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Synthesis and characterization of metal (II) complexes of a tetradentate Schiff base ligand

A tetradentate Schiff base ligand; [1,3-bis(naphthylideneimino)propane derived from 2-hrdroxy-1-naphthaldehyde with 1,3-diaminopropane and its metal complexes with copper, nickel and cobalt were synthesized. The ligand and the metal complexes were characterized by Infrared, UV/Visible, ^{1}H NMR and Plasma Desorption Mass Spectrometry (PDMS).

Ligand Metal Complex, M=Co(II), Cu(II), Ni(II)

The presence of an IR absorption band characteristic of the azomethine group at 1637cm^{-1} , mass fragment of the parent peek at 383.1 in PDMS, ^{1}H NMR signals at 8.9 ppm (azomethine group) and 13.4 ppm (O-H) confirm the formation of the tetradentate Schiff base ligand.

Shift of the IR absorption band from 1637cm^{-1} (free ligand) to a lower value (1618 cm^{-1}) in the cobalt complex shows the coordination of the nitrogen atom in the azomethine group to the cobalt ion. Absence of the O-H peak in ^{1}H NMR spectrum of the complex shows the coordination of the oxygen atom to the metal ion. Molecular ion peak at 440.4 in PDMS confirms the formation of the Schiff base cobalt complex having 1:1 metal to ligand stoichiometry.

Mass fragment at 497.8 in PDMS also suggests a cobalt complex having 2:1 metal to ligand stoichiometry. Copper and nickel complexes show peaks at 508.5 and 495.8 respectively, suggesting the presence of fragments of dimeric species. As expected copper complex does not show a ^{1}H NMR spectrum. ^{1}H NMR signals of nickel complex show slight deviations in chemical shift values when compared to the free ligand. All the ^{1}H signals observed for NMR spectra of both nickel and cobalt complexes in $CDCl_3$ do not show the splitting and have broadened indicating a dynamic equilibrium between at least two structural forms. The broadening shows that these complexes have small positive susceptibilities in $CDCl_3$.This suggest that there are weak solvent interactions with the metal complex giving rise to a dynamic equilibrium between diamagnetic square planar and a paramagnetic five- coordinated species in nickel.