LOW-TEMPERATURE HEAT CAPACITY AND THERMODYNAMIC FUNCTIONS OF A $Gd_2(MoO_4)_3$ SINGLE CRYSTAL

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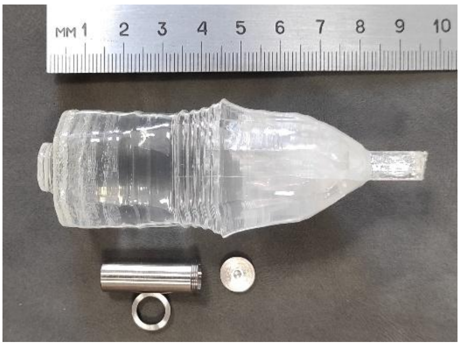
Rare-earth molybdates, including $Gd_2(MoO_4)_3$, are of considerable practical interest due to their nonlinear optical and ferroelectric properties, which underpin their applications in photonics and optoelectronic devices. Reliable thermodynamic data, in particular high-precision heat capacity over a wide temperature range, are essential for an adequate description of their physical behavior. Available literature data are limited to temperatures below 4.2 K and the 60–305 K interval and have been obtained for polycrystalline samples, thus precluding a consistent thermodynamic description of single-crystalline $Gd_2(MoO_4)_3$ over an extended temperature range.



Gadolinium molybdate single crystal and titanium calorimeter container

In this work, a large optically homogeneous single crystal of gadolinium molybdate ($Gd_2(MoO_4)_3$) was grown using the low-thermal-gradient Czochralski method and comprehensively characterized in terms of its phase, elemental, and impurity composition. For calorimetric measurements, a cylindrical sample was prepared from the crystal, precisely matching the dimensions of the inner cavity of the calorimeter container. High-precision heat capacity data in the temperature range 6–330 K were obtained by adiabatic calorimetry using a BKT-20 calorimeter [1]. Based on the experimental data, thermodynamic functions (entropy, enthalpy and reduced Gibbs energy) were calculated for the entire studied temperature range. Low-temperature heat capacity data below 4.2 K from the literature were consistently incorporated to ensure correct extrapolation to 0 K. The results obtained in our study were compared with literature data.

1. Bespyatov M.A. // J. Chem. Eng. Data 2025. V. 70. P. 3630.

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