

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. As tiny, short prismatic crystals with {010}, {110}, and {111} common; as sheaflike groupings and massive.

Physical Properties: *Cleavage:* Distinct on {110}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5 D(meas.) = 6.19 D(calc.) = [6.29]

Optical Properties: Semitransparent. *Color:* Dark reddish brown, with deep red internal reflections; tarnishes black on the surface. *Streak:* Yellowish brown. *Luster:* Vitreous to submetallic, greasy, dull.

Optical Class: Biaxial (+). *Pleochroism:* Strong; X = bright yellowish pink; Y = reddish brown; Z = deep brownish red. *Orientation:* X = a. *Dispersion:* $r < v$, strong. *Absorption:* $Z > Y > X$. $\alpha = 2.10$ $\beta = 2.20$ $\gamma = 2.31$ $2V(\text{meas.}) = 88^\circ$

R_1 – R_2 : (400) 14.7–18.7, (420) 14.4–18.1, (440) 14.1–17.5, (460) 13.9–16.9, (480) 13.6–16.4, (500) 13.4–16.0, (520) 13.2–15.7, (540) 13.0–15.4, (560) 12.9–15.2, (580) 12.8–15.0, (600) 12.6–14.9, (620) 12.5–14.8, (640) 12.5–14.7, (660) 12.4–14.5, (680) 12.4–14.4, (700) 12.3–14.3

Cell Data: *Space Group:* $Pbcn$. $a = 6.961(2)$ $b = 11.018(3)$ $c = 9.964(5)$ $Z = 4$

X-ray Powder Pattern: Långban, Sweden.

2.90 (100), 2.86 (100), 2.74 (100), 3.71 (80), 3.51 (80), 3.24 (80), 2.84 (80)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SiO ₂	15.95	16.45	16.59	Mn ₂ O ₃	22.26	13.55	21.79
TiO ₂		0.38		ZnO		0.05	
Al ₂ O ₃		0.30		PbO	59.79	59.59	61.62
Fe ₂ O ₃		6.62		MgO		0.05	
				Total	98.00	96.99	100.00

(1) "Chile." (2) Långban, Sweden; by electron microprobe, corresponding to $\text{Pb}_{1.98}(\text{Mn}_{1.28}\text{Fe}_{0.61}\text{Al}_{0.04}\text{Ti}_{0.04}\text{Mg}_{0.01})_{\Sigma=1.98}\text{Si}_{2.02}\text{O}_9$. (3) $\text{Pb}_2\text{Mn}_2\text{O}_2\text{Si}_2\text{O}_7$.

Polymorphism & Series: Forms a series with melanotekite.

Occurrence: In a cavity in calcite in a metamorphosed stratiform zinc deposit (Franklin, New Jersey, USA); in veinlets cutting franklinite ore in bedded manganese deposits (Ushkatyn deposits, Kazakhstan).

Association: Quartz, barite, apatite ("Chile"); braunite, richterite, barite (Långban, Sweden); calcite, willemite, franklinite (Franklin, New Jersey, USA); garnet, tephroite, franklinite, braunite (Ushkatyn deposits, Kazakhstan).

Distribution: The unknown type locality is "southern Chile." From Långban; Jakobsberg; the Harstigen mine, near Persberg; and the Klintgruvan mine, near Kryibo, Värmland, Sweden. From Bona de Padru, near Ozieri, Sardinia, Italy. At Higher Pitts Farm, Priddy, Somerset, England. In the Kombat mine, 49 km south of Tsumeb, Namibia. In South Africa, in the Wessels mine, near Kuruman, Cape Province. From the Ushkatyn deposits, Atasui area, Kazakhstan. At Franklin, Sussex Co., New Jersey, USA.

Name: From the Greek for *spike* or *thorn*, for its prismatic habit.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 544, 1039. (2) Gabrielson, O. (1961) The crystal structures of kentrolite and melanotekite. *Arkiv Mineral. Geol.*, 3, 141–151. (3) Glasser, F.P. (1967) New data on kentrolite and melanotekite: ternary phase relations in the system PbO – Fe_2O_3 – SiO_2 . *Amer. Mineral.*, 52, 1085–1093. (4) Moore, P.B., P.K. Sen Gupta, J. Shen, and E.O. Schlemper (1991) The kentrolite-melanotekite series, $4\text{Pb}_2(\text{Mn, Fe})_2^{3+}\text{O}_2[\text{Si}_2\text{O}_7]$: chemical crystallographic relations, lone-pair splitting, and cation relation to 8URe_2 . *Amer. Mineral.*, 76, 1389–1399.

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