

Coordination Behaviour of Dependent PH Pyrazine Derivatives

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Abstract- Pyrazine is a symmetrical molecule belonging to D_{2h} point Group. It is less basic than pyridine, pyridazine and pyrimidine. Derivatives such as Phenazine are well known for their antitumour, antibiotic and diuretic activities. Tetramethyl pyrazine, also known as ligustrazine, is reported to scavenge superoxide anion and decrease nitric oxide production in human polymorphonuclear leukocytes and is a component of some herbs in traditional Chinese medicine. Alkylpyrazines are chemical compounds based on pyrazine with different substitution patterns. Some alkylpyrazines are naturally occurring highly aromatic substances which often have a very low odour threshold and contribute to the taste and aroma of various foods including coffee and wines. Alkylpyrazines are also formed during the cooking of some foods via Maillard reactions. 2,3-Dimethylpyrazine is a component of the aroma of roasted sesame seeds.

Keywords : - anti-tumour, antibiotic and diuretic etc.

INTRODUCTION

Schiff bases belong to unique class of chelating ligands in coordination chemistry and have diverse applications in different fields owing to their greater sensitivity and synthetic flexibility to coordinate with different transition metal ions. Some drugs show improved activity when administered as metal complexes and coordinating possibility of drugs is found to be improved by condensing diverse primary amines with a variety of carbonyl compounds to make chemotherapeutic Schiff base metal complexes.

Schiff bases are the most versatile and thoroughly studied ligand systems in coordination chemistry. Metal complexes of Schiff bases have been reported to function as tuberculostatic, antitumour, antibacterial and antifungal agents. Metal chelates with multidentate Schiff bases have been used for purification of metals due to their high volatility and solvability in nonpolar solvents. Schiff bases find

various industrial and biological applications. A considerable number of Schiff base complexes have been reported to behave as antitumor, tuberculostatic and antifungal agents.

2,5-Dimethylpyrazine is used as flavour additive and odorant in foods such as cereals and products such as cigarettes. It occurs naturally in asparagus, black or green tea, crisp bread, malt, raw shrimp, soya, Swiss cheeses, and wheat bread.

2,6-Dimethylpyrazine (Fig. 1.4) is also used as flavour additive and odorant in foods such as cereals and products such as cigarettes. It occurs naturally in baked potato, black or green tea, crisp bread, French fries, malt, peated malt, raw asparagus, roasted barley, roasted filberts or pecans, wheat bread, wild rice (*Zizania aquatica*), and wort.

EXPERIMENTAL PREPARATION OF THE LIGAND

The schiff base ligands pyrazine-2-carbaldehyde semicarbazone and pyrazine-2-carbaldehydethiosemicarbazone were prepared by the condensation of pyrazine-2-carbaldehyde and semicarbazide/thiosemicarbazide in the presence of glacial acetic acid.

PROCEDURE

0.01 mole of pyrazine-2-carbaldehyde was dissolved in 20 ml of hot ethanol and the solution was filtered. 0.01 mole of semicarbazide/thiosemicarbazide was also dissolved in 20 ml of hot ethanol and the solution was filtered. The two hot solutions were mixed in 250 ml round-bottom flask and 5ml of glacial CH_3COOH was added to it. The content in the flask was refluxed for about 4 hour on a water-bath using water condenser. The solution was cooled to room temperature and then left overnight when light yellow crystals of pyrazine-2-carbaldehydesemicarbazone/

pyrazine-2-carbaldehydethiosemicarbazone were separated. The precipitate was filtered under suction,

washed with cold water and then with ethanol. It was then dried in an electric oven at about 110°C.

Table- Microanalytical data of ligands

Sl. No.	Ligand	% found (% calculated)				Molar mass Found (calculated)	Molecular Formula
		C	H	N	S		
1.	Pyrazine-2-carbaldehyde semicarbazone (HPCSCZ)	43.72	4.35	42.16	-	163.8	C ₆ H ₇ N ₅ O
		(43.64)	(4.24)	(42.42)		(165)	
2.	Pyrazine-2-carbaldehyde thiosemicarbazone (HPCTSCZ)	39.65	3.79	38.51	17.64	180.3	C ₆ H ₇ N ₅ S
		(39.78)	(3.86)	(38.67)	(17.68)	(181)	

RESULT AND DISCUSSION

The analytical, conductometric, magnetic and spectroscopic investigations of coordination compounds of Co(II) and Ni(II) ions with ligands pyrazine-2-carbaldehydesemicarbazone (HPCSCZ) and pyrazine-2-carbaldehydethiosemicarbazone (HPCTSCZ) synthesized in acidic (pH=4.0), neutral (pH=7.0) and alkaline (pH=10.0) media. The results of these investigations are discussed herein and suitable conclusions have been drawn regarding the structure of coordination compounds and the nature of bonding of the ligand(s) to metal ions in these coordination compounds. The coordination behaviour of ligands in acidic, neutral and alkaline media has been investigated.

CONDUCTOMETRIC INVESTIGATION OF COORDINATION COMPOUNDS

The prepared coordination compounds are insoluble in common organic solvents viz, carbon tetrachloride, chloroform, benzene, toluene, ether, methanol, ethanol, dioxane, THF (tetrahydrofuran), acetone and pyridine but they are soluble in DMSO (dimethyl sulphoxide) and DMF (dimethyl formamide). The molar conductances of prepared coordination compounds were measured in 10⁻³ M DMF solution at room temperature.

The molar conductance values of coordination compounds prepared in acidic and neutral media at pH=4.0 and 10.0 respectively are found in the range 163-176 ohm 1cm²mol⁻¹ indicating 1 : 2 electrolytic nature of coordination compounds. The electrolytic nature of these coordination compounds is due to the presence of two chloride ions outside the coordination

sphere. The presence of chloride ions in these compounds outside the coordination sphere was confirmed by the addition of silver nitrate reagent to the solution of coordination compounds leading to the formation of two moles of white precipitate of AgCl per mole of the coordination compound. On the other hand, the molar conductance values of coordination compounds prepared in alkaline medium (pH=10.0) are found in the range of 120-124 ohm-1cm²mol⁻¹. Indicating their 1 : 1 electrolytic nature.

CONCLUSION

Pyrazine is a symmetrical molecule with point group D_{2h}. Pyrazine is less basic than pyridine, pyridazine and pyrimidine. Pyrazine derivatives are of great industrial and medicinal value. Derivatives such as phenazines are well known for their antitumor, antibiotic and diuretic activities. Tetramethylpyrazine, also known as ligustrazine, is reported to scavenge superoxide anion and decrease nitric oxide production in human polymorphonuclear leukocytes and is a component of some herbs in traditional Chinese medicine. Some alkyl pyrazines are naturally occurring highly aromatic substances which often have a very low odour threshold and contribute to the test and aroma of various foods including coffee and wines. It is well known that some drugs have enhanced activity when administered as metal chelates.

Keeping in view the wide range of applications of pyrazine derivatives, pyrazine derivatives pyrazine-2-carbaldehyde semicarbazone (HPCSCZ) and pyrazine-2-carbaldehydethiosemicarbazone (HPCTSCZ) have been selected as ligands to synthesize their complexes with Co(II) and Ni(II) in acidic, neutral and alkaline

media. This is to investigate the coordination behaviour of these ligands at different pH.

The synthesized coordination compounds have been characterized on the basis of elemental analyses, molar mass determination, molar conductance and magnetic moment measurements, IR, UV and ¹H NMR spectral investigations.

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