Tinzenite  \((\text{Ca, Mn}^{2+}, \text{Fe}^{2+})_3\text{Al}_2\text{BSi}_4\text{O}_{15}(\text{OH})\)  

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Crystal Data:  Tridinic.  Point Group:  \(\Gamma\).  As aggregates of prismatic crystals, to 5 mm; massive.

Physical Properties:  Cleavage: \({\{100}\} \text{ good; } {\{001\}, {\{110\}}, {\{011\}}, \text{ poor}\} \text{ (by analogy to the axinite group). Fracture: } \text{Uneven to conchoidal. Tenacity: } \text{Brittle. Hardness } = 6.5\)

D(meas.) = 3.355–3.433  D(calc.) = 3.455

Optical Properties:  [Transparent to translucent.]  Color: Yellow, brownish yellow-green; orange to red in thin section.  Luster: [Vitreous.]

Optical Class:  Biaxial (−).  Pleochroism: In thick sections, weak; \(X = \text{light brown; } Y = \text{violet; } Z = \text{light yellow or colorless. } \alpha = 1.690(2) \beta = 1.698(3) \gamma = 1.705(3)\)  2V(meas.) = 80°–84°

Cell Data:  Space Group: \(P\overline{1}\). \(a = 7.095–7.162 \quad b = 9.103–9.129 \quad c = 8.874–8.946\)
\(\alpha = 91.35°–91.90° \beta = 98.27°–98.68° \gamma = 76.73°–76.97° \quad Z = 2\)

X-ray Powder Pattern:  Tinzen, Switzerland.  2.812 (10), 3.46 (8), 6.30 (7), 3.14 (7), 2.975 (7), 2.152 (7), 2.008 (7b)

Chemistry:

\[
\begin{array}{cccc}
\text{SiO}_2 & 40.80 & 41.20 & \text{CaO} \\
\text{TiO}_2 & 0.08 & & \text{BaO} \\
\text{B}_2\text{O}_3 & 5.65 & 4.98 & \text{Na}_2\text{O} \\
\text{Al}_2\text{O}_3 & 16.23 & 16.20 & \text{K}_2\text{O} \\
\text{Fe}_2\text{O}_3 & 1.59 & 1.60 & \text{H}_2\text{O}^+ \\
\text{MnO} & 21.19 & 19.15 & \text{H}_2\text{O}^- \\
\text{MgO} & 0.17 & 0.90 & \\
\end{array}
\]

Total 99.84 99.70

(1) Tinzen, Switzerland; corresponds to \((\text{Mn}_{1.77}\text{Ca}_{1.32}\text{Na}_{0.05}\text{K}_{0.02}\text{Mg}_{0.02})\Sigma=3.18(\text{Al}_{1.88}\text{Fe}^{2+}_{0.12})\Sigma=2.00\) \(\text{B}_{0.96}\text{Si}_{1.01}\text{O}_{15}(\text{OH})_{0.79}\). (2) Gambatesa mine, Italy; corresponds to \((\text{Mn}_{1.60}\text{Ca}_{1.42}\text{Mg}_{0.13}\text{Na}_{0.07}\text{K}_{0.06})\Sigma=3.28(\text{Al}_{1.88}\text{Fe}^{2+}_{0.12})\Sigma=2.06\) \(\text{B}_{0.88}\text{Si}_{4.06}\text{O}_{15}(\text{OH})_{0.76}\).

Polymorphism & Series:  Forms a series with manganaxinite.

Mineral Group:  Axinite group; \(\text{Ca} < 1.5 \text{ per formula unit, } \text{Mn} > \text{Fe.}\)

Occurrence:  In metamorphosed manganese-bearing ophiolites (Liguria, Italy); in quartz veins in cherts of the greenschist facies (Akatore, New Zealand).

Association:  Braunite, quartz.

Distribution:  From near Tinzen, in the Val d’Err, Graubünden, Switzerland. In the Cassagna and Gambatesa mines, Val Graveglia, near Chiavari, Liguria, Italy. From Akatore, New Zealand.

Name:  For the locality near Tinzen, Switzerland.

Type Material:  Federal Institute of Technology, Zurich, Switzerland, 194804; The Natural History Museum, London, England, 1926,499–501; Harvard University, Cambridge, Massachusetts, USA.


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