MS76.O03

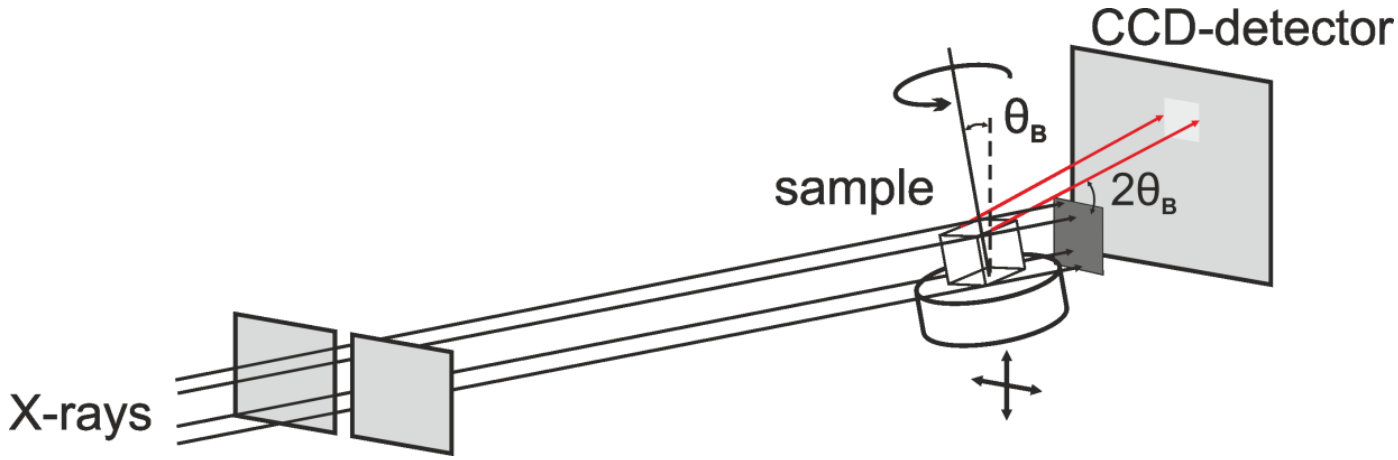
Retrieval of 3D deformations of single crystal defects by X-ray topo-tomography

V. Asadchikov[1], I. Besedin[1], A. Buzmakov[1], F. Chukhovskii[1], D. Zolotov[1], B. Roshchin[1]

[1]*A. V. Shubnikov Institute of Crystallography RAS, Moscow, Russia*

A challenge in X-ray topo-tomography is the issue of quantitatively determining the 3D-deformation-distribution field associated with single defects of crystal lattices. In the present report an endeavor is made to retrieve a 3D-deformation-distribution field around single line defects (dislocations) in crystals by using the X-ray topo-tomography method. The general layout of the X-ray topo-tomography experiment is depicted in Fig. 1[1]. For our purposes we have used plane-parallel samples of crystal Si with surface orientation (111), the sample thickness being 1 mm, in which the linear dislocations have been inserted according to [2]. The experiments were carried out at the X-ray wavelength of MoKα1 (λ=0.071 nm). Experimental series of the X-ray ($2\bar{2}0$)-reflection topography images with the rotation angle step 2° around the diffraction vector, the total angular range 360°, have been got out. Furthermore, such the 2D- topographic images are used for getting 3D-images by means of the modified algebraic method SART developed in [3]. In parallel, for 3D reconstruction the corresponding 2D-topographic dislocation images are simulated by use of the Born-approximation analytical and numerical solutions based on Takagi-Taupin equations describing the two-beam X-ray diffraction by the deformed crystals. Certainly, all the above approaches are applied to the comparative analysis of opportunities of determining 3D-deformation-distribution field around the dislocations under consideration.

[1] *D. A. Zolotov, A. V. Buzmakov, V. E. Asadchikov et al., Crystallography Reports, 2011, 56, 3, 393–396,* ***[2]*** *V. I. Barabashov, A. Yu. Komisla, Fizika Tverdogo Tela, 2005, 47, 2, 229-232 (in Russian),* ***[3]*** *D. A. Zolotov, A. V. Buzmakov, V. E. Asadchikov, ICTMS 2013. July 1-5 Ghent, Belgium. Book of Abstract. Posters, 97-99.*



Keywords: topo-tomography, Takagi-Taupin equations, SART algorithm