Preparation and characterization of complexes of 2-(Thiophene-2-Formylimino)-Sulphanilamido Pyrimidine with Nitrates of Divalent Transition metals

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Abstract:

The analysis of various transition metal complexes in understanding many biochemical processes is vital and hence it is necessary to study the importance of metal complexes. Metal complexes are not only used in anticancer drugs, antimicrobial and antiviral agents but also in the treatment of arthritis and inflammation also.
As analysis of various transition metal complexes is very important ,the present paper deals with the preparation and characterization of 2-(Thiophene-2-formylimino) sulphanilamido pyrimidine with nitrates of Mn(//) Co (//), Ni (//), Cu ((//)) and Zn ((//))

Key words: Metal complexes, octahedral, diamagnetic

It is well known fact that the activity of the drugs is increased when applied in the form of metal complexes[1-,2]. The study of various transition metal complexes as model for understanding many biochemical process requiring metal atoms is very much interesting[3-4]. It has been stressed the need for the study the importance of metal complexes[5-6].

Metal complexes play a vital role in the metabolic and toxicological functions in a biological system[7-8]. Metal complexes are used as anticancer drugs[9] antimicrobial and antiviral agents[10] and in the treatment of arthritis and inflammation.[11]

Transition metals and their complexes have attracted the interest of many workers due to their inherent bio-potency [12-14], striking structural aspect and unique stereo and magneto chemistry [15] Metal complexes with mutlidentate ligands evoked a lot of interest in recent years[16-19]

Among the organic chelating ligands azomethines are increasingly becoming important day by day because a large number of such compounds and their metal chelates possess appreciable antibacterial, fungicidal antituberclostic and anti-cancerous activities [20-24]. Several such compounds are used in medicine, industry, biochemistry and laboratory research

A large number of heterocyclic compounds are frequently used as chemotherapeutic agents and drug. Among the heterocycles furan, pyrrole and thiophene compounds containing azomethine grouping have been proved as better antibacterial agent.[24] Amines containing sulfone grouping have also been found of immense value as strong antibactrial agent

PEPARATION OF THE COMPLEXES

All the complexes were prepared by taking 0.002 mol of the ligand (a slight excess than the required amount) dissolved in 25ml of alcohol and 0.002 mol of the respective nitrates of the metal Mn(//) Co (//), Ni (//), Cu ((//)) and Zn ((//))dissolved in 25ml of alcohol and .002 mol of Alcohol were mixed together and refluxed for an hour. The reaction mixture was concentrated approximately half of the total volume and then cooled at ice temperature .Different coloured precipitate of the complexes of respective meals were obtained. The precipitates were filtered washed with ice cooled ethanol and dried in vacuum.

Elemental analysis :

Elemental analysis, colour and MP are shown in the table no1

Table 1

Analytical data of the Complexes of 2-(Thiophene-2-formylimine))-Sulphanilamido pyrimidine with the nitrates of Divalent Mn, Co, Ni, Cu and Zn.

Molecular formula	Colour	m.p.°C	Elemental analysis (%) calculated/observed				
			C	H	N	S	M
$[Mn\ L(NO_3)_2]_2$	Buff	230	34.41 34.43	2.30 2.32	16.05 16.10	12.24 12.26	10.49 10.50
$[CoL\ (NO_3)_2]_2$	Pink	234	34.16 34.20	2.29 2.30	15.93 15.96	12.15 12.18	11.17 11.18
$[NiL\ (NO_3)_2]_2$	Green	236	34.17 34.20	2.29 2.30	15.94 15.96	12.16 12.18	11.13 11.20
$[CuL\ (NO_3)_2]_2$	Green	238	33.85 33.86	2.27 2.28	15.79 15.80	12.04 12.06	11.93 11.96
$[ZnL\ (NO_3)_2]_2$	White	238	33.74 33.76	2.26 2.28	15.74 15.76	12.00 12.02	12.24 12.20

L= $C_{15}H_{12}N_4S_2O_2$

RESULTS AND DISCUSSION

The ligand and the complexes have been found stable in air at room, Elemental analysis data shows that in all the complexes metal ligand ratio is 1:1

Low molar conductivity in all the cases shows the absence of free anions. This shows that the anions have entered into the coordination sphere during the complex formation.

Table no2: Infrared spectral studies

Pertinent IR Frequencies in cm^{-1} of metal –nitrate-L-COMPLEXES

LIGAND	Mn-COMPLEX	CO-COMPLEX	Ni-COMPLEX	Cu-COMPLEX	Zn-COMPLEX	ASSIGNMENT
890(s)	870	875	875	855	890	Thiophene ring sulphur stretching vibrations
700(s)	660	680	675	675	685	
1610(s)	1580	1570	1570	1590	1590	$u_{c=N}$ azomethine stretching vibration
1290(m)	1290(w)	-1295(w)	-1292	1288(m)	-1290(w)	u_s sulphone group stretching vibration
1125(m)	1120(w)	-1120(w)	1128(w)	1122(w)	-1120	u_{as} sulphoe group streching vibration
	465	450	425	445	450	u_{M-N} stretching vibration
	375	365	380	395	355	u_{M-S} stretching vibration
	175	180	175	160	175	u_{M-NO3} stretching vibration

L=2-(Thiophene-2 formylimino)-Sulphanilamido pyrimidine

Comparison of the IR spectra of the ligand with that of its complexes indicates that the azomethine C=N frequency of the ligand have been shifted by 15-20 cm towards negative side indicating the participation of C=N nitrogen in the coordination.

The Ring sulphur stretching vibration of the thiophene ring have been found in all the complexes invariably shifted towards negative side by 20-35 cm, thus confirming the coordination of ring sulphur to metal in nitrato complexes the separation between, and v_4 and v_1 frequencies has been observed to the range 165-180 cm^{-1} .This confirms the coordination of nitrate ion as unidentate anion.

MAGNETIC MOMENTS AND ELECTRONIC SPECTRAL STUDIES

Table no3

Magnetic moment, Electronic Transitions and Ligand field Parameter of the metal –nitrate-L-Complexes

COMPLEXES	MAGNETIC MOMENT(μ_{eff}) B.M.	BANDS	ASSIGNMENT	10 Dq	B	u_2/u_1
Mn-complex	3.95	17800	$^4T_{1g}(G)$-----$^6A_{1g}(U_1)$	8158.33	741.66 (960.00)*	1.31
		23350	$^4T_{1g}(G)$-----$^6A_{1g}(U_2)$			
		24290	$^4E(G)$---- $^6A_{1g}$			
		27120	$^4T_{2g}(G)$---- $^4A_{1g}$			
Co-complex	2.90	8660	$^4T_{2g}(F)$-----$^4A_{1g}(F)(U_1)$	10138.53	1056.09 (1120.00)	2.08
		18050	$^4A_{2g}(F)$-----$^4A_{1g}(F)(U_2)$			
		19450	$^4T_{1g}(T)$-----$^4T_{1g}(F)$			
Ni-complex	2.60	8600	$^3T_{2g}(F)$-----$^3A_{2g}(U_1)$	8600.00	877.55 (1040.00)	2.18
		18820	$^3T_{1g}(P)$-----$^3A_{2g}(U_2)$			
Cu-complex	1.30	13200	$^2T_{2g}$-----^2E_g			

* Free ion B values.

As per table no3, it is clear that in nitrato complexes low value of magnetic moments indicate the formation of bi nuclear complexes

The observed magnetic moment value and the assignment suggest the formation of high spin octahedral complexes.

CONCLUSION : The complexes thus formed are binuclear high spin free octahedral complexes .The studies support absence of unpaired electrons thus confirming diamagnetic nature of complexes .

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