Umbrianite $K_7Na_2Ca_2[Al_3Si_{10}O_{29}]F_2Cl_2$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As rectangular, lamellar, or lath-shaped crystals to 200 μm, typically flattened on {010} displaying {010}, {001} and {100}; in sheaf-like aggregates to 500 μm.

Physical Properties: *Cleavage*: Perfect on (010), distinct on (100) and (001). *Tenacity*: Brittle. *Fracture*: Stepped to uneven. Hardness = ~5 VHN = 405-568, 473 average (20 g load). D(calc.) = 2.49 Nonfluorescent.

Optical Properties: Transparent. *Color*: Colorless. *Streak*: White. *Luster*: Vitreous. *Optical Class*: Biaxial (-). $\alpha = 1.537(2)$ $\beta = 1.543(2)$ $\gamma = 1.544(2)$ 2V(meas.) = 30(10)° 2V(calc.) = 44.3° *Orientation*: $X = b$; axes of the optical indicatrix ⊥ cleavage planes.

Cell Data: *Space Group*: *Pmmn*. $a = 7.0618(5)$ $b = 38.420(2)$ $c = 6.5734(4)$ $Z = 2$

X-Ray Diffraction Pattern: Pian di Celle volcano, Umbria, Italy.
9.65 (100), 6.59 (97), 3.296 (77), 3.118 (70), 2.819 (53), 2.903 (52), 6.91 (43)

Chemistry:

	(1)		(1)
SiO_2	42.83	SrO	0.05
TiO_2	0.05	Na_2O	3.61
Al_2O_3	11.58	K_2O	22.55
Fe_2O_3	2.04	F	2.89
MnO	0.06	Cl	5.04
MgO	0.40	S	0.01
CaO	10.96	$-O = (F, Cl)_2$	2.36
BaO	0.04	Total	99.76

(1) Pian di Celle volcano, Umbria, Italy; average electron microprobe and SIMS analyses supplemented by Raman spectroscopy; corresponds to $[K_{6.45}Na_{0.35}(Sr,Ba)_{0.01}]_{\Sigma=6.81}(Na_{1.22}Ca_{0.78})_{\Sigma=2.00}(Ca_{1.85}Mg_{0.13}Mn_{0.01}Ti_{0.01})_{\Sigma=2.00}[(Fe^{3+}_{0.34}Al_{3.06}Si_{9.60})_{\Sigma=13.00}O_{29.00}]F_{2.05}Cl_{1.91}(OH)_{0.04}$.

Mineral Group: Günterblassite group.

Occurrence: Essential groundmass, late-magmatic mineral in vesicular melilitolite, unstable under post-magmatic hydrothermal conditions and alters to Ba-rich hydrated phases.

Association: Kalsilite, leucite, fluorophlogopite, melilite, olivine (Fo 60), diopside, nepheline, Ti-rich magnetite, fluorapatite, cuspidine-hiortdahlite series minerals, götzenite, khibinskite, monticellite-kirschsteinite series minerals, westerveldite, various sulfides, peralkaline silicate glass.

Distribution: Pian di Celle volcano, Umbria, Italy.

Name: For *Umbria*, the region of Central Italy where the studied material was collected.

Type Material: A.E. Fersman Mineralogical Museum, RAS, Moscow (4157/1), and the Central Siberian Geological Museum, V.S. Sobolev Institute of Geology and Mineralogy, Novosibirsk, Russia (XIII-338/1).

References: (1) Sharygin, V.V., I.V. Pekov, N.V Zubkova, A.P. Khomyakov, F. Stoppa, and D.Y. Pushcharovsky (2013) Umbrianite, $K_7Na_2Ca_2[Al_3Si_{10}O_{29}]F_2Cl_2$, a new mineral species from melilitolite of the Pian di Celle volcano, Umbria, Italy. Eur. J. Mineral., 25, 655-669.