

MORPHOLOGY OF II↔III TRANSFORMATIONS IN THE MONOCRYSTAL $K_{0.945}Rb_{0.055}NO_3$

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Monocrystals of $K_{0.945}Rb_{0.055}NO_3$ were grown by an isothermal crystallization method, from an aqueous solution, and the growth morphology of crystals of III and II modifications during transformations II ↔ III was studied. It is established that the structural transformations in the crystal under investigation are enantiotropic and the equilibrium temperature between modifications II and III is $T = 455 \pm 0,5$ K. Monocrystal $K_{0.945}Rb_{0.055}NO_3$ were obtained from an aqueous solution at room temperature by isothermal crystallization. For the perfection and chemical purity of the obtained crystals, potassium nitrate of analytical grade and rubidium nitrate of chemical grade were subjected to additional purification by multiple crystallization. As a result, well-faceted crystals with an average size of $1 \times 0,5 \times 10$ mm and variety of external shapes were obtained. The resulting crystals were mainly needle-shaped, extending along the crystallographic direction [1].

Using a МИН-8 optical polarizing microscope equipped with a special heater, morphological studies were carried out, that is, visual observation of the crystal growth during polymorphic transformations [1]. These observations were carried out using a “Levenhuk C310 NK” film camera and recorded by a computer. The crystal temperature was measured with a thermocouple, whose tip was directly touched the surface of the sample. The accuracy of temperature measurement at $100^\circ C$ reached ± 0.5 . First, we determined the equilibrium temperature between modifications II and III, which is equal to $T_0 = (455 \pm 0,5)$ K. Observations in an optical polarizing microscope show that II → III polymorphic transformation occurs in the studied crystal at the temperature $T_{tr} > T_0$. Here, T_{tr} is the transformation temperature and T_0 is the phase equilibrium temperature. The temperature difference $\Delta T = T_{tr} - T_0$ that we determined [2,3], depends on the perfection and on the prehistory of the matrix monocrystal. The maximum deviation from the equilibrium temperature between modifications II and III is $\Delta T \sim 2$ K. Thus, it has been experimentally established that in $K_{0.945}Rb_{0.055}NO_3$ crystals, polymorphic transformations are enantiotropic in nature, and the growth of crystals of modifications III and II during II-III transformations occurs with the formation and growth of nuclei of the daughter modification within the matrix.

It is also determined that there is no intermediate modification between III and II modifications. The rhythmic growth that is found in potassium nitrate

crystals during the II \rightarrow III transformation [4] is not detected in this case. Polymorphic transformations occur according to the monocrystal \leftrightarrow monocrystal type. Partial replacement of K^+ ions by Rb^+ ions increase the equilibrium temperature between modifications II and III by about 55 K.

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NON-CLASSICAL BOUNDARY VALUE FORMULATION FOR 4D BIANCHI-TYPE HYPERBOLIC EQUATIONS WITH IRREGULAR COEFFICIENTS

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This paper investigates a four-dimensional (4D) combined boundary value problem for a loading-type Bianchi hyperbolic equation with non-smooth coefficients. The problem is formulated using non-classical boundary conditions of the 3D-in-the-geometrical-middle and 1D-in-the-middle type, which do not require matching conditions. It is proven that these non-classical boundary conditions are equivalent to classical four-dimensional conditions when the solution is considered in the isotropic Sobolev space. The hyperbolic Bianchi equation discussed generalizes several well-known equations of mathematical physics, including the Laplace, telegraph, and wave equations, as well as their 3D and 4D counterparts. The novelty lies in addressing the problem within the framework of non-smooth coefficients, where classical techniques, such as integration by parts and the use of Riemann functions, are not applicable due to the lack of a formally adjoint operator. The relevance of this study is supported by real-world applications such as fluid filtration in fractured media, moisture and heat transfer in heterogeneous environments, and biological process modeling. The results contribute to the theory of partial differential equations and provide theoretical foundations for solving complex applied problems where classical assumptions on smoothness are not valid.

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