

Palermoite

(Li, Na)₂(Sr, Ca)Al₄(PO₄)₄(OH)₄

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Crystal Data: Orthorhombic. *Point Group:* 2/m 2/m 2/m. Long prismatic crystals, showing {100}, {010}, {110}, {031}, {011}, striated || [100], to 5 mm; granular.

Physical Properties: *Cleavage:* On {001}, perfect; on {100}, fair. *Fracture:* Fibrous to subconchoidal. *Tenacity:* Brittle. Hardness = 5.5 D(meas.) = 3.22 D(calc.) = 3.26 White cathodoluminescence in X-ray beam.

Optical Properties: Semitransparent. *Color:* Colorless, white, pale pink. *Streak:* White. *Luster:* Vitreous to subadamantine.

Optical Class: Biaxial (-). *Orientation:* X = a; Y = c; Z = b. *Dispersion:* r < v, moderate. $\alpha = 1.627$ $\beta = 1.642$ $\gamma = 1.644$ 2V(meas.) = ~20°

Cell Data: *Space Group:* Imcb. a = 11.556(5) b = 15.847(7) c = 7.315(4) Z = 4

X-ray Powder Pattern: Palermo #1 mine, New Hampshire, USA.

3.089 (100), 4.360 (64), 3.129 (60), 2.905 (53), 3.320 (52), 2.596 (48), 2.436 (46)

Chemistry:	(1)	(2)	(1)	(2)
P ₂ O ₅	42.89	43.65	BaO	0.10
Al ₂ O ₃	30.83	30.18	Li ₂ O	4.00 n.d.
Fe ₂ O ₃	0.30		Na ₂ O	1.32
FeO		0.35	K ₂ O	0.10
MgO	0.10	0.02	H ₂ O ⁺	5.36 n.d.
CaO	1.39	1.65	H ₂ O ⁻	0.30
SrO	12.93	11.34	Total	99.69

(1) Palermo #1 mine, New Hampshire, USA; corresponds to (Li_{1.74}Na_{0.28}K_{0.01})_{Σ=2.03}(Sr_{0.81}Ca_{0.16}Fe_{0.02}Mg_{0.02})_{Σ=1.01}Al_{3.93}(PO₄)_{3.92}(OH)_{3.87}. (2) Giogo di Toirano, Italy; partial analysis by electron microprobe, total Fe as FeO.

Occurrence: A late hydrothermal product in a complex zoned granite pegmatite (Palermo #1 mine, New Hampshire, USA); near quartz veins in sandstones and conglomerates subjected to greenschist metamorphism (Giogo di Toirano, Italy).

Association: Siderite, childrenite–eosphorite, beraunite, crandallite, whitlockite, brazilianite, goyazite, apatite, quartz (Palermo #1 mine, New Hampshire, USA); lazulite, goyazite, brazilianite (Giogo di Toirano, Italy).

Distribution: In the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire, USA. From Giogo di Toirano, near Bardineto, Liguria, Italy. In the Xiyuantou pegmatite, Nanping, Fujian Province, China.

Name: For its occurrence at the Palermo #1 mine, New Hampshire, USA.

Type Material: Harvard University, Cambridge, Massachusetts, USA, 101342.

References: (1) Mrose, M.E. (1953) Palermoite and goyazite, two strontium minerals from the Palermo mine, North Groton, New Hampshire. *Amer. Mineral.*, 38, 354 (abs.). (2) Frondel, C. and J. Ito (1965) Composition of palermoite. *Amer. Mineral.*, 50, 777–779. (3) Moore, P.B. and T. Araki (1975) Palermoite, SrLi₂[Al₄(OH)₄(PO₄)₄]: its atomic arrangement and relationship to carminite, Pb₂[Fe₄(OH)₄(AsO₄)₄]. *Amer. Mineral.*, 60, 460–465. (4) Cortesogno, L., L. Gaggero, and G. Lucchetti (1987) Phosphate mineralizations in a permo-triassic sequence (Giogo di Toirano, Italy). *Neues Jahrb. Mineral., Monatsh.*, 305–313.