

Crystal Data: Monoclinic. *Point Group:* $2/m$. As arrow-headed crystals with stubby curved faces in radial clusters <2 mm in diameter, and as acicular crystals to 500 μm in aggregates.

Twinning: Extensive, pseudo-orthorhombic revealed by structure analysis.

Physical Properties: *Cleavage:* None. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 4-4.5 VHN (dense aggregate) = 280-320, 300 average (20 g load). $D(\text{meas.}) = 3.11(2)$ $D(\text{calc.}) = 3.08$ Nonfluorescent. Slowly soluble in HCl.

Optical Properties: Translucent in thin needles, opaque in aggregates. *Color:* Dark green, almost black. *Streak:* Olive-green, (in 10-12 hours, changes to brownish red). *Luster:* Vitreous. *Optical Class:* Biaxial (-). $\alpha = 1.722(2)$ $\beta = 1.730(2)$ $\gamma = 1.737(2)$ $2V(\text{calc.}) = 86^\circ$ *Orientation:* $c \parallel Z$. *Pleochroism:* Strong; $X = \text{olive-green}$, $Y = \text{grayish blue}$, $Z = \text{dark green with a blue tint}$. *Absorption:* $X > Y > Z$.

Cell Data: *Space Group:* $P2_1/n$. $a = 16.950(2)$ $b = 11.650(1)$ $c = 6.2660(6)$ $\beta = 90.000(4)^\circ$ $Z = 4$

X-ray Powder Pattern: Kovdor alkaline-ultramafic complex, Kola Peninsula, Russia. 4.805 (100), 5.83 (89), 3.533 (84), 6.87 (77), 2.868 (66), 3.787 (62), 9.61 (53)

Chemistry:	(1)
MgO	11.16
MnO	0.78
FeO	25.00
Fe ₂ O ₃	29.90
P ₂ O ₅	12.46
TiO ₂	0.04
<u>H₂O</u>	<u>[20.18]</u>
Total	99.51

(1) Kovdor complex, Kola Peninsula, Russia; average electron microprobe analysis, H₂O calculated (the Penfield method gave 19.7 wt. %), FeO/Fe₂O₃ partitioned by Mössbauer spectroscopy; corresponding to $\text{Fe}^{3+}_{2.00}(\text{Fe}^{2+}_{2.02}\text{Mg}_{1.61}\text{Fe}^{3+}_{0.17}\text{Mn}^{2+}_{0.06})_{\Sigma=3.86}(\text{P}_{1.02}\text{O}_4)(\text{OH})_{11.0}\cdot\text{H}_2\text{O}$.

Occurrence: A rare (only a few hundred mg are known to exist) low-temperature hydrothermal mineral in vugs in veins of dolomitic carbonatite.

Association: Pyrite, rutile, a ternovite-like mineral, catapleiite, rimkorolgitite, bobierrite, collinsite, juonniite, strontiowhitlockite, pyrrhotite.

Distribution: From the Kovdor alkaline-ultramafic complex, Kola Peninsula, Russia.

Name: Alludes to the crystal morphology, which resembles a double-edged sword (*gladius* in Latin).

Type Material: A.E. Fersman Mineralogical Museum, Moscow, Russia (2310/1), and in the Geological Museum, Institute of Geosciences, University of Oulu, Finland (12182).

References: (1) Liferovich, R.P., E.V. Sokolova, F.C. Hawthorne, K.V.O. Laajoki, S. Gehör, Y.A. Pakhomovsky, and N.V. Sorokhtina (2000) Gladiusite, $\text{Fe}^{3+}_2(\text{Fe}^{2+}, \text{Mg})_4(\text{PO}_4)(\text{OH})_{11}(\text{H}_2\text{O})$, a new hydrothermal mineral species from the phoscoritecarbonatite unit, Kovdor complex, Kola Peninsula, Russia. *Can. Mineral.*, 38, 1477-1485. (2) (2001) *Amer. Mineral.*, 86, 1113 (abs. ref. 1). (3) Sokolova, E., F.C. Hawthorne, C. McCammon, and R.P. Liferovich (2001) The crystal structure of gladiusite, $(\text{Fe}^{2+}, \text{Mg})_4\text{Fe}^{3+}_2(\text{PO}_4)(\text{OH})_{11}(\text{H}_2\text{O})$. *Can. Mineral.*, 39(4), 1121-1130.