Thadeuite  
\((Ca, Mn^{2+})(Mg, Fe^{2+}, Mn^{2+})_3(PO_4)_2(OH, F)_2\)

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Crystal Data:  Orthorhombic.  Point Group:  222.  Cleavable massive, to ~1 cm, also granular.

Physical Properties:  Cleavage:  On \{010\}, very good; another perpendicular.
Hardness = < 4  \(D(\text{meas.}) = 3.25(1)\)  \(D(\text{calc.}) = 3.21\)

Optical Class:  Biaxial (−).  Orientation:  \(X = c; Y = b; Z = a\).  \(\alpha = 1.568\)  \(\beta = 1.597(2)\)  \(\gamma = 1.600(2)\)  \(2V(\text{meas.}) = 33(2)^\circ\)

Cell Data:  Space Group:  \(C222_1\).  \(a = 6.412(3)\)  \(b = 13.563(8)\)  \(c = 8.545(5)\)  \(Z = 4\)

X-ray Powder Pattern:  Panasqueira, Portugal.
3.38 (100), 3.00 (31), 2.793 (31), 2.626 (23), 2.185 (18), 3.61 (16), 3.61 (16), 1.696 (11)

Chemistry:

\[
\begin{array}{ll}
P_2O_5 & 38.7 \\
FeO & 11.3 \\
MnO & 5.6 \\
MgO & 24.3 \\
CaO & 14.7 \\
F & 2.4 \\
OH & [7.1] \\
-O = (F_2, OH) & [4.3] \\
\text{Total} & [99.8]
\end{array}
\]

(1) Panasqueira, Portugal; by electron microprobe, average of three analyses, total Fe as FeO, total Mn as MnO; \((OH)^1\)− calculated for \(P_2O_5(\text{OH}+F) = 1:1\); corresponds to \((Ca_{0.96}Mn_{0.04})_{\Sigma=1.00}(Mg_{2.21}Fe_{0.57}Mn_{0.25})_{\Sigma=3.03}(PO_4)_{2.00}(\text{OH})_{1.53}F_{0.46})_{\Sigma=1.99}\).

Occurrence:  A very rare primary mineral in the margins of hydrothermal veins, formed between 230°–360° C and 100–1000 bars.

Association:  Fluorapatite, wolfeite, topaz, muscovite, sphalerite, quartz, chalcopyrite, pyrrhotite, siderite, arsenopyrite, chlorite, vivianite, althausite, panasqueiraite.

Distribution:  In the Panasqueira Sn–W deposit, Portugal.

Name:  Honoring Professor Décio Thadeu, Technical University, Lisbon, Portugal, for his studies on Portuguese ore deposits.

Type Material:  Department of Geology and Mineralogy, University of Michigan, Ann Arbor, Michigan; National Museum of Natural History, Washington, D.C., USA, 143141.


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