Witzkeite

\[ \text{Na}_4\text{K}_4\text{Ca(NO}_3)_2\text{(SO}_4)_4\cdot2\text{H}_2\text{O} \]

**Crystal Data:** Monoclinic.  *Point Group:* 2/m.  Crystals, to 140 μm, are elongated tabular.

*Hardness* = 2  \( D(\text{meas.}) = 2.40(2) \)  \( D(\text{calc.}) = 2.403 \)

*Optical Class:* Biaxial (−).  \( \alpha = 1.470(5) \)  \( \beta = 1.495(5) \)  \( \gamma = 1.510(5) \)  
2V(\text{meas.}) = 50°-70°  
*Orientation:* \( X = b, Y = a, Z = c \).  
*Dispersion:* Weak, \( r > v \).

**Cell Data:**  *Space Group:* C2/c.  
\( a = 24.902(2) \)  \( b = 5.3323(4) \)  \( c = 17.246(1) \)  
\( \beta = 94.281(7)° \)  \( Z = 4 \)

**X-ray Powder Pattern:** Punta de Lobos, Tarapacá region, ~ 90 km south of Iquique, Chile.  
12.38 (100), 2.07 (54), 3.10 (24), 4.13 (19), 2.48 (12), 2.69 (9), 2.99 (7)

**Chemistry:**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{Na}_2\text{O} )</td>
<td>12.83</td>
<td>14.89</td>
</tr>
<tr>
<td>( \text{K}_2\text{O} )</td>
<td>22.64</td>
<td>22.62</td>
</tr>
<tr>
<td>( \text{CaO} )</td>
<td>7.57</td>
<td>6.73</td>
</tr>
<tr>
<td>( \text{FeO} )</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>( \text{SO}_3 )</td>
<td>39.96</td>
<td>38.46</td>
</tr>
<tr>
<td>( \text{N}_2\text{O}_5 )</td>
<td>12.7</td>
<td>12.97</td>
</tr>
<tr>
<td>( \text{H}_2\text{O} )</td>
<td>4.5</td>
<td>4.33</td>
</tr>
<tr>
<td>Total</td>
<td>100.64</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Punta de Lobos, Tarapacá region, ~ 90 km south of Iquique, Chile; average of 5 electron microprobe analyses supplemented by IR spectroscopy, \( \text{H}_2\text{O}, \text{CO}_2 \), and \( \text{N}_2\text{O}_5 \) determined by CHN analysis; corresponding to \( \text{Na}_{3.40}\text{K}_{3.95}\text{Ca}_{1.11}\text{Fe}_{0.05}(\text{NO}_3)_{1.93}(\text{SO}_4)_{4.10}(\text{H}_4\text{O}_{1.81}) \).  
(2) \( \text{Na}_4\text{K}_4\text{Ca(NO}_3)_2\text{(SO}_4)_4\cdot2\text{H}_2\text{O} \).

**Occurrence:** In the oxidation zone of a guano deposit in an arid climate.

**Association:** Dittmanite, nitratine.

**Distribution:** From the southeast slope of Punta de Lobos, Tarapacá region, ~ 90 km south of Iquique, Chile.

**Name:** Honors Thomas Witzke (b. 1963), a German mineralogist whose study of alteration processes and products has resulted in the discovery and description of several new minerals.

**Type Material:** Museum of Mineralogy, Department of Geosciences, University of Padova, Italy (MMP M10009).