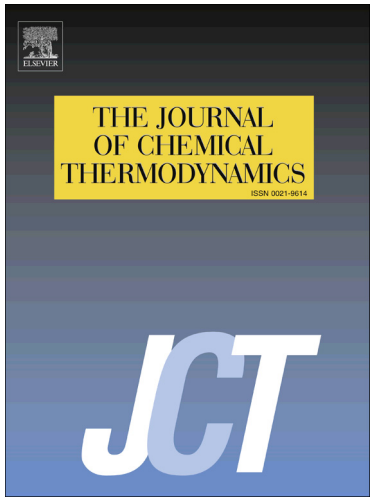

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Low-temperature thermodynamic properties of holmium selenide (2:3)

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Abstract

Holmium selenide Ho_2Se_3(cr) was synthesized and characterized by powder X-ray diffraction and energy dispersive analysis. The heat capacity of Ho_2Se_3(cr) has been measured by adiabatic method in the temperature range of (4.75–302.60) K. The pronounced λ- anomalies were found in $C_{p,m}(T)$ dependence with the maxima at temperatures T_{C1} = 6.03 K and T_{C2}= 228.40 K. A conclusion was drawn that the phase transition associated with antiferromagnetic ordering is observed at T_{C1}. The values of thermodynamic function (entropy, enthalpy and Gibbs reduced energy) were calculated from the experimental $C_p(T)$ dependence. Absolute entropy value was used for calculation of Ho_2Se_3(cr) formation entropy at T = 298.15 K.

Keywords: Heat capacity; Thermodynamic functions; Holmium selenide.

1. Introduction

Rare-earth chalcogenides are the perspective materials for practical application in thermoelectric converters of energy, laser technique, precise metallurgy and other fields of technology [1-4]. At the same time many properties of these compounds, including thermodynamic, are studied insufficiently. For calculating chemical equilibrium constants it is necessary to know the exact values of such quantities as entropy and enthalpy under standard conditions. The most reliable data of these quantities can be obtained from the results of the low-temperature heat capacity measurement [5-7]. At present, there are no data on the heat capacity of Ho_2Se_3 at low temperatures.