CHAPTER X
SUMMARY

Salient features of the studies carried out on vacuum deposited tellurium and selenium tellurium films of three different compositions in the present investigation are elucidated in this chapter.

X-ray diffractograms reveal polycrystalline nature of both tellurium and selenium tellurium thin films of three different compositions. Increase in particle size as well as decrease in strain and dislocation density with increase in film thicknesses have been observed. The composition of these films were estimated using RBS technique.

Dielectric properties of tellurium and selenium tellurium films have been studied at different frequencies and temperatures. A large increase in capacitance with decrease in frequency is observed in all the films. At higher thicknesses, a tendency of thickness independent behaviour of the dielectric constant is observed in all the materials. TCC and TCP values of the material of these films have been evaluated.

The a.c. and d.c. conduction studies have given an idea of the conduction mechanism prevailing in tellurium and selenium tellurium thin films of three different compositions. The a.c. conductivity has been explained based on electronic hopping conduction. The d.c. conduction studies reveal that the conduction process in tellurium, Se$_{0.7}$Te$_{0.3}$ and Se$_{0.5}$Te$_{0.5}$ thin films is space charge limited, while in Se$_{0.3}$Te$_{0.7}$ thin films it can be explained on the basis of Poole-Frenkel mechanism. The activation energy values of the material of these films are calculated.
The dielectric breakdown studies show that the thickness and temperature dependence of onset breakdown field follow the Forlani-Minnaja theory for tellurium and selenium tellurium thin films of different compositions.

Laser induced damage study has been carried out on tellurium and the $\text{Se}_x\text{Te}_{1-x}$ films of different thicknesses. The damage threshold density is calculated for all the films. A direct dependence of damage threshold on film thickness of tellurium, $\text{Se}_{0.7}\text{Te}_{0.3}$ and $\text{Se}_{0.5}\text{Te}_{0.5}$ thin films and an inverse dependence of damage threshold on film thickness of $\text{Se}_{0.3}\text{Te}_{0.7}$ films have been observed.

The measured values of the optical transmittance were used to obtain the optical constants of Te and $\text{Se}_x\text{Te}_{1-x}$ thin films. The values of refractive indices and band gap energy have been estimated. The transition type in these films was found to be direct and allowed.

The Hall mobility, conductivity and carrier concentration are determined from Hall studies in the temperature range 300-380 K. The $p$-type nature of the tellurium films and the three different compositions of SeTe thin films has been observed from the thermoelectric power studies. The values of thermoelectric power of all the films have been evaluated.

The present investigation provides data on dielectric, a.c.conduction, dielectric breakdown and laser induced damage of the vacuum evaporated tellurium and $\text{Se}_x\text{Te}_{1-x}$ thin films of three different compositions. It is believed that the data presented in this thesis, along with the other data available in the literature, will be very much useful for the exploitation of these films in a variety of applications.