**Kornerupine**  
\((\text{Mg, Fe}^{2+}, \text{Al, □})_{10} \text{(Si, Al, B)}_2 \text{O}_{21}(\text{OH, F})\)**

**Crystal Data:** Orthorhombic. \textit{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:** \textit{Cleavage:} Good on \{110\}. \text{Hardness} = 6-7  \text{D(meas.)} = 3.29-3.35  \text{D(calc.)} = 3.288

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

\textit{Optical Class:} Biaxial (-); may be pseudouniaxial (-).  \text{\(a = 1.660-1.671\)}  \text{\(\beta = 1.673-1.683\)}  \text{\(\gamma = 1.674-1.684\)}  \text{\(2V(\text{meas.}) = 3^\circ-48^\circ\)}  \text{\(\text{Pleochroism:} \text{X} = \text{colorless to green}; \text{Y} = \text{colorless, pale brownish yellow, pale yellowish green}; \text{Z} = \text{pale brownish green, green, light amber.}\)}

\textit{Orientation:} \(X = c; Y = a; Z = b\).  \text{\(\text{Dispersion:} r < v\ or\ r > v.\)}

**Cell Data:** Space Group: \textit{Cmcm}.  \text{\(a = 16.041(3)\)}  \text{\(b = 13.746(2)\)}  \text{\(c = 6.715(2)\)}  \text{\(Z = 4\)}

**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:**

<table>
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<tr>
<th></th>
<th>SiO(_2)</th>
<th>TiO(_2)</th>
<th>B(_2)O(_3)</th>
<th>Al(_2)O(_3)</th>
<th>FeO</th>
<th>MnO</th>
<th>MgO</th>
<th>CaO</th>
<th>Li(_2)O</th>
<th>Na(_2)O</th>
<th>H(_2)O</th>
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<td>1.44</td>
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(1) Fiskenesset, Greenland; by electron microprobe, Li, B, F by ion microprobe, H\(_2\)O calculated from stoichiometry; corresponding to \((\text{Mg}\text{3.48Fe}\text{0.18Li}\text{1.00Ca}\text{0.01Na}\text{0.01Al}\text{5.56Ti}\text{0.01})\text{Si}\text{9.35Al}\text{1.02B}_{0.31}\text{O}_{21}(OH\text{0.99F}_{0.01})\text{Si}_{5.91}\text{Al}_{1.00}\)

**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, granddierite, dumortierite, kyanite, sillimanite, andalusite, biotite, phlogopite, magnetite, ilmenite, hematite, rutile.

**Distribution:** Some localities for well-studied material follow. In Greenland, at Fiskenessset. At Bjordam, near Kragerô, Norway. In Germany, from Waldheim, Saxony. From Mautia Hill, Tanzania. On the Bok se Puts Farm, Namaqualand, Cape Province, South Africa. Gem crystals from Itregahy, near Betroka, and elsewhere in Madagascar. From gem gravels of the Matale, 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:**  