



Synthesis and infrared spectroscopic study of N, N'-bis(4-methoxybenzylidene)thiourea with its Co(II) and Ni(II) homobinuclear complexes

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ABSTRACT

New homobinuclear complexes of Co(II) and Ni(II) with a Schiff base, N,N'-bis(4-methoxybenzylidene)thiourea derived from [2+1] condensation reaction of 4-methoxybenzaldehyde and thiourea have been synthesized by conventional method. The Schiff base ligand and the complexes were characterized as appropriate by gravimetric determination of chloride content, thermogravimetric estimation of uncoordinated water, melting point, molar conductance measurement and infrared spectroscopy. The ligand was white crystalline solid of sharp melting point (150 °C) whereas the Co(II) and Ni(II) complexes were blue and golden colour with decomposition temperature of 190 °C and 198 °C, allusive of thermostability. Both complexes were hydrated and non-electrolytic in nature with four chloride ions coordinated to the bimetallic ions. The infrared spectroscopic study revealed that the ligand is a neutral tridentate diazamonothio moiety coordinated to the Co(II) and Ni(II) ions through its two azomethine nitrogen atoms (C=N) and thione sulphur (>C=S). The resultant data suggested formation of the homobinuclear complexes as $[M_2LCl_4] \cdot nH_2O$, (where $M^{2+} = Co$ or Ni , $L =$ Schiff base ligand and $n = 4$ for Co and 6 for Ni complex), possessing square planar structure.

1. Introduction

Thiourea which is also known as thiocarbamide is a white crystalline solid compound that consist of sulphur and nitrogen atoms [1]. The chemical attention of thiourea derivatives lies in the fact that they are ambidentate ligands with nitrogen and sulphur atoms susceptible for coordination and they have binding sites relevant to those in living organisms [2]. They possess two potential donor atoms (N and S), showing amazingly rich coordination chemistry. This remarkable tendency as hosts has facilitated the use of thiourea derivatives in ramifying new applications in the field of binding chemistry [3].

Plenty of research work have been done on ordinary complexes, chelates and mixed ligand complexes [4-6]. In order to fiddle with the properties of the complexes originating due to metal ions, polynuclear complexes with inclusion of more than one homo or hetero metals is imperative [7].

In a study, Kafi-Ahmadi *et al.* [8] synthesized a new Schiff base ligand by condensation reaction of 4-dimethylaminobenzaldehyde and 1,3-phenylenediamine. Treatment of this Schiff base ligand with Zinc(II) nitrate and Cadmium(II) nitrate in ethanol medium afforded the corresponding metal complexes. The synthesized ligand and complexes were characterized by their UV-Vis, FT-IR and ¹H-NMR, ¹³C-NMR spectral data and elemental analysis. The spectral data suggest an octahedral geometry for these complexes. Antibacterial activities of both synthesized free ligand and complexes were investigated against *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis* bacteria. The complexes showed better antibacterial activity in comparison with that of the free ligand against selective bacteria.

In this paper, we reported the synthesis of homobinuclear transition metal complexes with Schiff base containing thiourea in order to investigate its coordination behaviour.

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