Staurolite $(Fe^{2+}, Mg)_2Al_9(Si, Al)_4O_{20}(O, OH)_4$

Crystal Data: Monoclinic, pseudo-orthorhombic. *Point Group:* $2/m$. Commonly in prismatic crystals exhibiting {110}, {010}, {001}, and {101}, typically rough, to 12 cm. *Twinning:* Commonly as 60° twins with {231} as twin plane, may be cyclic; less commonly as 90° cruciform twins with {031} as twin plane.

Physical Properties: *Cleavage:* Distinct on {010}. *Fracture:* Subconchoidal. *Tenacity:* Brittle. Hardness = 7–7.5 D(meas.) = 3.74–3.83 D(calc.) = 3.686

Optical Properties: Transparent to opaque. *Color:* Dark reddish brown to blackish brown, yellowish brown, rarely blue; pale golden yellow in thin section. *Streak:* White to grayish. *Luster:* Subvitreous to resinous.
Optical Class: Biaxial (+). *Pleochroism:* X = colorless; Y = pale yellow; Z = golden yellow. *Orientation:* $X = b$; $Y = a$; $Z = c$. *Dispersion:* $r > v$, weak. *Absorption:* $Z > Y > X$.
$\alpha = 1.736–1.747$ $\beta = 1.742–1.753$ $\gamma = 1.748–1.761$ 2V(meas.) = 80°–90°

Cell Data: *Space Group:* $C2/m$. $a = 7.863–7.871$ $b = 16.534–16.613$ $c = 5.632–5.663$ $\beta = 90.00°–90.45°$ Z = 2

X-ray Powder Pattern: Pizzo Forno, Switzerland. (ICDD 15-397).
3.012 (100), 2.693 (100), 2.372 (80), 3.559 (60), 2.400 (60), 1.515 (60), 1.511 (60)

Chemistry:

	(1)		(1)
SiO_2	27.82	MnO	0.22
TiO_2	0.32	CoO	0.02
Al_2O_3	54.91	ZnO	0.19
Fe_2O_3	0.43	MgO	0.62
Cr_2O_3	0.01	Li_2O	0.36
FeO	12.39	H_2O	[2.26]
		Total	[99.55]

(1) Black Mountain, Grafton Co., New Hampshire, USA; by electron and ion microprobe, average of 23 analyses, H_2O determined on a separate sample; corresponds to $(Fe^{2+}_{1.43}Li_{0.20}Mg_{0.13}Mn_{0.03}Zn_{0.02})_{\Sigma=1.81}(Al_{8.64}Fe^{3+}_{0.04}Ti_{0.03})_{\Sigma=8.71}(Si_{3.85}Al_{0.15})_{\Sigma=4.00}O_{24}H_{2.08}$.

Occurrence: Common in pelitic schists, gneisses, and argillaceous rocks regionally metamorphosed to amphibolite grade; also a detrital mineral.

Association: Almandine, sillimanite, kyanite, tourmaline, muscovite, quartz, chloritoid.

Distribution: Widespread, with fine crystals from, for example: at Pizzo Forno and Alpe Piona, Ticino, Switzerland. On Mt. Greiner, Zillertal, Tirol, Austria. From the Keivy massif, Kola Peninsula, Russia. Large twins, in the old Provinces of Finistère and Morbihan, in "Brittany," France. From Fanzeres, Portugal. In the USA, at Franconia, Grafton Co., New Hampshire; Chesterfield, Hampshire Co., Massachusetts; near Blue Ridge, Fannin Co., Georgia; near Picures, Taos Co., New Mexico. In Brazil, in Minas Gerais, from Rubellita and Ardenella; Agua Quente, Rio Pardo de Minas; and Fazenda Graniais.

Name: Derived from the Greek for a *cross*, describing the common twins.

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