Mushistonite  
(Cu, Zn, Fe$^{2+}$)Sn$^{4+}$(OH)$_6$

Crystal Data: Cubic.  
Point Group: 4/m 3 2/m.  
In fine-grained earthy aggregates.

Physical Properties:  
Hardness = 4–4.4  
VHN = 240–254  
D(meas.) = n.d.  
D(calc.) = n.d.

Optical Properties:  
Semitransparent.  
Color: Brownish green to malachite-green, yellow-brown; colorless in thin section; gray in reflected light.  
Luster: Vitreous.

Optical Class: Isotropic.  
$n = \text{n.d.}$

Cell Data:  
Space Group: Pn3m.  
a = 7.705–7.735  
Z = 4

X-ray Powder Pattern:  
Mushiston deposit, Tajikistan.  
3.880 (100), 2.740 (50), 1.729 (35), 1.578 (23), 2.230 (20), 1.932 (16), 2.330 (13)

Chemistry:  
<table>
<thead>
<tr>
<th>Element</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SnO$_2$</td>
<td>52.2</td>
<td>47.2</td>
</tr>
<tr>
<td>FeO</td>
<td>3.3</td>
<td>10.6</td>
</tr>
<tr>
<td>CuO</td>
<td>13.5</td>
<td>11.4</td>
</tr>
<tr>
<td>ZnO</td>
<td>11.1</td>
<td>7.0</td>
</tr>
<tr>
<td>Ag$_2$O</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>H$_2$O</td>
<td>[19.1]</td>
<td>[23.6]</td>
</tr>
<tr>
<td>Total</td>
<td>[99.3]</td>
<td>[99.8]</td>
</tr>
</tbody>
</table>

(1) Mushiston deposit, Tajikistan; by electron microprobe, original analysis elemental, here converted to oxides, H$_2$O calculated from excess O given, (OH)$^{1-}$ confirmed by IR; corresponds to (Cu$_{0.48}$Zn$_{0.39}$Fe$_{0.17}$)$_{\Sigma}$=1.04Sn$_{1.00}$(OH)$_{5.95}$.  
(2) Do.; corresponds to (Cu$_{0.48}$Zn$_{0.39}$Fe$_{0.17}$)$_{\Sigma}$=1.04Sn$_{1.00}$(OH)$_{5.95}$.

Mineral Group: Schoenfliesite group.

Occurrence:  
In the oxidized zone of a tin deposit, replacing stannite (Mushiston deposit, Tajikistan); from a zoned pegmatite (Etta mine, South Dakota, USA).

Association:  
Stannite, chalcopyrite, sphalerite, galena (Mushiston deposit, Tajikistan); cassiterite, pseudomalachite, quartz (Etta mine, South Dakota, USA).

Distribution:  
In the Mushiston tin deposit, Kaznok Valley, Zeravshan Mountains, Tajikistan.  
From the Etta mine, near Keystone, Pennington Co., South Dakota, USA.

Name:  
For its occurrence in the Mushiston deposit, Tajikistan.

Type Material:  
Mining Institute, St. Petersburg, 1999/1; A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 81069.

References:  
(2) (1985) Amer. Mineral., 70, 1331 (abs. ref. 1).  