Tellurium and its organic derivatives in recent years have attracted considerable interest in the field of organic synthesis, ligand chemistry, organic superconductors, photoimaging agents, radiopharmaceuticals for diagnostic purposes etc. The ligand chemistry of tellurium was little explored until 1970's however, in recent years this has become quite an interesting and active area of research as evident from the number of publications appearing in the literature. The organotellurium ligands containing soft tellurium alongwith hard donor atoms such as N and O can provide insight into competitive coordination behaviour between the hard and soft donors towards a metal centre and also stabilise low as well as high oxidation states of the metal atom. Such systems are important in transition metal catalysed asymmetric synthesis and as single source precursors in MOCVD processes.

Also, synthetic tetraazamacrocycles are considered typically good models for oxygen carrier due to the presence of four N-donor sites, appropriate for metal-ligand binding. Over recent years, considerable effort has been made towards the design and synthesis of tellurium containing macrocycles. Such ligands that contain different ring sizes and mixed donor functionalities are capable of rich coordination chemistry. The present work has, therefore, been undertaken with a view to prepare the metal complexes with tellurium containing 10-membered and 12-membered tetraazamacrocycles (Te₂N₄M system) by template condensation of diaryltellurium dichlorides and ethylenediamine/trimethylene diamine with divalent metal chlorides.

The thesis entitled “INVESTIGATIONS ON METAL COMPLEXES WITH ORGANOTELLURIUM LIGANDS” has been divided into five chapters.

The first chapter is a review of literature on various aspects of chemistry of organotellurium compounds. An attempt has been made to cover the literature on different types of tellurium ligands with a special emphasis on the
ligation behaviour of tellurium containing macrocycles. An objective of the present work has also been discussed.

The second chapter deals with the synthesis and physical properties of metal complexes. The diaryltellurium(IV) of dichlorides, \( R_2\text{TeCl}_2 \) (\( R = p\)-hydroxyphenyl, 3-methyl-4-hydroxy phenyl, \( p\)-methoxyphenyl) have been obtained by direct reaction of tellurium tetrachloride with phenol, \( o\)-cresol and anisole, respectively. These dichlorides upon reaction with ethylenediamine and divalent metal chlorides yield the desired complexes.

These metal complexes have been characterized using conductance, magnetic measurements, electronic absorption, infrared and proton magnetic resonance spectral techniques, the results of which are presented in the third and fourth chapters.

The conductance measurements in DMSO and acetonitrile predict these complexes to be weak to 1 : 1 electrolytes except a few which dissociate beyond 1 : 1 type electrolyte. Magnetic moment measurements in conjunction with electronic spectra have been used to gain information about the oxidation state and stereochemistry of the metal ion in these complexes. These studies suggest the distorted octahedral or tetragonal geometry for \( \text{Mn}^{II} \), \( \text{Co}^{II} \), \( \text{Ni}^{II} \), \( \text{Cu}^{II} \), \( \text{Zn}^{II} \), \( \text{Cd}^{II} \) and \( \text{Hg}^{II} \) complexes and a square planar geometry for \( \text{Pd}^{II} \) and \( \text{Pt}^{II} \) complexes.

The fourth chapter covers the structural aspects of these metal complexes as predicted jointly by infrared and proton magnetic resonance spectroscopic techniques. These studies suggest the formation of tellurium containing tetraazamacrocycles and subsequently coordination through N-atoms of tetraazamacrocycles. The possibility of linkage of tellurium to the metal ion is also ruled out on the basis of these spectral studies. The infrared and \( ^1\text{H} \) NMR studies also support the structures of metal complexes predicted by other physico-chemical techniques.

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