Heneuite

\[ \text{CaMg}_5(\text{PO}_4)_3(\text{CO}_3)(\text{OH}) \]

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**Crystal Data:** Triclinic. *Point Group:* \( \overline{1} \). As cleavable nodular masses, to several cm.

**Physical Properties:** Cleavage: Good on \{001\}. Hardness = 5.5 D(meas.) = 3.016(7) D(calc.) = 3.016

**Optical Properties:** Transparent to translucent. *Color:* Pale blue-green. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (−). \( \alpha = 1.586(2) \quad \beta = 1.620(2) \quad \gamma = 1.630(2) \quad 2V(\text{meas.}) = \sim 50^{\circ} \quad 2V(\text{calc.}) = 56^{\circ} \)

**Cell Data:** *Space Group:* \( P\overline{1} \). \( a = 6.311(1) \quad b = 10.843(1) \quad c = 8.676(1) \quad \alpha = 95.01(1)^{\circ} \quad \beta = 93.41(1)^{\circ} \quad \gamma = 101.04(1)^{\circ} \quad Z = 2 \)

**X-ray Powder Pattern:** Tingelstadtjern, Norway. 2.70 (100), 2.87 (90), 2.79 (80), 2.836 (42), 3.67 (40), 2.845 (40), 2.60 (37)

**Chemistry:**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{P}_2\text{O}_5 )</td>
<td>38.6</td>
<td>40.67</td>
</tr>
<tr>
<td>( \text{As}_2\text{O}_5 )</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>( \text{CO}_2 )</td>
<td>8.23</td>
<td>8.41</td>
</tr>
<tr>
<td>( \text{FeO} )</td>
<td>0.39</td>
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</tr>
<tr>
<td>( \text{MgO} )</td>
<td>37.9</td>
<td>38.49</td>
</tr>
<tr>
<td>( \text{CaO} )</td>
<td>10.9</td>
<td>10.71</td>
</tr>
<tr>
<td>( \text{Na}_2\text{O} )</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>( \text{H}_2\text{O}^+ )</td>
<td>2.54</td>
<td>1.72</td>
</tr>
<tr>
<td>( \text{H}_2\text{O}^- )</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>99.82</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Tingelstadtlørn, Norway; after adjusting \( \text{H}_2\text{O}^+ \) to 1.8%, corresponds to \( \text{Ca}_{1.04}\text{Na}_{0.03}\Sigma=1.07\quad(\text{Mg}_{5.02}\text{Fe}_{0.03}\Sigma=5.05)(\text{PO}_4)_{2.90}(\text{AsO}_4)_{0.05}\Sigma=2.95(\text{CO}_3)_{1.00}(\text{OH})_{1.07} \). (2) \( \text{CaMg}_5(\text{PO}_4)_3(\text{CO}_3)(\text{OH}) \).

**Occurrence:** In a serpentine–magnesite deposit developed in a regional metamorphic terrain.

**Association:** Althausite, apatite, magnesite, serpentine.

**Distribution:** From the Tingelstadtlørn quarry, Modum, Norway.

**Name:** Honors Professor Henrich Neumann (1914–1983), Mineralogical-Geological Museum, University of Oslo, Oslo, Norway.

**Type Material:** Mineralogical-Geological Museum, University of Oslo, Oslo, Norway; National Museum of Natural History, Washington, D.C., USA, 164471.


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