Grandviewite  

\[ \text{Cu}_3\text{Al}_9(\text{SO}_4)_2(\text{OH})_{29} \]

**Crystal Data:** Monoclinic.  
*Point Group:* 2, m, or 2/lm.  
As radiating sprays of acicular laths, to 0.5 mm elongated along [100] or [001] and flattened on {001} or {100}. Terminations are nearly always rounded, some are chisel-like. Perched on botryoidal crusts of chalcoalumite.

**Physical Properties:**  
*Cleavage:* Perfect on {l00} or {001}.  
*Tenacity:* Sectile.  
*Fracture:* Uneven.  
*Hardness = 2*  
*D(meas.) = 2.81  
*D(calc.) = 2.72  
*Nonfluorescent.*

**Optical Properties:**  
*Color:* Greenish blue.  
*Sterility:* Strong when concordant stacks of elongated plates are viewed perpendicular to the stacking direction.  
*Orientation:* \( Y = b, Z \) approximately parallel to elongation.

**Cell Data:**  
*Space Group:* \( P2_1, P2_1/m \) or \( P2_1m \)  
\( a = 10.908(2) \text{ Å} \)  
\( b = 6.393(3) \text{ Å} \)  
\( c = 10.118(2) \text{ Å} \)  
\( \beta = 107.47(2)^\circ \text{ Å} \)  
\( Z = 1 \)

**X-ray Powder Pattern:** Grandview mine, Coconino County, Arizona, USA.  
6.208 (100), 3.949 (79), 5.287 (35), 9.667 (33), 2.816 (14), 3.625 (10), 2.990 (9)

**Chemistry:**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CuO</td>
<td>21.4</td>
<td>21.33</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>40.7</td>
<td>41.01</td>
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<tr>
<td>SO₃</td>
<td>14.5</td>
<td>14.31</td>
</tr>
<tr>
<td>H₂O</td>
<td>23.3</td>
<td>23.35</td>
</tr>
<tr>
<td>Total</td>
<td>99.9</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Grandview mine, Coconino County, Arizona, USA; electron microprobe analysis supplemented by FT-IR spectroscopy, Cu (AAS), Al (colorimetric), SO₃ and H₂O by TGA, water of crystallization absent in the derived stoichiometry; corresponding to \( \text{Cu}_2.97\text{Al}_{8.82}(\text{SO}_4)_{25}(\text{OH})_{28.55} \).

(2) \( \text{Cu}_3\text{Al}_9(\text{SO}_4)_2(\text{OH})_{29} \).

**Occurrence:** A secondary mineral formed by the oxidation of Cu-bearing sulfides.

**Association:** Chalcoalumite, cyanotrichite, carbonatecyanotrichite.

**Distribution:** At the Grandview mine (also known as the Last Chance mine), at Cape Royal, Horseshoe Mesa, Grand Canyon National Park, Coconino County, Arizona, USA [TL].

**Name:** For the locality that produced the first specimens.

**Type Material:** Geosciences Department, Museum Victoria, Melbourne, Australia (M50490).

**References:**  