HEAT CAPACITY AND THERMODYNAMIC FUNCTIONS OF SINGLE CRYSTAL $LiRbMo_3O_{10}$ FROM 0 K TO THE MELTING POINT

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The search for new scintillation materials and the study of their properties are currently actively developing. Inorganic single crystal scintillators find application in areas such as medical imaging, nuclear safety, high-energy physics, and others. Double alkali metal molybdates are promising scintillation materials. In the presented work, we investigated for the first time the thermodynamic properties of single crystal $LiRbMo_3O_{10}$.

A $LiRbMo_3O_{10}$ single crystal (see Figure) was produced via the low-gradient Czochralski technique in air using a weight-controlled growth setup. The obtained crystal was then cut into samples of various sizes for further study.

$LiRbMo_3O_{10}$ single crystal grown in the [001] direction.

The phase and elemental composition of the grown single crystal were confirmed by X-ray phase analysis, mass spectrometry, and atomic emission spectroscopy. The total impurity content in the sample does not exceed $1 \cdot 10^{-2}$ wt%.

Heat capacity data for the $LiRbMo_3O_{10}$ single crystal in the interval from 5 K to the onset melting temperature (T_{onset}= 785±1 K) were obtained using a BKT-20 adiabatic calorimeter and a Netzsch 204 F1 Phoenix differential scanning calorimeter. Analysis of the experimental data revealed a boson peak in the heat capacity behavior below 10 K. Based on the obtained heat capacity data, thermodynamic functions (entropy, enthalpy, and reduced Gibbs energy) were calculated in the range of 0–785 K, and the characteristic Debye temperature was determined.

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