

# Synthesis And Spectral Studies Of Some New Binuclear Thiocyanate Complexes Containing Schiff Base Ligands Derived From 3,4-Diaminotoluene

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## Abstract

New Schiff base ligands L<sub>1</sub>, L<sub>2</sub> and L<sub>3</sub> were synthesized from the reaction of 3,4-diaminotoluene with indole-3-carboxaldehyde, 4-morpholine carboxaldehyde or 2-naphthaldehyde. Complexes of CoCd(SCN)<sub>4</sub> with those ligands have been synthesized and characterized. The characterization of ligands and their complexes was done by elemental analysis, molar conductance, <sup>1</sup>H, <sup>13</sup>C-NMR, mass spectra, magnetic susceptibility, infrared, and electronic spectral studies. All the synthesized ligands were bidentate, and the complexes are monomeric binuclear mixed metal bridges of type LCo(NCS)<sub>2</sub>Cd(SCN)<sub>2</sub> (L = L<sub>1</sub>, L<sub>2</sub> or L<sub>3</sub>), non-electrolytes and have a four-coordinate number corresponding to tetrahedral geometry.

**Key words:** Schiff base, Bimetallic, Complex, Bridged thiocyanates

## Introduction

Schiff bases can be easily obtained from primary amines condensing with carbonyl compounds, whether they are aldehydes or ketones<sup>(1-3)</sup>. Bidentate Schiff bases containing two nitrogen donor atoms are important in the formation of stable compounds as a result of their coordination with different metal ions, which reflects their importance in biological systems<sup>(4,5)</sup>. There is recognition of the significance of metal complexes of Schiff bases in the disciplines of supramolecular chemistry, material science, medicinal applications, and bioinorganic chemistry<sup>(6)</sup>. Compounds related to organic oxygen carriers, both natural and synthetic, as well as active stereospecific catalysts for reduction, oxidation, hydrolysis, and transformation reactions in inorganic and organic chemistry, are all produced by Schiff base metal complexes<sup>(7)</sup>. Due to their potential for use in numerous chemistry domains, dinuclear metal complexes and the ligands that promote their formation have been thoroughly studied<sup>(8-10)</sup>. For these dimeric complexes to form, the single-coordinated metal ion must be in an unsaturated coordination environment, and there must be bridging atoms or groups, such as thiocyanates<sup>(11)</sup>. In this work, we have studied the synthesis of some Schiff bases as ligands coordinated with complexes of CoCd(NCS)<sub>4</sub> to obtain new complexes with the formula CoCd(NCS)<sub>4</sub>L (L = Schiff base ligands), and then they were characterized by different spectroscopic and analytical methods.

## Materials and reagents

The analytical reagent grade (AR) and highest purity of all compounds utilized were employed. They included 3,4-diaminotoluene (Merck), indole-3-carboxaldehyde (Merck), 4-morpholine carboxaldehyde (Merck), 2-naphthaldehyde (Merck), cobalt (II) nitrate hexahydrated (Sigma), cadmium (II) nitrate tetrahydrated (Sigma), potassium thiocyanate (Sigma), DMSO (Sigma), methanol (Sigma), and ethanol (Sigma).

## Instruments

Using the ECS-4010 CHNSO analyzer, microanalyses of carbon, hydrogen, and nitrogen were performed. A phoenix-986 AA spectrophotometer used atomic absorption to determine the metal content of the complexes.