

**Chiavennite****CaMn<sup>2+</sup>Be<sub>2</sub>Si<sub>5</sub>O<sub>13</sub>(OH)<sub>2</sub>•2H<sub>2</sub>O**

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**Crystal Data:** Orthorhombic, pseudohexagonal. *Point Group:* *mm*2. Crystals are hemimorphic, spearhead-shaped, flattened on {010}, and display the pyramid {161}, to 1 cm. In aggregates and spherulites of such crystals; as grains and crusts.

**Physical Properties:** *Cleavage:* Good to perfect on {100}, {010}, and {001}.  
Hardness = ~3 D(meas.) = 2.56–2.64 D(calc.) = 2.65

**Optical Properties:** Translucent. *Color:* Pale orange-yellow; in thin section, colorless to yellow or orange-yellow; color sharply zoned near crystal margins. *Streak:* White to pale ocher. *Luster:* Vitreous to pearly.  
*Optical Class:* Biaxial (+). *Pleochroism:* Weak; *X* = colorless to pale yellow; *Z* = yellow-orange. *Orientation:* *X* = *a*; *Y* = *b*; *Z* = *c*. *Absorption:* *Z* > *X*.  $\alpha = 1.594\text{--}1.596$   $\beta = 1.600$   
 $\gamma = 1.613\text{--}1.618$  2*V*(meas.) = n.d. 2*V*(calc.) = 50°

**Cell Data:** *Space Group:* *P*2<sub>1</sub>*ab*. *a* = 8.866(7) *b* = 31.34(2) *c* = 4.787(3) *Z* = 4

**X-ray Powder Pattern:** Tanno, Italy.

15.7 (100bb), 2.903 (100), 3.28 (75), 4.15 (30), 3.93 (30b), 3.82 (30), 1.944 (30)

| <b>Chemistry:</b>              | (1)  | (2)  | (1)                 | (2)   |
|--------------------------------|------|------|---------------------|-------|
| SiO <sub>2</sub>               | 52.5 | 50.0 | Na <sub>2</sub> O   | 0.3   |
| Al <sub>2</sub> O <sub>3</sub> | 3.6  | 6.76 | K <sub>2</sub> O    | 0.04  |
| FeO                            |      | 2.01 | F                   | 0.21  |
| MnO                            | 12.9 | 10.6 | H <sub>2</sub> O    | 11.3  |
| BeO                            | 9.3  | 8.72 | CO <sub>2</sub>     | 0.83  |
| MgO                            |      | 0.14 | –O = F <sub>2</sub> | 0.09  |
| CaO                            | 10.2 | 9.69 | Total               | 100.1 |
|                                |      |      |                     | 99.99 |

(1) Tanno, Italy; by electron microprobe; Be determined spectrographically, H<sub>2</sub>O by TGA; corresponds to (Ca<sub>0.97</sub>Na<sub>0.05</sub>)<sub>Σ=1.02</sub>Mn<sub>0.97</sub>(Be<sub>1.98</sub>Al<sub>0.03</sub>)<sub>Σ=2.01</sub>(Si<sub>4.65</sub>Al<sub>0.35</sub>)<sub>Σ=5.00</sub>O<sub>12.63</sub>(OH)<sub>2.37</sub>•2.16H<sub>2</sub>O. (2) Langangen, Norway; by a variety of analytical methods; corresponds to (Ca<sub>0.92</sub>Na<sub>0.12</sub>)<sub>Σ=1.04</sub>(Mn<sub>0.80</sub>Fe<sub>0.15</sub>Mg<sub>0.02</sub>)<sub>Σ=0.97</sub>(Be<sub>1.86</sub>Al<sub>0.14</sub>)<sub>Σ=2.00</sub>(Si<sub>4.43</sub>Al<sub>0.57</sub>)<sub>Σ=5.00</sub>O<sub>12.45</sub>(OH)<sub>2.49</sub>F<sub>0.06</sub>•1.83H<sub>2</sub>O.

**Occurrence:** Coating beryl in late-stage pegmatites (Tanno, Italy); in vugs in syenite pegmatites (Norway).

**Association:** Beryl, bavenite (Tanno, Italy); analcime, aegirine, helvite, eudidymite, natrolite, feldspar (Norway).

**Distribution:** From Tanno, Chiavenna, Lombardy, Italy. In Norway, in the Heia and Vevja larvikite quarries, near Larvik, Tvedalen district; near Blåfjell, Langangen, and in the Saga larvikite quarry, Porsgrunn, Langesundsfjord; and at Bakkane, Brunlanes. Large crystals on Utö Island, Sweden.

**Name:** For the Italian locality at Tanno, Chiavenna.

**Type Material:** University of Rome, Rome, Italy, 24342; University of Oslo, Norway; National Museum of Natural History, Washington, D.C., USA, 159917.

**References:** (1) Bondi, M., W.L. Griffin, V. Mattioli, and A. Mottana (1983) Chiavennite, CaMnBe<sub>2</sub>Si<sub>5</sub>O<sub>13</sub>(OH)<sub>2</sub>•2H<sub>2</sub>O, a new mineral from Chiavenna (Italy). *Amer. Mineral.*, 68, 623–627. (2) Raade, G., R. Åmli, M.H. Mladeck, V.K. Din, A.O. Larsen, and A. Åsheim (1983) Chiavennite from syenite pegmatites in the Oslo Region, Norway. *Amer. Mineral.*, 68, 628–633. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written permission of Mineral Data Publishing.