

Synthesis and Spectral Characterization of Ni (II) Macrocyclic Complex

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Abstract

Synthesis and spectral characterization of Ni (II) is done by using X-ray photo electron spectra, binding energy has been calculated. The molar conductance, IR spectra characterize the macrocyclic complex which has octahedral geometry.

Keywords: Synthesis, Binding Energy, Molar Conductance.

Introduction

Complexes with chelating ligands generally have increased stability relative to those of greater stability when the donor atoms are incorporated in to a cyclic ligands that surrounds the metal ion.

The study of transition metals complexes of macrocyclic ligands as model for biological systems mainly from the difficulties encountered in is plating the biological system.

Nickel plays important role in nichel plating and in batteries.

Aim of the Study

The aim of doing this work is to make macrocyclic complexes using Ni II as a metal ion.

Review of Literature

A significant number of macrocyclic drugs are currently on the market, found to have a wide range of application such as self assembly on surfaces.

Tetra aza macrocyclic ligands and their substituted derivatives are involved in diverse application such as catalysis, enzymes mimics, chemical senses of macrocyclic complexes of the transition metals have a number of unique properties offered by the macrocyclic environments.

Nickel played an important role in batteries and nickel plating.

Materials and Methods

Solvent E Merck (LR Grade & Ranbaxy), NiCl₂.XH₂O (AR grades). The elemental analysis for C,H,N were determined on a semi-micro scale. The x-ray photoelectron spectra were recorded on VG scientific ESCA-3 MK-II electron spectrometer.

Experimental

Synthesis of The Ligands

The reaction is carried out in 2:2 molar ratio. The appropriate amount of dicyclohexyl carbodiimide and catalytic amount of 4- dimethyl aminopyridine in minimum amount of dichloroethane at 0°C put in round bottom flask. The resulting mixtures was stirred for 10-12 hours at 0°C. The solid products were crystallized from benzene and dried in vacuum.

Synthesis of the Complex

The reaction is carried out in 1:1 molar ratio 0.9-0.8g ligands were dissolved in methanol. The reaction is followed by the addition on NiCl₂.XH₂O solution 14-18 membered tetra as a macrocyclic ligands and their complexes was derived by the condensation of dicarboxylic acids with primary diamines.

Result & Discussion

On the basis of elemental analysis on the complexes were found to have general composition NiLX₂ (where L = L' & X = Cl⁻ as shown in table-1

Table-1: Elemental Analysis and Molar Conductance Data of [Ni (MacL) X₂] Complexes

S.No.	Complex	Elemental Analysis Found (Calc. %)			Molar Conductance ohm-1 cm mol-1
		C	H	N	
1	[Ni(MacL ¹)Cl ₂]	32.8 (32.5)	6.6 (6.4)	15.3 (15.2)	22

The Electronic Spectra

The nickel (II) complexes with coordination number six in all cases have a high spin electronic configuration & regular octahedral complexes are characterized by the presence of three moderately intense bands as shown in table-2.

Table-2: Electric Special Bands of [Ni(MacL¹)X₂] Complexes.

S.No.	Complex	λ_{\max} UV (cm ⁻¹)
1	[Ni(MacL ¹)Cl ₂]	17921.22321

X-Ray Photo Electron Spectra

It has seen that Ni2P_{1/2}, 3/2 photo-electron peaks binding energy values were observed more NiX₂.xH₂O (X=Cl⁻) suggest that Nickel ions have more electron density in metal complexes [Ni (L) X₂].

S.No.	Complexes	Ni ⁺² ion		N1s (from Ligand)
		Ni 2p _{1/2}	Ni 2p _{3/2}	
1.	NiCl ₂ .2H ₂ O	872.6	855.8	-
2.	[Ni (MacL ¹) Cl ₂]	871.6	854.6	401.8

Conclusion

The prepared metal complexes [Ni (MacL)Cl₂] on the basis of elemental analysis, molar conductance and X-ray photoelectron spectra data octahedral geometry is established for them as shown in fig.

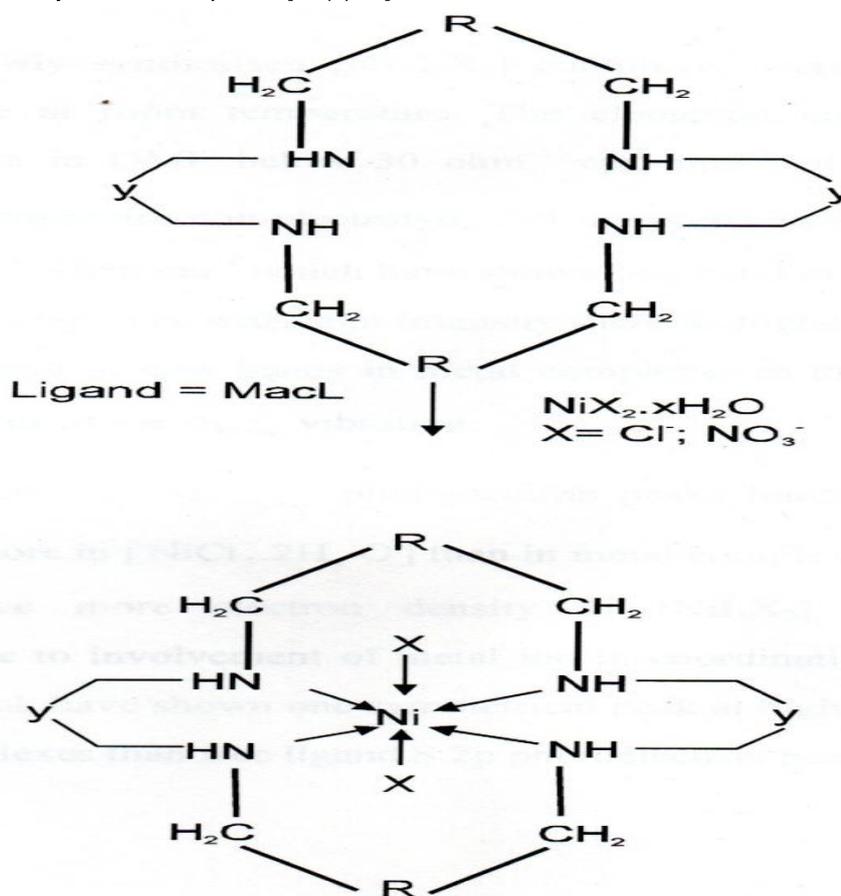


Fig. 2 : [Ni (MacL)X₂] complexes

End notes

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