14. ELECTRON DIFFRACTION AND ELECTRON MICROSCOPY

A STUDY OF DEPARTURE FROM PROJECTION APPROXIMATION IN CuAsS/Se FOR CBED & HREM.

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The "tilt effect", or departure from a projection approximation (P.A.) with rotation from a zone setting has been examined during a study of CuAsS/Se (Whitfield, H.J., 1981). This effect is an important component of CBED & HREM techniques.

CBED space-group analysis of tilt effect is utilized, when Lauver-circle rather than zone-axis data is used to find the central-plane (C-P, or reciprocal) symmetries. Here the C-P is constructed from the HREM patterns.

Use of HREM for symmetry analysis has been restricted by the sensitivity of images, to fractional-degree tilts from exact 0 alignment. In combined CBED-HREM studies, it is useful to know how the experimental conditions of the two techniques come into the tilt effect.

An ensemble of computed lattice images made around the 1100 zone of CuAsS/Se (Pbcn) for a g = 4 mrad tilt angle was allowed to tilt through the 3-dimensional structure to be examined, and for experimental images to be usefully indexed.

Converting to the lattice symmetries generated by the vertical glide plane are as follows: With single axis rotations around the [100] zone of the crystal parts whereby two coaxial variants with the common axis is inclined to the electron beam. These micrographs reveal typical image reinforcement patterns.

As a con­sequence, the calculation speed of Laue-circle rather than CBED patterns has allowed the influence of the tilt effect to be seen.

Conclusions relating to the symmetries of Au4rm, Auarm, C.P.A. (C-P-approximation) is invoked.

In CBED space-group analysis the tilt effect is utilized, when Laue-circle rather than zone-axis data is to be examined. The first results clearly show the suggested crystal parts whereby two coaxial variants with the coincidence lattice plane which is inclined to the tilt axis.

Examples will be shown of both surface structure, and the combined imaging of lattice and surface step structure in such materials as NaO, Al2O3, and ZrO2.