CRYSTALLOGRAPHY

Non-basal Glide Bands in Ice Crystals

In the course of observations on etch channels appearing on the (0001) plane of plastically deformed ice crystals, a photomicrograph reproduced as Fig. 1 was obtained. This shows a pattern of chemical etch pits produced by an etching substance of ethylendichloride at the smooth basal plane of the bottom of a large thermal etch pit. As was reported previously[1,2], individual minute etch pits in the figure correspond in the ice crystal to a dislocation which is emerging to the plane of observation perpendicular or at an angle near perpendicular. Examinations[3] of etch channels made it clear that channels running in crystallographic orientation $\langle 10\bar{1}0 \rangle$ or $\langle 1120 \rangle$ are, in both cases, trails left behind by dislocations moved as a part of non-basal glide systems in ice crystals. Since all the etch pits in Fig. 1 are aligned in orientations of either $\langle 10\bar{1}0 \rangle$ or $\langle 11\bar{2}0 \rangle$, they must correspond to dislocations on the same non-basal glide planes as were considered in the case of etch channels (Fig. 2).

The majority of lines of etch pits in Fig. 1 are directed to $\langle 10\bar{1}0 \rangle$, which is the direction of etch channels caused by motion of screw dislocations $\frac{1}{3}\langle \bar{1}\bar{1}23 \rangle$ on the $\{11\bar{2}2\}$ planes. Hence the lines of etch pits should be considered as emergences of glide bands which have resulted from expansion and multiplication of dislocation loops on the $\{11\bar{2}2\}$ planes. This idea is based on the works of Johnston and Gilman[4], who observed similar lining up of dislocation etch pits on the $\{100\}$ planes of LiF crystals. Since shear stress was applied on the sides of a specimen of slab form which was so cut that its surface would coincide with basal plane of ice crystal, it did not cause basal glides but had its component on the $\{11\bar{2}2\}$ planes as shown in Fig. 2. Therefore, operation of a cross-glides multiplication mechanism on the $\{11\bar{2}2\}$ planes can be the same as that on $\{110\}$ planes of LiF crystal. Double lines of etch pits as shown by *A*, *B* and *C* at the top of Fig. 1 may be considered as results of cross-glides which occurred on the non-basal glide planes of $\{11\bar{2}2\}$.

It can be seen in Fig. 1 that some rows of etch pits are oriented to the direction of $\langle 11\bar{2}0 \rangle$. Likewise to the preceding case, multiplication mechanism of cross-glides can have occurred on the non-basal glide planes of $\{10\bar{1}0\}$. On some of the rows of etch pits, discontinuities between pits are connected by short segments of etch channels.

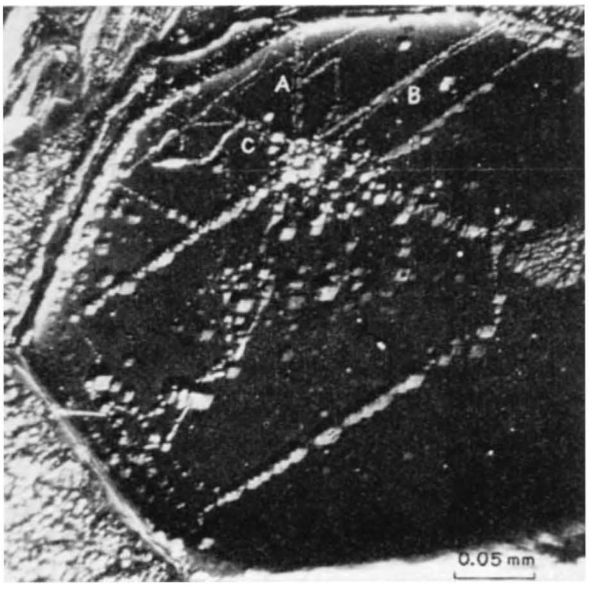

Fig. 1. Glide bands which consist of lining up of dislocation pits on the (0001) plane of ice crystals. (× 200)

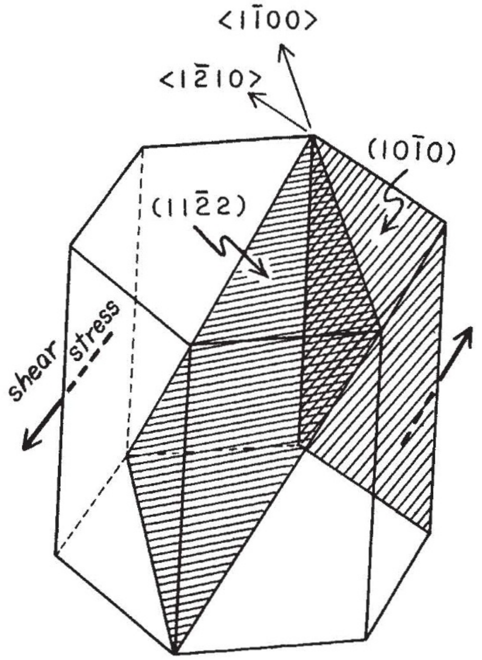

Fig. 2. Schematic representation of non-basal glide planes in ice crystals

This fact indicates that there must be a strong relationship between etch channels and glide bands observed here. It is still not clear what is the real cause of production of rows of etch pits in a particular local area instead of production of etch channels which are predominant in other areas on the same specimen. However, such features of etch pits supply additional evidence of the occurrence of non-basal glides on the $\{11\bar{2}2\}$ and $\{10\bar{1}0\}$ planes of ice crystals. The cross-glides mechanism of multiplication of dislocations given as an interpretation of the features would be of much use for understanding plastic deformation of ice crystals when more information is obtained.

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Stacking Faults in Cadmium Sulphide

Single crystals of cadmium sulphide less than 1000 Å thick have been studied in transmission in the electron microscope. Stacking faults similar to those observed in zinc sulphide have been discovered[1]. The crystals were grown from the vapour—the powder was heated at 900° C in a stream of argon at atmospheric pressure. Electron diffraction patterns showed the crystals to be of the wurtzite phase, plate-like parallel to $(2\bar{1}\cdot 0)$ as in the case of zinc sulphide crystals grown by the same technique.

The stacking faults fall into two categories. The first are stacking faults on $(00\cdot 1)$ planes (Fig. 1). These are attributed to thin intergrowths of varying width of the zinc blende phase, or possibly of wurtzite 4*H* or 6*H* phases, if the latter two modifications of cadmium sulphide exist. Evidence from electron diffraction patterns of thin intergrowths of all these polymorphs has been found for the case of zinc sulphide (unpublished work). It seems reasonable, therefore, that similar intergrowths should exist in cadmium sulphide, since the stacking fault array is identical with that found in zinc sulphide. The second series of stacking faults observed are characterized by systems of fringes which lie parallel to the *c* direction.