Giessenite  \( \text{Pb}_{28}\text{Cu}_{2}^{1+}(\text{Bi},\text{Sb})_{19}\text{S}_{57} \)

**Crystal Data:** Monoclinic, pseudo-orthorhombic.  \(^{\text{Point Group: } 2/m}\)  As fine needles, to 1.5 mm.  **Twinning:** Intimately on \{100\}.

**Physical Properties:**  
Hardness = \(\sim 2.5\)  \(VHN = 65\)  \(D(\text{meas.}) = \text{n.d.}\)  \(D(\text{calc.}) = 7.45\)

**Optical Properties:**  
Opaque.  **Color:** Grayish black.  **Streak:** Grayish black.  **Luster:** Metallic.  
\(R_1 - R_2:\)  \(\text{n.d.}\)

**Cell Data:**  
**Space Group:**  \(P2_1/n\).  
\(a = 34.51(3)\)  \(b = 38.18(5)\)  \(c = 4.080(8)\)  \(\beta = 90.33(5)\)°  
\(Z = 2\)

**X-ray Powder Pattern:**  
Bjørkåsen, Norway.  
2.0271 (100), 3.436 (90), 3.404 (90), 2.1514 (90), 2.9061 (70), 2.8867 (70), 2.8413 (70)

**Chemistry:**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{Pb})</td>
<td>47.5</td>
<td>48.3</td>
<td>48.9</td>
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<tr>
<td>(\text{Cu})</td>
<td>1.2</td>
<td>0.7</td>
<td>0.88</td>
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<tr>
<td>(\text{Ag})</td>
<td></td>
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<tr>
<td>(\text{Fe})</td>
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<td></td>
<td>0.09</td>
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<tr>
<td>(\text{Bi})</td>
<td>29.8</td>
<td>31.7</td>
<td>31.2</td>
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<tr>
<td>(\text{Sb})</td>
<td>4.2</td>
<td>3.5</td>
<td>3.1</td>
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<tr>
<td>(\text{S})</td>
<td>16.5</td>
<td>[16.0]</td>
<td>16.4</td>
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<td><strong>Total</strong></td>
<td>99.2</td>
<td>[100.2]</td>
<td>[100.71]</td>
</tr>
</tbody>
</table>

(1) Binntal, Switzerland; by electron microprobe, average of three analyses; corresponds to \(\text{Pb}_{25.88}\text{Cu}_{2.13}(\text{Bi}_{16.16}\text{Sb}_{3.89})\text{S}_{19.99}\text{S}_{58.08}\).  (2) Bjørkåsen, Norway; by electron microprobe, average of three analyses, S assumed; corresponds to \(\text{Pb}_{26.36}\text{Cu}_{1.24}(\text{Bi}_{17.15}\text{Sb}_{3.25})\text{S}_{20.49}\text{S}_{56.41}\).  (3) Do.; by electron microprobe, average of eight analyses, original total given as 100.8%; corresponds to \(\text{Pb}_{26.50}(\text{Cu}_{1.55}\text{Fe}_{0.18}\text{Ag}_{0.15})\text{S}_{19.88}(\text{Bi}_{16.76}\text{Sb}_{2.86})\text{S}_{19.62}\text{S}_{57.42}\).

**Polymorphism & Series:**  
Forms a series with izoklakeite.

**Occurrence:**  
Of hydrothermal origin, with other sulfides.

**Association:**  
Galena, pyrite, pyrrhotite, sphalerite, tennantite, seligmannite, geocronite, quartz, dolomite.

**Distribution:**  
In Switzerland, from Turtschi, between Giessen and Binn, about 2 km from the Lengenbach quarry, Binntal, Valais [TL]; and at Lake Zervreila, Vals, Graubünden.  From the Bjørkåsen sulfide deposit, Otoften, northern Norway.  At the Vena mines, near Askersund, Örebro, Sweden.  In the Otome mine, Yamanashi Prefecture, Japan.

**Name:**  
For Giessen, a village nearby the Binntal, Switzerland.

**Type Material:**  
Natural History Museum, Basel, Switzerland, SG393.

**References:**  

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