## Maneckiite $NaCa_2Fe_2^{2+}(Fe^{3+}Mg)Mn_2(PO_4)_6(H_2O)_2$

**Crystal Data**: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As imperfect crystals (sometimes zoned) to ~150 $\mu$m.

**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 (+). $\alpha$ = 1.698(2) $\beta$ = 1.706(2) $\gamma$ = 1.727(2) 2V(meas.) = 65.9(1.5)° 2V(calc.) = 64° *Orientation*: $X \parallel a$, $Y \parallel b$, $Z \parallel c$. *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) $b$ = 12.914(5) $c$ = 11.664(4) Z = 4

**X-ray Powder Pattern**: Michałkowa, 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**:

| | (1) |
|---|---|
| $P_2O_5$ | 42.45 |
| $Fe_2O_3$ | [8.65] |
| FeO | [15.19] |
| MnO | 11.64 |
| CaO | 11.07 |
| MgO | 4.56 |
| SrO | 0.15 |
| $Na_2O$ | 2.81 |
| $H_2O$ | [3.58] |
| Total | 100.02 |

(1) Michałkowa, Góry Sowie Block, Lower Silesia, southwestern Poland.; average of 14 electron microprobe analyses, $H_2O$, FeO and $Fe_2O_3$ calculated for electroneutrality and the stoichiometry of the wicksite group; corresponds to $(Na_{0.91}\square_{0.09})_{\Sigma=1.00}(Ca_{1.98}Sr_{0.01})_{\Sigma=2.00}(Fe^{2+}_{1.77}Mg_{0.23})_{\Sigma=2.00}(Fe^{3+}_{1.09}Mg_{0.91})_{\Sigma=2.00}(Mn_{1.65}Fe^{2+}_{0.35})_{\Sigma=2.00}(PO_4)_6(H_2O)_2$.

**Mineral Group**: Wicksite supergroup.

**Occurrence**: In the outer zone of phosphate nodules. A product of Na- and Ca-metasomatism in a weakly fractionated anatectic 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 Michałkowa, 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 Wrocław, Wrocław, Poland (MMWr IV7674 and MMWr IV7677).

**References**: (1) Pieczka, A., F.C. Hawthorne, B. Gołębiowska, A. Włodek, and A. Grochowina (2017) Maneckiite, ideally $NaCa_2Fe_2^{2+}(Fe^{3+}Mg)Mn_2(PO_4)_6(H_2O)_2$, a new phosphate mineral of the wicksite supergroup from the Michałkowa pegmatite, Góry Sowie Block, southwestern Poland. Mineral. Mag., 81(3), 723-736. (2) (2018) Amer. Mineral., 103, 834 (abs. ref. 1).