



Synthesis and characterization of Ni(II) complex with Schiff base derived from benzophenone and 2-aminophenol

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ABSTRACT

A Schiff base ligand was obtained when benzophenone and 2-aminophenol reacted with each other under normal circumstances. Interaction of the Schiff base ligand with $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ gave rise to hydrated, ash coloured complex of high thermostability. Characterization using some physicochemical techniques such as solubility, melting point, molar conductivity and FT-IR were carried out. The results revealed the solubility of the synthesized compounds in different solvents. The water of crystallization was calculated to constitute 2.8 %, consistent with 1 water molecule of crystallization. On subjection to conductivity measurement, an observed molar conductance of $2.55 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ proved that the complex is a non-electrolyte. The FT-IR spectrum of the ligand exhibits a band at 1684.88 cm^{-1} attributed to $\nu \text{C}=\text{N}$ which shifted to a higher frequency in the spectrum of the complex. This shifting indicates that the ligand coordinates to the Ni(II) ion *via* the azomethine nitrogen. On the basis of spectral analysis, the complex could be formulated as $[\text{NiL}_2] \cdot \text{H}_2\text{O}$. It could be inferred that the ligand behaved as monoanionic bidentate ligand with the azomethine nitrogen (N) and phenol oxygen (O) as the coordination sites assuming a four-coordinate square planar geometry.

1. Introduction

Schiff bases are organic compounds, considered to be a subclass of imines, which may be secondary aldimines or ketimines depending on the nature of the parent carbonyl compounds, which are synthesized by nucleophilic addition of aliphatic or aromatic amines with carbonyl compounds forming intermediate hemiaminals followed by elimination of water, the reaction often being catalyzed in acid medium. They have the general formula $\text{R}-\text{CH}=\text{NR}'$ where $\text{R}' \neq \text{H}$. The presence of the azomethine function in the Schiff base compounds renders them as potential candidates for forming a wide range of complex compounds with both transition and non-transition metal ions [1,2]. In recent times, plenty works have been reported complexes of Schiff base containing 2-aminophenol with mostly aldehyde [3-12]. Subbaraj et al. [13] reported Schiff bases derived from substituted benzophenone and aniline with metal(II) ions (Mn, Co, Ni Cu and Zn).

Paucity of information in the literature on the synthesis of Schiff base derivable from benzophenone

and 2-aminophenol with its Ni(II) complex as well as the chelation behaviour of the Schiff base towards metal(II) ion has prompted the research work.

2. Results and Discussion

The physical and analytical data of the compounds are presented in Table 1. The benzophenone and 2-aminophenol yielded the ligand with percentage yield of 24.38 % and a sharp melting point of $220 \text{ }^\circ\text{C}$ indicating its purity and relative thermal stability. The interaction of the ligand with $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ produced an ash coloured complex with percentage yield of 39.74 %. The formation of this coloured complex might be due to d-d transition or nature of the ligand [14]. The molar conductivity of the Ni(II) complex in DMF was calculated as $2.55 \text{ Ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$. This low value indicates non-electrolyte hence no anions are present [15].

The solubility of the Schiff base and its Ni(II) complex was studied in different polar and non-polar solvents. The result shows that the ligand was soluble in hot and cold acetone, insoluble in hot and cold chloroform and slightly soluble in hot diethyl ether. It also showed that the

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