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OPTICAL AND MAGNETIC PROPERTIES OF SCHIFF BASED TRANSITION METAL COMPLEXES OF (Z)-5-(METHOXYMETHOXY)-2-(1-(PHENYLIMINO)ETHYL)PHENOL) AND (Z)-2-BROMO-4-CHLORO-6-(1-((4-NITROPHENYL)IMINO)ETHYL)PHENOL DERIVATIVES

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ABSTRACT

Acetophenol and aromatic amine derivatives are antibacterial agents. The biological activities of metal complexes differ from those of either ligand or the metal ions. An increase or decreases in biological activities have been reported for several transition metal complexes. Novel metal Copper (II) (B1) and Nickel (II) (M4) complexes of Acetophenol and aromatic derivatives have been synthesized by Schiff based method. Optical properties investigated by UV-VIS spectroscopy in the range 200-800 nm and the photoluminescence study of these chelates has been carried out for the emission properties. Moreover, the Magnetic Susceptibility study is also performed to explore the magnetic response of these chelate against magnetic field.

Keywords: Antibacterial agents, Metal complexes, Optical and magnetic properties.

INTRODUCTION

Compounds with the structure of –C=N– (azomethine group) are known as Schiff bases, which are usually synthesized by condensation of primary amines and active carbonyl groups. Schiff bases are an important class of compounds in the medicinal and the pharmaceutical field, including antibacterial **[1, 2]**, antifungal **[3, 4]**, and antitumor activity **[5, 6]**.Acetophenol and aromatic amine derivatives have been found wider use as antibacterial agents. Biological activity of metal complexes differs from those of either ligands or the metal ions and increased and or decreased biological activities have been reported for several transition metallic complexes **[7].** The individual Schiff bases are considered to be promising antifungal, anticonvulsant activity for treatment of HIV. As a part of our ongoing research work novel compounds to investigate the structure function relationship, we report here the magnetic and optical properties of the novel metal complexes of (Z)-5-(methoxymethoxy)-2-(1-(phenylimino)ethyl)phenol) [B1]and (Z)-2-bromo-4-chloro-6-(1-((4-nitrophenyl)imino)ethyl)phenol[M4]derivatives.

METHODOLOGY

SYNTHESIS

The methanolic solution of transition metals copper (II) and nickel (II) (0.01mol, 10ml) and Schiff bases ligand (Z)-5-(methoxymethoxy)-2-(1-(phenylimino)ethyl)phenol) and (Z)-2-bromo-4-chloro-6-(1-((4nitrophenyl)imino)ethyl)phenol derivatives have been taken in 1:2 (metal /ligand) ratio. The pH solution has been maintained during the course of the reaction by adding few drops of liq.NH3/glacial acetic acid. The reaction mass was refluxed for 2-3 hours on a water bath. After the end of reaction, it was cooled to room temperature and solvent was allowed to evaporate. Precipitated colored complexes was filtered and washed with methanol: water (1:1) mixture, recrystallized from methanol and dried over anhydrous CaCl2 in desiccators. It was further dried in an electric oven at 50-70°C. The chemical structure of synthesized metal chelates [Cu (II), Ni (II)] of Schiff base ligand(Z)-5-(methoxymethoxy)-2-(1-(phenylimino)ethyl)phenol) and (Z)-2-bromo-4-chloro-6-(1-((4-nitrophenyl)imino)ethyl)phenol derivatives are as shown in **Figure 1(a)**&**Figure1(b).**

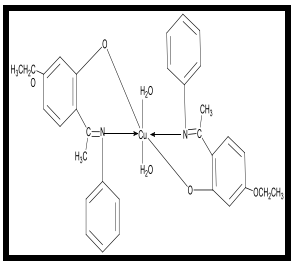

Figure: 1(a) The chemical diagram of compound B1.

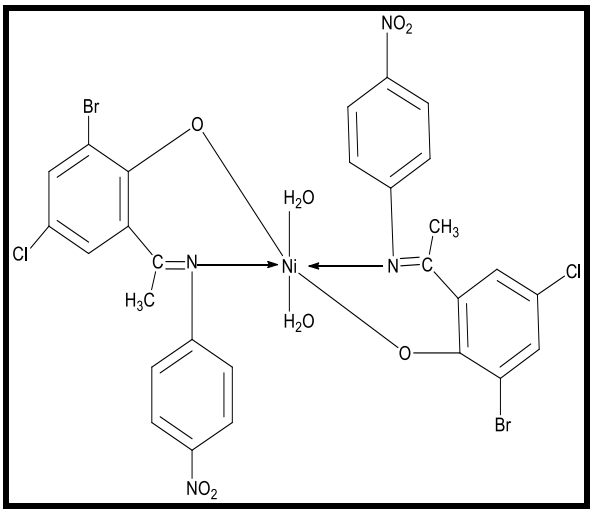

Figure: 1(b) The chemical diagram of compound M4.

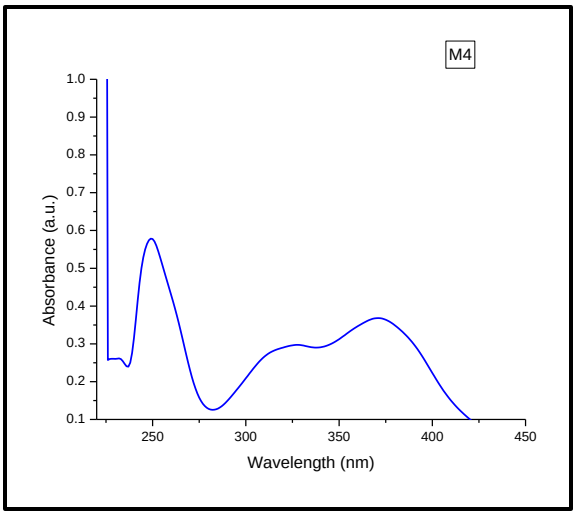

Figure: 2(b) Absorption spectra of compound M4.

RESULTS AND DISCUSSION

Optical Investigations

1. UV-VIS Spectroscopy

The solution of the title compounds are prepared by dissolving powdered compound in DMSO solvent to record the absorption spectra of compounds and are presented in **Figure 2(a)** and in **Figure2(b)**. In UV-VIS absorption spectrum of B1 compound, the two maximum absorption peaks at 258nm , 277 nm and in the spectrum of M1 compound, the three maximum absorption peaks observed about 249.31, 327.61, 370.86 nm respectively which reveal $\pi \rightarrow \pi^*$ transition. **[8-10]**

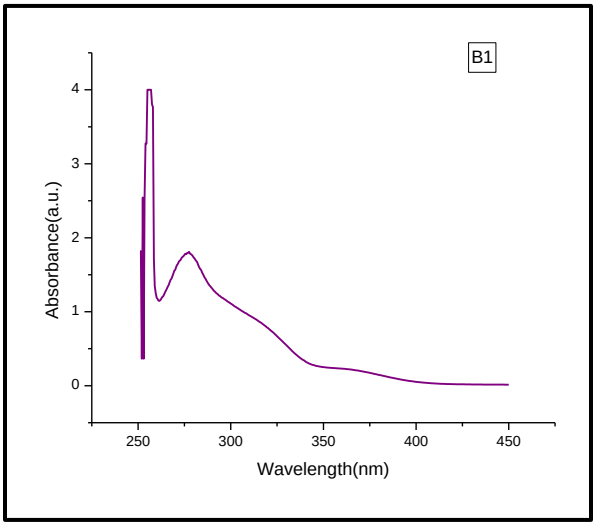

Figure: 2(a) Absorption spectra of compound B1.

2. Photoluminescence Spectroscopy

Photoluminescence (PL) spectra of ligand-metal complexes are recorded in liquid state at room temperature and are depicted in **Figure 3(a)** and in **Figure 3(b)**. An excitation state applied to B1 and M4 compounds is 300 nm. The maximum emissions found in B1 are 485 nm, 530 nm, 601 nm and that of for M4 are 486 nm, 528 nm, 600 nm respectively. The strong emission for metal complex can be assigned as ligand-to-metal charge transfer.

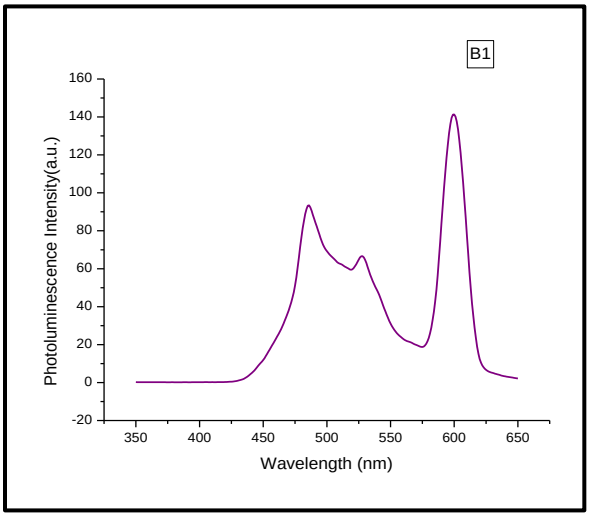

Figure: 3(a) Emission spectra of compound B1.

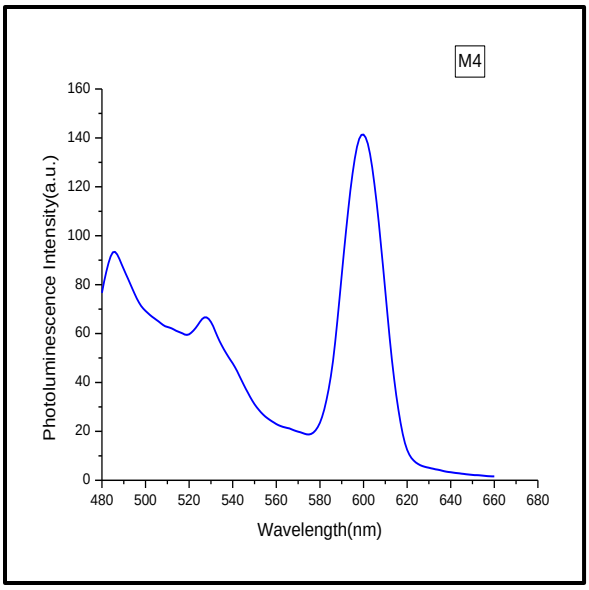

Figure: 3(b) Emission spectra of compoundM4.

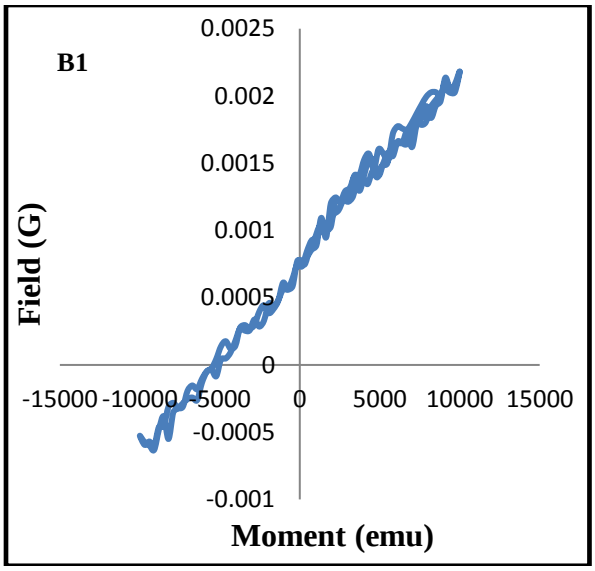

Figure: 4(a) Magnetic measurement of compound B1.

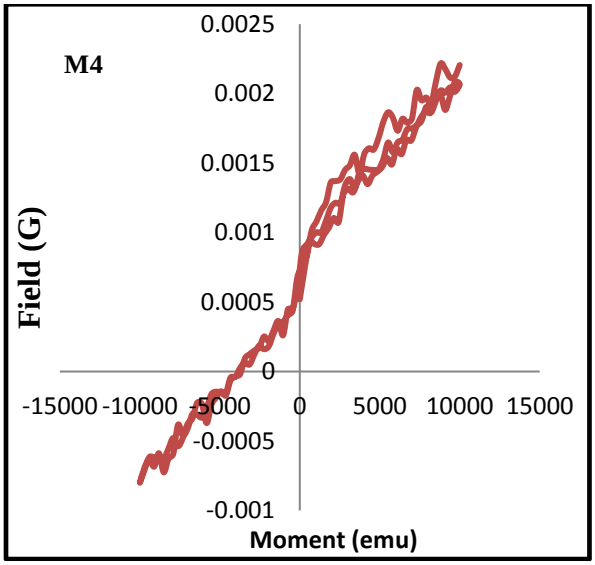

Figure: 4(b) Magnetic measurement of compound M4.

3. Magnetic Susceptibility

The Magnetic measurement of compounds B1 and M4 are shown in **Figure 4(a)** and in **Figure 4(b)** respectively**.** The magnetic behavior of the title compounds B1 and M4 are studied at room temperature (293K). The graphs have been plotted for Magnetic field (G) vs. Magnetic moment for compound B1 and M4. The slope of the graph gives magnetic susceptibility: χ = M/H. For B1 complex, slope = 1.43837×10^{-7} emu/G. The slope is positive, which reveals that the title compound B1 possesses paramagnetic property. In the metal complex B1,Cu (II) ion ($3d^9$) has one unpaired electron in the 3d shell, therefore compound is considered to have magnetic moment close to the spin-only value $1.73\mu_B$. For M4 complex, slope = 1.57404×10^{-7}emu/G. The slope is positive, which reveals that the title compound M4 possesses paramagnetic property. In the metal complex M4, Ni (II) ion ($3d^8$) has two unpaired electron in the 3d shell, therefore compound is considered to have magnetic moment close to $2.83\mu_B$.

CONCLUSION

Schiff bases are considered as a very important class of organic compounds because of their ability to form complexes with transition metal ions. The Cu (II) and Ni (II) metal complexes of (Z)-5-(methoxymethoxy)-2-(1-(phenylimino) ethyl)phenol) and (Z)-2-bromo-4-chloro-6-(1-((4-nitrophenyl)imino)ethyl)phenol derivatives are successfully synthesized. Both the metal complexes form a distorted octahedral coordination geometry connecting metal ion via oxygen and nitrogen atoms. The optical property supported by PL, reveals that both the chelates exhibit luminescence property. The value of magnetic succeptibility [χ for B1, M4 is 1.43837×10^{-7} emu/G, 1.57404×10^{-7}emu/G respectively] indicates paramagnetic behaviour

of both the metal complexes. Further study to investigate 3-D structure of both these compounds is in progress.

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