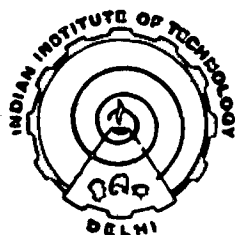


**SYNTHESIS AND COMPLEXATION BEHAVIOUR  
OF HYBRID ORGANOTELLURIUM  
(Te,O) LIGANDS**

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*THESIS SUBMITTED  
IN FULFILMENT OF THE REQUIREMENTS  
FOR THE AWARD OF THE DEGREE OF  
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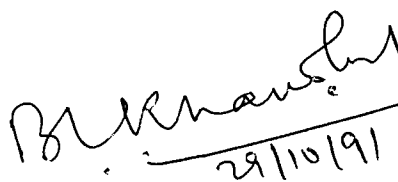


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C E R T I F I C A T E

This is to certify that the thesis entitled "SYNTHESIS AND COMPLEXATION BEHAVIOUR OF SOME HYBRID ORGANOTELLURIUM (Te,O) LIGANDS "being submitted by Mr. Sebastian Thomas to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in Chemistry, is a record of bonafide research work carried out by him. Mr. Sebastian Thomas has worked under our guidance and supervision and has fulfilled the requirements of this thesis which, to our knowledge, has reached the requisite standard.

The results contained in this thesis have not been submitted, in part or in full, to any other university or institute for the award of any degree or diploma.

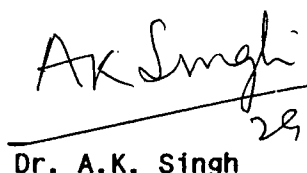
  
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## ABSTRACT

In the thesis entitled "SYNTHESIS AND COMPLEXATION BEHAVIOUR OF SOME HYBRID ORGANOTELLURIUM (Te, O) LIGANDS", the synthesis of ligands, aryltelluroacetic acids, 2-aryltelluroethanols, aryl(2-hydroxy-5-methylphenyl)tellurides, bis(2-hydroxy-5-methylphenyl)telluride and ditelluride and their reactions (mostly complexation) with Hg(II), Pd(II), Pt(II) and Cu(II) have been reported. The ligands and complexes were characterised by elemental analysis and electronic, IR,  $^1\text{H}$ ,  $^{13}\text{C}\{^1\text{H}\}$  NMR spectra in conjunction with their molecular weight and conductance measurements.

The aryltelluro acetic acids,  $\text{ArTeCH}_2\text{COOH}$  ( $\text{L}_1$ ) and 2-aryltelluroethanols,  $\text{ArTeCH}_2\text{CH}_2\text{OH}$  ( $\text{L}_2$ ) where  $\text{Ar} = \text{C}_6\text{H}_5$ , 4-MeOC $_6\text{H}_4$  and 4-EtOC $_6\text{H}_4$  have been synthesised by the reactions of sodium aryltellurolates ( $\text{ArTe}^-\text{Na}^+$ ) with monochloro acetic acid and 2-chloroethanol respectively. The hydrogen bonding in phenyltelluroacetic acid is greater in comparison to that of acetic acid which has been evidenced by its IR,  $^1\text{H}$ ,  $^{13}\text{C}\{^1\text{H}\}$  NMR spectra. This is consistent with the polarity of Te-C bond where Te becomes positively charged. In 2-aryltelluroethanols hydrogen bonding does not seem to be different from that of ethanol.  $\text{L}_1$  and  $\text{L}_2$  both ligate with Hg(II), Pd(II) and Pt(II) to form complexes of composition  $[(\text{L}-\text{H})\cdot\text{MCl}]_2$ . The ligands coordinate in a uninegative bidentate mode of bonding through O and Te which has been supported by  $^1\text{H}$  NMR and IR spectra of the complexes.

Electronic spectra of Pd(II) and Pt(II) complexes of L<sub>1</sub> and L<sub>2</sub> suggest square planar geometry around these metal ions. Molecular weights of the complexes support dimeric structure formed through bridging chlorines.

Aryl(2-hydroxy-5-methylphenyl)tellurides (L<sub>3</sub>) (Ar = C<sub>6</sub>H<sub>5</sub>, 4-MeOC<sub>6</sub>H<sub>4</sub> or 4-EtOC<sub>6</sub>H<sub>4</sub>) were synthesised by hydrazine reduction of the corresponding dichlorides obtained from *p*-cresol by ortho-mercuration followed by transmetallation reaction with ArTeCl<sub>3</sub>. Its complexes with Hg(II), Pd(II) and Pt(II) having stoichiometries [(L<sub>3</sub>-H).MCl] seem to be dimeric with bridging chlorines on the basis of their <sup>1</sup>H NMR and IR spectra, conductance and molecular weight measurements. Moreover coordination through both Te and O has to be invoked to explain the formation of these complexes and their spectral and physical properties.

Bis(2-hydroxy-5-methylphenyl)telluride (L<sub>4</sub>) was prepared by hydrazine reduction of the corresponding diaryltellurium (IV) chloride synthesised by the direct reaction of *p*-cresol with TeCl<sub>4</sub>. Hg(II) complex of L<sub>4</sub> having stoichiometry HgCl(L<sub>4</sub>-H) seems to be polymeric which on reaction with PPh<sub>3</sub> gives a soluble complex of composition PPh<sub>3</sub>HgCl(L<sub>4</sub>-H). The uninegative bidentate mode of coordination for L<sub>4</sub> in this complex may be inferred from <sup>1</sup>H NMR and IR spectral data. Bis(2-hydroxy-5-methylphenyl)ditelluride (L<sub>5</sub>) was prepared by metabisulphite reduction of ArTeCl<sub>3</sub> (Ar = 5-CH<sub>3</sub>-2-OH-C<sub>6</sub>H<sub>3</sub>) obtained by o-mercuration of *p*-cresol followed by transmetallation with TeCl<sub>4</sub>. With Hg(II) the ditelluride forms a compound of composition

$R\text{Te} \cdot \text{HgCl}_2$  in which Te-Te bond appears to be affected. However the compound is insoluble and amorphous. Therefore its structural characterisation is extremely difficult. Reaction of ditelluride ( $L_5$ ) with  $\text{CuCl}_2$  results in the formation of a tellurenyl compound  $\text{ArTeCl}$ . Its unusual stability is attributed to the existence of a  $\text{Te} \cdots \text{O}$  secondary interaction which is supported by its IR,  $^1\text{H}$ ,  $^{13}\text{C}\{^1\text{H}\}$  NMR spectra.

## CONTENTS

		Page No.
CHAPTER I	INTRODUCTION	
1.1	NEUTRAL MONODENTATE TELLURIUM LIGANDS	2
1.2	ANIONIC MONODENTATE LIGANDS	6
1.3	BIDENTATE LIGANDS	9
1.3.1	(Te,Te) LIGANDS	9
1.3.2	(Te,N) LIGANDS	11
1.3.3	(Te,O) LIGANDS	13
1.3.4	(Te,Y) LIGANDS	14
1.4	TRI-AND HIGHER POLYDENTATE ORGANO TELLURIUM LIGANDS	15
1.5	APPLICATIONS OF ORGANOTELLURIUM LIGANDS	18
1.6	PRESENT WORK - OBJECTIVES AND ITS SCOPE	19
1.7	REFERENCES	22
CHAPTER II	MATERIALS AND METHODS	
2.1	CHEMICALS	28
2.2	SYNTHETIC PROCEDURES	29
2.2.1	TELLURIUM TETRACHLORIDE	29
2.2.2	4-METHOXYPHENYL TELLURIUM TRICHLORIDE	30
2.2.3	4-ETHOXYPHENYL TELLURIUM TRICHLORIDE	30
2.2.4	PHENYL TELLURIUM TRICHLORIDE	30

2.2.5	DIPHENYL DITELLURIDE	31
2.2.6	BIS(4-METHOXYPHENYL) DITELLURIDE	31
2.2.7	BIS(4-ETHOXYPHENYL) DITELLURIDE	32
2.2.8	(2-HYDROXY-5-METHYLPHENYL) MERCURIC CHLORIDE	32
2.3	PHYSICO CHEMICAL STUDIES	33
2.3.1	ELEMENTAL ANALYSIS	33
2.3.2	MELTING POINT	34
2.3.3	MOLECULAR WEIGHT DETERMINATION	34
2.3.4	CONDUCTANCE MEASUREMENTS	35
2.3.5	INFRARED AND FAR INFRARED SPECTRA	35
2.3.6	UV-VIS SPECTRA	36
2.3.7	NUCLEAR MAGNETIC RESONANCE SPECTRA	36
2.4	REFERENCES	37
CHAPTER III	ARYLTELUROACETIC ACIDS - SYNTHESIS AND LIGATION WITH Hg(II), Pd(II) AND Pt(II)	
3.1	INTRODUCTION	38
3.2	EXPERIMENTAL	39
3.2.1	SYNTHESIS OF ARYLTELUROACETIC ACIDS (1-3)	39
3.2.2	SYNTHESIS OF MERCURY (II) COMPLEXES OF 1-3	40
3.2.3	SYNTHESIS OF PALLADIUM (II) COMPLEXES OF 1-3	40
3.2.4	SYNTHESIS OF PLATINUM (II) COMPLEXES OF 1-3	40

3.3	RESULTS AND DISCUSSION	41
3.3.1	CONDUCTANCE AND MOLECULAR WEIGHT	43
3.3.2	IR AND ELECTRONIC SPECTRA	43
3.3.3	$^1\text{H}$ AND $^{13}\text{C}\{^1\text{H}\}$ NMR SPECTRA	45
3.4	CONCLUSION	48
	TABLES	51
	FIGURES	61
3.5	REFERENCES	71
CHAPTER IV	2 - ARYLTELLUROETHANOL - SYNTHESIS AND LIGATION WITH Hg(II), Pd(II) AND Pt(II)	
4.1	INTRODUCTION	72
4.2	EXPERIMENTAL	73
4.2.1	SYNTHESIS OF 2 - ARYLTELLUROETHANOL (1-2)	73
4.2.2	SYNTHESIS OF Hg(II) COMPLEXES OF 1-2	74
4.2.3	SYNTHESIS OF Pd(II) COMPLEXES OF 1-2	74
4.2.4	SYNTHESIS OF Pt(II) COMPLEXES OF 1-2	74
4.3	RESULTS AND DISCUSSION	75
4.3.1	CONDUCTANCE AND MOLECULAR WEIGHT	76
4.3.2	IR AND ELECTRONIC SPECTRA	77
4.3.3	$^1\text{H}$ AND $^{13}\text{C}\{^1\text{H}\}$ NMR SPECTRA	78
4.4	CONCLUSION	81
	TABLES	83

	FIGURES	88
4.5	REFERENCES	95
CHAPTER V	ARYL (2-HYDROXY-5-METHYLPHENYL) TELLURIDES : SYNTHESIS AND COMPLEXATION WITH Hg(II), Pd(II) AND Pt(II)	
5.1	INTRODUCTION	97
5.2	EXPERIMENTAL	98
5.2.1	SYNTHESIS OF ARYL (2-HYDROXY-5-METHYLPHENYL) TELLURIUM (IV) CHLORIDES (1-3)	98
5.2.2	SYNTHESIS OF ARYL (2-HYDROXY-5-METHYLPHENYL) TELLURIDES (4-6)	99
5.2.3	SYNTHESIS OF Hg(II) COMPLEXES OF 4-6	99
5.2.4	SYNTHESIS OF Pd(II) COMPLEXES OF 4-6	100
5.2.5	SYNTHESIS OF Pt(II) COMPLEXES OF 4-6	100
5.3	RESULTS AND DISCUSSION	101
5.3.1	CONDUCTANCE AND MOLECULAR WEIGHT	102
5.3.2	IR AND ELECTRONIC SPECTRA	103
5.3.3	$^1\text{H}$ AND $^{13}\text{C}\{^1\text{H}\}$ NMR SPECTRA	104
5.4	CONCLUSION	106
	TABLES	108
	FIGURES	117
5.5	REFERENCES	125

**CHAPTER VI****BIS(2-HYDROXY-5-METHYLPHENYL) TELLURIDE  
AND DITELLURIDE - SYNTHESIS AND REACTIONS  
WITH HgCl<sub>2</sub> AND CuCl<sub>2</sub>**

6.1	INTRODUCTION	126
6.2	EXPERIMENTAL	127
6.2.1	SYNTHESIS OF BIS(2-HYDROXY-5-METHYLPHENYL) TELLURIUM DICHLORIDE (1)	127
6.2.2	SYNTHESIS OF BIS(2-HYDROXY-5-METHYLPHENYL) TELLURIDE (2)	127
6.2.3	SYNTHESIS OF HgCl <sub>2</sub> .2 (3)	128
6.2.4	SYNTHESIS OF (PPh <sub>3</sub> ).HgCl <sub>2</sub> (4)	128
6.2.5	SYNTHESIS OF BIS(2-HYDROXY-5-METHYLPHENYL) TELLURIUM TRICHLORIDE (5)	128
6.2.6	SYNTHESIS OF BIS(2-HYDROXY-5-METHYLPHENYL) DITELLURIDE (6)	129
6.2.7	REACTION OF BIS(2-HYDROXY-5-METHYLPHENYL) DITELLURIDE WITH HgCl <sub>2</sub> (7)	129
6.2.8	REACTION OF BIS(2-HYDROXY-5-METHYLPHENYL) DITELLURIDE WITH CuCl <sub>2</sub> (8)	130
6.3	RESULTS AND DISCUSSION	130
6.3.1	IR SPECTRA	133
6.3.2	<sup>1</sup> H AND <sup>13</sup> C{ <sup>1</sup> H} NMR SPECTRA	135

6.4	CONCLUSION	137
	TABLES	139
	FIGURES	149
6.5	REFERENCES	161
	SUMMARY AND FURTHER SCOPE OF THE WORK	163
	PUBLICATIONS FROM THE THESIS	169