dibromo-o-xylene in 2:1 mole ratio to yield the dial derivative(I), further the dial derivative is made to undergo schiff's base condensation with 1,2- diamino benzene to yield the 16-membered macrocycle(L). The ligand isolated readily from the solution due to its sparingly soluble nature. The tetradentatedioxadiazamacrocyclic ligand (L) was characterized by elemental analysis, electronic spectroscopy, IR, <sup>1</sup>HNMR, <sup>13</sup>C NMR, CIMS and Cyclic voltammetric studies. The elemental analysis was in good agreement with the experimental and theoretical value, which ensures the formation of the macrocyclic ligand. The infrared spectral data of the ligand and the complexes are furnished in **Table-1**. The electronic spectral data of the ligand in **Table-3**. The physical properties of the ligand and the complexes were furnished in **Table-5**.

S.No.	Compound	υ(C=N) (cm <sup>-1</sup> )	υ(C=C) (cm <sup>-1</sup> )	υ(C-O) <sub>Aro</sub> (cm <sup>-1</sup> )	υ(C-O) <sub>Ali</sub> (cm <sup>-1</sup> )	ClO <sub>4</sub>
1	Ligand	1611	1488	1274	1112	-
2	$[Co(L)Cl_2]$ (ClO <sub>4</sub> )	1589	1508	1271	1099	1090
3	$[Co(L)Br_2]$ (ClO <sub>4</sub> )	1590	1508	1269	1088	1087
4	$[Co(L)(NO_3)_2]$ (ClO <sub>4</sub> )	1591	1507	1273	1105	1080
5	$[Ni(L)Cl_2]$	1595	1510	1270	1086	-
6	$[Ni(\mathbf{L})Br_2]$	1597	1508	1268	1080	-
7	$[Ni(\mathbf{L})(NO_3)_2]$	1593	1507	1265	1083	-
8	[Cu(L)Cl] (ClO <sub>4</sub> )	1607	1529	1267	1090	1085
9	$[Cu(\mathbf{L})Br]$ (ClO <sub>4</sub> )	1606	1526	1272	1086	1087
10	$[Cu(\mathbf{L})NO_3]$ (ClO <sub>4</sub> )	1601	1524	1268	1088	1080
11	$[Zn(L)Cl_2]$	1593	1508	1272	1108	-
12	$[Zn (L)Br_2]$	1600	1457	1270	1091	-
13	$[Zn (L) (NO_3)_2]$	1590	1467	1273	1109	-

Table-1 The infrared spectral data o	f the ligand (L) and its	perchlorate complexes of (	(L)
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S.No.	Complexes	Frequency Range (cm <sup>-1</sup> ) / (nm)
1	$[Co(L)Cl_2]$ (ClO <sub>4</sub> )	29850 (335 nm), 30769 (325 nm)
2	$[Co(L)Br_2]$ (ClO <sub>4</sub> )	29850 (335 nm)
3	$[Co(L)(NO_3)_2]$ (ClO <sub>4</sub> )	29850 (335 nm), 30769 (325 nm)
4	$[Ni(L)Cl_2]$	20661 (484 nm), 25906 (386 nm), 30581 (327 nm)
5	$[Ni(\mathbf{L})Br_2]$	20665 (483 nm), 25909 (385 nm), 30581 (327 nm)
6	$[Ni(\mathbf{L})(NO_3)_2]$	20661 (484 nm), 25906 (386 nm), 30581 (327 nm)
7	[Cu(L)Cl] (ClO <sub>4</sub> )	23529 (425 nm), 30211 (331 nm)
8	[Cu(L)Br] (ClO <sub>4</sub> )	23584 (424 nm), 30395 (329 nm)
9	[Cu(L)NO <sub>3</sub> ] (ClO <sub>4</sub> )	23529 (425 nm), 30211 (331 nm)
10	$[Zn(\mathbf{L})Cl_2]$	29850 (335 nm)
11	$[Zn (L)Br_2]$	30303 (330 nm)
12	$[Zn (L)(NO_3)_2]$	29850 (335 nm)

Table-2 Electronic spectral data of the Co<sup>3+</sup>, Ni<sup>2+</sup>, Cu<sup>2+</sup> and Zn<sup>2+</sup> perchlorate complexes of (L)

 Table-3: CHN analysis data of the ligand (L)

	% of C		% of H		% of N		
Ligand	Cal	Obs Cal		Obs	Cal	Obs	
	value	value	value	value	value	value	
	80.56	80.47	3.96	3.93	15.24	14.89	

Table-4:Physical properties of the  $Co^{3+}$ ,  $Ni^{2+}$ ,  $Cu^{2+}$  and  $Zn^{2+}$  perchlorate complexes of (L)

S.No.	Name of the Complexes	Color	Molecular Weight	Yield %	Molar Conductance (mho cm <sup>2</sup> mol <sup>-1</sup> )mho	Nature of the electrolyte
1	$[Co(L)Cl_2](ClO_4)$	Pale Rose	747	73	68.23	1:1
2	$[Co(L)Br_2]$ (ClO <sub>4</sub> )	Dirty White	837	75	72.76	1:1
3	$[Co(L)(NO_3)_2]$ (ClO <sub>4</sub> )	Pale Rose	801	74	74.34	1:1
4	$[Ni(L)Cl_2]$	Pale Rose	650	82	36.73	Neutral
5	$[Ni(\mathbf{L})Br_2]$	Black	738	84	35.14	Neutral
6	$[Ni(L)(NO_3)_2]$	Black	702	80	37.21	Neutral
7	$[Cu(\mathbf{L})Cl]$ (ClO <sub>4</sub> )	Reddish Brown	717	76	70.47	1:1
8	[Cu(L)Br] (ClO <sub>4</sub> )	Dark Brown	762	78	65.53	1:1
9	$[Cu(\mathbf{L})NO_3]$ (ClO <sub>4</sub> )	Dark Brown	744	75	76.37	1:1
10	$[Zn(L)Cl_2]$	Yellow	654	74	35.71	Neutral
11	$[Zn (L)Br_2]$	Yellow	744	76	36.12	Neutral
12	$[Zn (L) (NO_3)_2]$	Dark yellow	708	72	37.24	Neutral

	•				_	_	-	-	-		
		Scan		Reduction				Oxidation			
S. No.	Name of the Complexes	Rate (mV/s <sup>-</sup> <sup>1</sup> )	E <sub>pc</sub> (mV)	E <sub>pa</sub> (mV)	E <sub>1/2</sub> (mV)	ΔE <sub>p</sub> (mV)	E <sub>pc</sub> (mV)	E <sub>pa</sub> (mV)	E <sub>1/2</sub> (mV)	ΔE <sub>p</sub> (mV)	Reversible / Irreversible
1	[Co(L)Cl <sub>2</sub> ] (ClO <sub>4</sub> )	300	- 1000	-530	-765	470	990	1400	1195	2050	Irreversible
2	$[Co(\mathbf{L})Br_2]$ (ClO <sub>4</sub> )	300	-920	-680	-800	200	-80	190	55	270	Irreversible
3	[Ni(L)Cl <sub>2</sub> ]	200	- 1000	-700	-850	150					Irreversible
4	[Ni(L)Br <sub>2</sub> ]	200	-700	- 1380	- 1040	340					Irreversible
5	[Cu(L)Cl](ClO <sub>4</sub> )	300	-350	-260	-305	90	000	960	980	1960	Irreversible
6	[Cu(L)Br](ClO <sub>4</sub> )	300					950	770	860	860	Irreversible

Table-5: Cyclic voltammetric data of 16-membered [N<sub>2</sub>O<sub>2</sub>] macrocyclic complexes

### **Infrared spectra**

The presence of aldehyde peak at 1664 cm<sup>-1</sup> in the dial derivative(I) and the absence of the sharp v(OH) peak at 3404 cm<sup>-1</sup> endures the formation of the dial intermediate (I)<sup>xv</sup>. The infrared spectrum of the intermediate (I) and Ligand (L) is depicted in **Fig.1** and **Fig.2**. The characteristic infrared absorption bands of the ligand (L) are shifted and lowered in intensity on complex formation and new vibrational bands characteristic of the complex appear. The sharp band of high intensity occurring at 1611 cm<sup>-1</sup> characteristic of v(C=N) absorption in the free ligand, is shifted to lower frequencies 1589 - 1607 cm<sup>-1</sup> in all the transition metal ion complexes<sup>xvi</sup>. This indicates that all the four donor atoms namely the two azomethinenitrogens and the two oxo donors are coordinated to the central metal ion. This also confirms the formation of the presence of uncoordinated or free perchlorate groups<sup>xvii,xviii</sup>. The infrared spectral data of the Co<sup>3+</sup>, Ni<sup>2+</sup>, Cu<sup>2+</sup> and Zn<sup>2+</sup> complexes of (L) are given in **Table.1**.



Fig.1. Infrared spectrum of the intermediate



## Fig.2. Infrared spectrum of the Ligand

On complex formation, the v(C=N) peak which appears at 1611 cm<sup>-1</sup> in the pure ligand has been shifted towards lower frequencies in the corresponding complexes<sup>xix,xx</sup>. This observation is in good agreement with the coordination of the azomethine group with the central metal ions. The occurrence of two types of v(C-O) stretching frequencies corresponding to v(C-O) aromatic and v'(C-O) aliphatic nature ensures the coordination of the two oxa groups with the central metal ions. The ligand is found to act as neutral dioxadiazatetradentate ligand (L). The stretching due to v(C=C) occurs within the range of 1450-1515 cm<sup>-1</sup> in all the complexes<sup>xxi</sup>. All the perchlorate complexes exhibit  $v(ClO_4)$  stretching pertaining to free ionic perchlorate groups around 1059-1085 cm<sup>-1</sup> in all the perchlorate ion containing complexes

The<sup>1</sup>**H NMR spectrum** of the dial derivative (I) exhibits a sharp singlet at 11 ppm assigned to the aldehydic protons, the multiplet centered around 7.2 to 8.1ppm has been attributed to the aromatic protons from both naphthalene and benzene moieties. The four proton sharp singlet appearing at 5.4ppm has been assigned to the methylene protons.

The <sup>1</sup>H NMR spectrum of the intermediate (I) are depicted in **Fig.3.** The <sup>13</sup>C NMR of dial derivative (I) exhibits a sharp peak at 78 ppm with 70% intensity which has been assigned to the methylenic carbons, the sharp peak of weak intensity observed at 192 ppm has been assigned to aldehydic carbon and the medium intensity peaks centered around 112-138 ppm has been attributed to the aromatic carbon atoms pertaining to benzene and naphthalene moieties<sup>xxv</sup>.

The<sup>13</sup>C NMR spectrum of the intermediate (I) are depicted in Fig.4. The <sup>1</sup>H NMR spectrum of the ligand (L) exhibits a multiplet around 7.1 ppm to 8.1 ppm assignable to the aromatic protons of Napthaldehyde and benzene groups, the singlet of medium intensity occurring at 9.4 ppm has been assigned to azomethine protons in the macrocycle. The unsymmetrical triplet occurring around 1.6 to 2.4 has been assigned to the hydrogen bond that can be formed due to a transfer of proton from the macrocycle moiety that can form hydrogen bond between the two oxa donors in the macrocycle. The <sup>1</sup>H NMR spectrum of the Ligand(L) is depicted in Fig.5. The mass spectrum of the dial derivative (I) exhibited the molecular base peak at 443 m/z of low intensity confirming the formation of the dioxaadiaza tetra dentate macrocyclic ligand. The chemical ionization mass spectrum of the ligand exhibited a  $[M+H]^+$  molecular ion peak at 519 m/e value. The mass spectrum of the ligand (L) is depicted in Fig.7. The CHN analysis of the ligand is in good agreement of the observed value.



Fig.3.<sup>1</sup>H NMR spectrum of the Intermediate



Fig. 4.<sup>13</sup>C NMR spectrum of the Intermediate



Fig.5. <sup>1</sup>H NMR spectrum of the ligand (L)



Fig.6. Mass spectrum of the ligand (L)



Fig.7. Electronic absorption spectra of [Cu(L)NO<sub>3</sub>] (ClO<sub>4</sub>)

#### Characterization of the Co(III), Ni(II), Cu(II) and Zn(II) complexes of the ligand (L)

The perchlorate complexes of the macrocyclic ligand (L) were synthesized both by the reaction of the preformed ligand and metal perchlorate in 1:1 mole ratio in ethanol, and by the metal template method wherein the precursors and the corresponding metal perchlorates were made to react simultaneously in one pot synthesis method. The preformed ligand and metal perchlorate yielded better results than the template procedure. The varying coloured complexes obtained were characterized using elemental analysis, molar conductance, UV-vis spectroscopy, FAB-MS magnetic susceptibility and cyclic voltammetry. The infrared spectral data of the ligand and the complexes are tabulated in **Table-1**. On complex formation the  $\nu$ (C=N) peak which appears at 1611cm<sup>-1</sup> <sup>1</sup>in the pure ligand has been shifted towards lower frequencies which is in good agreement with the coordination of the azomethine group with the central metal ions. The occurrence of two types of v (C-O) stretching frequencies corresponding to v(C-O) aromatic and v(C-O) aliphatic nature ensures the coordination of the two oxa groups with the central metal ions. The ligand is found to act as neutral dioxadiazatetradentate ligand. The stretching due to v(C=C) occurs within the range of 1450-1515 cm<sup>-1</sup>in all the complexes. All the perchlorate complexes exhibit v(ClO<sub>4</sub>) stretching pertaining to free ionic perchlorate groups around 1059-1085 cm<sup>-1</sup>in all the complexes<sup>xxvi,xxvii</sup>. The electronic spectral data reveal that all the metal ions exist in their usual oxidation states, the cobalt(III)complexes in which cobalt acquires d<sup>6</sup>state and is expected to exhibit an single electronic transition, and it is observed so indicating that the cobalt ion is in 3<sup>+</sup>oxidation state<sup>xxviii,xxix,xxx</sup>.

#### **Electrochemical studies**

The redox properties of Co(III), Ni(II) and Cu(II) complexes were investigated in DMSO solution with tetrabutyl ammonium perchlorate (TBAP) as the supporting electrolyte by cyclic Voltammetry and the redox potentials are expressed with reference to Ag/Agcl.

The chloroNi(II) complex display one oxidation and one reduction peak. These are due to Ni(II) / Ni(I) couple, the anodic peak occurs at  $E_{pa}$ = -700mV and the cathodic peak at  $E_{Pc}$  = 1000mV. This couple is found to be irreversible in nature due to the large value of  $\Delta E_p$ . The cyclic voltammogram of [Cu(L)Cl] (ClO<sub>4</sub>)exhibit two cathodic and two anodic waves, one corresponding to metal center and the other ligand centered redox reaction. The higher value of  $\Delta E_p$  indicates that the complexes exhibit irreversible electron transfer. The cyclic voltammogram of [Cu(L)Br](ClO<sub>4</sub>)exhibit onecathodic and one anodic peak. The higher value of  $\Delta E_p$  indicates that the complexes exhibit irreversible electron transfer. The cyclic that the complexes exhibit irreversible electron transfer. The cyclic and [Cu(L)Cl<sub>2</sub>] (ClO<sub>4</sub>), [Ni(L)Br<sub>2</sub>] and [Cu(L)Cl] (ClO<sub>4</sub>)are depicted in **Fig.8**.



Fig. 8. Cyclic votammogram of [Ni(L)Br<sub>2</sub>]

#### **Conclusion:**

The predesigned[16]-membered neutral dioxadiazatetradentatemacrocyclic ligand (L) has been achieved through, two step synthetic strategy. The conventional method and microwave assisted synthetic methods yield the ligand in good yields. No further purification was required, to attain the sharp melting point. The sharp melting point and the good agreement of the elemental analysis along with the spectroscopic evidences confirms the formation the [16]-membered neutral dioxadiazatetradentatemacrocyclic ligand (L). The dioxadiazatetradentatemacrocyclic ligand, readily complexes with the transition metal ions such as Cobalt(III), Nikckel(II), Copper(II) and Zinc(II) metal salts in ethanolic medium. The investigation of spectroscopic data of the metal complexes of the macrocyle revealed the formation of mononuclear complexes of molecular formula  $M(C_{41}H_{43}N_2O_2)X_2$ .

The synthesized compound and its complexes of Cobalt (III), Nickel (II), Copper (II) and Zinc (II) perchlorate ions were characterized. The structural data established on the basis of <sup>1</sup>H and <sup>13</sup>C NMR, mass, elemental analysis (C,H,N) infrared, ultra violet and magnetic susceptibility analysis of complexes were recorded and discussed.

# Acknowledgement

The author **L. Rakesh Sharma** acknowledges the principal and management of St. Joseph's College, Trichirappalli and I am very much thankful to Dr. A. N. Paul Angelo and my friends for their support and encouragement. The author also thanks SJC (ACIC), Pondicherry, Lupin Research part Pune, CECRI - Karaikudi for the use of their instrumentation facilities.

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