**Popovite**

\[ \text{Cu}_5 \text{O}_2 (\text{AsO}_4)_2 \]

**Crystal Data:** Triclinic.  
*Point Group:* 1. As prismatic, tabular or lamellar crystals, to 0.2 mm.

**Physical Properties:**  
*Cleavage:* None.  
*Fracture:* Uneven.  
*Tenacity:* Brittle.  
*Hardness* = \( \sim 3.5 \)  
*D(meas.)* = n.d.  
*D(calc.)* = 5.30

**Optical Properties:**  
*Color:* Olive-green to dark olive-green, light yellow-green.  
*Cleavage:* None.  
*Fracture:* Uneven.  
*Tenacity:* Brittle.  
*Hardness* = \( \sim 3.5 \)  
*D(meas.)* = n.d.  
*D(calc.)* = 5.30

**Optical Class:** Biaxial (+).  
\( \alpha = 1.84(1) \)  
\( \beta = 1.86 \)  
\( \gamma = 1.96(1) \)  
\( 2V(meas.)* = 50(20)^{\circ} \)  
\( 2V(calc.)* = n.d.  
*Dispersion:* Strong, \( r < v \).  
*Pleochroism:* Distinct; \( Z = \) olive-green with a grayish hue, \( Y = n.d. \), \( X = \) green.  
*Absorption:* \( X > Z \).

**Cell Data:**  
*Space Group:* \( \tilde{P}1 \).  
\( a = 5.1450(3) \)  
\( b = 6.2557(3) \)  
\( c = 6.2766(4) \)  
\( \alpha = 100.064(5)^{\circ} \)  
\( \beta = 96.351(5)^{\circ} \)  
\( \gamma = 95.100(5)^{\circ} \)  
\( Z = 1 \)

**X-ray Powder Pattern:** Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia.  
2.927 (100), 2.968 (90), 2.768 (67), 2.462 (67), 2.513 (55), 3.465 (43), 3.715 (36)

**Chemistry:**

<table>
<thead>
<tr>
<th>Element</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CuO</td>
<td>63.28</td>
<td>63.38</td>
</tr>
<tr>
<td>ZnO</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>V_2O_5</td>
<td>0.12</td>
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<tr>
<td>As_2O_5</td>
<td>35.80</td>
<td>36.62</td>
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<tr>
<td>SO_3</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.03</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia; average of 5 electron microprobe analyses supplemented by Raman spectroscopy; corresponding to \((\text{Cu}_4.99\text{Zn}_{0.04})\Sigma=5.03(\text{As}_1.95\text{S}_{0.02}\text{V}_{0.01})\Sigma=1.98\text{O}_{10-}\).  
(2) \( \text{Cu}_5\text{O}_2(\text{AsO}_4)_2 \).

**Occurrence:** Formed as sublimates on basaltic scoria around an active volcanic fumarole.

**Association:** Ericlaxmanite, kozyrevskite, urusovite, lammerite, lammerite-\( \beta \), johillerite, bradaczekite, tenorite, hematite, aphthitalite, anhydrite, langbeinite, calcio-langbeinite, As-bearing orthoclase, anhydrite, langbeinite, calcio-langbeinite, arcanite, wulfite, krasheninnikovite, steklite, palmierite, tilasite, svabite, alarsite, Cu-gahnite, OH-free fluoborite.

**Distribution:** From the Arsenatnaya fumarole, Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka, Russia.

**Name:** Honors the Russian mineralogists Vladimir Anatol’evich Popov (b. 1941) and Valentina Ivanovna Popova (b. 1941), Institute of Mineralogy, Urals Branch, Russian Academy of Sciences, Miass, Chelyabinsk Oblast, Russia.

**Type Material:** A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (94135).

**References:**