CHAPTER VI

UNUSUAL MICROSTRUCTURES ON SOME UNION SOUTH AFRICAN NATURAL DIAMONDS

6.1 Introduction

The conclusion drawn in the earlier chapters is further confirmed from the study of the microstructures on some rounded dodecahedra from Union South Africa. The crystals were purchased from Scott Williams Mineral Company, Inc., Scottsdale, Arizona, U. S. A., and were about fourty in number. A majority of them were small dodecahedra having light brownish colour. Almost all the faces of each crystal were examined. In this chapter only the typical observations, which have not been reported so far, are described. It may be pointed out that of all the crystals examined, only two showed any unusual features. The remaining crystals showed usual features.

6.2 Microstructures on crystal no. 10

This is a small rounded dodecahedron having a small region on one face on which the usual trigons are observed, thereby indicating that it is a small octahedral face. This is shown in figure 59 (X 600). As can be seen from figures 60 (X 1000) and 61 (X 1000), the typical photomicrographs showing the microstructures on the remaining faces, these microstructures consist of features and some net work pattern as reported by Emara and Tolansky (1956). Attention is drawn to the following features :

(1) All the triangular features are oriented in the same way.

(2) They are of different sizes.

(3) The shape of the triangular features varies in different regions of the same picture.

(4) In some regions they are equilateral triangles while in others they are elongated triangles.

(5) The elongation observed is different in different regions.

(6) All triangular features confined to a small region have more or less the same shape.

These triangular features were examined by a light profile microscope. Figure 62 (X 1200) shows the multiple light profile running over some of the triangular features of figure 61 (X 1000). It is clearly seen from the shift of the profile that the triangular features are not the usual depressions but elevations. It is also found that the heights of the various triangular features are different. The maximum height which is computed from the shift in the light profile in figure 62 is 2.3 microns. The minimum height could not be determined with multiple beam interferometry, as the face was highly curved and the features were very small. Examination of the features on the other faces reveals that their shapes change slowly as one moves from one portion to another on the same face.

Thus figures 63 (a) (X 800) and 63 (b) (X 800) and figure 64 (X 800) reveal the two extremities of the triangular features. In figure 63 some of these features are more or less equilateral with a slight elongation, while in figure 64 (X 800) they are more or less boat--shaped. The morphology of these boats appears to be nearly the same as the boat-shaped depressions usually observed on the dodecahedral faces. That these boat--shaped features are not depressions but elevations is revealed by the multiple light profile picture in figure 65 (X 600).

6.3 Microstructures on crystal no. 5

As the features observed on this crystal are generally the same as those observed on crystal no. 10, the details of these features have not been described. However, figure 66 (X 1000) shows the pattern observed on most of the faces of this crystal. The triangular features are prominent in the figure along with other complicated patterns. As before it has been verified that the triangular features are all elevated.

It may be pointed out that the micro-disc pattern observed by Pandeya and Tolansky (1961) was completely missing on all the faces of these two crystals.

6.4 Production of triangular elevations in the laboratory

The triangular elevations, similar to those described above, have been produced (Chapter XI) by etching (111) cleavages of diamond in an atmosphere of oxygen, in the laboratory. Thus figure 67 (X 700) shows the triangular hillocks produced by etching. Attention may be drawn to the fact that the triangular features observed in figure 67 have almost the same morphology as that of the triangular features observed on natural faces of diamond and described in this chapter.

6.5 Conclusions

From the observations on crystal no. 10 it is seen that there are trigons on one face and triangular hillocks on the other faces. The existence of trigons and the net work pattern on the same crystal leads to conjecture that the crystal might have undergone dissolution after its growth was completed, and it is during this process of dissolution that both the trigons on octahedral face and triangular hillocks observed on the other faces of the crystal might have been produced. The different shapes of these features may be due to the faces being non-uniformly curved which ultimately gives rise to change in the indices of the face from one region of the crystal to the other. The fact that triangular hillocks can be produced in the laboratory by etching as described in Chapter XI, confirms the author's belief that their formation is probably due to dissolution.