pendicular to the c-axis, reveal growth striations parallel to this axis. These are not observed with diffraction vectors parallel to the c- axis. This situation is advantageous for the utilization as soft X-ray monochromator for synchrotron radiation.

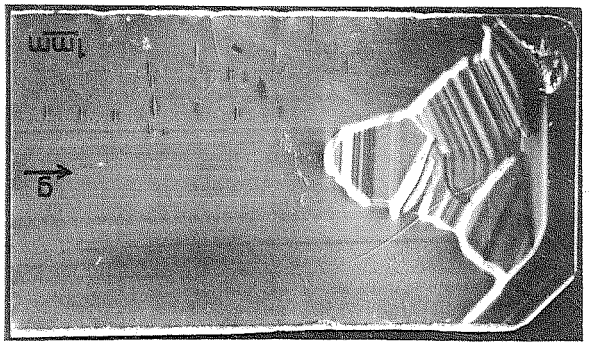

Fig. 1. X-ray topography of a natural beryl plate parallel to [0001]. Cu Kα (0002) reflection.

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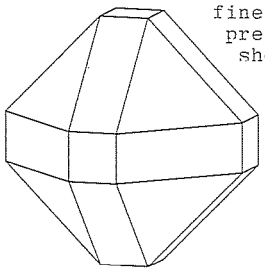
11.1–5 PSEUDO-DODECAHEDRAL GROWTH OF NATURAL DIAMOND. By Moreton Moore and W.G. Machado, Royal Holloway College, University of London, Egham, Surrey, TW20 0EX, and G.S.Woods, CSO Valuations Ltd., 17 Charterhouse St.,London, EC1N 6RA, England.

The rhombic dodecahedron is not usually a growth form for natural diamond, but one of dissolution (Moore & Lang, J.Cryst.Growth (1974) 26, 133). {110} may however predominate in the growth of synthetic diamond (Kanda et al., J.Cryst.Growth (1982) 60, 441). In natural coated diamonds there is a sharp transition from the growth of good quality crystal to fibrous growth under conditions of constitutional supercooling. Some such diamonds exhibit rhombic dodecahedral facets, in addition to the more usual octahedral and cuboid faces. X-ray topography has shown that these {110} faces have grown by fibre branching along octahedral directions: [111] + [11$\bar{1}$] → (110). The cube faces result from branching in all four <111> directions (Moore & Lang, Phil. Mag. (1972) 26, 1313). The rhombicuboctahedral habit is a natural consequence of <111> fibrous growth upon an octahedral core. The dodecahedral faces are finely corrugated,with trigons present on the sloping sides, showing that they are composed of numerous {111} surfaces. The dodecahedron is not a true growth form for natural diamond.



11.1–6 X-RAY STUDY OF Ti DIFFUSED $LiNbO_3$ CRYSTAL PERFECTION

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Diffusion of Ti into $LiNbO_3$ single crystals is the most widely used method for fabricating optical waveguides, since because of this there are large increases in both the ordinary and extraordinary refractive indices. Ti:$LiNbO_3$ waveguides are made by coating $LiNbO_3$ substrates with thin (200-500 Å)Ti films; then the samples are annealed in a controlled atmosphere (flowing dry O_2 was used) at about 1000 C for a few hours. During heat treatment Ti oxides forming a $(Ti_{0.65}Nb_{0.35})O_2$ layer and then it diffuses for a few microns into $LiNbO_3$. Owing to the large Ti concentration within the diffused layer and to the high temperature treatment, the crystal perfection of the diffused layer may worsen. To correlate optical and structural properties of the waveguides, X-ray diffraction studies of diffused layers were performed.

Precise determination of strain in the diffused layers was obtained with the double crystal rocking curve method, using the parallel arrangement and a high perfection $LiNbO_3$ single crystal as a monochromator. In undiffused samples, X-ray rocking curves were as narrow as those theoretically predicted, while in diffused crystals, in addition to the well resolved peak of the unperturbed substrate, a broad satellite peak from the diffused layer was also present. The angular shift between the two peaks makes the lattice mismatch (or strain) determination possible.

The presence of induced crystal defects was investigated by X-ray diffraction topography, using a conventional Lang camera in the scanning reflection geometry. Both Y-cut and Z-cut $LiNbO_3$ samples were investigated. Moreover, the main diffusion parameters, i.e. Ti film thickness (250-550 Å) and diffusion time (1-50 hs) were changed.

A large increase of misfit dislocation density and a relevant strain decrease at increasing diffusion times were observed in all of the above cases. Furthermore, a correlation between crystal perfection and optical in-plane energy losses in waveguides was obtained.