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Effect of Biological Studies on Transition Metal Complexes of Substituted Oxazole

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Abstract – Transition metal complexes of 2-Amino-4-(p-hydroxy phenyl)-5-chloro oxazole were prepared and characterized by their elemental analysis. It shows that it form 1 : 2 (Metal : Ligand) complexes. The structure of these complexes were established by the IR, UV and magnetic studies. The fungicidal activity of these complexes were also determined by growth method on various fungi at different concentration.

Key Words : Transition Metal, Fungicidal, Magnetic

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INTRODUCTION

The chemistry and wide range of application of oxazole compounds have been reported in literature. These compounds have shown wide range of applications, they can be used as hypertensive, analgesic, anti-inflammatory, antibacterial, antiviral, anti-tubercular, anticonvulsant[6] urinary tract infection sedative, cardiac stimulant[8], antihistaminic muscle relaxant and hypotensive.

Recently Pattanayak has reported, that addition of chlorine increases the fungicidal activity, he also reported that with increase of chlorine atom in the molecule the activity increases regularly. Survey of the literature shows that few references[11-15] are available but no systematic study has been done so far so is worthwhile to study the preparation and characterization of substituted oxazole.

The present paper with the preparation of 2-Amino-4-(p-hydroxy phenyl)-5-chloro oxazole and its metal complexes. The stoichiometry of the newly synthesized complexes were established by their elemental analysis. They U.V., I.R., far I.R., magnetic measurements were carried out to establish their structure. The ligand as well as the metal complexes were screened for their fungicidal activity against various fungi at different concentration.

EXPERIMENTAL

(a) Synthesis of the ligand :

The ligand 2-Amino-4-(p-hydroxy phenyl)-5-chloro oxazole was prepared by the method reported in literature.

(b) Preparation and isolation of metal complexes :

All the complexes were prepared by mixing ethanolic solution of ligand with appropriate metal salts in the same solvent and in proper ratio. The mixed solutions were refluxed on water bath. The contents were concentrated and cooled, crystals were separated out. These crystals were filtered washed thoroughly with ethanol and dried.

RESULT AND DISCUSSION

From the elemental analysis table the stoichiometery ratio comes to be 1 : 2 except in the case of Fe (III) where it is 1 : 3.

I.R. SPECTRAL STUDIES

On comparision of the spectra of ligand with that of metal complexes it is observed that the □ (C– N) stretching frequency observed at 3450 cm^{-1} in the free ligand remains practically unchanged after complexation, they show that ring nitrogen is not taking part in complexation. The antisymmetric and symmetric □ (NH) stretching frequencies appeared in the region 3440-3400, 3340-3300 cm^{-1} in the free ligand get shifted to lower frequency after complexation. This shows that nitrogen of the amino group is taking part in complex formation. In all the complexes a band appeared in the region 375-280 cm^{-1} assigned to □ (M– O) bond. This shows that the oxygen of the oxazole ring is taking part in coordination. The characteristic band of oxazole system were observed in the region 1640-1600, 1595-1580 and 1560-1530 cm^{-1} . In the ligand as well as in all the complexes a band appeared in the region 600-500 cm^{-1}. This is due to □ (C– Cl) band.

MAGNETIC AND ELECTRONIC SPECTRAL STUDIES

Fe (III) COMPLEXES :

The magnetic moment value of Fe (III) complexes were found in the region 4.9-5.3 B.M. The electronic spectra shows bands in the region 14000-15000, 16000-17000, 24500-25500 cm^{-1} assigned to $^6A_{1g}$ $\square\square$ $^4T_1$ (^4D) ($\square_1$) $^6A_{1g}$ $\square\square$ $^4T_{1g}$ ($\square_2$) and $^6A_{1g}\square\square$ $^4A_{2g}$ ($\square_3$) transitions respectively the spectral and magnetic suggest octahedral structure of Fe (III) complexes.

Co (II) Complexes :

In the case of Co(II) nitrate, chloro and sulphato complexes bands are observed in the range 8000-8500,15000-18000, 20000-23000 cm^{-1} . These bands are assigned to $^4A_2$ (F) $\square\square$ $^4T_2$, ($\square_1$), $^4A_2$ (F) $\square\square$ $^4T_1$ ($\square_2$) and $^4A_2$ (F) $\square\square$ $^4T_1$ (P) ($\square_3$) respectively[16]. The magnetic moment value 4.0-4.42 B.M. and spectral data suggest tetrahedral structure[17]. In the acetato complexes bands are observed at 8600, 17000, 21000 cm^{-1} assigned to $^4T_{1g}$ (F) $\square\square$ $^4T_{2g}$ (F) ($\square_1$), $^4A_{2g}$ (F) ($\square_2$) and $^4T_{1g}$ (P) ($\square_3$) respectively. The magnetic moment value observed 5.0 B.M. This and the spectral studies shows into octahedral geometry.

Ni (II) COMPLEXES :

The electronic spectra of Ni(II) complexes show bands in the region 8500-9000 cm^{-1} , 14000-15750 cm^{-1} and 24050-24200 cm^{-1} characterstic of octahedral Ni(II) ion. These observed energies of three spin allowed transitions $^3A_{2g}$ $\square\square$ $^3T_{2g}$, $^3A_{2g}$ $\square\square$ $^{33}T_{1g}$ (F) and $^3A_{2g}$ $\square\square$ $^3T_{1g}$ (P) agree well with those predicted from Liehr and Ballhausen[18] energy level diagram for Ni(II) in a ligand field of octahedral symmetry. The magnetic moment value are in between 2.90-3.20 B.M. which is in support of high spin octahedral structure.

Cu (II) Complexes :

The electronic spectra of Cu(II) complexes show absorption bands in the region 15500-16000, 18500-20000 cm^{-1} assignable to $^2B_{1g}$ $\square\square$ $^2A_{1g}$ and $^2B_{1g}$ $\square\square$ ^2E_g transitions respectively. A unique peaks also obtained in all the cases around 14000 cm^{-1} this is characteristic of planar geometry. The Cu(II) complexes are paramagnetic in nature and are having magnetic moment value suggest squareplanar configuration of Cu(II) complexes.

FUNGICIDAL ACTIVITY :

The fungicidal activity of ligand and metal complexes were determined using growth method. The fungitoxicity data revealed that the ligand is more toxic than its metal complexes. The Fungitoxicity also varies from fungus to fungus as well as on the change of concentration. At higher concentration the ligand as well as the metal complexes are more toxic. The toxicity decreases with decrease of concentration.

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