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"SPECTRAL STUDIES & ANTIMICROBIAL STUDIES ON Cu(II) WITH SCHIFF BASE CONTAINING SNS DONOR LIGANDS"

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ABSTRACT

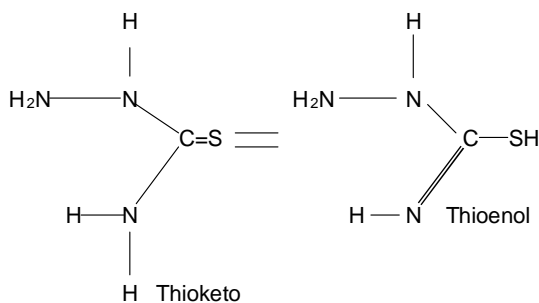
Complexes of the ligand 1,6-Dimercapto-1,6-Diamino-2,4,5-Triaza-3-Phenyl-3-Hexene with Cu(II) metal ion of composition $[ML_2]X_2$ M= Cu(II) X=Cl⁻, Br⁻, ClO₄⁻, CH₃COO⁻, NO₃⁻ have been synthesized by the condensation of metal salt with the ligand (MAAPHE) in the molar ratio 1:2 in an ethanolic medium and it is characterized by elemental analysis, molar conductivity, IR, electronic spectra and magnetic susceptibility. IR spectral data suggests that the ligand behaves as tridentate SNS donor site. The ligand complexes were treated for their antimicrobial, antifungal activities against *A. flavus* and *A. niger* by cup diffusion method. The MIC values in molar concentration ($\times 10^{-4}$) of ligand and its complexes is in the range 0.186 – 0.250. Metal complexes have been found to show an appreciable increase in their antimicrobial activities in comparison to ligand.

Keywords : Cu(II) complexes, MAAPHE, SNS Donor site, Antimicrobial.

INTRODUCTION

Metal complexes of ligands containing S and N donor atoms are known to possess antimicrobial, antifungal¹ activities due to presence of multihetero functional group². In continuation of previous work³ coordination compound with thiosemicarbazide and related ligands have received great attention due to their existence in tautomeric form.

The present paper describes the synthesis of Cu(II) complexes with SNS donor atom of ligand MAAPHE.

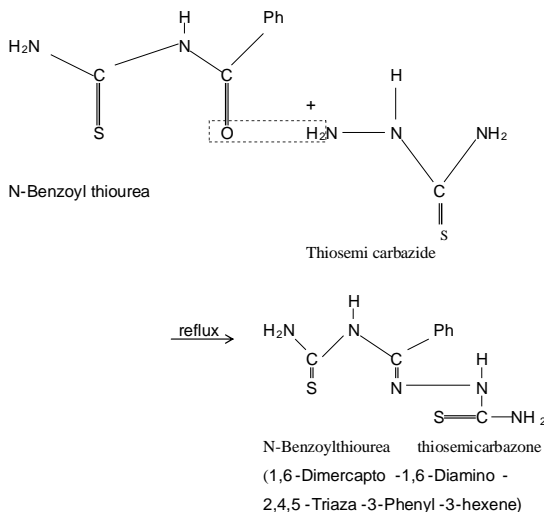


EXPERIMENTAL

All the chemicals used were of AR grade. The ligand and metal complexes were analysed according to standard methods⁴.

Preparation of the ligand

The Schiff base 1,6-Dimercapto-1,6-Diamino-2,4,5-Triaza-3-Phenyl-3-hexene (MAAPHE) was prepared by refluxing equimolar concentration of thiosemicarbazide and N-benzoyl thiourea in ethanolic medium for 5 hours. When the reaction was complete the volume of the mixture was reduced to half. On cooling the solution overnight in a refrigerator raw silky crystals separated out. The crystals were filtered and washed several times with cold ethanol. It was dried over fused CaCl₂ and analysed (m.p. = 232 ± 2°C yield = 70%) as C₉H₁₁N₅S₂.



Preparation of the complexes

The hot ethanolic solution (15 ml) of corresponding metal salt (0.01 mol) was mixed with the ligand (0.02 mol) and heated on waterbath for 3 to 4 hours. On cooling to 0°C a coloured complex separated out in each case. The same was filtered washed with 50% ethanol and dried in vacuo and analysed. In addition to this central metal atom along with the ligand various complexes also prepared by taking different salt of Cu(II) metal.

RESULTS AND DISCUSSION

The IR spectra of the ligands MAAPHE as well as the metal complexes are recorded in the region 4000-300 cm⁻¹. The ligand can coordinate with metal ions through thione sulphur and azomethine N-atom of thiourea and thiosemicarbazide moiety.

The spectra of ligand exhibits a group of strong and broad bands in the range 3400-3100 cm⁻¹ of combined mode of $\nu_{(N-H)}$, $\nu_{(S-H)}$ and ν_{NH_2} suggesting the existence of tautomeric form.

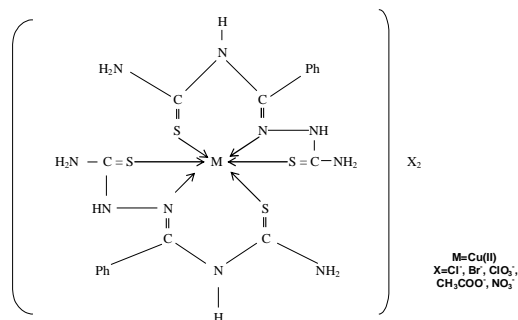
The IR spectra of ligands exhibits two strong and broad bands at 1695 cm⁻¹ and at 780 cm⁻¹ which may be assigned to $\nu_{(C=N)}$ and $\nu_{(C=S)}$ ⁵⁻⁶. These bands after complex formation go into red shift which indicates coordination may takes place through azomethine N-atom as well as thione sulphur atom of the ligand⁷⁻⁸. The $\nu_{(C=S)}$ band at 780cm⁻¹ in the ligand experiences a downward shift⁹ in the metal complexes and appears at 710-700 cm⁻¹. The bands of 950 cm⁻¹ is assigned to $\nu_{(N-N)}$ showing red shift at 925-910 cm⁻¹ after complexation. In the far infrared region new additional bands in the region 455-450 cm⁻¹ and 420-410 cm⁻¹ may be assigned to $\nu_{(M-N)}$ and $\nu_{(M-S)}$ respectively¹⁰.

The electronic spectra of all the Cu(II) complexes exhibits at broad single band spreading in the region 21000-16750 cm⁻¹ and charge transfer band in the vicinity of 26000-25400 cm⁻¹ which may be assigned to **transition** ${}^2E_g \rightarrow {}^2T_{2g}$ suggesting octahedral environment around Cu(II) complexes. The magnetic moment values of Cu(II) complexes further confirmed by the meff values in the range 1.65 to 1.78 B.M. The molar conductivity measurement in the region 120 – 127 Ohm⁻¹ cm² mol⁻¹ indicates that complexes of type [M(MAAPHE)₂]X₂ were measured in solvent found to be electrolytic in nature 1:2 type.

The antibacterial activity and antifungal activity of the ligands and its complexes (0.1 and 0.2 % per tests) were checked by S Aurus (Gram negative) and E. Coli (Gram negative); A flavus. by cup diffusion method¹¹. The **MIC values** in molar

concentration ($\times 10^{-4}$) of the ligand and its metal complexes is in the region **0.186-0.250**. The data indicate that the metal complexes are more potent in inhibiting growth of micro-organism than the ligand. Better activities of the complexes as compared to free ligand could be understood in terms of chelation theory¹².

The proposed geometry or stereochemistry of the complexes will be as follows.



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