KINETICS OF STRUCTURAL TRANSFORMATIONS IN A MONOCRYSTAL $K_{0,940}Ag_{0,060}NO_3$

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Radiation of structural transformations in alkali metal nitrates has of great practical importance. This process is closely related to the technology of obtaining monocrystals of solid solutions with polymorphism.

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In addition, these compounds are used in pyrotechnics, explosives technology, medicine, and also in the electro-vacuum industry [1].

Numerous works have been devoted to the study of the mechanism of polymorphic transformations in alkali metal nitrates [2-5]. To clarify the effects of partial replacement of K^+ions with Cs^+, Rb^+Ag^+ ions on the mechanism of polymorphic transformation, we planned and conducted certain experimental works [6,7].

To clarify the mechanism of structural transformations, measuring the rate of crystal growth during polymorphic transformations as a function of temperature is of great importance. In this work, we measured the growth rate of crystal II (orthorhombic modification) modification into hexagonal III modification in the $K_{0,940}Ag_{0,060}NO_3$monocrystal. The measurements were carried out according to the method proposed in [8].

The conditions under which crystal growth occurs in the solid phase are fundamentally different from those for the growth of crystals from a solution, melt, or vapor. In this case, the edges of the growing crystal do not collide with free atoms and molecules, but must capture particles from the adjacent layers of the surrounding matrix, which has a crystalline structure, in which each of the atoms or molecules occupies a very specific position. As a result, crystal growth occurs due to the constant movement of the boundary between two non-conjugated lattice regions. The moving layer for such movement helps to reduce the surface free energy. The experimental data obtained from 6 crystals were processed using the MATLAB program, which gives a functional dependence of the growth rate of the III-hexagonal phase on temperature during the II→III transformation in the form

$$v = (0{,}2815\Delta T + 0{,}4484\Delta T^2 + 0{,}0081\Delta T^3) \cdot 10^2 \frac{cm}{s}$$

Where $\Delta T = T_{tr} - T_o$, $T_{tr}$is the transformation temperature, T_0 is the phase equilibrium temperature. Figure 1 shows a graph of the growth rate of the new phase as a function of temperature, constructed from experimental data and data obtained by the experimental formula.

The conducted experiments show that two groups of surface defects should be distinguished. When a new phase grows with a clear linear boundary, only a relatively small number of localized disturbances are observed, the impact on growth may remain the same over time. Minor disturbances to this thin structure result in minor changes in growth rate.

During repeated transformation, the accumulation of voltage and deformation bends the linear phase boundary. Depending on the nature of the counter defect, the movement of the phase boundary may even stop. There have also been cases where a visible curvature of the phase interface occurs and more and more new nuclei are formed in front of it, as a result of which the growth rate of the crystal increases.

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