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Research Article

Synthesis, Spectral Characterization and XRD Studies of Transition Metal Complexes with Some Schiff-Base Ligands.

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ABSTRACT

The transition metal complexes of the type $[M(bpy)_2(L)]$ $(OAc)_2.(nH_2O)$ containing Schiff base ligands derived from 2-chloro ethyl amine and 2-hydroxy-4-nitro benzaldehyde were synthesized and characterized by elemental analysis, Powder XRD, UV–vis, IR, ^{1}H NMR, spectral methods. The IR and ^{1}H NMR, spectral data revealed that the ligands coordinate with the metal ions in a bidentate fashion through azomethine nitrogen and phenolic oxygen to form complexes. Elemental analysis data confirmed that the complexes have a 1:2:1 molar ratio among the metal and ligands. Powder XRD shows the sharp crystalline peaks indicating the crystalline state of the complexes.

KEYWORDS

2-chloro ethyl amine, 2, 2 – bipyridine, Transition metal complexes.

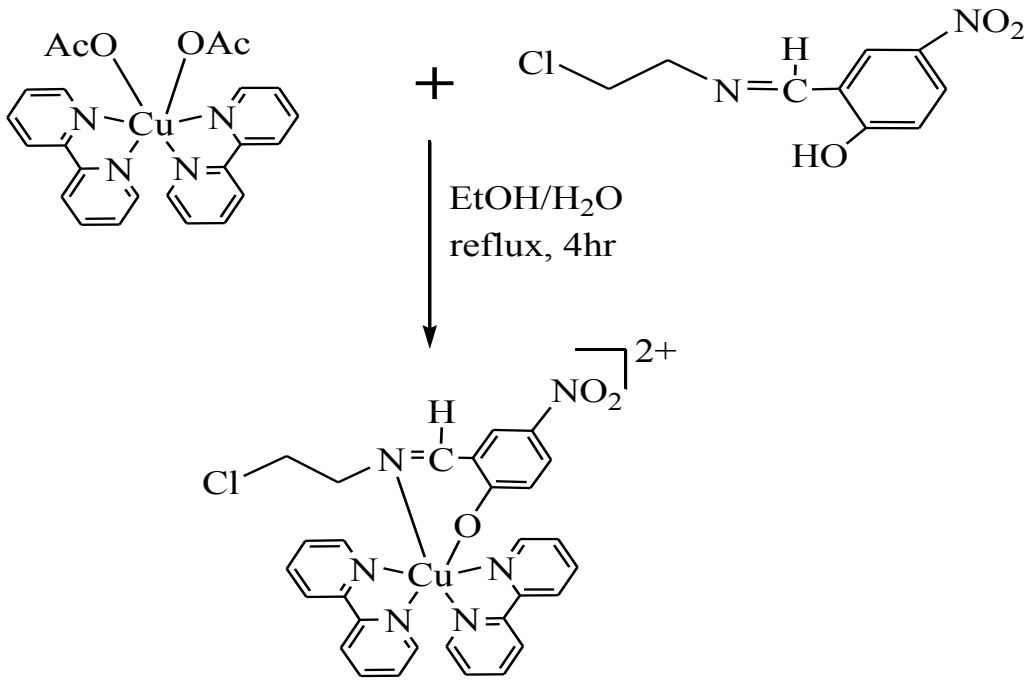
1. INTRODUCTION

Transition metal complexes of Schiff bases play an important role in coordination chemistry for analytical, physical, and biochemical purposes [1-3].A large number of Schiff bases and their complexes has been investigated for great details, such as their ability to bind oxygen, catalytic activity, photochromic properties. Transition metal Schiff base complexes are used in various fields, such as medicine, agriculture industries involved in oxygen metabolism. Transition metal complexes with 1, 10 phenanthroline and 2, 2 – bipyridine are used as new therapeutic agents, various crystallographic features and in petroleum refining. The present work deals with the synthesis of Schiff base ligand derived from 2-chloro ethyl amine and their transition metal complexes. They were characterized using analytical and various spectral techniques.

2. MATERIALS AND METHODS

2.1. Synthesis of complexes

The complexes were prepared by refluxing a solution of $[M(bpy)_2](OAc)_2.nH_2O$ and ligands(1mmols) in aqueous ethanol (20 ml) for 4h. The solid obtained were filtered, washed with ethanol and then dried as shown in (Scheme 1) [4].



Scheme 1. Synthesis of complex

3. RESULTS AND DISCUSSION

3.1. Elemental Analysis

Elemental analysis data confirmed that the complexes have a 1:2:1 molar ratio between the metal and ligands. i.e. one mole of metal acetate reacted with two moles of 2, 2 – bipyridine and one mole of ligands to give the corresponding complexes. All the complexes show the analytical results close to the theoretical values indicating the presence of two types of ligands.

3.2. IR Spectra

The IR spectrum of ligand and complex is shown in (Figures 1). The spectra of free Schiff base ligand showed the broad band at 3444cm^{-1} were due to stretching vibrations of phenolic OH. This bands was absent in the complexes, indicating de protonation on coordination. The band at 1365 cm^{-1} attributed to the phenolic C–O stretching vibrations of the free ligands was shifted to 1426 cm^{-1} upon complexation. The imine (C=N) functional group of the free ligands was observed at1658cm^{-1} was shifted to 1619cm^{-1} in the spectra of the complexes, indicating coordination of azomethine nitrogen of the Schiff base ligands to metal ion [5]. The mode of coordination of the Schiff base ligands was supported by the appearance of two new weak bands in the lower frequency region at 569cm^{-1} and 426cm^{-1}. These bands were assigned to the M–N and M–O stretching vibrations.

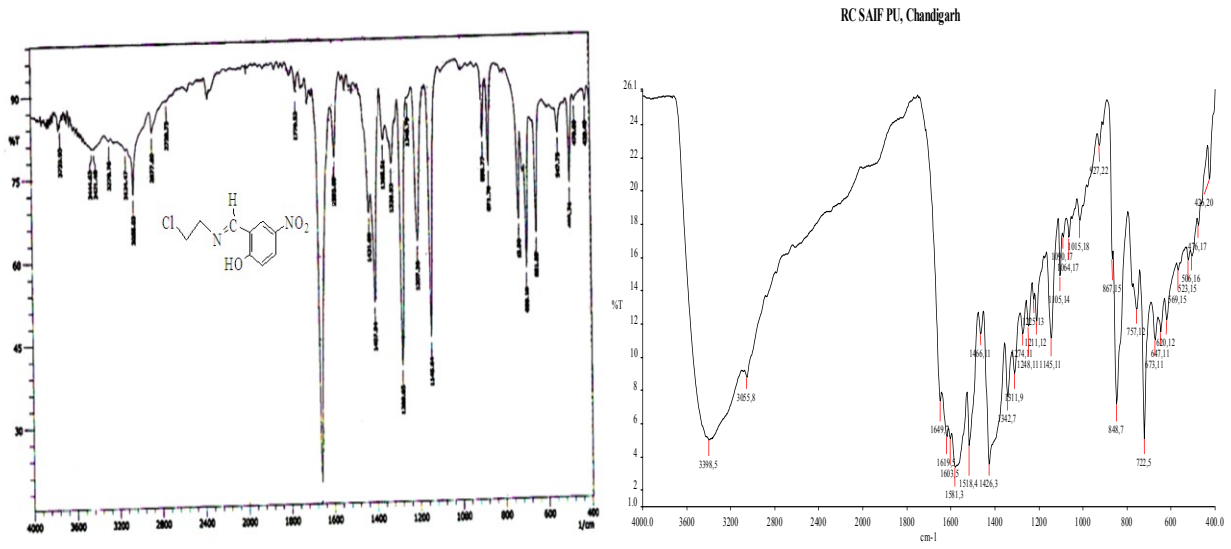


Figure 1. IR spectra of the ligand and complex

3.3. Electronic Spectra

The electronic spectra of the ligand and their Cu(II) complex were carried out in DMSO. The absorption band observed in 270–350 nm range respectively were assigned to π–π* and n–π*

transitions [6]. The bands observed at 350 nm was assigned to the π–π* transitions of the azomethine, which were shifted to 420nm in the electronic spectra of complex [7]. The bands observed at 270 nm were assigned to the π–π* transitions of the phenol indicating the Schiff base ligand is coordinating via phenolic O and the azomethine N.

3.4. Powder XRD

Powder XRD patterns of complexes show the sharp crystalline peaks indicating their crystalline phase [8,9]. The diffraction pattern of complexes is measured in the range (2θ = 0–80°) are shown in (Figure 2).

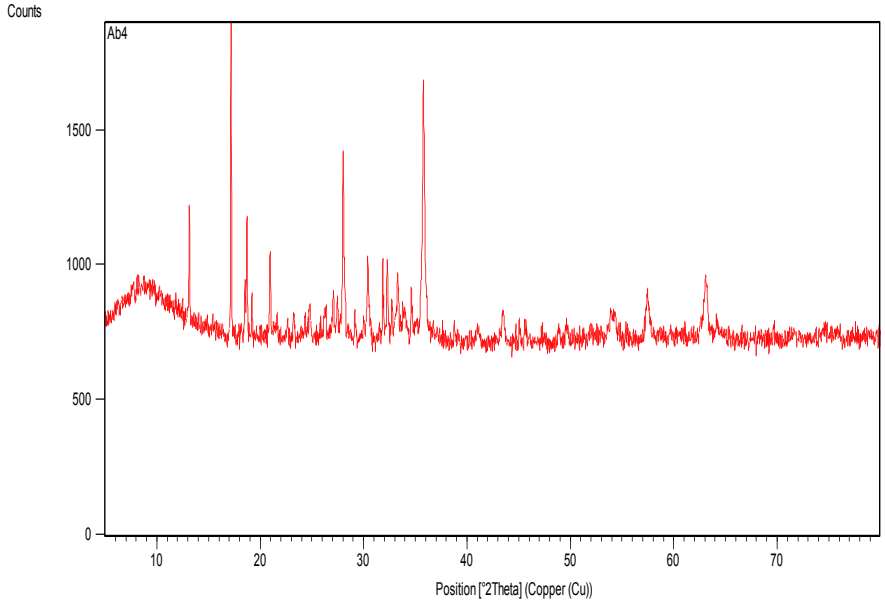


Figure 2. Powder XRD pattern of complex.

4. CONCLUSION

The transition metal complexes of the type $[M(bpy)_2(L)]$ $(OAc)_2.(nH_2O)$ containing Schiff base ligands derived from 2-chloro ethyl amine and 2-hydroxy-4-nitro benzaldehyde were synthesized and characterized. Based on the above observations of the elemental analysis, UV-Vis., IR, ^{1}H-NMRspectral data and Powder XRD it is possible to determine the type of coordination of the ligands in their complexes. Powder XRD indicates the crystalline state of the complexes.

5. REFERENCES

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