International Journal of Advance Research in Science and Engineering
Vol. No.9, Issue No. 09, September 2020
www.ijarse.com
IJARSE
ISSN 2319 - 8354

# “Synthesis, Characterization and Biological Activity of Complexes of Ligand with Transition metals”

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## Abstract

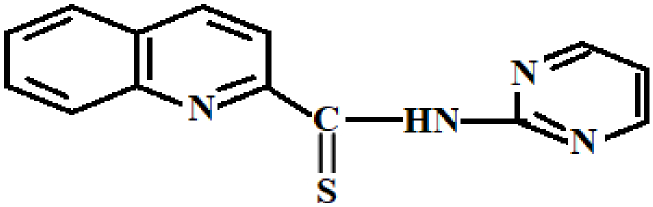
*The transition metal complexes of Fe(II), Co(II), Ni(II), Cu(II) and Zn(II) with the substance N-(2-Pyrimidyl) quinoline-2-thiocarboxamide (L) were synthesized. The complexes were characterised by elemental analyses, metal content, chemical analysis ways (IR, UV-vis), physical phenomenon and condition measurements and by thermal studies. According to all this data, we tend to propose associate octahedral geometry for Fe(II) and Co(II) complexes, a square-planar geometry for Ni(II) and Cu(II) complexes and a tetrahedral geometry for Zn(II) complex. The biological activity of the substance and its complexes was studied against hand-picked microorganism escherichia and cocci aureus. it absolutely was found that each one the complexes square measure biological active and show higher activity than the free ligand.*

***Key words: Transition metal complexes, Biological activity,bivalent substance.***

## INTRODUCTION

All these facts inspire our interest within the complicated compounds with these heterocyclic ligands. Here we tend to report the synthesis, characterization and biological activities of Fe(II), Co(II), Ni(II), Cu(II) and Zn(II) with the N-(2-Pyrimidyl) quinoline-2-thiocarboxamide (L).

The structure of the N-(2-Pyrimidyl) quinoline-2-thiocarboxamide could also be diagrammatic as below.



The chemistry of thiocarboxamides and their derivatives continues to be of interest because of their attention-grabbing structural options and conjointly because of their biological importance. The synthesis of various heterocyclic compounds like alkali,α,β and γ-Picoline,thiadiazoles, quinoline, etc . owing to their versatile properties, thiocarboamides square measure utilized in rubber processing as accelerators, as inhibitors of metal corrosion, and in electroplating industries as polyolefin stabilizers. The thiocarboxamide derivatives have shown important activities like antituberculosis drug, growth activity, anthelmintic activity, gland disease activity; central systema nervosum depressant etc.

## EXPERIMENTAL

### *Material and Methods*

All the chemical and solvents used for the synthesis were of analytical grade.

### Synthesis of Ligand :

The substance N-(2-Pyrimidyl) quinoline-2-thiocarboxamide were ready victimization Willgerdot reaction.Quinaldine and 2-aminopyrimidine were distilled merchandise and sulphur was of conjointly pure from 2-amino –pyrimidine ,quinaldine and sulphur were mixed in an exceedingly two hundred ml flask fitted with water condenser.The mixture was refluxed at 160°C for ten hours on a sand tub maintained tempareture between 165-175°C. The mixture was left over night. The solid brown crystals obtained were filtered and recrystallised doubly with fermentation alcohol.The buff compounds were obtained, dried in vaccum,the freezing point of the required product were found to be 135-142°C.

### Synthesis of the complexes

The metal complexes were ready by an equivalent general method: metal chloride bromide (0.021 mole) dissolved in forty cubic centimetre ethyl alcohol was slowly additional to substance (0.02 mole) dissolved in propanone (50 ml) .The content was treated with a number of drop of NH4OH Associate in Nursingd refluxed on steam tub for half an hour. The green precipitate separated on diluting the answer with water.It was filtered ,washed with binary compound ethyl alcohol and dried in desicator over CaCl2.

## RESULTS AND DISCUSSION

The complexes obtained area unit crystalline diversely colored powders, whose melting points area unit above that of the free substance. The results of elemental analysis (C,H,N and S) and also the metal contents beside chemical formula and melting points of the thiocarboxamide. The molar electrical physical phenomenon showed that Fe(II),Co(II) and Ni(II) complexes area unit non electrolytes whereas Zn(II) complexes area unit electrolytes.

### Colour and elemental analysis for the ligand and its Fe$^{(II)}$,Co$^{(II)}$,Ni$^{(II)}$,Zn$^{(II)}$ and Cu$^{(II)}$ complexes

| S.N | Compound | Colour | Analysis Found(cal) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Metal | Carbon | Hydrogen | Nitrogen | Sulphur | Chloride |
| 1. | $[Fe(C_{14}H_{10}N_4S)Cl_3]$ | Brown | 13.02<br>(13.03 | 39.22<br>(39.24) | 2.32<br>(2.33) | 13.07<br>(13.08) | 7.46<br>(7.47) | 24.86<br>(24.87) |
| 2. | $[Co(C_{14}H_{10}N_4S)Cl_2.H_2O]2H_2O$ | Brown | 13.08<br>(13.09) | 37.34<br>(37.37) | 3.54<br>(3.55) | 12.44<br>(12.46) | 7.10<br>(7.11) | 15.77<br>(15.78) |
| 3. | $[Ni(C_{14}H_{10}N_4S)Cl_2.H_2O]2H_2O$ | Yellowish brown | 13.04<br>(13.05) | 37.35<br>(37.37) | 3.54<br>(3.55) | 12.45<br>(12.48) | 7.10<br>(7.11) | 15.78<br>(15.76) |
| 4. | $[Zn(C_{14}H_{10}N_4S)Cl]Cl$ | Yellow | 16.24<br>(16.26) | 41.71<br>(41.75) | 2.45<br>(2.48) | 13.90<br>(13.91) | 7.93<br>(7.95) | 17.62<br>(17.64) |
| 5. | $[Cu(C_{14}H_{10}N_4S)Cl_2.H_2O]2H_2O$ | Yellowish Green | 13.96<br>(13.98) | 3.96<br>(39.97) | 3.52<br>(3.53) | 12.32<br>(12.33) | 7.04<br>(7.05) | 15.61<br>(15.62) |

## IR spectra

The data of the IR spectra of complexes were compared with those of the free matter so as to see the donor atoms that will be involve in co-ordination.The thiocarboxamide forms a posh wave cluster with four characteristic bands within the 1600 - 600 cm-1 .In the spectrum of the free matter the band at 3260 cm-1 characteristic for N-H and at 1560 cm-1 allotted to N-H seem within the spectra of the complexes at lower frequencies.N-H bands stay nearly an equivalent in each spectra of matter and complexes . This means the N-H remains infact and will share in evolisation throughout co-ordination i.e. c=s cluster stay infact and participate in co-ordination.This is confirmed by the very fact that c=s band position shifts to lower oftenness by 25-30 cm-1.Thus shifting to lower frequency is attributed to co-ordination of matter to metal particle through Thione sulphur.

In the spectra of complexes a replacement band seems 280± 10.which is appointed to M-o vibrations and this conjointly suggests the co-ordination of thione sulphur.The band showing 2950±5 in complexes containing water in co-ordination/lattice is appointed thanks to –OH absorption. In the spectra of carboxylato complexes a band seems 1640±5 that appointed to (c=o) vibrations. Therefore, it's terminated that N-(2-Pyrimidyl) quinoline-2-thiocarboxamide behaves as a rough matter altogether the complexes which the coordination takes place at the sulphur and nitrogen atoms of the thiocarboxamidegroup.

## Magnetic moment and UV-Vis spectra

Electronic spectra and magnetic measurements were performed so as to get data concerning the pure mathematics of the complexes.

`The μeff values of Co(II) and Ni(II) complexes were found to be five.20and 3.05, indicating AN octahedral pure mathematics round the metal ions and 1.96 B.M.for Cu(II) complicated severally, indicating a distorted octahedral pure mathematics.

The electronic spectrum of Co(II) sophisticated showed bands at 10520 and 19230 cm-1 transferrable to 4T1g(F) → 4T2g(F), and 4T2g(F) → 4T1g(P) transitions, severally, that unit of measurement characteristic to

Ni(II) sophisticated exhibited a pair of transitions at 18800 and 21200 cm-1 transferrable to 1A1g → 1A2g, and 1A1g → 1B1g transitions, severally, that correspond to the octahedral maths.

The UV-Vis spectrum of Cu(II) sophisticated displays a broad band at 18691 cm-1 due to due to 2A1g transition, that favours the distorted octahedral maths around the central antimonial particle.

Zn (II) sophisticated presents no physical phenomenon at intervals the visible domain.

usually|this can be} often in agreement with the electronic structure of the central antimonial particle with a d10 electronic configuration, that the crystal theory does not predict the presence

The absorption bands, that appear at intervals the electromagnetic radiation domain, unit of measurement thought of to be characteristic to the matter.

## Biological activity

The biological activity of the thioamide and its metal complexes with the quality (streptomycin), the subsequent results were obtained: the biological activity of the thioamide was but that of streptomycin; the biological activity of the metal complicatedes was over that of the free substance and therefore the biological activity of the Fe(II) complex was capable that of normal, whereas the biological activity of the opposite metal complexes was but that of the standard; the biological activity of the complexes follows the order:

Fe(II)>Co(II)=Ni(II)=Cu(II)>Zn(II)

## CONCLUSIONS

The transition metal complexes with a thiocarboxamide matter N-(2-pyrimidyl)-quinoline2 thioamide (L) were ready in environmentally benign manner and characterised. The IR spectra indicate particle that the matter acts in rough fashion by bonding to the central metal through the element and sulphur atoms. Electronic spectra and magnetic measurements gave info concerning the octahedral pure mathematics of the Co(II) and Ni(II) advancedes and Cu(II) complex have a distorted octahedral pure mathematics. The biological activity of all the complexes is on top of that of the free thiocarboxamide matter and follow the order: Cu(II) > Ni( II) > Co(II) > matter.

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