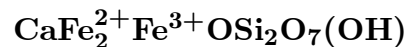


**Ilvaite**

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**Crystal Data:** Orthorhombic or monoclinic. *Point Group:*  $2/m\ 2/m\ 2/m$  or  $2/m$ . Crystals prismatic, striated  $\parallel \{001\}$ , to 25 cm; columnar, radiating, or compact massive.

**Physical Properties:** *Cleavage:* Distinct on  $\{001\}$  and  $\{010\}$ . *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5.5–6  $D(\text{meas.}) = 3.99\text{--}4.05$   $D(\text{calc.}) = 4.064$

**Optical Properties:** Opaque, translucent in fine fragments. *Color:* Iron-black or dark grayish black. *Streak:* Black, inclining to green or brown. *Luster:* Submetallic.

*Optical Class:* Biaxial (+). *Pleochroism:* In thin section, intense;  $X =$  dark green;  $Y =$  yellow-brown to dark brown;  $Z =$  dark brown; in reflected light, light gray to bluish gray, pinkish red to violet. *Orientation:*  $X = c$ ;  $Y = b$ ;  $Z = a$ . *Dispersion:*  $r < v$ , strong.

*Absorption:*  $X > Y > Z$ .  $\alpha = 1.727$   $\beta = 1.870$   $\gamma = 1.883$   $2V(\text{meas.}) = 20^\circ\text{--}30^\circ$   
 $R_1\text{--}R_2$ : (400) 8.7–10.4, (420) 8.6–10.3, (440) 8.5–10.2, (460) 8.2–10.1, (480) 7.9–10.0, (500) 7.6–9.9, (520) 7.3–9.8, (540) 7.0–9.8, (560) 6.7–9.8, (580) 6.3–9.8, (600) 5.8–9.8, (620) 5.5–9.8, (640) 5.2–9.8, (660) 5.0–9.8, (680) 5.1–9.7, (700) 5.4–9.6 *Anisotropism:* Very strong.

**Cell Data:** *Space Group:*  $Pbnm$ .  $a = 8.800$   $b = 13.019$   $c = 5.852$   $Z = 4$ , or *Space Group:*  $P2_1/a$ .  $a = 13.0103(5)$   $b = 8.8039(4)$   $c = 5.8517(3)$   $\beta = 90.209(5)^\circ$   $Z = 4$

**X-ray Powder Pattern:** Gruba, Oberhalbstein Valley, Graubünden, Switzerland; monoclinic. 2.676 (100), 2.849 (93), 2.840 (93), 7.305 (70), 2.865 (70), 2.721 (70), 2.714 (70)

**Chemistry:**

	(1)	(2)
SiO <sub>2</sub>	29.30	29.40
Fe <sub>2</sub> O <sub>3</sub>	20.30	19.53
FeO	33.50	35.15
MnO	1.97	
CaO	13.71	13.72
H <sub>2</sub> O	1.90	2.20
Total	100.68	100.00

(1) Ilímaussaq intrusion, Greenland. (2)  $\text{CaFe}_2^{2+}\text{Fe}^{3+}\text{OSi}_2\text{O}_7(\text{OH})$ .

**Polymorphism & Series:** Orthorhombic and monoclinic forms are known.

**Occurrence:** In contact metasomatic rocks and iron deposits; in metamorphosed limestones and dolostones with other calc-silicate minerals.

**Association:** Quartz, magnetite, hedenbergite, sphalerite, fluorite.

**Distribution:** Many localities, even for fine material. From Elba, at Rio Marina and Capo Calamita; on Mt. Mulatto, near Predazzo, Trentino-Alto Adige, Italy. Very large crystals from Seriphos, Cyclades Islands, Greece. In Germany, at St. Andreasberg, Harz Mountains; near Herborn, Hesse; and Schneeberg, Saxony. In Norway, at Fossum, near Skeen. At Thyrill, Iceland. From the Kangerdluarssuk Plateau, in the Ilímaussaq intrusion, southern Greenland. In the Kamioka mine, Gifu Prefecture, and the Obira mine, Bungo, Oita Prefecture, Japan. Fine crystals at Dal'negorsk, Primorskiy Kray, Russia. In the USA, splendid crystals from the Laxey mine, South Mountain, Owyhee Co., Idaho; from Middlemarch Pass, Dragoon Mountains, Cochise Co., Arizona; on Copper Mountain, Prince of Wales Island, Alaska.

**Name:** From the Latin name, *Ilva*, for the Island of Elba, on which it was first found.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 541–542. (2) Dietrich, V. (1972) Ilvait, Ferroantigorit und Grealith als Begleiter oxidisch-sulfidischer Vererzungen in den Oberhalbsteiner Serpentiniten. Schweiz. Mineral. Petrog. Mitt., 52, 57–74 (in German with English abs.). (3) Ghose, S., A.W. Hewat, and M. Marezio (1984) A neutron powder diffraction study of the crystal and magnetic structures of ilvaite from 305 K to 5 K – a mixed valence iron silicate with an electronic transition. Phys. Chem. Minerals, 11, 67–74. (4) Finger, L.W. and R.M. Hazen (1987) Crystal structure of monoclinic ilvaite and the nature of the monoclinic-orthorhombic transition at high pressure. Zeits. Krist., 179, 415–430.

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