

Sicklerite

Li(Mn²⁺, Fe³⁺)PO₄

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Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Massive, as rims around and in crystals and masses of triphylite-lithiophilite.

Physical Properties: *Cleavage:* {100}, good. Hardness = ~ 4 D(meas.) = 3.45 D(calc.) = [3.54]

Optical Properties: Subtranslucent to opaque. *Color:* Yellow to red-brown, black; yellow-brown in thin section. *Streak:* Pale yellowish brown, brown, reddish brown. *Optical Class:* Biaxial (-). *Pleochroism:* X = deep reddish, or deep yellow; Y = paler reddish or paler yellow; Z = very pale reddish or very pale yellow. *Orientation:* X = a. *Dispersion:* $r \gg v$, very strong. $\alpha = 1.710\text{--}1.720$ $\beta = 1.730\text{--}1.738$ $\gamma = 1.745$ 2V(meas.) = $> 60^\circ$

Cell Data: *Space Group:* $Pmnb$. $a = 6.030(15)$ $b = 10.082(9)$ $c = 4.750(5)$ $Z = 4$

X-ray Powder Pattern: Tanco pegmatite, Canada. (ICDD 33-802). 2.971 (100), 2.495 (75), 3.497 (40), 2.448 (35), 5.037 (30), 4.327 (30), 1.6081 (25)

| Chemistry: | (1) | (2) |
|--------------------------------|-------|----------|
| P ₂ O ₅ | 43.10 | 46.68 |
| Fe ₂ O ₃ | 11.26 | 8.06 |
| Mn ₂ O ₃ | 2.10 | |
| MnO | 33.60 | 37.12 |
| CaO | 0.20 | 0.12 |
| (Li, H) ₂ O | 3.80 | [7.85] |
| Na ₂ O | | 0.13 |
| K ₂ O | | 0.04 |
| H ₂ O | 1.71 | n.d. |
| insol. | 4.18 | |
| Total | 99.95 | [100.00] |

(1) Pala, California, USA. (2) Stewart mine, California, USA; by electron microprobe, total Fe as Fe₂O₃, total Mn as MnO, (Li, H)₂O by difference; corresponds to (Li_{0.94}Na_{0.01})_{Σ=0.95}(Mn_{0.80}Fe_{0.15}³⁺)_{Σ=0.95}(PO₄)_{1.00}.

Polymorphism & Series: Forms a series with ferrisicklerite.

Occurrence: Formed by late hydrothermal alteration or weathering of triphylite-lithiophilite in complex zoned granite pegmatites.

Association: Huréaulite, stewartite, jahnsite, phosphosiderite (Pala, California, USA).

Distribution: In the USA, in the Vanderburg mine, Hiriart Mountain, and the Stewart mine, Pala district, San Diego Co., California; from the White Picacho district, Yavapai Co., Arizona; in the Custer Mountain mine, 2.5 km east-southeast of Custer, Custer Co., South Dakota. From the Tanco pegmatite, Bernic Lake, Manitoba, Canada. At Tammela, and in the Viitaniemi pegmatite, near Eräjärvi, Finland. From Varuträsk, at the Norrö pegmatite, on Rånö Island, and on Utö Island, Sweden. From Sidi-bou-Othmane, Morocco. Occurs at Wodgina, Western Australia. Probably present in many other pegmatites; chemical analyses are desirable for certainty that the material fits the present definition.

Name: Honoring the Sickler family, mineral collectors, formerly of Pala, California, USA.

Type Material: Harvard University, Cambridge, Massachusetts, 101195; National Museum of Natural History, Washington, D.C., USA, 93653.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 672–673. (2) Shigley, J.E. and G.E. Brown, Jr. (1985) Occurrence and alteration of phosphate minerals at the Stewart pegmatite, Pala district, San Diego Co., California. Amer. Mineral., 70, 395–408.

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