Xanthoxenite $Ca_4Fe_2^{3+}(PO_4)_4(OH)_2 \cdot 3H_2O$

Crystal Data: Triclinic. *Point Group:* $\bar{1}$ or 1. Platy or lathlike crystals, in lamellar aggregates and crusts.

Physical Properties: *Cleavage:* {010}, perfect. Hardness = 2.5 D(meas.) = 2.97 D(calc.) = 3.38

Optical Properties: Semitransparent. *Color:* Pale yellow, brownish yellow; pale yellow to pale lemon-yellow in transmitted light. *Luster:* Dull to slightly waxy.
Optical Class: Biaxial (–). *Pleochroism:* Faint in thick grains; in shades of yellow.
Dispersion: $r < v$, strong. *Absorption:* $Y > X = Z$. $\alpha = 1.704(3)$ $\beta = 1.715(3)$ $\gamma = 1.724(3)$ 2V(meas.) = Large.

Cell Data: *Space Group:* $P\bar{1}$. $a = 6.70(4)$ $b = 8.85(4)$ $c = 6.54(3)$ $\alpha = 92.1(2)°$ $\beta = 110.1(2)°$ $\gamma = 93.2(2)°$ Z = 1

X-ray Powder Pattern: Palermo #1 mine, New Hampshire, USA.
3.05 (10), 2.73 (9), 3.22 (8), 3.48 (7), 2.23 (6), 6.24 (5), 4.94 (4)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
P_2O_5	37.62	38.1	38.37	Na_2O		0.10	
Al_2O_3	0.01	0.23		K_2O		0.05	
Fe_2O_3	21.68	16.6	21.58	H_2O^+	9.13	10.90	
MnO	4.55	4.10		H_2O^-	0.86		
MgO	0.91	0.50		H_2O			9.74
CaO	24.99	29.3	30.31	insol.	0.78		
SrO		0.11		Total	100.53	[100.0]	100.00

(1) Palermo #1 mine, New Hampshire, USA; corresponds to $(Ca_{3.28}Mn_{0.47}Mg_{0.17})_{\Sigma=3.92}Fe_{2.00}(PO_4)_{3.90}(OH)_{2.14} \cdot 2.69H_2O$. (2) Přibyslavice, Czech Republic; recalculated to 100% after deduction of quartz 3.90% from an original total of 99.89%; corresponds to $(Ca_{3.90}Mg_{0.10}Na_{0.02})_{\Sigma=4.02}Fe_{1.98}(PO_4)_{4.00}(OH)_2 \cdot 2.51H_2O$. (3) $Ca_4Fe_2(PO_4)_4(OH)_2 \cdot 3H_2O$.

Occurrence: An uncommon alteration product of triphylite in complex zoned granite pegmatites.

Association: Apatite, whitlockite, childrenite–eosphorite, laueite, strunzite, stewartite, mitridatite, amblygonite, siderite.

Distribution: In the USA, from the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire; in the Tip Top, Linwood, and White Elephant mines, near Custer, Custer Co., South Dakota; at the Champion mine, White Mountains, Mono Co., California; in the Dunton quarry, Newry, and on Black Mountain and Red Hill, Rumford, Oxford Co., Maine. From Hühnerkobel, near Zwiesel, and at Hagendorf, Bavaria, Germany. From Přibyslavice and Otov, Czech Republic. At the Lavra da Ilha pegmatite, in the Jequitinhonha River, and Sabinópolis, near Taquaral, Minas Gerais, Brazil.

Name: From the Greek for *yellow* and supposed chemical resemblance to *cacoxenite*.

Type Material: Harvard University, Cambridge, Massachusetts, USA, 119745 [xanthoxenite redefined]. The name was originally applied to a partially described mineral [= stewartite ?] from the Hühnerkobel pegmatite, Germany, type material destroyed in World War II.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 977–978. (2) Frondel, C. (1949) Wolfeite, xanthoxenite, and whitlockite from the Palermo mine, New Hampshire. Amer. Mineral., 34, 692–705. (3) Moore, P.B. and J. Ito (1978) I. Whiteite, a new species, and a proposed nomenclature for the jahnsite-whiteite complex series. II. New data on xanthoxenite. III. Salmonsite discredited. Mineral. Mag., 42, 309–323.