

Synthesis and Characterization of Copper (II) Complex of Glycine

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ABSTRACT

Copper(II)Complex of amino acid was synthesized by refluxing the mixtures of ethanolic solutions of glycine and copper(II)chloride. The complex compound was characterized by melting point (225°C), P^H 5.78 at 28°C, moisture content of 5% with a yield of 68%. The compound is insoluble in water but readily soluble in methanol. It has the molar conductance of $1.82 \times 10^{-6} \Omega^{-1} \text{mol/dm}^3$. The metal ion ratio to ligand is 1:2. The IR spectrum shows band observable in the complex compound indicating the coordination of the amino acetic acid (glycine) to the copper(II)ion.

INTRODUCTION

Coordination chemistry deals with the compounds formed as a result of coordinate bond formed between the central metal atom /ion and the coordinating ligand. The central metal/ion is usually transition element while the ligand is any neutral, molecule or charged ion that possesses at least a lone pair of electron.

Glycine is also known as amino acetic acid; it is colourless, sweet tasting and crystalline solid. Its molecular formula is $\text{C}_2\text{H}_5\text{NO}_2$ with molar mass of 75.07g mol^{-1} . Glycine has important properties of which include biosynthetic intermediate. It also acts as a neurotransmitter^{1,2}.

Transition elements are generally defined as elements with partially filled d orbital. Transition elements have the tendency to form coordination compounds with ligands because they usually have small atomic /

ionic size, high charge or show high oxidation state. They have vacant low energy orbital that can accommodate lone pairs of electron donated by ligands³. The variability in their oxidation states is due to their linear increase in ionization enthalpies throughout their s and d orbital^{4,5}.

The aim of this study is to synthesize copper (II) complex using glycine as the ligand.

MATERIALS AND METHODS

Synthesis of Glycine Copper (II) Complex

An aqueous solution of hydrated copper (II) chloride (0.05mol) solution was prepared and mixed with ethanolic solution of glycine (0.05mol) as the ligand. The mixture was refluxed for 3 hours. The

complex was recovered from the solution by filtration and washed with ethanol. It was dried in the desiccator and the weight was recorded. Melting point, colour, pH,

moisture content, yield, molar conductance, UV visible, and infrared spectroscopy were determined.

RESULTS

Table 1 shows the physical and chemical characteristics of the glycine Cu (II) complex.

Table 1 physical and chemical characteristics of the glycine Cu (II) complex.

| | |
|-------------------|---|
| Colour | Greenish –black |
| Melting point | 225 ⁰ C |
| p ^H | 5.78 |
| Moisture content | 5.0% |
| % yield | 68% |
| Molar conductance | 1.82 x 10 ⁻⁶ Ω ⁻¹ mol/dm ³ |

Table.2: IR spectral data of the ligand and copper (II) complex.

| Compound | V (N - H) | V(O - H) | V (C = O) | V (C - H) | V (M - L) |
|-----------------------------|-----------|----------|-----------|-----------|-----------|
| Ligand | 4685.25 | 3177.83 | 1654.01 | 1410.11 | . |
| <i>Cu (Gly)₂</i> | 4682.25 | 3177.83 | 1654.01 | 1410.11 | 746.48 |

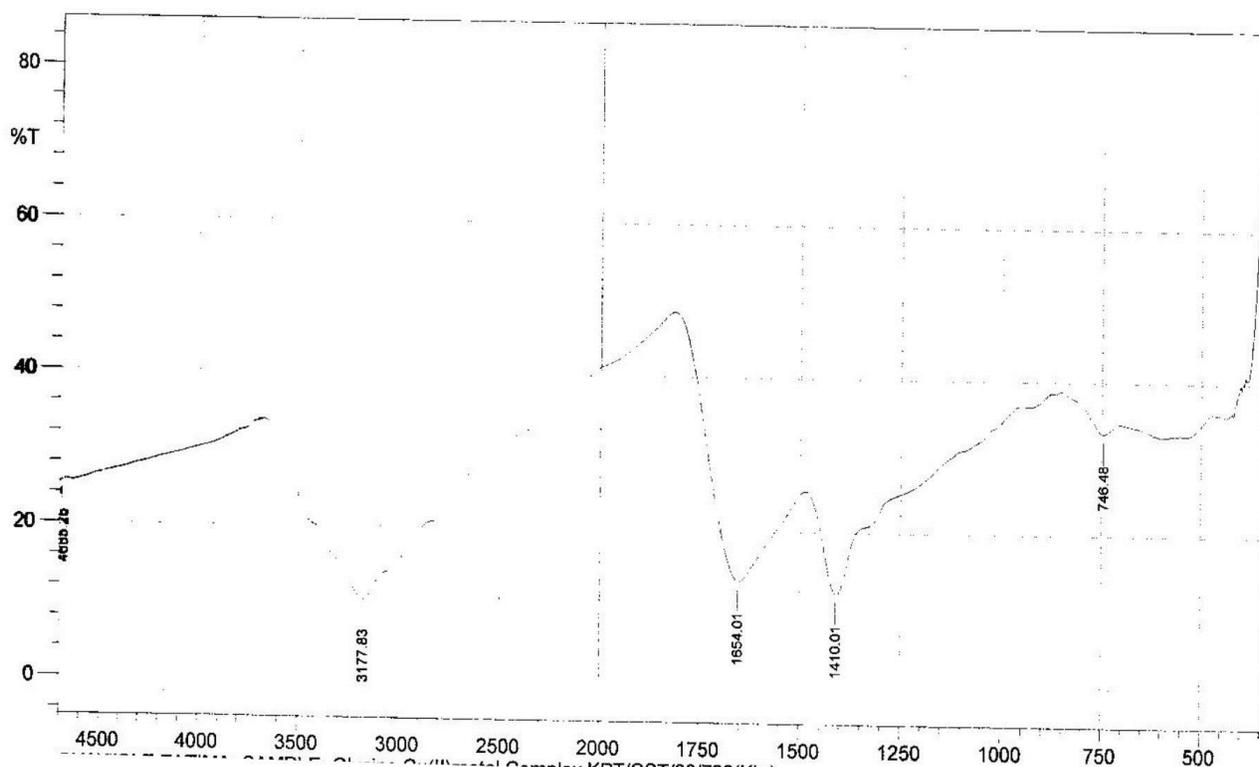


Figure 1: IR spectral of copper glycine complex

DISCUSSION

The complex obtained was greenish black in colour. The melting point of the ligand (glycine) was found to be 233°C while the melting point of the complex formed was 225°C with P^H of 5.78 at 28°C. The moisture content of the complex was 5% with a total yield of 68%. The conductivity of the complex was $1.82 \times 10^{-6} \Omega^{-1} \text{mol/dm}^3$. The characteristic functional groups present in the complex were confirmed by IR (Fig. 1). The stretching IR band was assigned to $-\text{NH}_2$ group at 4685.25 cm^{-1} . O-H group was assigned to the band at 3177.83 cm^{-1} . C=O showed a band at 1654.01 cm^{-1} . The band

1410.11 cm^{-1} was assigned to C-H and the M-L at 746.48 cm^{-1} . The Cu-N bond stretches occurred in the region $450-500 \text{ cm}^{-1}$. For the UV- spectroscopy, the wavelength of absorbance of the compound was found to be 497.00nm.

CONCLUSION

The synthesis of copper(II) complex using glycine as ligand was achieved in 68% yield and Molar conductance of $1.82 \times 10^{-6} \Omega^{-1} \text{mol/dm}^3$. The antibacterial and antifungal activities of the complex are therefore suggested for further studies.

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