

Fluorcarmoite-(BaNa)**Ba□Na₂Na₂□CaMg₁₃Al(PO₄)₁₁(PO₃OH)F₂**

Crystal Data: Monoclinic. *Point Group:* *m*. As equant platy prismatic crystals to 15 mm.

Physical Properties: *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* n.d. Hardness = ~7.5
VHN = 1236 D(meas.) = 3.40 D(calc.) = 3.394

Optical Properties: Translucent. *Color:* Yellow-orange. *Streak:* Yellow-orange. *Luster:* Vitreous.
Optical Class: Biaxial (+). $\alpha = 1.6240(5)$ $\beta = 1.6255(5)$ $\gamma = 1.6384(5)$ $2V(\text{meas.}) = 35(2)^\circ$
 $2V(\text{calc.}) = 37.9^\circ$ *Pleochroism:* Weak, pale yellow to colorless.

Cell Data: *Space Group:* *Cc*. $a = 16.4013(3)$ $b = 9.9487(1)$ $c = 24.4536(8)$ $\beta = 105.725(2)^\circ$ $Z = 4$

X-ray Powder Pattern: Maremola Creek, near Isallo, Magliolo municipality, Savona, Liguria, Italy.
3.012 (100), 2.682 (39), 2.735 (32), 3.188 (28), 2.818 (28), 2.526 (25), 4.959 (25)

Chemistry:	(1)	(2)
Na ₂ O	5.83	6.92
K ₂ O	0.36	
CaO	2.64	3.13
SrO	0.46	
BaO	7.12	8.56
MnO	2.01	
FeO	17.68	
MgO	15.12	29.26
Al ₂ O ₃	2.57	2.85
P ₂ O ₅	44.96	47.55
F	2.14	2.12
- O = F ₂	0.90	0.89
H ₂ O	[0.33]	0.50
total	100.32	100.00

(1) Maremola Creek, near Isallo, Magliolo municipality, Savona, Liguria, Italy; average of 15 electron microprobe analyses supplemented by Raman spectroscopy, H₂O calculated from stoichiometry, P₂O₅ reduced to 95% to obtain 12 P apfu; corresponds to (Na_{3.77}Ca_{0.94}Ba_{0.93}K_{0.15}Sr_{0.09}□_{0.12}) $\Sigma=6.00$ (Mg_{7.52}Fe²⁺_{4.93}Mn²⁺_{0.57}) $\Sigma=13.02$ Al_{1.01}(PO₄)₁₁(PO₃)(OH_{0.74}F_{0.26})F₂.
(2) BaNa₂Na₂CaMg₁₃Al(PO₄)₁₁(PO₃OH)F₂.

Mineral Group: Arrojadite group.

Occurrence: In a river pebble derived from phosphate-bearing quartzites.

Association: Quartz, almandine, fluorapatite.

Distribution: In a pebble from the riverbed of the upper Maremola Creek, near Isallo, Magliolo municipality, Savona, Liguria, Italy.

Name: For Monte *Carmo* di Loano, the highest peak in the area where the mineral was found. A member of the arrojadite group with Mg²⁺ dominant at the *M* sites and suffixes for dominant Ba at the *A1* and Na at the *B1* sites. The prefix “*fluor*” indicates dominant F in the *W* site.

Type Material: Regional Science Museum, Torino, Italy (M/15940).

References: (1) Cámara, F., E. Bittarello, M.E. Ciriotti, F. Nestola, F. Radica, F. Massimi, and R. Bracco (2019) Fluorcarmoite-(BaNa), the first Mg-dominant mineral of the arrojadite group. *Eur. J. Mineral.*, 31(4), 823-836. (2) (2021) *Amer. Mineral.*, 106, 160 (abs. ref. 1). (3) 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.