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## Photochemical Characterization & Biological Properties of Some divalent metal chelates of Thiosemicarbazone Schiff Base

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Metal chelates of divalent transition metal ions have been prepared by its reaction of N-Benzoylthiourea and Thiosemicarbazide with corresponding metal(II) salt. The metal complexes have been characterized on the basis of their elemental analysis, potentiometric studies, conductance measurement and spectral studies. The complexes have been screened for their biocidal activities against bacteria staphylococusaureus, bacillus subtilis, E. coli and fungi A. niger, D. Australientis. The metal chelates were found to be potent antimicrobial agents compared to the ligands.

**Key Words:** Chelates, divalent transition metal ion, Biocidal, Schiff Base

### INTRODUCTION

Metal Complexes with Schiff base ligand containing Nitrogen sulphur donor atoms have been formed useful as potential drugs, fungicidal agents and antibacterial agents<sup>1-6</sup>.

In the recent years, immense interest has been developed in metal complexes with ligand N-S-S moieties<sup>7</sup> considering the importance of such transition metal complexes and in continuation of our work on transition metal complexes with thiosemicarbazone. In order to evaluate the microbiological importance and their biological activity were also carried out.

### EXPERIMENTAL

The ligand N-benzoyl thioureathiosemicarbazone were synthesized by refluxing equimolar concentration of ethanolic solution of N-benzoylthiourea with thiosemicarbazide. The yellowish silky crystal precipitate formed was filtered and dried over fused calcium chloride and analyzed (m.p.= 232±2°C, yield 75%) as C<sub>9</sub>H<sub>11</sub>N<sub>5</sub>S<sub>2</sub>.

The metal salt (BDH) and other solvent were reagent grade chemicals.

#### Preparation of metal complex

BTUTS (0.02 mol) was mixed with solution of respective metal salt (0.01 mol). The reacting solution was refluxed in nitrogen atmosphere on a steam bath for 2-3 hours. On cooling to 0°C, a coloured crystal obtained was filtered, washed with ethanol and recrystallized from acetone 80-81% yield was obtained. All the experimental studies showed satisfactory elemental analysis.

The bacterial activity of Schiff base and their metal complex was carried out against 24 hours culture of these selected bacteria. The organisms tested were S. acereus, E. coli, B. subtilis. The bacterial activity was performed by cup diffusion technique.

The agar cups were made by preceeded(10ml) agar medium at 50C by boring1cm thick broth culture on a plate by 10mm cork borer2-3 drops of melted agar were pipetted into it, incubated for 24 hours and zone of inhibition observed. Streptomycin was used as standard and the results obtained are in table 1.

Compound	Diameter of zone of inhibition(mm)		
	S. Aureus	B. Subtilis	E. Coli
Ligand/Metal complex			
BTUTSC	8.5	9.2	7.2
Co(II)	14.2	13.5	10.3
Ni(II)	15.0	15.2	10.8
Cu(II)	10.8	12.4	9.3

**Table 1**

All the metal complexes have been screened for their antifungal activity by Vincent method against fungi *A. Niger*, *D. Australiensis*. A suspension of spores of the test organism was produced by shaking a 3 day old culture of organism with 0.85% saline(10ml) in test tube and successive 9,8,7,6 and 5ml aliquot of the liquid medium were inoculated with one drop of the spore suspension applied by means of a pasture pipette. To the aliquot was added added and acetone solution of the compound being tested from a calibrated, sterile pasture pipette, to produce a final concentration of 10,100 and 1000ppm. The tubes were incubated at 28°C for 24 hours and percentage growth inhibited was recorded. Inhibition of the fungus growth was determined as difference in growth between the control plate and those treated with the test compounds.

## RESULTS AND DISCUSSION

The IR spectra of the ligand BTUTS as well as their metal complexes are recorded in the region 4000-300cm<sup>-1</sup>. The ligand can coordinate with metal ions through thionesulphur and azomethineN-atom of thiourea/thiosemicarbazone moiety

The IR spectra of ligand, a band observed around 1680-1695 cm<sup>-1</sup>with decreased sharpness and intensity indication the participation of azomethine nitrogen in complexation<sup>9</sup>.

Study of magnetic and electronic spectral data is quite informative in characterizing octahedral geometry of the complexes. Conductivity of the complexes of the type [M(BTUTS)<sub>2</sub>]X<sub>2</sub> were measured in the solvent DMF at the conc. 10<sup>-3</sup> m and all the complexes were found to be electrolytic in nature 1:2 type and conductivity values are in the range of 140-170 ohm<sup>-1</sup>cm<sup>2</sup>mol<sup>-1</sup>.

Antimicrobial screening data reveal that the toxicity of metal chelates has increased considerably as compared to their parent ligand against the same microorganism and under identical experimental conditions. BTUTS was found to possess better antimicrobial property due to presence of ring sulphur. On comparing the toxicity of metal chelates Ni(II) seems to better anti bacterial activity than those of Co(II) and Cu(II) chelates. Ligand was found less effective towards *E. Coli*.

On the basis of average % inhibitions observed after 24 hours all the metal complex were found to display moderate and good level of toxicity against 1000ppm but their toxicity decreased markedly on dilution at 100ppm and 10ppm.

## REFERENCES

1. H. Petering, H Buskrik , Jerim , Pharmacologist,5,271 (1963)
2. A. Lewis, R.G. Shephard, Medicinal Chemistry, Willey, New York, 431 (1970)
3. R.R. Jha& S.R. Sahu, Asian J. Chemistry, 10, 717 (1998)
4. A.Z. Halve & A. Goyal, Orient J. Chemistry, 12, 87 (1996)
5. J.J. Desai, P.G. Desai & A.G. Mehta, Asian J. Chemistry, 12, 87 (1996)
6. B.K. Rai, Asian J. Chemistry, 14, 312 (2002)
7. K.C. Satpathy& G.C. Pradhan, J. Indian Chemistry, 66, 92 (1989)
8. C.H Collins, Microbiological Method, Buttorworth, London, 364 (1974)
9. G. Varasanyi, Assignment for vibrational spectra of benzene derivative vol. II, Adam Higher London (1974)