13-Defects, Microstructures and Textures

We will discuss these techniques, showing their possibilities and limitations. For instance we will show how it is possible to correct a varying background which often exists in the topographs, due to extended strains, and which severely prevents from observing small defects in the back areas of the image or enhance the visibility of an anisotropic feature. It is also possible to study an anisotropic texture in the images. Fourier and entropy techniques are complementary. We will compare their results and try to build a strategy for image analysis.

Two kinds of treatments may be considered. On-line analysis for standard features such as background correction, off-line treatment to extract special features. The scientist, having the knowledge of the contents of a topograph, is the only person able to choose between the various means of analysis. Thus a full investigation of a given topograph is a long process which must be applied to selected images only after a first rapid analysis.


Bragg-case synchrotron double-crystal images of stacking faults have been studied in a synthetic diamond. The topographs taken on the tails of the rocking curve showed well pronounced interference fringes arising from the stacking faults: the first such observation in Bragg diffraction geometry. The fringes were strongly dependent upon the angular setting, being invisible at the rocking curve maximum but gaining in contrast and becoming more closely spaced further from the maximum. These experimental images were compared with predictions of plane-wave dynamical theory and a reasonably good correspondence was obtained when the finite beam divergence was taken into account. It was found that the theoretical fringe sequences depended upon the type of stacking fault, and confirmed that the stacking faults observed were of intrinsic type.

PS-13.02.20 DOMAIN WALLS IN FERROELECTRICS. By M. Yokoyama and S. Senuki. 1-10-8, Torusihak, Setagaya, Tokyo. Sango Tsukuba RC, Tsukuba, Japan.

Images of imperfections which arise from the dynamical diffraction effect are observed on X-ray topographs of perfect or nearly perfect crystals. If a mosaic spread of a specimen crystal is a few minute of arc (which is ten times as large as that of perfect crystals), intensity in a Laue section topograph is uniform and the intensity is proportional to the integrated intensity of the Bragg reflection. Images of antiparallel domain walls and of the regions in the intermediate state of polarization reversal have been observed on the section topographs of ferroelectric NaN03 and thioarsenic crystals with such a mosaic spread. Structure of domain walls and of the intermediate state regions have been determined from dependences of contrast of the images on the indices of Bragg reflection and the relation between the contrast of images and on the change in intensity of domain walls of Na03 near the Curie temperature Tc. Results of these series of studies have made clear the structures of 180° domain walls and the polarization reversal procedure.

PS-13.02.21 STRUCTURE FACTORS OF LAYER SYSTEMS – EXAMPLE: BRAUG REFLECTORS (GaAlAs/GaAs).


Shifts of the atomic positions inside a layers system have a strong influence on the diffracted intensities even for high order satellites and, hence, have to be described correctly. At these high orders the Fourier components of the term exp(-iub) (i.e. defocusing vector; u shift in the atomic positions as compared to a reference lattice) might be negligible but neighboring high Fourier orders of the electric susceptibility qa(r) are combined with low orders of the exponential. For that reason the concentration profile inside a layer stack of a quasi binary compound cannot be calculated straightforward from the diffraction curves. On the other hand due to intermixing of Fourier orders the structure factors also depend on the phases of the Fourier components. If the satellite reflections are well separated a simulation procedure based on the integrated intensities of the satellites and the Fourier transform of the mo