Eleonorite

\[
\text{Fe}^{3+}\text{d}(\text{PO}_4)\text{d}O(O\text{H})\text{d}4\cdot6\text{H}_2\text{O}
\]

**Crystal Data**: Monoclinic.  
*Point Group*: 2/m.  
As prismatic crystals displaying {301}, {100}, and {301}, flattened on {100}, or with a rhombic cross section, to 3.5 mm; typically in random or radial aggregates to 5 mm.

**Physical Properties**: 
*Cleavage*: Perfect on {100}.  
*Tenacity*: Brittle.  
*Fracture*: n.d.  
*Hardness* = 3  
*D(meas.)* = 2.92(1)  
*D(calc.)* = 2.931  
Dissolves slowly in dilute HCl.

**Optical Properties**: 
*Translucent*.  
*Color*: Red-brown.  
*Streak*: Light red-brown.  
*Luster*: Vitreous.  
*Optical Class*: Biaxial (+).  
\[\alpha = 1.765(4)\quad \beta = 1.780(5)\quad \gamma = 1.812(6)\quad 2\nu(meas.) = 75(10)^\circ\]

2\nu(calc.) = 70°  
*Pleochroism*: Strong; \(X = \) brownish yellow, \(Z = \) brown-red.  
*Orientation*: \(X = b, Z\) and \(Y\) parallel (100).  
*Absorption*: \(Z > Y > X\).  
*Dispersion*: Very strong, \(r > v\).

**Cell Data**:  
*Space Group*: C2/c.  
\[a = 20.679(10)\quad b = 5.148(2)\quad c = 19.223(9)\quad \beta = 93.574(9)^\circ\quad Z = 4\]

10.41 (100), 9.67 (38), 3.071 (34), 4.816 (31), 7.30 (29), 3.432 (18), 3.197 (18)

**Chemistry**:  
(1) \(\text{Al}_2\text{O}_3\) 1.03  
\(\text{Mn}_2\text{O}_3\) 0.82  
\(\text{Fe}_2\text{O}_3\) 51.34 52.82  
\(\text{P}_2\text{O}_5\) 31.06 31.29  
\(\text{H}_2\text{O}\) 16.4 15.89  
Total 99.58 100.00

(1) Rotläufchen mine, Waldgirmes, Wetzlar, Hesse, Germany; average of 5 electron microprobe analyses supplemented by IR spectroscopy, \(\text{H}_2\text{O}\) by chromatography of ignition products, \(\text{Fe}_2\text{O}_3\) by Mössbauer spectroscopy; corresponds to \((\text{Fe}^{3+}^{\text{5.70 Al}_{0.18}\text{Mn}^{3+}_{0.09}}\text{O}_4\text{P}_{4.03}\text{O}(\text{OH})_{4.34}5.98\text{H}_2\text{O})\).  
(2) \(\text{Fe}^{3+}\text{d}(\text{PO}_4)\text{d}O(O\text{H})\text{d}4\cdot6\text{H}_2\text{O}\).

**Occurrence**: A supergene mineral formed by solid-state oxidation of beraunite.

**Association**: Goethite, quartz, calcite, lepidocrocite, manganese oxides, cacoxenite (Eleonore mine); goethite, rockbridgeite, dufrénite, kidwellite, variscite, matulaite, planerite, cacoxenite, strengite, wavellite (Rotläufchen mine); goethite, quartz, cacoxenite, rockbridgeite (Gutglück mine).

**Distribution**: From the Eleonore Iron mine, Dünsberg, near Giessen, the Rotläufchen mine, Waldgirmes, and the Gutglück mine, Braunfels, Wetzlar, Hesse, Germany.

**Name**: For the mine that produced the first specimens.

**Type Material**: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4684/1 and 4684/2).

**References**:  
(2) (2017) Amer. Mineral., 102, 1144-1145 (abs. ref. 1).