Ferro-obertiite

\[ \text{NaNa}_2(\text{Fe}^{2+} \text{Fe}^{3+} \text{Ti}) \text{Si}_8 \text{O}_{22} \text{O}_2 \]

Crystal Data: Monoclinic. **Point Group:** 2/m. As prismatic to acicular crystals, to 1.25 mm, elongated on [001].

**Physical Properties:** **Cleavage:** Perfect on {110} with 56° intersections. **Fracture:** Splintery. **Tenacity:** Brittle. **Hardness = 6**. **D(meas.) = n.d.**. **D(calc.) = 3.330**

**Optical Properties:** Transparent. **Color:** Black. **Streak:** Gray. **Luster:** Vitreous. **Pleochroism:** \( X = \) dark brown, \( Y = \) brown, \( Z = \) dark gray. **Orientation:** \( X \wedge a = 77.3° \) (in \( \beta \) acute), \( Y \parallel b, Z \wedge c = 91.2° \) (in \( \beta \) obtuse). **Optical Class:** Biaxial (+). \( \alpha = 1.671(1) \) \( \beta = 1.674(1) \) \( \gamma = 1.675(1) \) \( 2V(\text{meas.}) = 60(3)° \) \( 2V(\text{calc.}) = 59.9° \)

**Cell Data:** **Space Group:** C2/m. \( a = 9.845(4) \) \( b = 18.018(8) \) \( c = 5.296(3) \) \( \beta = 103.86(3)° \) \( \gamma = 90° \) \( Z = 2 \)

**X-ray Powder Pattern:** Coyote Peak, Humboldt County, California, USA. 2.722 (100.), 8.448 (80), 3.407 (60), 3.144 (50), 2.596 (50), 2.533 (40), 2.178 (30)

**Chemistry:**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{SiO}_2 )</td>
<td>52.47</td>
<td>50.65</td>
<td>8.70</td>
<td>9.80</td>
</tr>
<tr>
<td>( \text{Al}_2\text{O}_3 )</td>
<td>0.09</td>
<td></td>
<td>1.51</td>
<td></td>
</tr>
<tr>
<td>( \text{TiO}_2 )</td>
<td>6.51</td>
<td>8.42</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>( \text{Fe}_2\text{O}_3 )</td>
<td>[4.54]</td>
<td>8.41</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>( \text{FeO} )</td>
<td>18.43</td>
<td>22.72</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>( \text{MgO} )</td>
<td>5.74</td>
<td></td>
<td>-O=Fe</td>
<td>0.21</td>
</tr>
<tr>
<td>( \text{MnO} )</td>
<td>0.15</td>
<td></td>
<td>Total</td>
<td>100.09</td>
</tr>
<tr>
<td>( \text{CaO} )</td>
<td>0.90</td>
<td></td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

(1) Coyote Peak, Humboldt County, California, USA; average of 10 electron microprobe analyses, \( \text{Fe}^{2+} \) calculated from structure analysis; corresponding to \( ^4(\text{Na}_{0.72}\text{K}_{0.28})(\text{Na}_{1.85}\text{Ca}_{0.15})(\text{Mg}_{1.30}\text{Fe}^{2+}_{2.35} \text{Mn}^{2+}_{0.02}\text{Fe}^{3+}_{0.52}\text{Al}_{0.01}\text{Ti}_{0.75}\text{Li}_{0.10})(\text{Si}_{7.99}\text{Al}_{0.01})\text{O}_{22}(\text{O}_{1.16}\text{Fe}_{0.25}\text{OH}_{0.59}) \). (2) \( \text{NaNa}_2(\text{Fe}^{2+} \text{Fe}^{3+} \text{Ti}) \text{Si}_8 \text{O}_{22} \text{O}_2 \)

**Polymorphism & Series:** Forms a series with oberite.

**Mineral Group:** Oxo amphibole.

**Occurrence:** As metasomatic reaction products in lithic-wacke sandstone fragments in an alkali diatreme.

**Association:** Aegirine, alkali feldspar.

**Distribution:** From Coyote Peak, Humboldt County, California, USA.

**Name:** To conform to IMA nomenclature for a ferrous (ferro)-dominant analog of oberite.

**Type Material:** Royal Ontario Museum, Toronto, Canada (M54035).