



METAL COMPLEXES OF DITHIOCARBAMATE: PREPARATION, CHARACTERIZATION, AND ITS BIOLOGICAL ACTIVITY

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Abstract

Metal complexes of Ammonium Phenyl di-thiocarbamate from Ammonium phenyl dithiocarbamate(L¹) and Copper Chloride(M¹), Nickel Chloride(M²), Cobalt Nitrate(M³), Cadmium Chloride(M⁴), Mercurus Chloride(M⁵) are reported and characterized based on IR, NMR, In the present investigation compounds have been tested for their antibacterial and antifungal activity against Escherichia coli, Staphylococcus aureus, Candida albicans and T. mentagrophytes respectively.

Keyword : Ammonium phenyl di-thiocarbamate, metal complex, Antifungal, Antibacterial activity Escherichia coli, Staphylococcus aureus, Candida albicans and T. mentagrophytes

INTRODUCTION

Organic dithiocarbamates have attracted a great deal of importance due to their interesting chemistry and wide utility. [1-7] Organic dithiocarbamates are valuable synthetic intermediates, 8 which are ubiquitously found in a variety of biologically active compounds. Functionalization of the carbamate moiety offers an attractive method for the generation of derivatives, which may constitute interesting medicinal and biological properties. [9] Dithiocarbamates are also widely used in medicinal chemistry and have found application in the treatment of cancer [10] and have been tested in clinical trials for various indications including HIV. [11-14]. Organic dithiocarbamates are valuable synthetic intermediates [15] which are ubiquitously found in a variety of biologically active compounds. Functionalization of the carbamate moiety offers an attractive method for the generation of derivatives, which may constitute interesting medicinal and biological properties [16]

METHOD OF PREPARATION

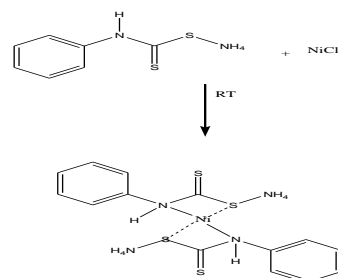
A] Preparation of complexes of ammonium phenyl dithiocarbamate :

1] Nickel complex

1M ammonium phenyl dithiocarbamate and 1M nickel chloride solution heated with each other for an hour, complex is formed.

Structure :

Complex of Ammonium phenyl dithiocarbamate with Ni metal ion

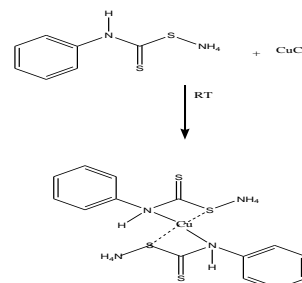


II] Copper Complex

1M ammonium phenyl dithiocarbamate and 1M copper chloride solution heated for an hour, complex is formed.

Structure :

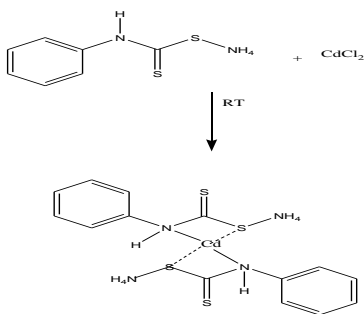
Complex of Ammonium phenyl dithiocarbamate with Cu metal ion



3] Cadmium Complex

1M ammonium phenyl dithiocarbamate and 1M cadmium nitrate solution heated for an hour, complex is formed.

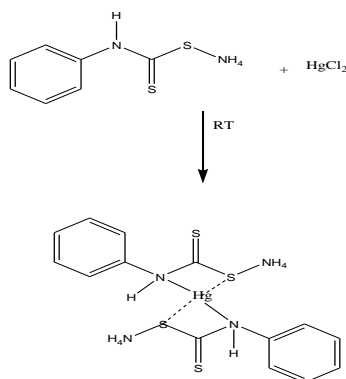
Complex of Ammonium phenyl dithiocarbamate with Cd metal ion



IV] Mercuruscomplex

1M ammonium phenyl dithiocarbamate and 1M Mercurus chloride solution are mixed with each other, complex is formed.

Complex of Ammonium phenyl dithiocarbamate with Hg metal ion



RESULT AND DISCUSSION

The reaction of ammonium phenyl thiocarbamate act as ligand and metal like Copper Chloride(M¹), Nickel Chloride(M²), Cobalt Nitrate(M³), Cadmium Chloride(M⁴), Mercurus Chloride(M⁵) gives complexes and IR, 1H NMR elemental analysis (Table-1) as show bellow

Spectral data :

Nickel Complex :

H-NMR spectrum analysis of Complex of Ni²⁺ showed the presence of following peaks. The chemical shift can be correlated as shown below in table (1)

IR VALUE :

n 3398 cm⁻¹ (N-H), 1633cm⁻¹ (C=S) , 1450 cm⁻¹ (C-N), 757 cm⁻¹ (C-S), 697 cm⁻¹ (Ni-N) and NMR data as bellow :

Table-1:

Sr. No.	Signal Position (δ-ppm)	Relative No. of H- atom	Multiplicity	Assignment
1	7.2	10	S	Ar-H
2	3.8	2	d	-NH
3	9.8	8	S	-NH ₄

Spectral data

Copper complex

H-NMR spectrum analysis of Complex of Cu²⁺ showed the presence of following peaks. The chemical shift can be correlated as shown below in table No. 2

IR DATA :

3204 cm⁻¹ (N-H), 1593cm⁻¹ (C=S) , 1450 cm⁻¹ (C-N), 756 cm⁻¹ (C-S), 691 cm⁻¹ (Cu-N) and NMR data as bellow in table 2

Table-2:

Sr. No.	Signal Position (δ-ppm)	Relative No. of H- atom	Multiplicity	Assignment
1	7.4	10	S	Ar-H
2	4.2	2	d	-NH
3	9.87	8	S	-NH ₄

Spectral data

Mercury complex

H-NMR spectrum analysis of Complex of Hg²⁺ showed the presence of following peaks.

IR VALUE:

3201 cm⁻¹ (N-H), 1546cm⁻¹ (C=S) , 1403 cm⁻¹ (C-N), 756 cm⁻¹ (C-S), 696 cm⁻¹ (Hg-N) and NMR data as bellow in Table No

Table-3:

Sr. No.	Signal Position (δ-ppm)	Relative No. of H- atom	Multiplicity	Assignment
1	7.4	1	S	Ar-H
2	4.4	1	d	-NH
3	10.3	4	S	-NH ₄

Cadmium complex

H-NMR spectrum analysis of Complex of Cd²⁺ showed the presence of following peaks. The chemical shift can be correlated as shown below. Table No .4

IR VALUE:

3245 cm⁻¹ (N-H), 1598cm⁻¹ (C=S) , 1498 cm⁻¹ (C-N), 758cm⁻¹ (C-S), 689 cm⁻¹ (Cd-N) and NMR data as bellow in table No.4

Table- 4:

Sr. No.	Signal Position (δ-ppm)	Relative No. of H- atom	Multiplicity	Assignment
1	7.6	1	S	Ar-H
2	3.9	1	d	-NH
3	9.87	4	S	-NH ₄

On the basis of elemental analysis and spectral data the molecular formula of Ni²⁺, Cu²⁺, Hg²⁺, Cd²⁺ was established as , C₁₄ H₂₀ N₄ S₄ M

The M.P.recorded in the

Table-5:

A)Metal Complex (Ammonium phenyl dithiocarbamate)	Melting Point
Copper complex	112 ⁰ C
Nickel chloride	108 ⁰ C
Cadmium complex	110 ⁰ C
Mercurus complex	105 ⁰ C

Microbial activity

All the compounds have been screened for both antimicrobial using cup plate agar diffusion method[17-20] by measuring the inhibition zone in mm. The compounds were taken at a concentration of 1 mg/ml using DMF. as solvent. The compounds were screen for antibacterial activity against *Escherichia coli*, *Staphylococcus aureus*, and antifungal activity against *Candida albican* & *T. mentagrophyts* in nutrient agar medium. The results are presented in Table-6

From the observation ,Nickel complex and copper complex show significant activity against *P. aeruginosa* and *E.Coli*. Cobalt complex show significant activity against *S.aureus*. Nickel complex show significant activity against *Candida albican* than *Tmentagrophyts*. Copper and cobalt complex also show excellent activity against *Candida albicans* as shown bellow.

Table-6: Antimicrobial activities of Metal Complexes of Ammonium phenyl dithiocarbamate

Compound	Antibacterial (mm)		Antifungal (mm)	
	E.Coli	S.aureus	Candida albicans	T.mentagr ophyts
Nickel complex	19	15	24	14
Copper complex	16	16	23	16
Mercury complex	12	14	13	12
Cadmium complex	10	15	14	11

CONCLUSION

The new series complex of ammonium phenyl di thiocarbamates were synthesized by utilizing a simple and efficient method in good yields. The structures assigned have been supported by adequate spectral data. The results of antimicrobial activity revealed that of the compounds exhibited prominent activity against the bacteria *E.coli* and *S.aureus*, and fungi *Candida albican* and *T.mentagrophyts*

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