

STUDIES ON Ni⁺⁺ COMPLEXES WITH SCHIFF BASE LIGANDS

Dr. Harimohan Kumar**

Deptt. Of Chemistry

J. P. University, Chapra

Dr. Vikash Kumar Singh*

Deptt. Of Chemistry

J. P. University, Chapra

Surjeet Kumar*

Deptt. Of Chemistry

J. P. University, Chapra

Abstract

A series of new structurally novel unsymmetrical Schiff base ligands were prepared by the condensation reaction in a 1:1:1 molar ratio of 2-hydroxy-1-naphthaldehyde, 2,6-diaminopyridine and substituted salicylaldehyde or salicylaldehyde and kept stirring at room temperature for four days.

All the ligands formed were orange yellow in color and melted within the range 135-195⁰C. They were also obtained in high yield and high purity.

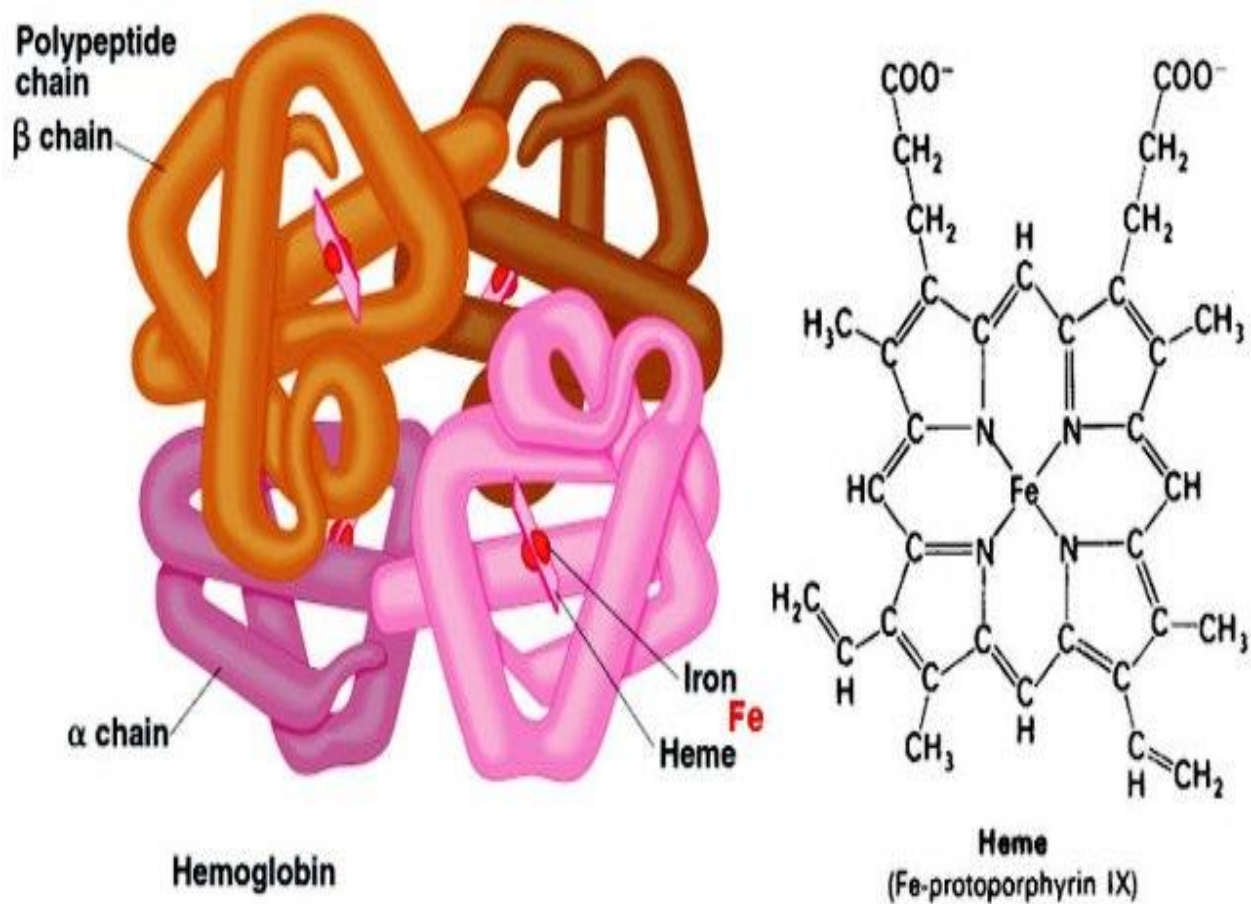
The following factors were found to affect the course of the synthesis

- (i) The sequence of addition of the reagents,
- (ii) Temperature of the solution of the starting reagents (Solution chilled to about 4⁰ C),
- (iii) The nature of the diamine used and
- (iv) The reaction time.

A change in reaction time from four days to just three hours or the use of warm solution of the starting reagents produced mixed products. From the above observations it seems that the condensation reactions occurred stepwise.

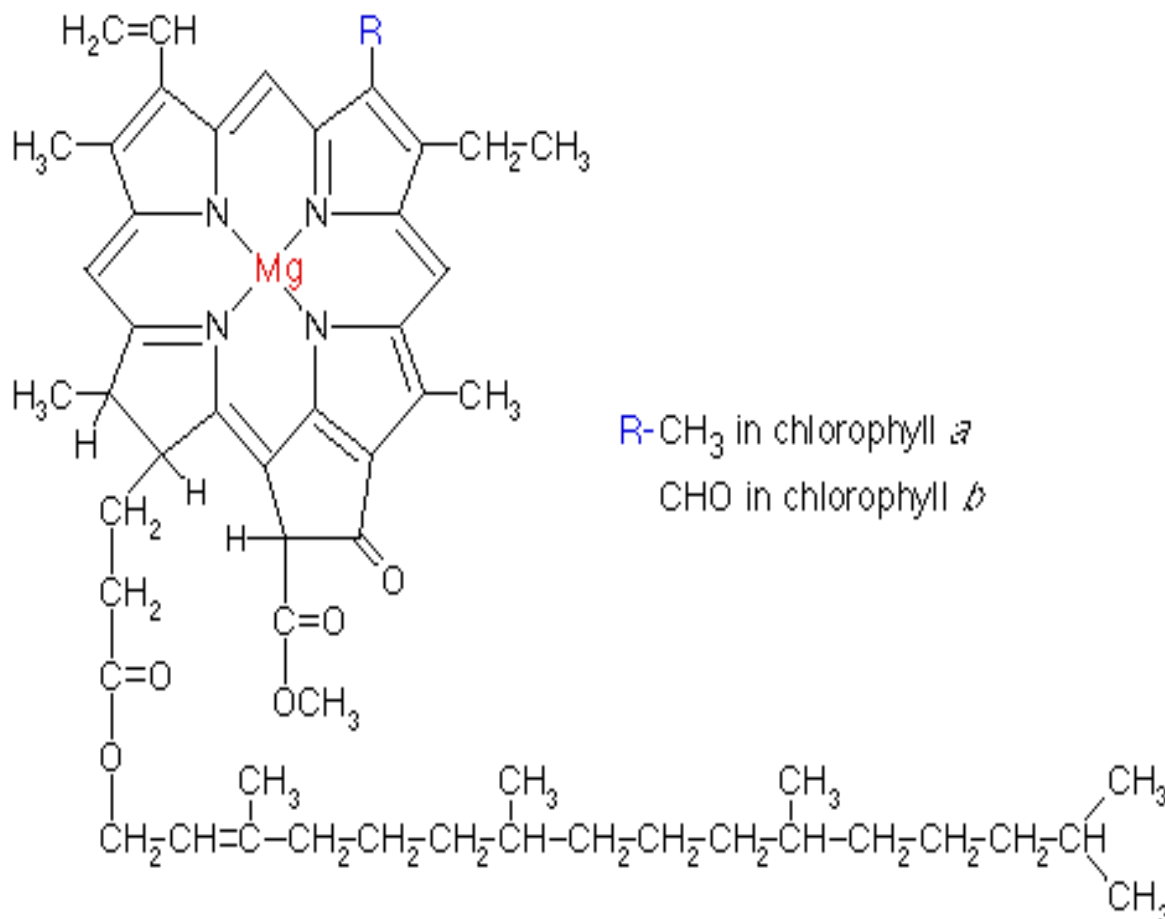
INTRODUCTION

Coordination compounds are most useful for the mankind. Some coordination compounds are made by the nature and some by coordination chemists. Hemoglobin responsible for respiration is natural coordination compounds.



Chlorophyll another coordination compounds, responsible for the photosynthesis is a natural coordination compound.





The structure of chlorophyll

Phthalocyanin imparting color to life is a natural coordination compound.

RESULTS AND DISCUSSION

Synthesis

A series of new structurally novel unsymmetrical Schiff base ligands were prepared by the condensation reaction in a 1:1:1 molar ratio of 2-hydroxy-1-naphthaldehyde, 2,6-diaminopyridine and substituted salicylaldehyde or salicylaldehyde and kept stirring at room temperature for four days.

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Table

Physical properties and analytical data for the Schiff bases and Ni⁺⁺ complexes.

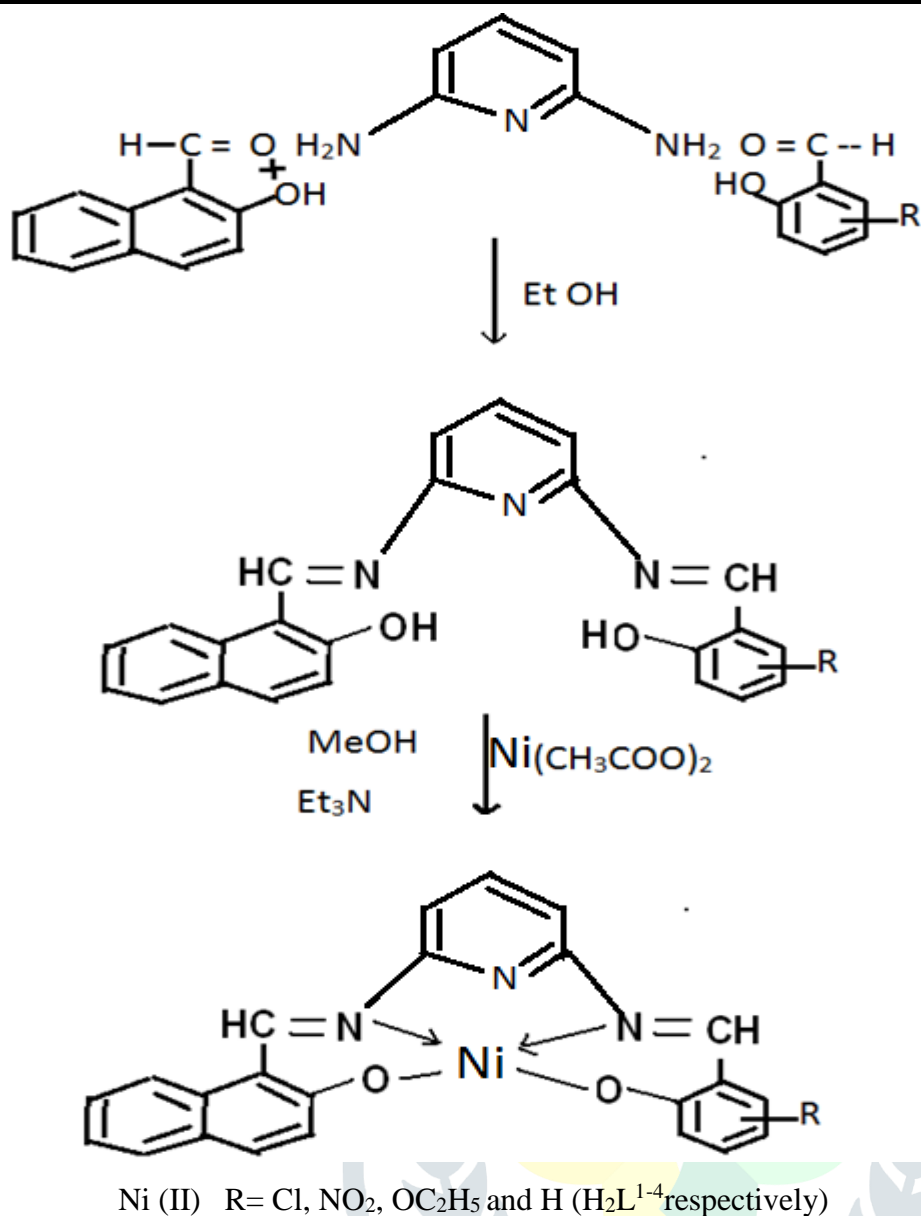
The sequence of reaction is shown in scheme

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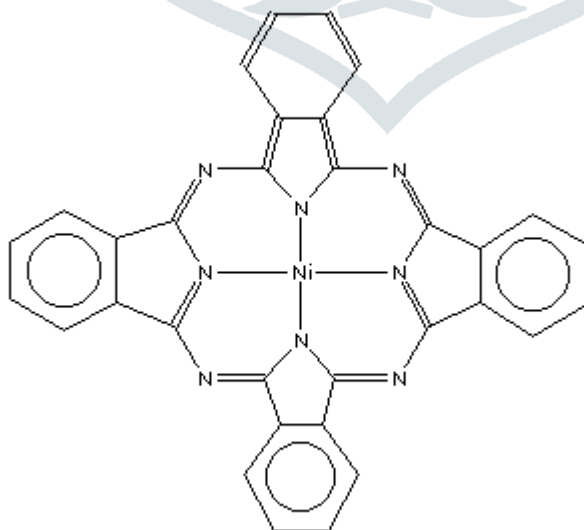
Compounds	Empirical formula	Formula weight	Yield	Color	M.P.(°C)	Microanalysis Found (cal)			
						%C	%H	%N	%M
H ₂ L ¹	C ₂₃ H ₁₅ N ₃ O ₂	365	85	Orange Yellow	194-195	75.57 (75.61)	4.07 (4.10)	11.42 (11.50)	
H ₂ L ²	C ₂₃ Cl H ₁₄ N ₄ O ₄	399.5	72	Orange Yellow	134-135	69.12 (69.17)	3.40 (3.50)	10.50 (10.53)	
H ₂ L ³	C ₂₃ H ₁₄ N ₄ O ₄	410	80	Orange Yellow	140-145	67.20 (67.31)	3.32 (3.41)	13.54 (13.65)	
H ₂ L ⁴	C ₂₅ H ₁₉ N ₃ O ₃	409	78	Orange Yellow	185-186	73.25 (73.35)	4.57 (4.65)	10.21 (10.27)	
NiL ¹	[Ni(C ₂₃ H ₁₅ N ₃ O ₂)]	424	96	Red	>250	65.00 (65.09)	3.48 (3.53)	9.85 (9.90)	13.87 (13.91)
NiL ²	[Ni[C ₂₃ ClH ₁₄ N ₄ O ₄]]	458.5	95	Red	>250	60.21 (60.26)	3.00 (3.05)	9.10 (9.17)	12.83 (12.88)
NiL ³	[Ni(C ₂₃ H ₁₄ N ₄ O ₄)]	469	92	Red	>250	58.74 (58.84)	2.90 (2.98)	11.89 (11.94)	12.49 (12.57)
NiL ⁴	[Ni(C ₂₅ H ₁₉ N ₃ O ₃)]	468	90	Red	>256	64.03 (64.10)	3.90 (4.05)	8.92 (8.97)	12.57 (12.60)

- (v) The sequence of addition of the reagents,
- (vi) Temperature of the solution of the starting reagents (Solution chilled to about 4⁰ C),
- (vii) The nature of the diamine used and
- (viii) The reaction time.

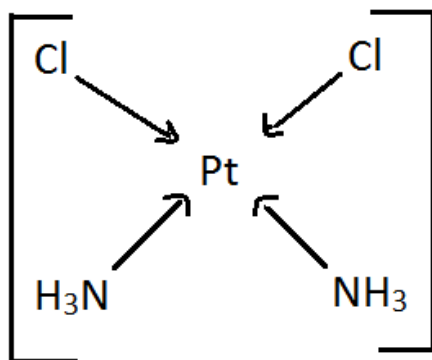
A change in reaction time from four days to just three hours or the use of warm solution of the starting reagents produced mixed products. From the above observations it seems that the condensation reactions occurred stepwise. The preparation of the unsymmetrical Schiff bases and their metal(II) complexes can be represented as follows.



scheme



Cis-platin, an anticancer drug is a man made coordination compound.



Coordination compounds are formed by the union of metal cations and ligands. The most widely studied metal cation is Ni^{++} and the widely studied class of ligands is Schiff bases. This preference of Schiff base ligands for Ni^{++} ion is due to the ability of this ion to act as a metal template for ligand forming reaction, the lack of interfering redox or hydrolysis reactions and a relatively well understood ligand field description of the various coordination geometries of Ni^{++} . Macrocyclic Schiff base ligands have attracted utmost attention.

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