SYNTHESIS AND CHARACTERIZATION OF HYDROXYARYLTELLURIUM(IV) HALIDES

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DEDICATED

TO

MY

BELOVED

PARENTS

C E R T I F I C A T E

This is to certify that the thesis entitled, "Synthesis and Characterization of Hydroxyaryltellurium(IV) Halides" being submitted by Mr. Krishan Kumar to the Indian Institute of Technology, Delhi for the award of the degree of 'Doctor of Philosophy', is a record of bonafide research-work carried out by him. Mr. Krishan Kumar has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis, which to my 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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A B S T R A C T

Though a large number of organotellurium compounds are reported in literature, only a few hydroxyaryltellurium(IV) halides appear to have been identified and no systematic study has yet been carried out on their syntheses and properties. The present work has, therefore, been undertaken with a view to prepare the hydroxyaryltellurium(IV) halides, R_nTeX_{4-n} (R = hydroxyaryl; X = Cl, Br and I; n = 1-3), and characterize them in solution as well as in the solid state using various physico-chemical techniques.

The thesis has been divided into six chapters.

The first chapter is a review of the literature on various aspects of chemistry of organotellurium compounds. An attempt has been made to cover the literature on organotellurium(IV) halides in such a way so as to bring out the discrepancies clearly.

The second chapter deals with the synthesis and physical properties of hydroxyaryltellurium(IV) halides. The hydroxyaryltellurium(IV) chlorides have been prepared by direct reaction of $TeCl_4$ with various hydroxybenzenes, and the corresponding bromides and iodides by halogen-exchange reactions.

The behaviour of hydroxyaryltellurium(IV) halides in solution has been described in the third chapter. The conductance measurements in nitrobenzene, acetone and acetonitrile, and the cryoscopic measurements in nitrobenzene reflect the 1:1 electrolytic behaviour of $RTeBr_3$, $RTeI_3$ and R_3TeX type compounds. The $RTeCl_3$ compounds are found to be less dissociated whereas R_2TeX_2 exihibit the molecular nature in these solutions.

The fourth chapter covers the structural aspect of hydroxyaryltellurium(IV) halides. NMR, IR, far IR and mass spectroscopic techniques have been used to elucidate the structures of these compounds. NMR, IR and far IR studies suggest the linking of tellurium to a phenyl carbon atom at a position para to the hydroxyl group unless it is otherwise occupied. The molecular ion peaks are not observed in the mass spectra of these compounds. Based on the various tellurium containing ions, the fragmentation schemes have been suggested.

Some reactions of hydroxyaryltellurium(IV) halides like halogen-exchange, reduction and hydrolysis have been described in the fifth chapter.

A resume and further scope of the work is given in the sixth and the last chapter.

C O N T E N T S