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ORIGINAL ARTICLE





## SYNTHESIS AND SPECTRAL ANALYSISOF SOME CO-ORDINATION COMPOUNDS: AN OVERVIEW

#### KAMINI KUMARI AND SANDEEP SUDHANSHU

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#### Abstract:

In this paper a new series of complexes of Co(II) and Ni(II) with amino acid and 2-amino-iso butyric acid have been synthesized exhibits 1:2 metal-ligand ratio. Characterization of the ligand as well as complexes has been done on the basis of elemental analysis, Infra-red and magnetic susceptibility measurements. The ligand have been found to Co-ordinate through nitrogen and sulphur atoms. The complexes are binary and ternary complexes and are thermally stable.

The present paper describe the formation of complexes of Co(II) and Ni(II) with L-cystein and 2-amino is butyric acid.

#### **KEYWORDS:**

2-amino-iso butyric acid, 1:2 metal-ligand ratio, L-cystein.

#### **INTRODUCTION**

For present study we have selected amino acid and substituted amino acids because a very less work has been done on synthesis of complexes with transition elements. P.V. Marykutty and Geetha Parameswaran1 reported synthesis of Fe(II), Co(II), Ni(II) and Mn(II) complexes of Anthracene carboxaldehyde semicarbazone.

Liang-Nian Ji and Jin-Gang Liu<sup>2</sup> reported that transition metal complexes are possible molecular tools or the study of nucleic acid. Sami A. Zabin and C.R. Tehurkar<sup>3</sup> reported fluorescence, antibacterial and pigmentation studies of some binuclear Schiff base complexes. The ligand and their metal Ni(II), Zn(II) complexes shows good antibacterial activities. Praveen Sharma and Surendra N. Dubey<sup>4</sup> reported Co(II), Ni(II) and Zn(II) complexes with 3 - acetyl - amino - 2 - benzoyl benzofuran. Results shows that Co(II), Ni(II) complexes are polymeric octahedral and the ligand behaves as bidentate in all the complexes. Takaji Yasui Jinsai Hidaka and Yoichi Shimura<sup>5</sup> studied circular dichorism of Co(II) complexes with L-amino acids. A binary complexes of Fe(III) with amino acids has been reported. Ru Hu, Jia-Yuan, Li Xian-Jun<sup>6</sup> reported three new crowned bis-Schiff's bases and their cobalt (II) complexes. Sakiyan, Iffet, Gunduz, Neda, Gunduz Turgut7 synthesized Mn (III) complexes of Schiff bases derived from amino acid such as glycine, L-alanine, L-histidine etc. Where characterized by elemental analysis, IR and magnetic susceptibility. Y. Jadegound, Omkar B. Ijare, N.N. Mallikarjuna, S.D. Angadi and BHM. Mruthyunjayasyamy8 synthesised Cu(II), Co(II) and Ni(II) complexes with Schiff bases in ethanol medium and characterized by IR spectra and magnetic data. Many metal complexes of semicarbazone have been known for their pharmacological properties including activity against tuberculosis9 bacterial10 and viral functions11.

TitleSYNTHESIS AND SPECTRAL ANALYSISOF SOME CO-ORDINATION COMPOUNDS: AN OVERVIEW Source:Indian Streams Research Journal [2230-7850 ]KAMINI KUMARI AND SANDEEP SUDHANSHU yr:2012 vol:2 iss:11 SYNTHESIS AND SPECTRAL ANALYSISOF SOME CO-ORDINATION COMPOUNDS.....



#### **EXPERIMENTAL SETUP**

Solid complexes are prepared by taking different transition metal nitrate and ligands. The metals used are cobalt nitrate and ferric nitrate of analytical grade and prepared in double distilled water. Ligands used for complex formation are obtained from sd-fine chemicals. The ligands used as L-cystein and 2-aminoisobutyric acid.

#### **SYNTHESIS**

The complexes are prepared by using transition metal nitrate and ligands are from sd-fine chemical. 50 ml of nitrate solution and in that 100 ml of ligand solution 1:2 ratio added with constant stirring. The crystals obtained are kept at room temperature for sometime. The coloured crystals obtained are collected and dried in an electric oven.

#### ELEMENTALANALYSIS

For finding the percentage of constituent elements of complex such as C, H, O and N. The elemental analysis is done by Wockhardt Ltd, Aurangabad.

#### Infra-Red Spectra

Transition metal complexes with amino acid and substituted amino acids were prepared and characterized by Infra-red spectra. The spectra are recorded using IR- spectropotometer 8700 FTIP by Wockhardt Ltd.

#### MAGNETIC SUSCEPTIBILITY

It is measured on Gouy balance. Standard substance used in mercury tetra thiocyanto cobalt. The Xg value is  $16.44 \times 10^{-6}$  cgs unit. The tube is suspended to the arms of Gouy balance and reading are recorded when current is ON and OFF of each complex.

#### **RESULTS AND DISCUSSION**

Synthesis of solid complexes are very useful since some transition metal complexes are found to posses biological activity against bacteria, fungi and certain type of tumors. Studies on metal complexes of nitrogen containing ligands, especially heteroaromatic nitrogen bases are of much interest<sup>12</sup>.

Elemental analysis of the complexes obtained are stable at room temperature. The analytical data obtained by using thermal conductivity detector and eager 200 software.

Sr.	Complex	Colour		% A	nalysis Fou	ind (Calcula	ated)		Molecular
No	-		С	Н	Ν	0	S	М	weight
1.	Co(II)-cystein	Pink	24.316	3.761	9.525	24.421	19.793	18.184	312.05
			(22.696)	(3.782)	(7.880)	(25.218)	(20.212)	(18.576)	
2.	Ni(II)-cystein	Light	23.303	4.396	9.164	24.034	19.479	19.624	299.82
		green	(24.080)	(4.347)	(9.364)	(21.404)	(21.444)	(19.632)	
3.	Ni(II)-2- amino	Light	28.786	7.188	9.644	15.855	0.00	38.527	163.7
	isobutyric acid	blue	(29.662)	(6.797)	(8.651)	(19.775)	(0.00)	(36.274)	
4.	Co(II)-2-amino	Violet	41.933	11.334	12.448	5.165	0.00	29.12	269.93
	isobutyric acid		(46.490)	(12.326)	(10.559)	(6.033)	(0.00)	(22.22)	
5.	Co(II)-cystein-	Pink	23.901	4.001	9.297	28.044	19.137	15.62	346.05
	2-amino iso		(23.859)	(3.728)	(10.435)	(27.836)	(15.936)	(14.93)	
	butyric acid								
6.	Ni(II)-Cystein-	Light	29.217	5.872	11.334	13.994	25.943	13.64	405.88
	2-amino iso	green	(29.841)	(6.217)	(10.444)	(15.915)	(23.918)	(14.59)	
	butyric acid								



The proposed chemical structure for the transition metal complex

Table-2:IR Spectral Band in cm<sup>-1</sup>

Sr.	Compound			Band	l Vibratio	ns		
No.		$\nu_{\text{(N-H)}}$	$\nu_{(C-H)}$	$\delta_{(N-H)}$	$\nu_{(M\text{-}O)}$	$\nu_{(C-S)}$	$\nu_{\rm  (S-H)}$	$\nu_{\rm (M-S)}$
1.	Co(II)-cystein	3340.5	2923.9	1604.0	547.7	786.9	2360.7	447.5
2.	Ni(II)-cystein	3348.0		1604.0	540.0	709.8	2098.4	455.0
3.	Co(II)-2-amino-sio but yric acid	3031.9	2815.9	1581.5	547.7	786.9		
4.	Ni(II)-2-amino isobut yric acid	3178.5	2985.6	1589.2	524.6	786.0		
5.	Co(II)-cystein-2-aminoiso butyric acid	3340.5	2977.9	1596.9	547.7	732.9	2584.4	447.5
6.	Ni(II)-cystein-2-aminoiso butyric acid	3348.2	2916.2	1620.3	540.0	779.2	2584.4	455.2

#### **MAGNETIC SUSCEPTIBILITY:**

Measurement of effective magnetic moment µeff can be used to estimate the number of band type or oxidation state of a Co-ordination metal ion. At its simplest mean using the so called "spin-only" formula.

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BM Where, BM =Bohr magnetons.

For present study effective magnetic moments has been studied at room temperature. The value of  $\mu$  eff are:

Sr.	Complexes	Colour	Solubility	μeff(BM)
No.				
1.	CO(II)-cystein	Pink	CCl <sub>4</sub>	1.66
2.	Ni(II)-cystein	Light green	Methanol	1.80
3.	Ni(II)-2-amino isobutyric acid	Light blue	Ethanol	1.69
4.	Co(II)-2-amino isobutyric acid	Violet	Hot water	1.73
5.	Co(II)-cystein-2 amino isobutyric acid	Pink	Chloroform	1.84
6.	Ni(II)-cystein-2-amino isobutyric acid	Light green	Dioxane	1.85

Table-3: Results of Magnetic Susceptibility

J.K. Nag, D. Das, S. Pal and C. Sinha<sup>16</sup> reported synthesis and magnetic moments of copper and Schiff base. The magnetic moments found are (1.7-1.8 BM) deviated slightly from the spin values. The homodinuclear copper complex shows very low magnetic moment, 0.80 BM per copper centre. In case of Co(II) complexes the observed moment for the spin free octahedral and tetragonal distorted octahedral complexes which are in excess of the spin-only value of 0.8 to 1.3 BM. The spin spread Co(II) complexes having moments in the range 2.2 - 2.9 BM are more certainly square planar in structure<sup>17</sup>. The magnetic moment values suggest that the Co(II) complexes are of flow spin type with one unpaired electrons<sup>18</sup>.

If the ligand have only a weak field the splitting in small, and only when each of the t<sub>2</sub>g and eg level contains one such complexes are called as high spin or spin free. The magnetic moment value of 0.78 BM in close to the range observed for same square planar Ni(II) complexes in which the partial paramagnetic (0.94 -1.24 BM) considered to be caused by spin crossover from singlet to triplet state<sup>19</sup>.

Xishi Tai et al<sup>20</sup> reported synthesis of transition metal complexes of Novel Schiff base ligand. The elemental analysis indicates the complex of H<sub>2</sub>L with Co(II), Cu(II) can be formulated as Metal-ligand. The IR band appearing at 420 - 430 cm<sup>-1</sup> and 541 - 560 cm<sup>-1</sup> are assigned to v<sub>(M-N)</sub> vibrations. It also suggested that the complexes are nearly square planar coordinated accordingly.

Different worker<sup>21-22</sup> reported in the synthesis of Trioxime, Hydrazone complexes with some metal like Ni<sup>2+</sup>, Cu<sup>2+</sup>, Co<sup>2+</sup> etc. the magnetic susceptibility measurements of Ni(II) – complex indicate that this complex is diamagnetic and magnetic moments of Co(II) complex are 1.76 BM. Bayazeed H. Abdullah<sup>22</sup> showed the complex formation of Cd(II), Ni(II) and Cu(II) with N-phenyl-N)2-pyrimidyl) thiourea shows BM 3.06, 2.15 susceptibility measured at room temperature.

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