Lakargiite $CaZrO_3$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As pseudo-cubic crystals to 35 μm bounded by {100} and {111}, as skeletal crystals and spherulite-like forms <200 μm, in aggregates to 200 μm. As pseudomorphs after zircon.

Physical Properties: *Cleavage*: on {110} and {001}. *Fracture*: Uneven. *Tenacity*: Brittle. Hardness = 8-9 VHN = 1392-1708, 1545 average (100 g load). D(meas.) = n.d. D(calc.) = 4.587

Optical Properties: Transparent. *Color*: Red-brown (high Ti) to yellowish, almost colorless; in thin section, light-brown to colorless; red-brown and pink internal reflections in reflected light. *Streak*: Light-brown to cream-white. *Luster*: Vitreous to adamantine, submetallic for dark varieties. *Optical Class*: Biaxial(+) synthetic. α = 2.1(1) β = 2.1(1) γ = 2.1(1) 2V(meas.) = ~ 0° *Orientation*: X = *a*, Y = *c*, Z = *b*. Non-pleochroic.

Cell Data: *Space Group*: *Pbnm*. *a* = 5.556(1) *b* = 5.715(1) *c* = 7.960(1) Z = 4

X-ray Powder Pattern: Upper Chegem caldera, North Caucasus, Kabardino-Balkaria, Russia. 2.807 (100), 1.610 (36), 1.988 (34), 3.970 (28), 2.850 (25), 2.771 (22), 1.640 (18)

Chemistry:

	(1)		(1)
UO_3	2.24	Sc_2O_3	0.38
Nb_2O_5	0.56	Cr_2O_3	0.34
Ta_2O_5	0.09	Al_2O_3	0.04
ZrO_2	40.34	Ce_2O_3	0.53
SnO_2	11.14	La_2O_3	0.58
TiO_2	7.89	Nd_2O_3	0.14
HfO_2	0.90	CaO	31.08
ThO_2	0.84	SrO	0.10
SiO_2	0.04	MgO	0.01
Fe_2O_3	2.46	Total	99.70

(1) Upper Chegem caldera, North Caucasus, Kabardino-Balkaria, Russia; average of 24 electron microprobe analyses supplemented by IR and Raman spectroscopy; corresponding to $(Ca_{0.985}Sr_{0.002})_{\Sigma=0.987}(Ce_{0.006}La_{0.006}Th_{0.006}Nd_{0.001})_{\Sigma=0.019}(Zr_{0.582}Ti^{4+}_{0.176}Sn_{0.131}Fe^{3+}_{0.055}U^{6+}_{0.014}Sc_{0.010}Cr^{3+}_{0.008}Hf_{0.008}Nb^{5+}_{0.007}Si_{0.001}Ta^{5+}_{0.001}Al_{0.001})_{\Sigma=0.986}O_3$.

Polymorphism & Series: Belongs to the ternary solid solution $CaZrO_3$-$CaTiO_3$-$CaSnO_3$.

Mineral Group: Perovskite group.

Occurrence: In high-temperature skarns formed in sanidinite-facies conditions of contact metamorphism in carbonate-silicate rocks occurring as xenoliths in ignimbrites.

Association: Spurrite, larnite, calcio-olivine, calcite, cuspidine, rondorfite, reinhardbraunsite, wadalite, perovskite, minerals of the ellestadite group.

Distribution: From between the Lakargi and Vorlan mountain peaks, Upper Chegem (Verkhniy Chegem) caldera, North Caucasus, Kabardino-Balkaria, Russia.

Name: For *Lakargi* Mountain, Russia.

Type Material: Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow (3590/1).

References: (1) Galuskin, E.V., V.M. Gazeev, T. Armbruster, A.E. Zadov, I.O. Galuskina, N.N. Pertsev, P. Dzierżanowski, M. Kadiyski, A.G. Gurbanov, R. Wrzalik, and A. Winiarski (2008) Lakargiite $CaZrO_3$: A new mineral of the perovskite group from the North Caucasus, Kabardino-Balkaria, Russia. Amer. Mineral., 93, 1903-1910. (2) Stoch, P., J. Szczerba, J. Lis, D. Madej, and Z. Pędzich (2012) Crystal structure and *ab initio* calculations of $CaZrO_3$. J. Eur. Ceramic Soc., 32, 665-670.