Sigismundite

$Na_3(Ba, K, Pb)(Ca, Sr)$
$(Fe^{2+}, Mg, Mn^{2+})_{14}Al(PO_4)_{12}(OH)_2$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Imperfect and shattered elongated crystals, to 1 cm, in massive lumps.

Physical Properties: *Cleavage:* Two, imperfect, at ∼110°. *Tenacity:* Brittle. Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.544

Optical Properties: Translucent. *Color:* Grayish green; greenish yellow in transmitted light. *Streak:* White. *Luster:* Greasy.
Optical Class: Biaxial. *Orientation:* Extinction ∼25° to elongation. $n = 1.65(1)$
2V(meas.) = n.d.

Cell Data: *Space Group:* $C2/c$. $a = 16.406(5)$ $b = 9.945(3)$ $c = 24.470(5)$
$\beta = 105.73(2)°$ Z = 4

X-ray Powder Pattern: Near Madésimo, Italy.
3.010 (100), 3.178 (51), 2.678 (42), 2.523 (27), 2.805 (25), 4.519 (23), 2.775 (21)

Chemistry:

	(1)		(1)
P_2O_5	40.50	CaO	2.09
SiO_2	0.02	SrO	1.09
Al_2O_3	2.45	BaO	5.68
FeO	27.64	Na_2O	4.44
MnO	0.70	K_2O	0.26
PbO	0.76	H_2O	[0.86]
MgO	10.85	Total	[97.34]

(1) Near Madésimo, Italy; average of ten analyses, total Fe as FeO, total Mn as MnO, H_2O from crystal-structure analysis; corresponds to $Na_{3.02}(Ba_{0.78}K_{0.12}Pb_{0.07}Sr_{0.02})_{\Sigma=0.99}(Ca_{0.79}Sr_{0.20})_{\Sigma=0.99}(Fe_{8.12}Mg_{5.68}Mn_{0.21})_{\Sigma=14.01}Al_{1.01}(PO_4)_{12}(OH)_2$.

Occurrence: A very rare mineral in phengitic quartzite, formed probably by metamorphism of phosphatic organic matter.

Association: Quartz, apatite, iron carbonates, potassic feldspar, rutile, schorl, barite, celestine, lazulite, woodhouseite, crandallite, kaolinite, mitridatite, diaspore, svanbergite, vanadinite, albite, iron oxides.

Distribution: From near Madésimo, Spluga Valley, Lombardy, Italy.

Name: In honor of Pietro Sigismund (1874–1962), mineral collector specializing in minerals from Val Malenco, Italy.

Type Material: Civic Museum of Natural History, Morbegno, Italy.

References: (1) Demartin, F., C.M. Gramaccioli, T. Pilati, and E. Sciesa (1996) Sigismundite, $(Ba, K, Pb)Na_3(Ca, Sr)(Fe, Mg, Mn)_{14}Al(OH)_2(PO_4)_{12}$, a new Ba-rich member of the arrojadite group from Spluga Valley, Italy. Can. Mineral., 34, 827–834. (2) (1997) Amer. Mineral., 82, 432–433 (abs. ref. 1).