**Shilovite**  
\[ \text{Cu(NH}_3\text{)}_4(\text{NO}_3\text{)}_2 \]

**Crystal Data:** Orthorhombic.  
**Point Group:** mm2.  
As imperfect, thick tabular to equant crystals, to 0.15 mm.

**Physical Properties:**  
**Cleavage:** None.  
**Fracture:** Sectile.  
**Tenacity:** n.d.  
**Hardness:** \( \leq 2 \)  
D(meas.) = n.d.  
D(calc.) = 1.92  
Dissolves in water.

**Optical Properties:**  
**Color:** Deep violet-blue.  
**Streak:** Violet-blue (changes to light blue with decomposition).  
**Luster:** Vitreous.  
**Translucency:**  
**Orientation:** Biaxial (+).  
\( \alpha = 1.527(2) \)  
\( \beta = 1.545(5) \)  
\( \gamma = 1.610(2) \)  
2V(meas.) = 40-50°  
2V(calc.) = 57°

**Cell Data:**  
**Space Group:** Pnn2.  
\( a = 23.6585(9) \)  
\( b = 10.8238(4) \)  
\( c = 6.9054(3) \)  
Z = 8

**X-ray Powder Pattern:**  
Pabellón de Pica Mountain, Iquique Province, Tarapacá Region, Chile.  
5.841 (100), 4.162 (88), 4.005 (62), 3.462 (50), 5.208 (47), 5.931 (41), 2.811 (40)

**Chemistry:**  
<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
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<tbody>
<tr>
<td>Cu</td>
<td>26.04</td>
<td>24.85</td>
</tr>
<tr>
<td>Fe</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>30.80</td>
<td>32.87</td>
</tr>
<tr>
<td>O</td>
<td>35.95</td>
<td>37.54</td>
</tr>
<tr>
<td>H</td>
<td>[4.74]</td>
<td>4.74</td>
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<tr>
<td>Total</td>
<td>97.84</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Pabellón de Pica Mountain, near Chanabaya, Iquique Province, Tarapacá Region, Chile; average of 3 electron microprobe analyses supplemented by IR spectroscopy, H calculated; corresponding to (Cu\(_{1.06}\)Fe\(_{0.01}\))H\(_{12.56}\)N\(_{5.87}\)O\(_{6.00}\).  
(2) \( \text{Cu(NH}_3\text{)}_4(\text{NO}_3\text{)}_2 \).

**Occurrence:** In a guano deposit developed on chalcopyrite-bearing gabbro in a desert climate.

**Association:** Halite, ammineite, atacamite (a product of ammineite alteration), thénardite.

**Distribution:** From Pabellón de Pica Mountain, near Chanabaya, Iquique Province, Tarapacá Region, Chile.

**Name:** Honors Alexander Evgen’evich Shilov (1930-2014), Russian chemist and Academician of the Russian Academy of Sciences, a specialist in biomimetics and the chemistry of nitrogen.

**Type Material:** A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4542/1).

**References:**  