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Eliseevite, $Na_{1.5}Li[Ti_2Si_4O_{12.5}(OH)_{1.5}]\cdot 2H_2O$, a new microporous titanosilicate from the Lovozero alkaline massif (Kola Peninsula, Russia)

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Abstract

Eliseevite, $Na_{1.5}Li[Ti_2Si_4O_{12.5}(OH)_{1.5}]\cdot 2H_2O$, is a new microporous titanosilicate of the lintisite-kukisvumite family [monoclinic, *C*2/*c*, $a = 27.48(1)$, $b = 8.669(4)$, $c = 5.246(2)$ Å, $\beta = 90.782(8)°$, $V = 1249.7(9)$ Å^3, $Z = 4$]. The mineral is found in two different peralkaline veins in an ijolite–foyaite–malignite differentiated complex of the Lovozero alkaline massif, Kola Peninsula, Russia. At Mt. Alluaiv, eliseevite occurs in an aegirine-eudialyte-sodalite-microcline vein as long-prismatic to fibrous crystals (up to 2 mm long) growing in voids of natrolitized sodalite in close association with albite, analcime, catapleiite, chabazite-Ca, gmelinite-K, manganoneptunite, microcline, murmanite, and an ussingite. At Mt. Punkaruaiv, it is found within a ussingite-aegirine-microcline vein as long-prismatic crystals (up to 0.8 mm long) in close association with chabazite-Ca, chkalovite, eudialyte, manganoneptunite, punkaruaivite, rhabdophane-(Ce), sodalite, sphalerite, and steenstrupine-(Ce). It is a late-stage, hydrothermal mineral formed as a result of alteration of murmanite. The mineral is transparent, pale creamy to colorless, with a vitreous luster and a white streak. Cleavage is perfect along {100}, fracture is splintery. Mohs hardness is about 5. In transmitted light, the mineral is colorless, biaxial (–): $\alpha = 1.665(2)$, $\beta = 1.712(2)$, $\gamma = 1.762(5)$ (for $\lambda = 589$ nm); $Y = b$, $Z \wedge a = 8–12°$. Dispersion is medium, $r < v$. $D_{calc} = 2.706$ g/cm^3, $D_{meas} = 2.68(4)$ g/cm^3. The mean chemical composition (n = 7) determined by the Penfield method (water), ICP-MS (Li), and electron microprobe (other elements) is (wt%): H_2O 10.50, Li_2O 2.85, Na_2O 9.15, K_2O 0.08, CaO 0.05, Fe_2O_3 0.21, Al_2O_3 0.08, SiO_2 46.87, TiO_2 29.40, Nb_2O_5 0.72, total 99.91. The empirical formula calculated on the basis of Si = 4 apfu is: $(Na_{1.51}K_{0.01}Ca_{0.01})_{\Sigma 1.53}Li_{0.98}[(Ti_{1.89}Nb_{0.03}Fe^{3+}_{0.01}Al_{0.01})_{\Sigma 1.94}Si_4O_{12.26}(OH)_{1.74}]\cdot 2.12H_2O$. The simplified formula taking into account the results of a single-crystal study is $Na_{1.5}Li\{Ti_2O_2[Si_4O_{10.5}(OH)_{1.5}]\}\cdot 2H_2O$. The six strongest reflections in the X-ray powder-diffraction pattern [*d* in Å, (*I*), (*hkl*)] are: 13.76(100)(200), 6.296(60)(310), 3.577(80)(710), 3.005(70)(421), 2.881(70)(910), 2.710(50)(62$\bar{1}$). The mineral is named in honor of Nikolai Aleksandrovich Eliseev (1897–1966), a remarkable Russian geologist and petrologist, Professor at Leningrad State University, for his contributions to the geology and petrology of metamorphic and alkaline complexes.

Keywords: Eliseevite, new mineral, microporous titanosilicate, peralkaline hydrothermal formation, Lovozero massif, Kola Peninsula, Russia