

Arrojadite-(BaFe)**BaFe²⁺(CaNa₂)Fe²⁺₁₃Al(PO₄)₁₁(PO₃OH)(OH)₂**

Crystal Data: Monoclinic. *Point Group:* m . As massive lumps to 4 cm.

Physical Properties: *Cleavage:* Good on {110}. *Tenacity:* Brittle. *Fracture:* Irregular. Hardness = 4-5 D(meas.) = n.d. D(calc.) = 3.544

Optical Properties: Translucent. *Color:* Grayish green. *Streak:* White. *Luster:* Greasy. *Optical Class:* Biaxial. n (calc.) = 1.639

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

X-ray Powder Pattern: Madesimo, Spluga Valley, northern 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 ₂ O ₅	40.50	SrO	1.09
Al ₂ O ₃	2.45	CaO	2.09
FeO	27.64	Na ₂ O	4.44
MnO	0.70	K ₂ O	0.26
MgO	10.85	SiO ₂	0.02
PbO	0.76	<u>H₂O</u>	[0.86]
BaO	5.68	Total	97.34

(1) Madesimo, Spluga Valley, northern Italy; average electron microprobe analysis, H₂O calculated from stoichiometry; corresponds to (Ba_{0.78}K_{0.12}Pb_{0.07}Sr_{0.02})_{Σ=0.99}Na_{3.02}(Ca_{0.79}Sr_{0.20})_{Σ=0.99}(Fe_{8.12}Mg_{5.68}Mn_{0.21})_{Σ=14.01}Al_{1.01}(OH)₂(PO₄)₁₂.

Mineral Group: Arrojadite group. A₂B₂CaNa_{2+x}M₁₃Al(PO₄)₁₁(PO₃OH_{1-x})W₂.

Occurrence: In phengitic quartzite formed by metamorphism of phosphatic organic matter (Spluga).

Association: Quartz, albite, apatite, ferrous carbonates.

Distribution: From Madesimo, Spluga Valley, northern Italy [TL]; at Chandler's Mills, Newport, New Hampshire, USA and at Buranga, Rwanda.

Name: *Arrojadite* indicates a member of the group with Fe²⁺ dominant at the *M* site; two suffixes indicate the dominant cation of the dominant valence state at the *A* and *B* sites. Honors Miguel Arrojado Ribeiro Lisboa (1872-1932), Brazilian geologist. Formerly 'sigismundite'.

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

References: (1) Chopin, C., R. Oberti, and F. Cámara (2006) The arrojadite enigma: II. Compositional space, new members, and nomenclature of the group. Amer. Mineral., 91, 1260-1270. (2) Cámara, F., R. Oberti, C. Chopin, and O. Medenbach (2006) The arrojadite enigma: I. A new formula and a new model for the arrojadite structure. Amer. Mineral., 91, 1249-1259. (3) Demartin, F., C.M. Gramaccioli, T. Pilati, and E. Sciesa (1996) Sigismundite, (Ba,K,Pb)Na₃(Ca,Sr)(Fe,Mg,Mn)₁₄(OH)₂(PO₄)₁₂, a new Ba-rich member of the arrojadite group from Spluga valley, Italy. Can. Mineral., 34, 827-834.