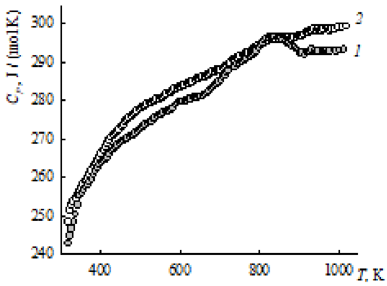
HEAT CAPACITY OF $Ca_2Ga_{2-x}Fe_xGeO_7$ (x = 0; 0.05)

Denisova L.T., *Galiakhmetova N.A.*, *Vasil'ev G.V.*
Siberian Federal University
660041, Krasnoyarsk, Svobodnyi pr., 79

The compound of Ca- gallogermanate ($Ca_2Ga_2GeO_7$) with the spatial group $P42_1m$ belongs to the melilite family and is promising as a basis for the production of electroluminescent displays, detectors, lasers, imaging devices and sensors.

Gallogermanates $Ca_2Ga_{2-x}Fe_xGeO_7$ (x = 0; 0.05) were synthesized using a high-temperature solid-phase reaction. Stoichiometric mixtures of pre-calcined initial oxides (CaO, Fe_2O_3, GeO_2 and Ga_2O_3) were crushed in an agate mortar and pressed into tablets and fired in air at temperatures of 1073 K (20 h) and 1573 K (60 h). The phase composition of the obtained compounds was controlled via X-ray phase analysis using a D8 ADVANCE diffractometer from Bruker, a VANTEC-1 linear detector. The heat capacity in the range of 320 - 1050 K was determined by differential scanning calorimetry using the thermoanalytical system STA 449 C Jupiter (Netzsch, Germany).



Temperature dependences of the molar heat capacity of $Ca_2Ga_{2-x}Fe_xGeO_7$ (x= 0 (*1*); 0.05 (*2*))

The Ca-gallogermanate synthesized by us had the following unit cell parameters: a = 7.89268(9) Å, c = 5.20861(7), V = 324.4675(84)Å^3. The obtained values are in satisfactory agreement with the data in the literature [1]. Replacing a part of the gallium with iron leads to a slight change in the lattice parameters: a = 7.90744(19) Å, c = 5.21016(15) Å, V = 325.7785(181) Å^3. From fig. it is seen that on the dependence $C_P = f(T)$ for $Ca_2Ga_2GeO_7$, there is an extremum at 815 K, which disappears when part of the gallium is replaced by iron. This fact can be explained by the existence of incommensurate–normal phase transition in melilite at high temperatures [1].

1. Bindi L., Bonazzi P. Incommensurate–normal phase transition in natural melilite: an in situ high-temperature X-ray single-crystal study // Phys Chem Minerals. 2005. Vol. 32. P. 89–96. https://doi.org/10.1007/s00269-004-0439-2

The work was carried out within the framework of the state assignment of the Ministry of Science and Higher Education of the Russian Federation for science of the Siberian Federal University, project FSRZ-2020-0013.