11. REAL AND IDEAL CRYSTALS

11.8-6 KINEMATIC THEORY OF X-RAY SCATTERING FROM CRYSTALS, CONTAINING DISLOCATIONS.
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As the extension of earlier approach (Ryaboshapka, C.P. Zavodskaya laboratory, 1961, 27, N 5, p.26) the results of the X-ray diffraction theory for deformed crystals have been systems treated. It follows from the statistical theory of scattering from crystals containing various dislocation structures has been used with the allowance for superposition of displacements made by all the defects in the crystal lattice. Emphasis was made on the necessity to analyze peculiarities in the anisotropic distribution of the X-ray intensity near the directions corresponding to the reciprocal lattice nodes. The optimum schemes are given for the selection of reflex type and the X-ray method in the study of different dislocation structures. X-ray effect (broadening regularities, reflex shifting and weakening, peculiarities in the diffuse background intensity distribution) due to dislocation structures of the last kind are discussed. These are dislocations that contribute mainly to the intensity distribution variation along the diffraction vector (straightline dislocations) and dislocation multipoles of an odd order (dislocation configurations bounded in space loop) along with the incident beam. Peculiarities in the intensity distribution of X-rays scattered from crystals containing dislocation structure. The kinematic approximation is treated. These dislocations contribute mainly to the azimuthal direction (dislocation walls of blocks and fragments) excess concentration of streaks and dislocation walls of one sign; dislocations of some kind, and so on). The possibilities are discussed to study the parameters of nonuniform distribution of various dislocation structures by the X-ray method. Experimental works are considered where peculiarities in the intensity distribution of the X-ray reflexes are connected with the parameters of different dislocation structures. Applicability of various X-ray methods for the experimental evaluation of the parameters that characterize the type of dislocation structures and their spatial distribution is treated. It is shown that the obtained theoretical results may serve as a physical basis for the X-ray study of dislocation structures in deformed crystals. This requires:
1) Investigation of the intensity distribution pattern with the aid of two methods which make it possible to define contributions to radial and azimuthal distribution (e.g. by \(8-28\) scanning and \(8\)-scanning with narrow slit). From the distribution curves shape the dislocation structure type may be found and the parameters estimated.
2) Measurement of specially selected reflexes to distinguish between different dislocation structures of the same type and to determine quantitatively their parameters.
3) The study of reflexion system according to the optimum scheme which follows from analysis of particular equations deduced for the dislocation structures that had been found at the stage (2).