

Arrojadite-(KFe)**Crystal Data:** Monoclinic. *Point Group:* *m*. As cleavable masses to 15 cm.**Physical Properties:** *Cleavage:* On {001}. *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = ~5 D(meas.) = 3.527 D(calc.) = 3.586 Nonfluorescent.**Optical Properties:** Transparent. *Color:* Dark yellowish green. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (-). $\alpha = 1.662\text{--}1.664$ $\beta = 1.668\text{--}1.670$ $\gamma = 1.672\text{--}1.675$ $2V(\text{meas.}) = 80^\circ\text{--}86^\circ$ *Pleochroism:* *X* = colorless; *Y* = colorless to pale green; *Z* = pale yellow-green. *Orientation:* *X* = *b*; $Y \wedge c = 18^\circ\text{--}21.5^\circ$. *Dispersion:* $r < v$, strong.**Cell Data:** *Space Group:* *Cc*. $a = 16.453(2)$ $b = 10.031(2)$ $c = 24.692(4)$ $\beta = 105.72(9)^\circ$ $Z = 4$ **X-Ray Diffraction Pattern:** South Dakota, USA. (ICDD 34-149)

3.042 (100), 2.714 (85), 3.222 (45), 2.774 (30), 2.852 (25), 2.751 (25), 2.550 (25)

Chemistry:	(1)		(1)	
	P ₂ O ₅	[40.70]	CaO	2.51
	Al ₂ O ₃	2.42	SrO	0.06
	FeO	28.48	BaO	0.12
	MnO	14.56	PbO	0.20
	ZnO	0.40	F	0.75
	MgO	1.37	H ₂ O	[0.94]
	Li ₂ O _{LAM}	0.26	—O = F	0.32
	Na ₂ O	6.16	Total	100.40
	K ₂ O	1.71		

(1) Nickel Plate mine, South Dakota, USA; average electron microprobe analysis, H₂O and P₂O₅ calculated, total includes SiO₂ = 0.03, TiO₂ = 0.05; corresponds to $\text{K}_{0.76}\text{Na}_{4.15}(\text{Ca}_{0.94}\text{Ba}_{0.02}\text{Pb}_{0.02}\text{Sr}_{0.01})_{\Sigma=0.99}(\text{Fe}^{2+}_{8.28}\text{Mn}^{2+}_{4.29}\text{Mg}_{0.71}\text{Li}_{0.37}\text{Zn}_{0.10})_{\Sigma=13.75}(\text{Al}_{0.99}\text{Ti}_{0.01})_{\Sigma=1.00}[(\text{OH})_{2.18}\text{F}_{0.82}]_{\Sigma=3.00}[(\text{P}_{11.99}\text{Si}_{0.01})\text{O}_{47}(\text{OH})_{1.00}]$.

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:** Graftonite, cassiterite, spodumene, beryl, muscovite (Nickel Plate mine).**Distribution:** From the Nickel Plate mine, near Keystone, Pennington Co., South Dakota, USA [TL]. Chemically similar material from the Smith mine, Newport, and the Palermo No. 1 and Nancy mines, North Groton, New Hampshire, USA.**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 ‘arrojadite’.**Type Material:** Mineral Museum, School of Mines, Paris, France (38431).**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.