Shilovite

**Cu(NH$_3$)$_4$(NO$_3$)$_2$**

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

D(meas.) = n.d.  D(calc.) = 1.92  
Dissolves in water.

*Optical Class:* Biaxial (+).  
$\alpha = 1.527(2)$  
$\beta = 1.545(5)$  
$\gamma = 1.610(2)$  
$2V(\text{meas.}) = 40-50^\circ$  
$2V(\text{calc.}) = 57^\circ$

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

**Chemistry:**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<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>
</tr>
<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 \((\text{Cu}_{1.09}\text{Fe}_{0.01})\text{H}_{12.56}\text{N}_{5.87}\text{O}_{6.00}\).  
(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:**  