

**Crystal Data:** Orthorhombic. *Point Group:* 222. As needles, elongated along [001], composed of subparallel crystallites showing {110} and {001}, to 0.5 mm; always in rosettelike and fibrous aggregates.

**Physical Properties:** *Cleavage:* Perfect on {001}. *Hardness* = 5.5 *D*(meas.) = 2.80–2.85 *D*(calc.) = 2.85

**Optical Properties:** Semitransparent. *Color:* White, pale green, may have a brown oxidization crust; colorless in transmitted light. *Streak:* White. *Luster:* Silky.

*Optical Class:* Biaxial (-). *Orientation:* *X* = *c*; *Y* = *a*; *Z* = *b*.  $\alpha = 1.589$   $\beta = 1.632$   
 $\gamma = [1.634]$   $2V$ (meas.) = 22°–25°

**Cell Data:** *Space Group:* P2<sub>1</sub>2<sub>1</sub>2. *a* = 17.631(1) *b* = 17.965(1) *c* = 3.1041(2) *Z* = 4

**X-ray Powder Pattern:** Schlegeistal, Austria.

2.829 (100), 2.2522 (94), 12.53 (83), 3.947 (72), 2.6211 (72), 6.27 (67), 1.1907 (67)

**Chemistry:**

	(1)		(1)
SiO <sub>2</sub>	0.02	K <sub>2</sub> O	0.01
B <sub>2</sub> O <sub>3</sub>	22.92	F	0.16
Al <sub>2</sub> O <sub>3</sub>	2.96	Cl	3.26
FeO	2.27	H <sub>2</sub> O <sup>+</sup>	10.40
MnO	0.17	H <sub>2</sub> O <sup>-</sup>	0.63
MgO	58.90	<u>-O = (F, Cl)<sub>2</sub></u>	<u>0.82</u>
CaO	0.14	Total	[101.03]
Na <sub>2</sub> O	0.01		

(1) Schlegeistal, Austria; by electron microprobe, total Fe as FeO, total Mn as MnO, B<sub>2</sub>O<sub>3</sub> determined photometrically, H<sub>2</sub>O by TGA, only (OH)<sup>1-</sup> present by IR, original total given as 100.40%; corresponds to (Mg<sub>6.60</sub>Al<sub>0.26</sub>Fe<sub>0.14</sub>Mn<sub>0.01</sub>Ca<sub>0.01</sub>)<sub>Σ=7.02</sub>(B<sub>0.99</sub>O<sub>2.97</sub>)<sub>3</sub>[(OH)<sub>4.37</sub>O<sub>0.26</sub>Cl<sub>0.42</sub>F<sub>0.04</sub>]<sub>Σ=5.09</sub>. (2) Do.; by electron microprobe, analysis not given; stated to correspond to (Mg<sub>6.05</sub>Al<sub>0.30</sub>Fe<sub>0.10</sub><sup>3+</sup>Fe<sub>0.05</sub><sup>2+</sup>)<sub>Σ=6.50</sub>(BO<sub>3</sub>)<sub>3</sub>(OH)<sub>4</sub>Cl<sub>0.40</sub>.

**Occurrence:** Probably formed by Alpine metamorphism, in a calcsilicate–carbonate lens in amphibolites (Schlegeistal, Austria).

**Association:** Calcite, dolomite, “chlorite”, clinohumite, brucite, ludwigite (Schlegeistal, Austria); sakhaite (Siberia, Russia).

**Distribution:** Found in the Furtschaglkar, in the Schlegeistal, Zillertal, Tirol, Austria. From the Cerdagne district, Pyrénées-Orientales, France. At an undefined locality [Titovskoye boron deposit, Tas-Khayakhtakh Mountains, Sakha] in Russia

**Name:** To honor Dr. Franz Karl (1918–1972), Professor of Mineralogy and Petrography, Christian Albrechts University, Kiel, Germany, for his studies of the geology of the eastern Alps.

**Type Material:** Mineralogical Institute and Museum, University of Kiel, Kiel; Institute for Mineralogy and Crystallography, Technical University, Berlin, Germany, 85/72; Natural History Museum, Vienna, Austria, L7676; Natural History Museum, Paris, France; National Museum of Natural History, Washington, D.C., USA, 149050–149052.

**References:** (1) Franz, G., D. Ackermann, and E. Koch (1981) Karlite, Mg<sub>7</sub>(BO<sub>3</sub>)<sub>3</sub>(OH, Cl)<sub>5</sub> a new borate mineral and associated ludwigite from the Eastern Alps. *Amer. Mineral.*, 66, 872–877. (2) Bonazzi, P., S. Menchetti, C. Sabelli, and R. Trosti-Ferroni (1986) Karlite: crystal structure and chemical composition. *Neues Jahrb. Mineral., Monatsh.*, 253–262.

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