X-RAY TOPOGRAPHIC STUDIES OF CRYSTAL LATTICE DEFECTS IN $Ca_{0.25}Sr_{0.75}NdAlO_4$ SINGLE CRYSTAL

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Oxide materials of general composition $ABCO_4$ (where A = Ca, Sr, Ba, B = La, Nd, Pr and C = Al, Ga) with the tetragonal perovskite-related K_2NiF_4-type structure are promising substrate materials for high temperature superconducting (HTSc) thin films, elements of thermal radiation receivers and other electronic devices due to their electrochemical and thermal properties and good lattice matching [1]. Further improvement of lattice matching can be obtained using crystals of solid solution in the systems $A_xA'_{1-x}BCO_4$ or $ABC_xC'_{1-x}O_4$ when the selection of the A/A' or C/C' ratio give the possibility of obtaining the proper lattice parameter [2-4]. Crystals of high structural quality are required for the applications so the characterisation of crystal lattice defects is of great importance.

In the present paper the defect structure was studied in the single crystal of $A_xA'_{1-x}BCO_4$ type with the formula $Ca_{0.25}Sr_{0.75}NdAlO_4$ The investigations were performed by conventional projection x-ray transmission topography and synchrotron radiation white beam back reflection topography.

The main defects revealed with these topographic methods were striation fringes associated with non-homogenous crystal chemical composition, which is typical for solid solutions and doped crystals (Figs. 1, 2). They are seen as diffraction contrasts of distinct fringes in the form of concentric rings. A significantly strong effect of lattice deformation associated with striation was revealed by white beam back reflection topograph with superimposed section topograph. The local lattice misorientation (especially associated with lattice parameter change) manifests itself in the bending of the section image (Fig. 2).

Apart from striations the topographs revealed a significant concentration of individual defects, most probably a kind of inclusions (Figs. 1, 2). The nature of these defects is under investigation.

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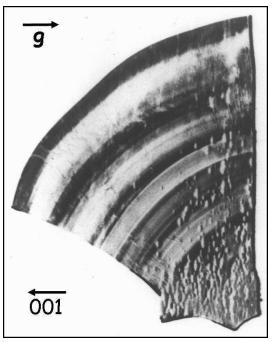

Figure 1. X-ray projection transmission topograph of the sample cut out from $Ca_{0.25}Sr_{0.75}NdAlO_4$ single crystal.

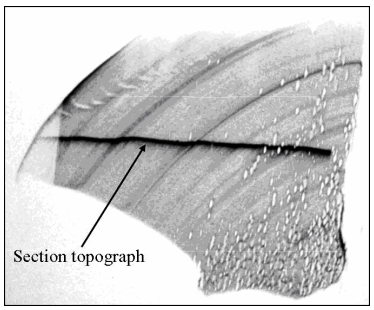

Figure 2. Synchrotron radiation white beam back reflection projection topograph with superimposed section topograph.

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