PREPARATION AND INVESTIGATION OF COMPLEXES OF SOME TRANSITION METALS WITH SCHIFF'S BASES

A THESIS

PRESENTED TO
FACULTY OF SCIENCE
AIN SHAMS UNIVERSITY
(Cairo)

By
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(M.Sc.)

FOR THE DEGREE OF DOCTOR
OF PHILOSOPHY
(Chemistry)

This work was carried out in the
Chemistry Department

Faculty of Education
Ain Shams University

1991

بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا إلا ما علمتنا

إنك أنت العليم الحكيم

صدق الله العظيم «سورة البقرة الآية ٣٢»

بسم الله الرحمن الرحيم

PREPARATION AND INVESTIGATION OF COMPLEXES OF SOME TRANSITION METALS WITH SCHIFF'S BASES

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ACKNOWLEDGEMENT

The author wishes to express his thanks to **Prof. Dr. Kamal A.R. Salib,** *Professor of Inorganic Chemistry, Faculty of Education, Ain Shams University for suggesting the problem and for his continuous guidance and help.*

The author also expresses his thanks to **Dr. Salah B. El-Maraghy** *for his continuous encouragement.*

Also, my thanks to **Prof. Dr. B.A. El-Shetary,** *Prof. of Inorganic Chemistry and Head of The Chemistry Department, Faculty of Education, Ain Shams University for his assistance which facilitated carrying out this research.*

Also, my thanks to all members of the Chemistry Department, for the facilities offered by them.

The following two manuscripts which were extracted from this work were accepted for publication and are in print:

1. Mono-, di- and tri- nuclear metal complexes of new pentadentate schiff bases.
   Kamal A.R. Salib, Salah B. El-Maraghy and Saied M. El-Sayed.
   Indian Journal of Chemistry. In print.

2. Preparation and properties of Metal Complexes with New Asymmetric Pentadentate Schiff Base Ligands.
   Kamal A.R. Salib, Saied M. El-Sayed and Aida M. El-Shabiny.
   Synthesis and Reactivity in Inorganic and Metal-Organic Chemistry, In print.

Publications & Information Directorate, CSIR
Hillside Road, New Delhi 110 012

INDIAN JOURNAL OF CHEMISTRY

Pub-3.4(20(501)90

Dated 19.11.90

Dear Dr Salib

You will be happy to note that the modified manuscript of your paper entitled " Mono ---- Schiff bases " has been accepted for publication. It has been rendered press-ready in consultation with the referee. Since some of the changes made are major, the edited manuscript enclosed may be examined and retyped, and the retyped manuscript sent to us in duplicate along with the edited version at the earliest. You are at liberty to correct any ambiguity in the edited version. The retyped manuscript should be checked properly before sending to us for any possible error. The proofs will be compared with the final press-ready copy received from you. The paper will be sent to the press after getting the retyped manuscript from you.

Thanking you,

P.S. (i) Please send the original drawings for all the figures.
(ii) Please delete Table 3 since the discussion in the text is self-explanatory.

Yours sincerely,

B. C. Sharma
(Dr B. C. SHARMA)
Editor

Encl: As above

Dr Kamal A Rizk Salib
Cairo, Egypt

~~Encl: As above~~

Synthesis and Reactivity in Inorganic
and Metal-Organic Chemistry

[illegible]
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Dear Dr Salib,

Paper No. 182

Whilst I must apologise to you for the time we have taken to process this paper, I am pleased to inform you that the referees have recommended publication and that the editorial process has been completed.

I would be grateful if you would consider carefully the amendments and queries on the enclosed MS, and send me a revised version together with the completed offprint request form in due course.

Yours sincerely,

Alan Pidcock

Return to you will be delayed
by the Gulf War

[illegible]

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CHAPTER I

INTRODUCTION

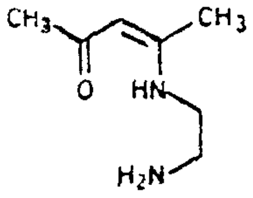
1. Importance of Schiff Base Complexes

Schiff base complexes have received considerable attention as biomimic model compounds [1-5]. N,N‾-bis(salicylidene)ethylenediaminato cobalt(II), Co(SALEN), absorbs molecular oxygen reversibly in the solid state [6]. Fe(SALEN) has become attractive as the model compound of natural iron protein, hemerythrin which binds molecular oxygen reversibly [7]. Cu(SALEN) is also a potential model compound of hemocyanin.N,N‾-bis(acetylacetone) ethylenediaminato cobalt(II), Co(ACACEN), has been reported to bind molecular oxygen reversibly in N,N-dimethylformamide [2,8]. Schiff base complexes incorporating two similar or different metal ions are also of special interest. They are similar to those found in the living organisms, e.g. enzymes and proteins which develop their activity in the presence of two or more metal ions [9-11]. These complexes are also useful in catalysis [12].

2. Half Unit Schiff Base Ligands

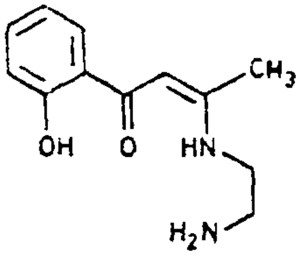
Usually the condensation of one molecule of the diamines with two molecules of ketonic compounds produce symmetrical Schiff bases such as ACACEN and SALEN.

In recent years chemists succeeded in preparing half unit Schiff base compounds by reacting one molecule of both the diamine and the ketonic compounds under certain conditions, e.g. half units (a) [13] and (b) [14] as shown in the following figure:



(a)

Tridentate half unit ligand

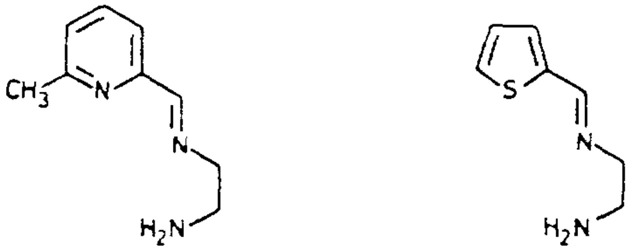


(b)

Tetradentate half unit ligand

The half unit prepared from acetylacetone and 1,2-diaminoethane is unstable for a long time and hydrolyses slowly [13]. However, it could be used for preparing unsymmetrical Schiff bases.

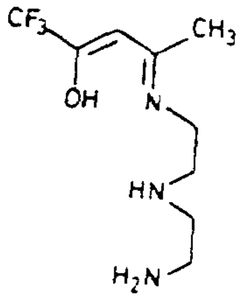
Not all half units derived from β-diketones could be easily prepared by direct condensation with diamines [15]. In this case, they may be obtained via their metal complexes which are initially prepared. Partial hydrolysis of the tetradentate Schiff bases derived from 6-methylpyridine-2-carbaldehyde [16] or thiophene-2-carbaldehyde [17] and 1,2-diaminoethane in the presence of metal ions (Fe(III) or Cu(II)) led to the isolation of metal complexes of the tridentate half units L_1 and L_2 as shown in the following figure:



L_1 L_2

Tridentate half unit ligands

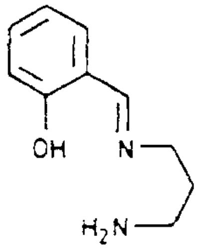
Similarly, partial hydrolysis of pentadentate Schiff base derived from 1,1,1-trifluoropentane-2,4-dione and 1,5-diamino-3-azapentane in the presence of Cu(II) or Ni(II) gives the metal complexes of L_3 as shown in the following figure:



L_3

Tetradentate half unit ligand

The half unit L_4 , as shown in the following figure, was not isolated by the reaction of 2-hydroxybenzaldehyde with an excess of 1,3-diaminopropane due to separation problems [18]. It was obtained through the formation of $[Ni(L_4-H)_2]$.



L_4

Tridentate half unit ligand

The nickel(II) ion in the complex could be removed from the complex using dimethylglyoxime as precipitant to give the free half unit.