Maneckiite

**NaCa$_2$Fe$^{2+}$(Fe$^{3+}$Mg)Mn$_2$(PO$_4$)$_6$(H$_2$O)$_2$**

**Crystal Data:** Orthorhombic.  
**Point Group:** 2/m 2/m 2/m.  
As imperfect crystals (sometimes zoned) to ∼150 μm.

**Physical Properties:** Cleavage: Good on {010}.  
Tenacity: Brittle.  
Fracture: Splintery.  
Hardness = ∼ 5  
D(meas.) = n.d.  
D(calc.) = 3.531

**Optical Properties:** Transparent.  
Color: Dark brown.  
Streak: Colorless.  
Luster: Vitreous.  
Optical Class: Biaxial (+).  
α = 1.698(2)  
β = 1.706(2)  
γ = 1.727(2)  
2V(meas.) = 65.9(1.5)°  
2V(calc.) = 64°  
Orientation: X || a, Y || b, Z || c.  
Dispersion: Obscured.  
Pleochroism: X = dark green, Y = dark blue-green, Z = light brown/tan.  
Absorption: X > Y > Z.

**Cell Data:** Space Group: Pcab.  
\[ a = 12.526(4) \quad b = 12.914(5) \quad c = 11.664(4) \quad Z = 4 \]

**X-ray Powder Pattern:** Michalkowa, Góry Sowie Block, Lower Silesia, southwestern Poland.  
2.759 (100), 2.916 (78), 3.020 (68), 2.844 (35), 2.869 (31), 2.825 (30), 2.121 (30)

**Chemistry:**

<table>
<thead>
<tr>
<th>Element</th>
<th>Formula</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P$_2$O$_5$</td>
<td>42.45</td>
<td></td>
</tr>
<tr>
<td>Fe$_2$O$_3$</td>
<td>[8.65]</td>
<td></td>
</tr>
<tr>
<td>FeO</td>
<td>[15.19]</td>
<td></td>
</tr>
<tr>
<td>MnO</td>
<td>11.64</td>
<td></td>
</tr>
<tr>
<td>CaO</td>
<td>11.07</td>
<td></td>
</tr>
<tr>
<td>MgO</td>
<td>4.56</td>
<td></td>
</tr>
<tr>
<td>SrO</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Na$_2$O</td>
<td>2.81</td>
<td></td>
</tr>
<tr>
<td>H$_2$O</td>
<td>[3.58]</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.02</strong></td>
<td></td>
</tr>
</tbody>
</table>

(1) Michalkowa, Góry Sowie Block, Lower Silesia, southwestern Poland.; average of 14 electron microprobe analyses, H$_2$O, FeO and Fe$_2$O$_3$ calculated for electroneutrality and the stoichiometry of the wicksite group; corresponds to (Na$_{0.91}$[I$_{0.09}$]O$_{2-1.00}$[Ca$_{1.90}$Sr$_{0.01}$])$_{2-2.00}$[Fe$^{2+}$$_{1.77}$Mg$_{0.23}$])$_{2-2.00}$[Fe$^{3+}_{1.09}$Mg$_{0.91}$])$_{2-2.00}$[Mn$_{1.65}$Fe$^{2+}_{0.35}$]O$_{2-2.00}$[PO$_4$]$_6$(H$_2$O)$_2$.

**Mineral Group:** Wicksite supergroup.

**Occurrence:** In the outer zone of phosphate nodules. A product of Na- and Ca-metasomatism in a weakly fractionated anatitic lithium-cesium-tantalum pegmatite induced by a hydrothermal fluid in the presence of Al$^{3+}$ from a neighboring aluminosilicate melt.

**Association:** Fluorapatite, wolfeite, Ca-rich graftonite, alluaudite-group minerals.

**Distribution:** From Michalkowa, Góry Sowie Block, Lower Silesia, southwestern Poland.

**Name:** Honors Andrzej Manecki (b. 1933), eminent Polish mineralogist and emeritus Professor, Department of Mineralogy, Petrography, and Geochemistry, Faculty of Geology, Geophysics and Environmental Protection, AGH University of Science and Technology, Cracow, Poland.

**Type Material:** Mineralogical Museum, University of Wroclaw, Wroclaw, Poland (MMWr IV7674 and MMWr IV7677).

**References:** (1) Pieczka, A., F.C. Hawthorne, B. Gołębiowska, A. Włodek, and A. Grochowina (2017) Maneckiite, ideally NaCa$_2$Fe$^{2+}$(Fe$^{3+}$Mg)$\text{Mn}_2$(PO$_4$)$_6$(H$_2$O)$_2$, a new phosphate mineral of the wicksite supergroup from the Michalkowa pegmatite, Góry Sowie Block, southwestern Poland. Mineral. Mag., 81(3), 723-736.  