ABSTRACT

The results of a systematic study of the growth and etch phenomena in single crystals of tellurium are presented in this thesis. It is given in three parts. Part I contains general information which provides the basic background for the present work and a brief description of the experimental techniques used in the work. Part II deals with the study of tellurium crystals while the work on Zn-Sb platelets is given in Appendix.

The general introduction, given in Chapter I, surveys the present day situation of the problems of crystal growth and etching. In Chapter II is given a review on the growth of metal single crystals, particularly from the vapour phase. The discussion is confined to low-melting point metals and semiconducting elements. Chapter III contains a brief review on the etch phenomena in metals and semiconductors. References on the work on non-metals are included to maintain the continuity of discussion. The experimental techniques are presented in brief in Chapter IV.

The results of a study on the growth and morphology of vapour-grown tellurium single crystals are given in Chapter V. It has been shown that fairly large, single crystals of tellurium in the form of hexagonal prisms can be grown in the laboratory by a simple method. The screw dislocation mechanism is active in the growth of these crystals.

The $(10\bar{1}0)$ prism faces of the asgrown tellurium crystals have been subjected to thermal etching. The results of this study are presented in Chapter VI. Thermal etching can be successfully employed to study the dislocations in tellurium single crystals.

The vapour grown tellurium whiskers have well developed $(10\bar{1}\bar{1})$ rhombohedron faces. The dislocation distribution on this surface has been studied by chemical etching. Chapter VII deals with the results of these investigations.

Micro-hardness studies were carried out on the prism planes of vapour grown crystals as well as the cleaved surfaces of melt grown crystals. A variation of hardness with load and the orientation of the

indenter w.r.t. the crystal axis is observed. The results are discussed in Chapter VIII.

The surface topographic studies on the vapourgrown platelets of Zn-Sb are given in Appendix. The concentration of impurity affects the mode of growth to some extent. But no transformation takes place from platelet to whiskers due to the variation in the impurity content. Therefore the mode of growth mainly depends on the supersaturation gradient and other conditions of growth.