

Kornerupine**(Mg, Fe²⁺, Al, □)₁₀(Si, Al, B)₅O₂₁(OH, F)**

Crystal Data: Orthorhombic. *Point Group:* 2/m 2/m 2/m. Crystals prismatic, to over 20 cm, showing principally {110}, {100}, and {010}, rarely terminated; as radiating aggregates.

Physical Properties: *Cleavage:* Good on {110}. *Hardness* = 6-7 *D*(meas.) = 3.29-3.35 *D*(calc.) = 3.288

Optical Properties: Transparent to translucent and opaque. *Color:* Colorless, white, blue, green, dark green, greenish yellow, yellow-brown, black. *Luster:* Vitreous.

Optical Class: Biaxial (-); may be pseuduniaxial (-). $\alpha = 1.660-1.671$ $\beta = 1.673-1.683$ $\gamma = 1.674-1.684$ $2V(\text{meas.}) = 3^\circ-48^\circ$ *Pleochroism:* X = colorless to green; Y = colorless, pale brownish yellow, pale yellowish green; Z = pale brownish green, green, light amber. *Orientation:* X = c; Y = a; Z = b. *Dispersion:* $r < v$ or $r > v$.

Cell Data: Space Group: *Cmcm*. $a = 16.041(3)$ $b = 13.746(2)$ $c = 6.715(2)$ $Z = 4$

X-ray Powder Pattern: Mautia Hill, Tanzania.

2.639 (100), 3.03 (80), 3.37 (60), 2.118 (60), 1.503 (40), 2.096 (30), 1.685 (30)

Chemistry:

	(1)		(1)
SiO ₂	29.80	MgO	18.96
TiO ₂	0.06	CaO	0.07
B ₂ O ₃	1.44	Li ₂ O	0.08
Al ₂ O ₃	45.85	Na ₂ O	0.04
FeO	1.60	F	0.01
MnO	0.05	<u>H₂O</u>	[1.21]
		Total	[99.17]

(1) Fiskensæset, Greenland; by electron microprobe, Li, B, F by ion microprobe, H₂O calculated from stoichiometry; corresponding to (Mg_{3.48}Fe_{0.16}Li_{0.04}Ca_{0.01}Na_{0.01}Al_{5.64}Ti_{0.01}) $\Sigma=9.35$ (Si_{3.67}Al_{1.02}B_{0.31}) $\Sigma=5.00$ O₂₁[(OH)_{0.99}F_{0.01}] $\Sigma=1.00$.

Occurrence: In boron-rich volcanic and sedimentary rocks subjected to amphibolite to granulite facies metamorphism; in metamorphosed anorthosite complexes.

Association: Sapphirine, cordierite, spinel, corundum, tourmaline, grandierite, dumortierite, kyanite, sillimanite, andalusite, biotite, phlogopite, magnetite, ilmenite, hematite, rutile.

Distribution: Some localities for well-studied material follow. In Greenland, at Fiskensæset. At Bjordam, near Kragerø, Norway. In Germany, from Waldheim, Saxony. From Mautia Hill, Tanzania. On the Bok se Puts Farm, Namaqualand, Cape Province, South Africa. Gem crystals from Itrongahy, near Betroka, and elsewhere in Madagascar. From gem gravels of the Matala, Ratnapura, and Embilipitiya districts, Sri Lanka. In the Harts and Strangways Ranges, Northern Territory, Australia. At Lac Ste-Marie, Quebec, Canada.

Name: For the Danish geologist, Andreas Nikolaus *Kornerup* (1857-1883).

Type Material: University of Copenhagen, Copenhagen, Denmark, 1883.754.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 560-561. (2) McKie, D. (1965) The magnesium aluminium borosilicates: kornerupine and grandierite. *Mineral. Mag.*, 34, 346-357. (3) Grew, E.S., R.K. Herd, and N. Marquez (1987) Boron-bearing kornerupine from Fiskensæset, West Greenland: a re-examination of specimens from the type locality. *Mineral. Mag.*, 51, 695-708. (4) Moore, P.B., P.K. Sen Gupta, and E.O. Schlemper (1989) Kornerupine: chemical crystallography, comparative crystallography, and its cation relation to olivine and to Ni₂In intermetallic. *Amer. Mineral.*, 74, 642-655. (5) Grew, E.S., J.V. Chernosky, G. Werdning, K. Abraham, N. Marquez, and J.R. Hinthorne (1990) Chemistry of kornerupine and associated minerals, a wet chemical, ion microprobe, and X-ray study emphasizing Li, Be, B and F contents. *J. Petrol.*, 31, 1025-1070. (6) Cooper, M.A., F.C. Hawthorne, and E.S. Grew (2009) The crystal chemistry of the kornerupine-prismatine series. I. crystal structure and site populations. *Can. Mineral.*, 47, 233-262.