

Complexes of α - Amino Succinic Acid with Some Metal Ions

Abstract

The complexes α -of amino succinic acid (LH_2), $C_4C_7ON_4$ with some metal ions (Ni^{2+} , Cu^{2+} , Co^{2+} , Mn^{2+} , Fe^{2+} and Hg^{2+}) of the type $ML \cdot H_2O$ and with Cr^{3+} of the type ML_2 have been prepared and characterised on the Basis Of their Elemental analysis, ir, Electronic And Magnetic Studies. The Ni(II)- and cu (II) - complex are square planar, Co(II), Mn(II). Fe(II) and Hg(II)-complexes are tetrahedral but CrL_2 is octahedral. only Ni(II)- and Hg(II)- complexes are diamagnetic, while others are paramagnetic.

Keywords: Ligand, Hybridisation, Liner, Vanished, Spectrum, Deprotonation, Attributed, Tentative, Coordinated

Introduction

In our earlier work [1] the complexes of Ni (ii) and Cu (ii) with N-Phenyl Glycine amide – P – Arsenic acid have been reported. Our present work deals with the complexes of α – amino succinic and with metal ions.

Manterials

$NiSO_4 \cdot 6H_2O$ (E.M.), $CuSO_4 \cdot 5H_2O$, $CoCl_2 \cdot 6H_2O$, $HgCl_2$ and $CrCl_3 \cdot 6H_2O$ (all B.D.H.) and α – amino succinic acid (Loba Chemic grade) were used in the present investigation.

Physical Measurements

Infrared spectra of the ligand and complexes in KBr phase in the range $4000-200cm^{-1}$ were studies using Perkin Elmer Spectrometer no. 577. The uv spectra of complexes in methanol in the range (850-200)nm were recorded on uv visible Spectre-pothometer Hitachi-320. The magnetic moments were determined using Guoy's balance.

Aim of the Study

The aim of investigation describe to it's the Ni(II)- and cu (II) - complex are square planar, Co(II), Mn(II). Fe(II) and Hg(II)-complexes are tetrahedral but CrL_2 is octahedral. only Ni(II)- and Hg(II)- complexes are diamagnetic, while others are paramagnetic.

Experimental

Ligard Solution

0.2M ligand solution was prepared by dissolving its 2.66gmin 50 ml ethanol and diluting with warm distilled water to 100ml.

Standard Solution of Metal Ions

0.1M solutions of the metal ions were used in the presentwork.

Preparation of Metal Complexes

Metal ions (1 mole) were mixed with reagent solution (1 mole), (2 moles in case of Cr^{3+} ions) separately with constant stirring, followed by drop wise addition or 2M NaOH solution [2M NH_4OH solution to Ni^{2+} ions]. The precipitate formed in each case was filtered washed and dried in air.

Results and Discussion

Complexes are soluble in methanol and are decomposed by dilute mineral acids. The colour of complexes, pH values of their formation, analytical data, magnetic moments and absorption on peaks in the uv spectra are incorporated in table 1.



Dazy Kumari
Lecturer,
Dept. of Chemistry,
Urdu College,
Gopalganj, India

Table-1

Complexes of Metals with α -amino Succinamic acid	pH of formation	Elemental Analysis Colour of complexes	% C found (Cal)	% H Found (Cal)	% N Found (Cal)	μ eff value	UVspectral value nm λ max
Ni (II)	7	Yellowish	29.70	3.68	8.61	00.00	512F
		Green	29.74		(8.50)		476S
			(27.74)	(3.71)	(8.67)		
Cu (II)	6	Violet blue	29.25	3.60	8.54	1.85	487S
			(29.30)	(3.66)			
Co (II)	7	Blue	29.60	8.65	8.60	3.89	526
		(Pinkish)	(29.62)	(8.71)	8.67		476S
Mn (II)	8	Pinkish	30.00	3.70	8.70	5.8	465
		Yellow	(30.10)	(3.76)	8.77		452
Cr (II)	9-10	pale	21.75	2.70	6.30	3.85	512 S
		Green	(21.81)	(2.76)	(6.36)		487 ms
							380 bs
Fe (II)	7	green	29.00	3.70	8.70	4.90	220 ms
			(30.01)	(3.75)	(8.78)		
			20.60	2.50	6.00		00.00
Hg(II)	9-10	white	20.60	2.50	6.00	00.00	505 s
			(20.66)	(2.58)	(6.02)		440 s

Magnetic Moment

The Ni(II)- complex is spin paired (diamagnetic) and Square planar through dsp^2 hybridisation. For the Cu(II) and Co(II)-Complexes slightly greater magnetic moments than spin only values are due to Jahn's Teller effect and spin orbitcoupling respectively. The Fe(II)-complex is paramagnetic and moment value corresponds four unpaired electrons. The Hg(II)- Complex is diamagnetic but magnetic moment of Cr(III)-complex corresponds to three unpaired electrons and it possesses probably Oh symmetry.

Electronic Spectra

The absorption peaks at 476 and 512 nm in the spectra of NiL. H₂O, assignable to $1A_{1g} \rightarrow 1B_{1g}$

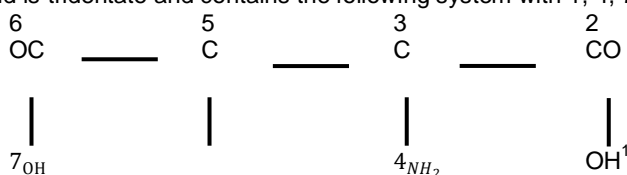
I.R.SPECTRA

A few relevant ir bands are places in table 2.

TABLE-2

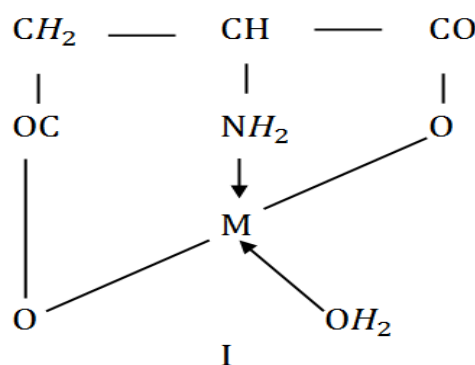
LH ₂ cm ⁻¹	NiL.H ₂ O cm ⁻¹	CuL.H ₂ O cm ⁻¹	CoL. H ₂ O cm ⁻¹	MnL. H ₂ O cm ⁻¹	CrL ₂ cm ⁻¹	Fel. H ₂ O cm ⁻¹	HgL. H ₂ O cm ⁻¹	Assignments
--	50S	5580S	3615	3590vs	--	3585	3600S	-O-H Stretch
3408	3380m	3340m	3340bs	3350m	3340m	3345m	3385m	-v (NH ₂)
2930	--	--	--	--	--	--	--	vs(COOH)
1650ws	1600	1600	1625bs	1620bs	1610bs	1615ms	1630bs	v(C=O)
1620ms	1580s	1565s	1570s	1570s	1560s	1550s	1590s	(δ NH ₂)
1330	1390m	1390s	1380s	1385s	1350ms	1380s	1390s	vs (COO)
--	1410m	1440mb	1395vs	1410m	1385m	1440s	1450s	vas (COO ⁻)
--	610ws	615s	610s	615s	605m	610m	620ms	Pr(NH ₂)
--	550m	510s	530ms	520ms	490m	480m	550m	V(M-N)
--	340 S	435S	425m	410M	450m	430m	450m	V(M-O)

The present ligand is tridentate and contains the following system with 1, 4, 7 binding sites.

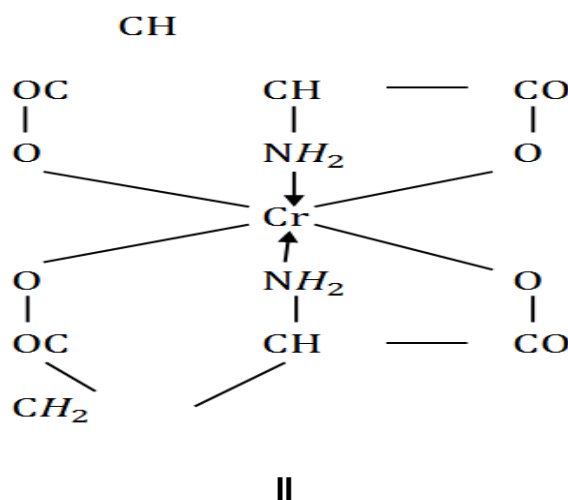


The broad sharp band with its centre at 2930 cm^{-1} in the spectrum of ligand assigned to $\text{Vs}(\text{COOH})$ disappears in spectra of all complexes, showing deprotonation by the metal ions [2,3]. The bands at $1600\text{-}1630\text{ cm}^{-1}$ in the spectra of ligand and complexes may be attributed to $\text{V}(\text{C}=\text{O})$ group. The sharp bands at $1450\text{-}1395\text{ cm}^{-1}$ and $1390\text{-}1330\text{ cm}^{-1}$ in the spectra of ligand and complexes may be attributed to $\text{V}(\text{C}=\text{O})$ group. The sharp bands at $1450\text{-}1395\text{ cm}^{-1}$ and $1390\text{-}1330\text{ cm}^{-1}$ in the spectra of complexes may be assigned to $\text{Vas}(\text{COO}^-)$ and $\text{Vs}(\text{COO}^-)$ respectively [3]. The medium sharp band at $3410\text{-}3408\text{ cm}^{-1}$ due to $\text{V}(\text{VH}_2)$ in the spectrum of ligand [4, 5] showed

downwards shift to $3340\text{-}85\text{ cm}^{-1}$ in complexes, showing donation through N of NH_2 group. Several sharp overtones in the spectrum of the ligand are found vanished in the spectra of complexes. The sharp bands at $550\text{-}490$ and $450\text{-}340\text{ cm}^{-1}$ in the spectra of complexes only suggest the formation of M-N and M-O bonds [6, 8]. On complexation $\text{V}(\text{C}=\text{O})$ appears to be increased in intensity to the sharp band at $3600\text{-}3550\text{ cm}^{-1}$ in spectra of ML. H_2O complexes suggest the presence of coordinated water molecules [4]. On the basis of above evidences, the following tentative structures of complexes may be proposed.



M=Ni (II), Cu (II), Co (II) Mn (II),
Fe (II) and Hg (II).



Acknowledgements

Thanks are due to Dr. U.N. Sharma, head of chemistry Rajendra College Chapra, J.P. University Chapra for valuable suggestion.

Reference

- Kumar, M., Mahto, H.R., Sharma, Vibha and Sharma, T., *J.Indian Chem.Soc.*, 66, 21, 73 (1989).
Mahto, C. B. and Singh, Mrs. Indu, *Acta Cienia Indica*, Vol. 18, C4(1992).
Mahto, C.B. and Kumari, Fulwanti, *Acta Ciencia India*, Vol. 16, C3 (1990).

Mc Aulliff, C.A. and Perry, W.D., *J.Chem.Soc.*, 634 (1979).

Subhas Satish, Dr. Kudeshia, *Spectrum Analysis*, Pragati Prakashan, P. 226 (1972-73).

Sharma, Y.R., *Elementary Organic Spectroscopy*, p. 122 (1989).

Nakamoto, K., *J.Chem. Phys.*, 42, 2590 (1965).

Rastogi, V.K. and Saxena, R.C., Khotnala, A.K. and Rastogi, J.N., *J.Indian Chem. Soc.*, LII, 10, 897 (1994).