graphic contrast analysis.

In some crystals inclusion like features were observed in the topographs. These are apparently inclusions of the flux materials.

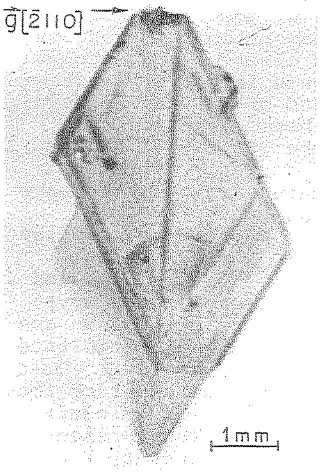

Fig.1: A typical projection topograph of a flux grown α-Al_2O_3 single crystal recorded with MoK_{α_1} radiation and [2̄110] diffraction vector.

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11.2-02 THE DEFECTS IN SYNTHETIC QUARTZ. Mai Zhenhong, Cui Shufan and Ge Peiwen, Institute of Physics, Chinese Academy of Sciences, Beijing, China.

The grown-in defects in synthetic quartz crystals grown from Z-cut seed plates were surveyed by X-ray topography and ion probe method. Besides usual dislocations and growth striations it has also been found some rare fault surfaces which have not been reported before. They appeared at the later stage of the growth and were situated in the grain boundaries along 11$\bar{2}$0 or 01$\bar{1}$0. The results of the ion probe experiments revealed that the concentration of impurities was much higher in the regions of fault surfaces than that in the matrix material. The configuration, the fault vector and the formation was suggested. A model of their formation was suggested theoretically and agreed well with the experiments.

11.2-01 DEFECT STRUCTURE ANALYSIS OF POLYCRYSTALLINE MATERIALS BY COMPUTER CONTROLLED DOUBLE CRYSTAL DIFFRACTOMETER AND POSITION SENSITIVE DETECTOR. By W. Mayo, R. Yazici, T. Takemoto, and S. Weissmann, College of Engineering, Rutgers University, Piscataway, NJ, USA.

Lattice defects of grains in stainless steel, aluminum and titanium alloys induced by fatigue, stress corrosion and corrosion fatigue were analyzed by rocking curve measurements. The work represents an extension of the X-ray double crystal diffractometer method using a photographic film to record the grain reflections (Weissmann, S., J. Appl. Phys. (1956) 27, 389). By utilizing a position-sensitive detector with interactive computer controls, the tedious and limiting task of data acquisition and analysis was greatly simplified. The specimen is irradiated with crystal-monochromated radiation and the numerous microscopic spots emanating from the reflecting grains are recorded separately by the position sensitive detector and its associated multichannel analyzer at each increment of specimen rotation. An on-line mini-computer simultaneously collects these data and applies the necessary corrections. This process is then automatically repeated through the full rocking curve range. The computer carries out the rocking curve analysis of the individual grain reflections as well as that of the entire reflecting grain population. The X-ray studies showed that the surface layer work-hardened much more rapidly than the bulk of the specimens. By analyzing the build-up of the excess dislocation density both in the surface layer and in the bulk, employing X-radiation of different penetration capability, the accrued prefracture damage could be determined and the onset of catastrophic failure predicted.

11.2-03 X-RAY STUDY OF NEAR-SURFACE STRAIN IN IMPLANTED SILICON. By B. C. Larson, J. F. Barhorst, and S. S. Goldenberg,+ Solid State Division, Oak Ridge National Laboratory,* Oak Ridge, TN 37830.

The magnitude and depth dependence of near surface strain in boron implanted (2×10^{15} and 1×10^{16} B cm^{-2}; 35 keV) silicon have been studied using 400 Bragg reflection profiles and CuKα x-rays. Bragg profile measurements were made on as-implanted silicon, implanted and laser annealed silicon, and implanted silicon after 650-900°C thermal annealing. The measurements were analyzed in terms of lattice strain using the dynamical theory of diffraction for one-dimensionally strained crystals where an iterative procedure was used to obtain strain profiles that would simulate the Bragg scattering data. Debye-Waller factor effects were included in the analysis and thermal diffuse scattering corrections were made on the measured data. Positive strain distributions were found for the as-implanted crystals and either negative strains or combinations of positive and negative strains were found for the laser and thermally annealed cases. These results will be discussed in connection with transmission electron microscopy observations of defects and defect microstructure associated with silicon under these conditions.

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