STUDIES ON METAL CHELATES OF 5, 7-DI-IODO, 8-HYDROXY QUINOLINO-4-(*p*-TOLYL) SULPHONAMIDE AS POTENTIAL DRUGS

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ABSTRACT

Complexes of Fe(III , Co(II), Ni(II), Cu(II) and Zn(II) with 5, 7-Di-iodo, 8-hydroxy quinolino-4-(*p*-tolyl) sulphonamide (DIHQTS) have been synthesized and characterized by elemental analysis, I.R. spectra and magnetic susceptibility measurements. All the complexes were found to be active against *S. aureus, S. typhii, S. comma* and *E. coli.*

INTRODUCTION

QUINOLINE and *p*-toluene sulphonamide have long been used for their medicinal properties. Some of the sulphonamides were also reported as drugs for the diseases like Cancer[1], Tuberculosis[2], Diabetes[3], *Malaris*[4], *Leprosy*[5] *and Convulsant*[6]. *Keeping in view* the authors have prepared the DIHQTS[7] which was found to be active against *S. aureus, S. typhii, S. comma* and *E. coli.*

At the same time the DIHQTS was also found to be a good chelating agent and hence its metal chelates are synthesized with a view to test the change in antibacterial activity on complexation.

EXPERIMENTAL

All chemicals employed were of AnalaR grade and recrystallized. The preparation of DIHQTS has already been reported by the same authors[7].

The ligand-metal ratio was determined by conductometric titration and Job's method of continuous variation which showed 2 : 1 complexation, however in case of Fe(III) complex the ligand-metal ratio is 3 : 1.

Isolation of Complexes

DIHQTS was dissolved in warm distilled water and was then treated with an appropriate amount of metal salt solutions in distilled water at a pH ranging from 8–9. The pH was maintained by using a solution of 8·50 ml to 21·30 ml of 0·1 N NaOH and 50 ml of 0·1 M $H_3H_3BO_3$. The resulting precipitate of the complex was filtered, washed with hot distilled water and dried.

The complexes thus formed are insoluble in all common organic solvents but found to be soluble in 50% acetic acid.

Analyses

Copper was estimated iodometrically nickel was estimated with dimethyl glyoxime and cobalt as tetrapyridine cobalt dithio-cyanate after removing the ligand. Iron and zinc were also estimated by standard methods. Nitrogen was estimated by modified Kjeldahl procedure[8] and sulfur by modified Messenger's method[9].

Magnetic Properties

Copper chelate has a value of 1·81 B.M. characteristic of a planar configuration with a hybrid dsp^2 bonds. The nickel and cobalt chelates give moment values of 2·98 and 1·76 B.M. respectively. The ferric and zinc chelates give moment values of 5·5 and 4·30 B.M. respectively. This suggests the formation of weak dsp^2 bonds *resonating with ionic ones.*

RESULTS AND DISCUSSIONS

The results of analyses and physical properties are recorded in Table I.

TABLE I

Compound	Composition	Colour	% N		% S		% Metal		μ eff. B.M.
			Calcd.	Found	Calcd.	Found	Calcd.	Found	
Fe–DIHQTS	Fe $(C_{16}H_{11}SN_2O_3I_2)_3$	Red	4·79	4·76	5·48	5·50	3·18	3·20	5·5
Co–DIHQTS	Co $(C_{16}H_{11}SN_2O_3I_2)_2$	Green	4·70	4·74	5·38	5·39	4·96	5·00	1·76
Ni–DIHQTS	Ni $(C_{16}H_{11}SN_2O_3I_2)_2$	Green	4·71	4·74	5·38	5·51	4·93	4·99	2·98
Cu–DIHQTS	Cu $(C_{16}H_{11}SN_2O_3I_2)_2$	Blue	4·69	4·50	5·36	5·38	5·32	5·33	1·81
Zn–DIHQTS	Zn $(C_{16}H_{11}SN_2O_3I_2)_2$	Grey	4·68	4·56	5·35	5·39	5·47	5·45	4·30

The analytical data given in Table I show that DIHQTS forms 2 : 1 coplexes with cobalt nickel, copper and zinc metal ions. However it forms 3 : 1 complexes with ferric metal ions.

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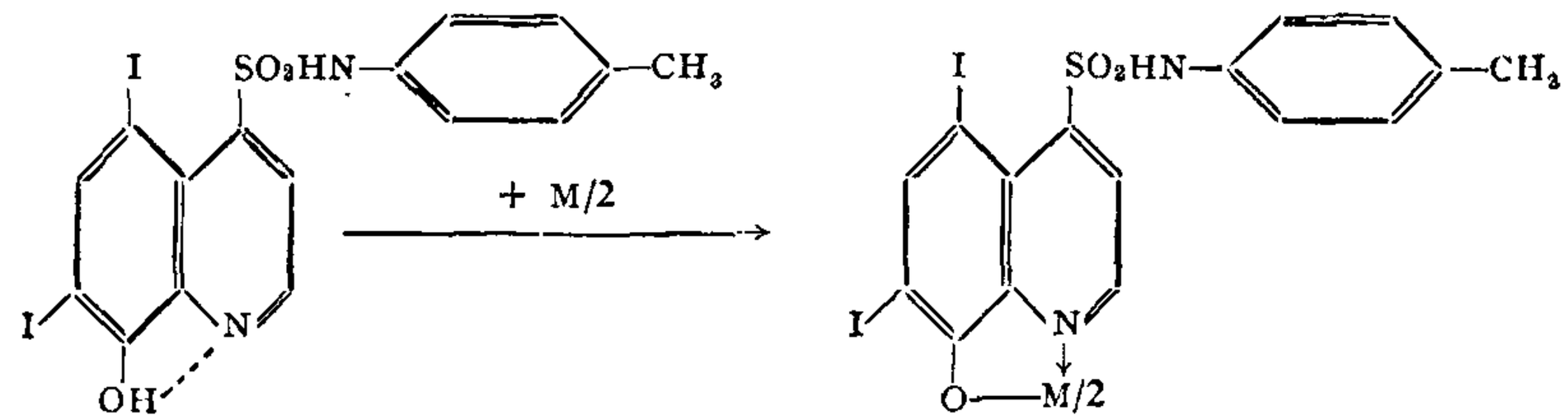
The melting points of all the complexes were found to be more than 300° C.

Infra Red Spectra

On the basis of I.R. spectra the intramolecular hydrogen bonded chelate structure has been proposed for DIHQTS. On metal chelate formation however the bands at 3350 cm^{-1} which appear in all complexes are not present in the original ligand between 3200–3600 cm^{-1} [10–11]. This is perhaps due to H-bonding. The disappearance of H-bonded-OH in the ligand and its reappearance in the metal complexes are the suggestive of O–M–N bond formation, where M is a metal atom. The bands between 1490–1600 cm^{-1} are due to aromatic rings. The bands at 500 cm^{-1} however confirm the presence of iodine in the complex. The presence of sulphonamide group (–SO_2NH–) in the structure has been established by the characteristic band in the vicinity of 1370 cm^{-1}. The reaction may be written as follows :



This structure confirms the structure suggested by Teuvo Nortia[12].

Screening for Antibacterial Activity

The metal chelates listed in Table I have been evaluated for their antibacterial activity. The test organisms employed were *Staphylococcus aureus*, *Salmonella typhii*, *Escherichia coli* and *S. comma*. The antibacterial activity of the chelates was tested by the usual cup-plate agar diffusion method[13].

Compounds No. 1, 2, 4 showed complete inhibition against *S. aureus* and *E. coli*. Compound No. 4 showed complete inhibition against *S. typhii* and *S. comma* also. Compound No. 1 showed complete inhibition against *S. typhii* and no inhibition against *S. comma*, compound No. 2 showed no inhibition against *S. typhii* but complete inhibition against *S. comma*. Compound No. 3 showed no inhibition against *S. aureus* and *E. coli* but partial inhibition against *S. typhii* and *S. comma*. Compound No. 5 showed no inhibition against *S. typhii*, *S. comma* and *E. coli* while partial inhibition against *S. aureus*. The antibacterial activities of the compounds are listed in Table II.

TABLE II

Sl. No.	Compound	Antibacterial activity against *S. aureus*	*S. typhii*	*S. comma*	*E. coli*
1.	Fe–DIHQTS	+	+	–	+
2.	Co–DIHQTS	+	–	+	+
3.	Ni–DIHQTS	–	±	±	–
4.	Cu–DIHQTS	+	+	+	+
5.	Zn–DIHQTS	±	–	–	–

(+) Complete inhibition; (±) Partial inhibition; (–) No inhibition.

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