Hagendorfite $NaCaMn^{2+}(Fe^{2+}, Fe^{3+}, Mg)_2(PO_4)_3$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Very rare as crystals, to 4 mm; commonly massive.

Physical Properties: *Cleavage:* Good on {001}; poor on {110}. Hardness = 4.5
D(meas.) = 3.71 D(calc.) = [3.84]

Optical Properties: Translucent. *Color:* Greenish black.
Optical Class: Biaxial (–). *Pleochroism:* Strong; X = yellowish brown, Y = green, Z = bluish green. *Orientation:* $Z = b$; $Y \wedge c$ = -22°. *Dispersion:* $r > v$. $\alpha = 1.735$ $\beta = 1.742$ $\gamma = 1.745$
2V(meas.) = 68°

Cell Data: *Space Group:* $I2_1/a$. $a = 10.933$ $b = 12.594$ $c = 6.515$ $\beta = 97.98°$ Z = 4

X-ray Powder Pattern: Hagendorf, Germany.
2.686 (10), 2.593 (8), 3.42 (7), 6.11 (6), 3.08 (6), 2.853 (6), 2.117 (6)

Chemistry:

	(1)
P_2O_5	42.26
Fe_2O_3	13.30
FeO	15.44
MnO	18.50
MgO	0.66
CaO	1.68
Na_2O	8.47
K_2O	0.17
Total	100.48

(1) Hagendorf, Germany; corresponding to $Na_{1.37}Ca_{0.14}K_{0.02}Mn^{2+}_{1.30}(Fe^{2+}_{1.08}Fe^{3+}_{0.83}Mg_{0.08})_{\Sigma=1.99}(P_{0.99}O_4)_3$.

Polymorphism & Series: Forms a series with varulite.

Mineral Group: Alluaudite group.

Occurrence: In complex granite pegmatites; in phosphatic nodules in shale.

Association: Triphylite, wolfeite, hematite (Hagendorf, Germany).

Distribution: From Hagendorf, Bavaria, Germany. At Rapid Creek, Yukon Territory, Canada. In the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire, USA.

Name: For Hagendorf, Germany, the locality which yielded the first specimens.

Type Material: Harvard University, Cambridge, Massachusetts, USA, 107297.

References: (1) Strunz, H. (1954) Hagendorfit, ein neues Mineral der Varulith-Hühnerkobelit-Reihe. Neues Jahrb. Mineral., Monatsh., 252–255 (in German). (2) (1955) Amer. Mineral., 40, 553 (abs. ref. 1). (3) Fisher, D.J. (1956) Hagendorfite unit cell. Bull. Geol. Soc. Amer., 67, 1694–1695. (4) Strunz, H. (1960) Karyinit, ein Arsenat vom Strukturtypus der Phosphate Hagendorfit und Alluaudit. Neues Jahrb. Mineral., Monatsh., 7–15 (in German). (5) Moore, P.B. and J. Ito (1979) Alluaudites, wyllieites, arrojadites: crystal chemistry and nomenclature. Mineral. Mag., 43, 227–235. (6) Fecia di Cossato, Y.M. and P. Orlandi (1987) Nuovi dati sui fosfati della pegmatite di Mangualde (Portogallo). Rend. Soc. Ital. Mineral. Petrol., 42, 263–270 (in Italian with English abs.).