

MS15-P131 - LATE | THERMAL EXPANSION OF ALLUAUDITE GROUP MINERALS (NICKENICHITE AND CALCIOJOHILLERITE)

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The alluaudite group minerals and compounds are prospective materials for cathodes of sodium batteries [1-2].

Specimens of two minerals of this group (nickenichite and calciojohillerite) were collected at Tolbachik Volcano, Kamchatka Peninsula, Russia [3]. The crystal structure consists of chains of MO_6 octahedra connected by the edge, which are parallel [10-1]. The AsO_4 tetrahedra link these chains into layers in the ac plane. The layers are combined into a framework, containing two types of channels parallel [001].

Thermal expansion of minerals is anisotropic: the maximum one is close to the a axis, the minimal – to the small diagonal of the parallelogram ac . The main values of tensors at 25 °C: $\alpha_{11}=13.7(2)$, $\alpha_{22}=9.0(1)$, $\alpha_{33}=3.2(1)\times 10^{-6}$ °C⁻¹ for nickenichite; $\alpha_{11}=13.6(3)$, $\alpha_{22}=9.9(2)$, $\alpha_{33}=2.9(1)$ × °C⁻¹ for calciojohillerite. The thermal expansion can be caused by the straightening of the corrugation of layers, and the result is that the channels size is suitable for ionic conductivity increase. Insignificant bending is observed on the temperature dependences of the cell parameters at 300 °C. These temperatures correspond to the beginning of the “order-disorder” process and are consistent with the data on ionic conductivity.

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[3] Filatov S.K., Krivovichev S.V., Vergasova L.P. J. Volcanology and Seismology. 12 (2018) 388.