

**Crystal Data:** Monoclinic. *Point Group:* 2/m. Crystals flattened on {100}, elongated along [001], rarely terminated, to 20 cm; as stellate clusters and sheaflike aggregates. *Twinning:* Common on {100}, rarely polysynthetic.

**Physical Properties:** *Cleavage:* Perfect micaceous on {100}; poor on {010}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 2-3 D(meas.) = 3.44-3.53 D(calc.) = 3.49

**Optical Properties:** Opaque, transparent to translucent in thin section. *Color:* Dark brown, brownish yellow, straw-yellow, reddish brown with a golden tint. *Streak:* Pale yellow, may have an orange tint. *Luster:* Submetallic on cleavages. *Optical Class:* Biaxial (+).  $\alpha = 1.735-1.749$   $\beta = 1.747-1.754$   $\gamma = 1.770-1.781$   $2V(\text{meas.}) = 21^\circ-41^\circ$  *Pleochroism:* X = yellow; Y = straw-yellow; Z = orange or straw-yellow. *Dispersion:*  $r > v$ ; strong. *Orientation:*  $X \perp b$ ;  $Z \wedge c \approx 4^\circ-8^\circ$ .

**Cell Data:** *Space Group:* Pnmn (for 2O).  $a = 19.128(4)$   $b = 7.0799(14)$   $c = 5.3824(11)$   $Z = \text{n.d.}$  *Space Group:* C2/m (for 2M).  $a = 19.215(5)$   $b = 7.061(2)$   $c = 5.3719(15)$   $\beta = 96.797(4)^\circ$   $Z = \text{n.d.}$

**X-ray Powder Pattern:** Kola Peninsula, Russia. (ICDD 17-751). 2.773 (100), 3.43 (55), 2.130 (45), 1.477 (45), 3.73 (40), 3.27 (40), 2.874 (40)

Chemistry:	(1)	(2)	(3)	(1)	(2)	(3)	
SiO <sub>2</sub>	30.40	30.93	32.20	SrO	14.58	14.12	16.43
TiO <sub>2</sub>	27.48	27.14	30.30	BaO	1.25	3.49	0.49
Al <sub>2</sub> O <sub>3</sub>		0.56		Na <sub>2</sub> O	12.35	10.64	12.38
Fe <sub>2</sub> O <sub>3</sub>	3.87	1.36		K <sub>2</sub> O	2.31	1.26	0.45
(Nb,Ta) <sub>2</sub> O <sub>5</sub>		0.16	0.43	F	1.82	1.10	
FeO	1.97	2.31	2.08	H <sub>2</sub> O <sup>+</sup>		0.56	
MnO	2.33	3.46	3.49	H <sub>2</sub> O <sup>-</sup>		0.16	
MgO	0.25	0.40	0.66	LOI	0.60		
CaO	1.41	2.48	0.84	- O = F <sub>2</sub>	0.77	0.46	
				Total	99.85	99.67	99.75

(1) Kukisvumchorr apatite deposit, Khibiny massif, Russia. (2) Mt. Karnasurt, Lovozero massif, Russia. (3) Mt. Alluaiv, Lovozero alkaline massif, Russia; average electron microprobe analysis representative of both polytypes; corresponding to  $(\text{Sr}_{1.18}\text{Na}_{0.66}\text{Ca}_{0.12})_{\Sigma=1.96}\text{Na}(\text{Na}_{1.30}\text{Mn}_{0.36}\text{Fe}_{0.22}\text{Mg}_{0.12})_{\Sigma=2.00}\text{Ti}_3(\text{Si}_2\text{O}_7)_2\text{O}_2(\text{OH})_2$ .

**Polymorphism & Series:** 2O and 2M polytypes.

**Occurrence:** In all rock types and most pegmatites of a differentiated alkalic massif; both polytypes coexist in ussingite-microcline-sodalite veins at Mt. Alluaiv (Lovozero massif, Russia).

**Association:** Microcline, nepheline, aegirine, ussingite, sodalite, albite, manganneptunite, vuonnemite, sphalerite, lomonosovite, betalomonosovite (Lovozero massif, Russia); microcline, nepheline, catapleite, aegirine, calcite, fluorite, analcime, pectolite (Pilansberg, South Africa).

**Distribution:** In Russia, in the Lovozero and Khibiny assifs, Kola Peninsula; in the Konder, Inagli, and Yllymakh massifs, Yakutia. In the Gardiner complex, near the head of Kangerdlugssuaq Fjord, Greenland. From the Langesundsfjord, Norway. At Pilansberg, Transvaal, South Africa. In the Rocky Boy stock, Bear Paw Mountains, Hill Co., Montana, USA. At Mont Saint-Hilaire, Quebec, Canada. From Pedro Balao, Poços de Caldas, Minas Gerais, and Serrote, Cascata, São Paulo, Brazil.

**Name:** From the Greek for *shining* and *leaf*, for its lustrous cleavage.

**References:** (1) Dana, E.S. (1899) Dana's system of mineralogy, (6th edition), app. I, 40. (2) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 207-209. (3) Vlasov, K.A., M.V. Kuz'menko, and E.M. Es'kova (1966) The Lovozero alkali massif. Akad. Nauk SSSR, 361-370 (in English).

- (4) Saf'yanov, Y.N., N.O. Vasil'eva, V.P. Golovachev, E.A. Kuz'min, and N.V. Belov (1983) Crystal structure of lamprophyllite. Doklady Acad. Nauk SSSR, 269, 117-120 (in Russian).
- (5) Krivovichev, S.V., T. Armbruster, V.N. Yakovenchuk, Y.A. Pakhomovsky, and Yu.P. Men'shikov (2003) Crystal structures of lamprophyllite-2*M* and lamprophyllite-2*O* from the Lovozero alkaline massif, Kola Peninsula, Russia. Eur. J. Mineral., 15, 711-718. (6) (2004) Amer. Mineral., 89(2), 470-471 (abs. ref. 5).