

# Complexation behavior of Schiff base toward transition metal ions

S.M. Ben-saber<sup>a</sup>, A.A. Maihub<sup>b</sup>, S.S. Hudere<sup>c</sup>, M.M. El-ajaily<sup>d,\*</sup>

<sup>a</sup>Pharmaceutical Chem. Department, Faculty of Pharmacy, Gar-Younis University, Benghazi, Libya

<sup>b</sup>Chemistry Department, Faculty of Science, Al-Fateh University, Tripoli, Libya

<sup>c</sup>The Man Great River Project (GMRUA), Libya

<sup>d</sup>Chemistry Department, Faculty of Science, Gar-Younis University, Benghazi, Libya

Received 21 April 2004; received in revised form 26 February 2005; accepted 1 March 2005

Available online 26 May 2005

## Abstract

Complexes of Iron, Cobalt, Nickel and Zinc ions with the Schiff base derived from *p*-dimethylaminobenzaldehyde and *o*-aminobenzoic acid were synthesized and investigated by several techniques using elemental analysis (C,H,N), molar conductance measurements, infrared and electronic spectra. The elemental analysis data suggest the stoichiometry to be 1:1 [M:L] ratio formation. The molar conductance measurements reveal the presence of non-electrolytic nature complexes. Infrared spectral data agreed with the coordination to the central metal ions through both the nitrogen atom of the azomethine and oxygen atom of the carboxyl group of the 2-aminobenzoic acid moiety. The electronic spectral data suggest the existence of octahedral geometry for Fe(III) complex, square planar geometry for Co(II) and Ni(II) complexes and tetrahedral geometry for Zn(II) complex.

© 2005 Elsevier B.V. All rights reserved.

**Keywords:** Complexation behavior; Schiff base; Transition metal ions

## 1. Introduction

Complexes of various metal ions with Schiff bases derived from 3-aminomethyl-4-amino-5-mercapto-1,2,4-triazole and thiocarbohydrazones have been extensively studied [1]. There is growing interest in the studies on metal complexes of Schiff bases derived from triazoles which are biologically important ligands [2]. The unsymmetrical Schiff base such as 1-hydroxy-2-acetonaphthoneacetylacetonethylenediamine and its complexes with some transition metal ions have been prepared and investigated by different techniques [3].

The complexes of Co(II), Ni(II) and Cu(II) ions with the Schiff bases derived from the condensation of salicylaldehyde and *o*-aminophenol or 2-aminobenzoic acid were synthesized and characterized by using different techniques; in particular the elemental analysis, molar conductance measurements, infrared and electronic spectra. The square planar geometry for all metal complexes were suggested [4,5].

As a continuation of our previous work on “The experimental studies on some Schiff bases complexes”, we are reporting here the complexation behavior of Schiff base derived from the condensation of *p*-dimethylaminobenzaldehyde and *o*-aminobenzoic acid with Fe(III), Co(II), Ni(II) and Zn(II) ions.

## 2. Experimental

### 2.1. Solvents and reagents

All chemicals used in this investigation were laboratory pure including FeCl<sub>3</sub>·6H<sub>2</sub>O, CoCl<sub>2</sub>·6H<sub>2</sub>O, NiCl<sub>2</sub>·6H<sub>2</sub>O, ZnCl<sub>2</sub>, NH<sub>4</sub>OH, C<sub>2</sub>H<sub>5</sub>OH, DMSO, DMF, CHCl<sub>3</sub>, *p*-dimethylaminobenzaldehyde and *o*-aminobenzoic acid and double distilled Water.

### 2.2. Physical measurements

The elemental analyses of C, H and N were performed in advanced laboratory of chemical analysis, Al-

\* Corresponding author.

E-mail address: [melagaily@yahoo.com](mailto:melagaily@yahoo.com) (M.M. El-ajaily).

Table 1  
Elemental analysis and molar conductances of the Schiff base and its complexes

Ligand/complex	Molecular weight	% C		% H		% N		MC
		Calculated	Found	Calculated	Found	Calculated	Found	
LH	268	71.64	71.70	5.97	5.20	10.44	10.33	–
[FeL(OH) <sub>2</sub> (H <sub>2</sub> O) <sub>2</sub> ]·2H <sub>2</sub> O	429	44.75	44.83	5.82	5.20	6.53	7.34	3.40
[CoL(OH)(H <sub>2</sub> O)]·H <sub>2</sub> O	379	50.65	50.29	5.27	4.60	7.38	8.38	5.20
[NiL(OH)(H <sub>2</sub> O)]·4H <sub>2</sub> O	432.7	44.37	43.64	6.00	6.81	6.47	7.18	7.90
[ZnL(OH)(H <sub>2</sub> O)]·2H <sub>2</sub> O	422.40	47.49	46.48	5.33	5.25	6.93	7.80	10.1

LH=free Schiff base.

MC=molar conductivity ( $\Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ).

Fateh University, Tripoli, Libya. The molar conductance measurements carried out in DMF solvent using conductivity meter model CMD650 digital meter. Infrared spectra were recorded using KBr disc technique on IFS-25DPUS/IR spectrometer (Bruker). The electronic absorption spectra were measured by using a Perkin-Elmer lambda 4 $\beta$  spectrophotometer in 1 cm matched silica cells.

### 2.3. Preparation of Schiff base

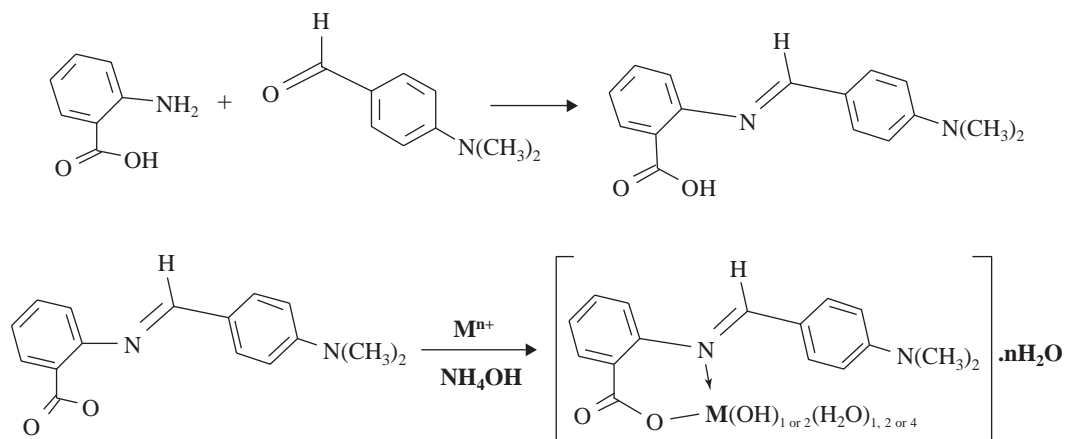
The Schiff base used was prepared by mixing an ethanolic solution (50 ml) of 1.49 g (0.01 mol) of *p*-dimethylaminobenzaldehyde with 1.37 g (0.01 mol) of *o*-aminobenzoic acid in the same volume of ethanol. The mixture then refluxed with stirring for 2 h. The precipitate was collected by filtration through Buchner funnel, recrystallized from ethanol, and dried at room temperature with 85% yield.

### 2.4. Preparation of complexes

The Schiff base complexes under investigation were prepared by mixing 25 ml ethanolic solution of the Schiff base (0.01 mol; 2.86 g) with 25 ml of the ethanolic solution of the metal salts (0.01 mol); FeCl<sub>3</sub>·6H<sub>2</sub>O (2.80 g) CoCl<sub>2</sub>·6H<sub>2</sub>O (2.38 g), NiCl<sub>2</sub>·6H<sub>2</sub>O (2.37 g), ZnCl<sub>2</sub>(1.36 g). If the solid complexes did not separate, few drops of NH<sub>4</sub>OH solution were added to adjust the pH=6–8. The obtained mixture was refluxed with stirring for 2 h, and then kept overnight to insure the complete reactions. Thus, the formed complexes were filtered, collected and then washed several times with hot ethanol until the filtrate becomes colorless. The complexes were dried in a desiccator over anhydrous calcium chloride under vacuum. The yield ranged from 70% to 80%. The complexes are insoluble in CH<sub>3</sub>OH and CH<sub>3</sub>CH<sub>2</sub>OH but soluble in CHCl<sub>3</sub> and DMF. The dried complexes were subjected to elemental and spectroscopic analyses.

## 3. Results and discussion

The condensation of *p*-dimethylaminobenzaldehyde with *o*-aminobenzoic acid in boiling ethanol yields one Schiff base compound. The chemical equations concerning the formation of the Schiff base and the complexes represented as follows:



Download English Version:

<https://daneshyari.com/en/article/10557166>

Download Persian Version:

<https://daneshyari.com/article/10557166>

[Daneshyari.com](https://daneshyari.com)