• 12.1 Introduction

The preceding chapters on etching gave a detailed account of the studies of dislocation in α SiC. However, an inherent disadvantage of the methods used by the author and other investigators is that only dislocations which intersect the basal plane are revealed. Occasionally etch pits are developed on the prismatic planes but the reliability is very poor. It is known that many dislocations which lie in the basal plane and are not revealed by the usual etching technique exist in SiC and these have been revealed by X-ray methods. Recently Tricket and Griffiths (1964) employed a decoration technique to reveal both basal and non-basal dislocations. Apart from this, no attempt has been made to study the basal dislocations. In the present investigation, a simple but reliable etchant has been developed by the author which could reveal all the dislocations intersecting the lateral sides.

12.2 Investigations of Suitable Etchants

The etchants which could produce well-defined pits on (0001) faces turned the lateral faces matt. Thermal etching also failed to produce any positive result. So the melts of NaOH and KOH were tried at a temperature range
of 600° C to 700° C and were found quite suitable. These etchants could produce pits on all lateral sides and their fractures in a period of 5 to 10 mts. Addition of one part of KNO₃ to two parts of NaOH helped to achieve a slower and hence a better etching. Therefore it was used for etching the lateral sides in the present work.

12.3 The Formation of Etch Patterns

Figure 80 shows a habit prism plane etched in NaOH + KNO₃ for 10 mts. The shape of the pits is triangular with the base parallel to <1120> direction and the vertex always in <0001> direction. In no case it was found that they were pointed towards <0001> direction. The sides of the pits got elongated in the <0001> direction with the increase of h in \{1011\} faces. The variation in shape of pits for some of the faces is shown in Figs. 81a, and 81b. \{1011\} pyramidal faces developed boat-shaped pits on etching, as shown in Fig. 82. On prolonged etching these pits turned deeper and some of them flat bottomed.

12.4 Etching of Fractured Lateral Faces

The etch patterns occurring on the fractured faces were similar to those observed on habit faces. Figs. 83a and 83b show a pair of matched, etched \{1010\} faces. The one to one correspondence of pits in number and position
Fractures along (11\(\overline{2}0\)) second order prism planes were available though such habit planes were absent. The etch pattern and the shape of the pits are shown in Figs. 84a and 84b which exhibit a remarkable correspondence in number and position.

The fractured faces were found undergoing a faster chemical reactivity.

12.5 Discussion

The results described above can be explained in terms of their association with sites of emergence of dislocations. The density of pits varied from crystal to crystal and occasionally from region to region. But unlike on the basal planes, generally there was no tendency of pits to crowd together. Nor any pile-up or polygon walls were observed. This is because the climb of dislocations in SiC due to plastic deformation is along the c-axis. This means that the bulk of the basal dislocations are more randomly distributed than the non-basal ones.

The chemical etching described here can certainly overcome the practical difficulties and the longer time consumption encountered in the X-ray methods and the decoration technique. Therefore it is advantageous over them in the study of basal dislocations.