

**Arrojadite-(BaNa)****BaNa<sub>3</sub>(Na,Ca)Fe<sup>2+</sup><sub>13</sub>Al(PO<sub>4</sub>)<sub>11</sub>(PO<sub>3</sub>OH)(OH)<sub>2</sub>**

**Crystal Data:** Monoclinic. *Point Group:* 2/m. As rounded masses or roughly crystallized individuals to 5 cm.

**Physical Properties:** *Cleavage:* Good on {110}. *Tenacity:* Brittle. *Fracture:* Irregular. Hardness = 4-5 D(meas.) = 3.54(2) D(calc.) = 3.76

**Optical Properties:** Translucent. *Color:* Pale grayish green; pale yellowish brown when altered. *Streak:* n.d. *Luster:* Greasy.

*Optical Class:* Biaxial (+).  $\alpha = 1.656(2)$   $\beta = 1.660(2)$   $\gamma = 1.664(2)$   $2V(\text{meas.}) = 44(1)^\circ$   $2V(\text{calc.}) = 45^\circ$  *Dispersion:* Intermediate. *Orientation:* OAP  $\perp$  to {110};  $Z \wedge c = 17-18^\circ$ .

**Cell Data:** *Space Group:* C2/c.  $a = 16.4984(6)$   $b = 10.0228(1)$   $c = 24.648(1)$   $\beta = 105.850(4)^\circ$   $Z = 4$

**X-ray Powder Pattern:** Luna albite pegmatite, Dorio, Lecco province, Italy. 3.137 (100), 2.818 (61), 3.303 (46), 2.667 (35), 2.878 (32), 3.488 (28), 4.621 (22)

<b>Chemistry:</b>	(1)	(2)		(1)	(2)
P <sub>2</sub> O <sub>5</sub>	39.73	39.72	CaO	2.22	1.29
Al <sub>2</sub> O <sub>3</sub>	2.40	2.35	Na <sub>2</sub> O	6.06	5.72
FeO	32.91	43.06	K <sub>2</sub> O	0.59	
MnO	5.41		H <sub>2</sub> O <sup>+</sup>	[0.42]	
MgO	3.60		H <sub>2</sub> O <sup>-</sup>	[0.70]	1.25
PbO	1.35		F	0.22	
BaO	4.43	7.07	<u>- O = (F,Cl)<sub>2</sub></u>	<u>0.09</u>	
SrO	0.35		Total	100.30	100.00

(1) Luna albite pegmatite, Dorio, Lecco province, Italy; average of 20 electron microprobe analyses supplemented by Raman spectroscopy, H<sub>2</sub>O<sup>+</sup> calculated from stoichiometry, H<sub>2</sub>O<sup>-</sup> calculated for 2 = OH+F+Cl pfu; corresponds to (Ba<sub>0.62</sub>K<sub>0.27</sub>Pb<sub>0.13</sub>Sr<sub>0.07</sub>) $\Sigma=1.09$ Na<sub>3</sub>(Na<sub>1.19</sub>Ca<sub>0.85</sub>) $\Sigma=2.04$ (Fe<sup>2+</sup><sub>9.82</sub>Mg<sub>1.92</sub>Mn<sup>2+</sup><sub>1.64</sub>) $\Sigma=13.38$ Al<sub>1.01</sub>(PO<sub>4</sub>)<sub>11</sub>(PO<sub>3</sub>OH)(OH<sub>1.75</sub>F<sub>0.25</sub>) $\Sigma=2$ . (2) BaNa<sub>3</sub>(Na,Ca)Fe<sup>2+</sup><sub>13</sub>Al(PO<sub>4</sub>)<sub>11</sub>(PO<sub>3</sub>OH)(OH)<sub>2</sub>.

**Mineral Group:** Arrojadite group.

**Occurrence:** A primary mineral in the blocky-plagioclase zone of a granitic pegmatite.

**Association:** Fluorapatite, albite.

**Distribution:** From the Luna albite pegmatite, Dorio, Lecco province, Italy.

**Name:** For the Ba-Na-rich member of the *arrojadite* group.

**Type Material:** Natural History Museum, Milan, Italy (38718); Laboratory of Mineralogy, University of Liege, Belgium (20391); Department of Mineral Sciences, National Museum of Natural History, Washington, D.C., USA; and Department of Geology and Petrography, Moravian Museum, Brno, Czech Republic.

**References:** (1) Vignola, P., F. Hatert, M. Baijot, F. Dal Bo, S. Andò, D. Bersani, A. Pavese, A. Risplendente, and F. Vanini (2016) Arrojadite-(BaNa), BaNa<sub>3</sub>(Na,Ca)Fe<sup>2+</sup><sub>13</sub>Al(PO<sub>4</sub>)<sub>11</sub>(PO<sub>3</sub>OH)(OH)<sub>2</sub>, a new phosphate mineral from the Luna albite pegmatite, Dorio commune, Lecco province, Italy. *Can. Mineral.*, 54(4), 1021-1032. (2) (2018) *Amer. Mineral.*, 103, 331 (abs. ref. 1 with comment).