

**Arrojadite-(PbFe)****Crystal Data:** Monoclinic. *Point Group:* *m*. As corroded crystals to ~1 mm.**Physical Properties:** *Cleavage:* On {001}. *Tenacity:* Brittle. *Fracture:* n.d. *Hardness* = 3.5-4  
D(meas.) = n.d. D(calc.) = 3.596 Nonfluorescent.**Optical Properties:** Transparent. *Color:* Pale honey-yellow. *Streak:* White. *Luster:* Vitreous.  
*Optical Class:* Biaxial (+).  $\alpha = 1.6585(5)$   $\beta = 1.6600(5)$   $\gamma = 1.6680(5)$   $2V(\text{meas.}) = 58.2(1)^\circ$   
 $2V(\text{calc.}) = 47^\circ$  *Dispersion:*  $r > v$ . *Orientation:*  $X = b$ . *Pleochroism:* None.**Cell Data:** *Space Group:* *Cc*.  $a = 16.4304(9)$   $b = 9.9745(5)$   $c = 24.5869(13)$   $\beta = 105.485(2)^\circ$   $Z = 4$ **X-Ray Diffraction Pattern:** Calculated pattern.

3.02 (100), 2.698 (55), 3.21 (43), 2.83 (35), 2.820 (33), 2.694 (32), 2.538 (30)

<b>Chemistry:</b>	(1)	(2)	(1)	(2)	
P <sub>2</sub> O <sub>5</sub>	[40.00]	37.41	SiO <sub>2</sub>	0.11	
Al <sub>2</sub> O <sub>3</sub>	2.30	2.23	TiO <sub>2</sub>	0.03	
FeO	18.38	44.18	SrO	0.45	
MnO	13.70		BaO	2.01	
ZnO	0.19		PbO	5.29	9.81
MgO	6.64		F	0.53	
Li <sub>2</sub> O <sub>LAM</sub>	0.606		H <sub>2</sub> O	[1.02]	1.19
Na <sub>2</sub> O	4.60	2.72	<u>-O = F</u>	<u>0.22</u>	
K <sub>2</sub> O	0.66		Total	99.00	100.00
CaO	2.15	2.46			

(1) Sapucaia pegmatite, Galileia, Minas Gerais, Brazil; average electron microprobe analysis, H<sub>2</sub>O and P<sub>2</sub>O<sub>5</sub> calculated. (2)  $A^1\text{Pb}^{A2}\square^{B1}\text{Fe}^{B2}\square^{Na1.2}\text{Na}_2^{Na3}\square^{Ca}\text{Ca}^M\text{Fe}_{13}\text{Al}(\text{PO}_4)_{11}^{Plx}(\text{PO}_3\text{OH})^W(\text{OH})_2$ .**Polymorphism & Series:** Forms a series with dickinsonite.**Mineral Group:** Arrojadite group.  $\text{A}_2\text{B}_2\text{CaNa}_{2+x}\text{M}_{13}\text{Al}(\text{PO}_4)_{11}(\text{PO}_3\text{OH}_{1-x})\text{W}_2$ .**Occurrence:** A high-temperature ( $\approx 800^\circ\text{C}$ ) primary mineral in granite pegmatites.**Association:** Triphylite, chloritized biotite, albite.**Distribution:** In the Sapucaia pegmatite, Galileia, Rio Doce basin, Minas Gerais, Brazil.**Name:** *Arrojadite* indicates a member of the group with Fe<sup>2+</sup> 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 Lisbôa (1872-1932), Brazilian geologist.**Type Material:** Mineral Museum, School of Mines, Paris, France (32088).**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.