New Mineral Names*

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**CAPRANICAITE***


Capranicaite forms as clear, vitreous crystals of up to 0.1 mm in size inside miarolitic cavities in a feldspathoid-bearing syenite block from the Vico volcanic complex in Capranica, Viterbo Province, Italy. It is found associated with K-feldspars, plagioclase, andradite, hornblende, biotite, magnetite, sodalite-häüyne series mineral, titanite, apatite, zircon, and a B-Be-Si phase. It exhibits a good cleavage on {001}, a splintery fracture, and its hardness could not be measured but is assumed to be less than 6. $D_{meas} = 2.41$ g/cm$^3$. The mineral is not fluorescent under short and long UV-light and has a white streak. The new species is biaxial (−), α = 1.495(1), β = 1.543(1), γ = 1.544(1), $2V_{meas} = 7.3(2)^\circ$, $2V_{calc} = 16^\circ$, and optical orientation is α || c, β ~ || a, γ || b, and the optical plane is (100). Capranicaite does not show any pleochroism.

Electron microprobe analyses (average of four analyses) gave SiO$_2$ 20.70, Al$_2$O$_3$ 32.91, B$_2$O$_3$ 22.90, K$_2$O 5.36, CaO 11.04, Na$_2$O 4.08, Cs$_2$O 2.20, sum 99.19 wt% corresponding to (K$_{0.66}$Cs$_{0.34}$)$_{32.79}$ (Ca$_{1.99}$Na$_{0.01}$)$_{31.90}$Al$_{1.91}$B$_{3.99}$Si$_{2.90}$O$_{18}$ based on 18 O atoms, with an ideal formula of (K,□)(Ca,Na)Al$_2$B$_2$Si$_5$O$_{12}$. The FTIR spectrum shows absorptions from 2289 to 2640 cm$^{-1}$ (BO$_3$), a broad absorption from 3627 to 3535 cm$^{-1}$ (H$_2$O/OH molecules), absorption at 1611 cm$^{-1}$ (H$_2$O) and a small but sharp band at 2341 cm$^{-1}$ (CO$_2$).

The crystal structure was solved on a platy 0.15 × 0.11 × 0.05 mm crystal using the intensity data collected with a Bruker AXS three-circle diffractometer equipped with a CCD detector, $R_{int} = 5\%$ for 3399 observed reflections [$F(I)/\sigma(I) \geq 3$]. Capranicaite is monoclinic, $P2_1/n$, $a = 4.8507(2)$, $b = 16.6156(6)$, $c = 20.5445(7)$ Å, $\alpha = 90.245^\circ$, $V = 1655.82(17)$ Å$^3$, $Z = 4$ (refined from single-crystal data). No X-ray diffraction data were collected due to the small amount of material available, the strongest calculated (CuKα radiation) diffraction lines are the following ($d_{obs}$ in Å) (I$_{obs}$%, $hkl$): 4.104(90,T21,121), 3.424(83,006), 3.234(100,124,044), 3.119(32,T41,141), 2.647(24,126), 2.425(31,200), 2.405(37,160), 2.342(25, T62,162), 2.184(38,048,T64), 1.564(30,20,010,T,6,10).

Fluorbritholite-(Y)*


Fluorbritholite-(Y) is a new mineral from Lagmannsvik and Kråkmo, Hararøy, Nordland, Norway. Both localities are alkaline granite-related pegmatites located within a 1750 Ma partially recrystallized granitoid gneiss. At Lagmannsvik, the mineral occurs as irregular grains and hexagonal, tabular crystals up to 1 mm in granular aggregates of Y-bearing fluorite and allanite-(Ce), associated with quartz aluminocerite-(Ce), bastnäsite-(Ce), britholite-(Y), gadolinite-(Y), hudholmenite-(Y), minerals of the thalénite-(Y)-fluorthalénite-(Y) series, kainosite-(Y), and tengerite-(Y). At Kråkmo, the mineral forms rims up to 0.5 mm thick around fluorapatite crystals that are embedded in quartz, fluorite, or allanite-(Ce). Fluorbritholite-(Y) has also been found at Mt. Vyuntspakhk, Western Keivy, Kola Peninsula, Russia, in an amazonite-bearing pegmatite in metasomatically altered gneiss near the contact with alkaline granites. Here it forms single, irregular grains and rarely coarse-grained, hexagonal short-prismatic to thick-tabular crystals up to 2.5 × 4 cm. Fluorbritholite-(Y) is transparent, light pink-brown to brown-pink, light brown, or dark brown. It has a pale brown to almost white streak, vitreous to greasy luster (metamict samples are resinous), is brittle, has an uneven to conchoidal fracture, Mohs hardness = 5.5, and no cleavage or parting was observed. It has a calculated density of 4.609 g/cm$^3$. Optically, fluorbritholite-(Y) is uniaxial negative (−), ω = 1.784(2), ε = 1.789(3), or anomalously biaxial positive (+), α = 1.784(2), β = 1.784(2), γ = 1.789(3), $2V_{meas} = 10(5)^\circ$. It is colorless and non-pleochroic. The FTIR spectrum of fluorbritholite-(Y) shows absorptions from 2289 to 2640 cm$^{-1}$.
The chemical composition of fluoroleakeite-(Y) was determined by WDS on a Cameca SX50 electron microprobe. The average (range) of four analyses on the holotype gave CaO 12.21 (11.3–13.0), MnO 1.06 (0.8–1.2), Y2O3 30.80 (29.4–31.7), La2O3 1.13 (0.9–1.3), CeO2 7.12 (6.7–7.9), Pr2O3 0.69 (0.5–0.8), Nd2O3 6.85 (5.7–7.9), Sm2O3 2.15 (1.7–2.9), Gd2O3 0.23 (1.8–2.9), Dy2O3 2.8 (2.2–3.6), Er2O3 2.61 (2.1–3.1), Yb2O3 3.75 (3.3–4.2), SiO2 24.18 (23.8–24.5), P2O5 0.29 (0.2–0.4), F 2.01 (1.8–2.3), O × (F,Cl) −0.85, total 99.03 wt%, corresponding to an empirical formula (based on 13 anions) of [(Y,2.013)2(Pr,0.06)2(Lu,1.063)2(Ce,7.12)7.970(Pr,0.05)2(O,0.071)23.249Ca,1.607(Mn,0.119)32.966{(Si,2.97),P,0.039,3)O,12[(F,7.30)2,12(O,0.000)]]

Powder X-ray diffraction data for fluoroleakite-(Y) were collected using a STOE STADI MP powder diffractometer (CuKα radiation) with a STOE linear position sensitive detector. The strongest lines on the diffraction pattern [d, in Å (I,%,hk,l)] include 4.104(27,200), 3.160(27,102), 2.826(100,121), 2.775(58,112), 2.737(46,300), 1.948(25,222), and 1.839(28,123), with refined unit-cell parameters of a = 9.464(2) Å, c = 6.845(2) Å, V = 531.04(4) Å³, Z = 2. Single-crystal X-ray structure data were collected on an Xcalibur S diffractometer with a CCD detector (MoKα radiation). A total of 14113 reflections were observed, with 474 unique reflections. The structure was refined in space group P63/m to Rl = 0.0466, wR2 = 0.0717 for 461 observed reflections with F2 > 4σ(F2). GoF = 1.309. The mineral is isostructural with fluorapatite.

Both the mineral and named have been approved by the IMA CNMC (IMA no. 2009-005). The mineral has been named as the fluoro-dominant analogue of britholite-(Y). The holotype specimen has been deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow (catalog no. 3762/1). P.C.P.

**FLUOROLEAKEITE**


Fluoroleakeite was discovered in the Verknee Espe deposit, Akjайайutas Mountains, Eastern Kazakhstan District, Kazakhstan. It occurs as poorly terminated prisms up to 3 mm in length as single-crystal, small aggregates and as inclusions in the mineral cámite. It has a splintery fracture, a hardness ~6, Dcalc = 3.245 g/cm³, and a perfect cleavage {110} characteristic of monoclinic amphiboles. Optically, fluoroleakeite is biaxial (−), indices of refraction α = 1.663(2), β = 1.673(7), γ = 1.660(2), 2Vmeas = 80.9(6)°, 2Vcalc = 79.4°, and optical orientation is X ^ a = 14.1° (in β obtuse), Y ⊥ b, Z ^ c = 75.9° (in β acute). It shows pleochroism in the following pattern: X = pale gray-green, Y = medium gray, Z = gray-brown. The mineral is black with a light gray to colorless streak and does not fluoresce under short and long-wave UV-light.

The chemistry of fluoroleakeite from a combination of electron microprobe analyses (average of 10 analyses) and structural determination for Li and the Fe²⁺/Fe³⁺ ratio gave SiO2 53.34, TiO2 1.27, Al2O3 0.62, V2O5 0.05, FeO 15.10, Fe2O3 6.0, MnO 2.04, ZnO 0.18, MgO 6.40, CaO 0.13, Na2O 9.08, K2O 1.98, Li2O 1.10, H2O(calc) 0.16, F 3.33, sum 99.39 wt% corresponding to an empirical formula of NaNa4(Mg,Fe)2Li2Si2O12F2 (Li0.28,Mg2.74,Fe1.95)2Na0.02,Zn0.01,Fe1.87,V0.00,Al1.98,Zr0.05,Si1.97,Al0.21)O2(F,2s,OH,0.02) based on 23 O atoms. The ideal formula is NaNa4(Mg,Fe)2Li2Si2O12F2.

The structure was solved on a 25 × 200 × 300 μm crystal using a Bruker AXS diffraction system equipped with a SMART APEX CCD detector to R int = 2.4% for 2423 observed reflections [Ic > 4σ(I)]. Fluoroleakeite is monoclinic, C2/m, with unit-cell parameters refined to a = 9.4927(3), b = 17.9257(6), c = 5.2969 Å, β = 103.990(1)°, V = 905.7(1) Å³, Z = 2. The strongest diffraction lines (Gandolfi camera, Ni-filtered CuKα radiation, 17 lines) naturally observed in Å (I,%,hk,l): 8.434(40,110), 4.463(30,021), 3.405(30,131), 3.137(20,310), 2.718(100,151), 2.541(20,202), 2.166(20,261). The presence of Li in the structure characterizes the leakeite-related amphiboles and improved detection methods for light elements such as Li suggest that Li-amphiboles to be more common that previously thought.

The new mineral takes its name from being the fluoro-dominant analog of the (OH)-dominant end-member mineral leakeite. The mineral and its name were approved by the IMA CNMC (2009-085) and the holotype material has been incorporated into the mineral collection of the Fersman Mineralogical Museum, Moscow, Russia under catalog no. 3828/1. R.R.

**HEKLAITE**


The new mineral heklaite was identified in five specimens from fumaroles formed by the 1991 eruption of the Hekla central volcano located in the Eastern Volcanic Zone in South Iceland. Heklaite occurs as micrometer to submicrometer glassy, colorless, transparent and non-fluorescent crystals with a white streak. Optical properties, hardness and density were not observed or measured due to the minute crystal size. Dcalc = 2.69 g/cm³. It forms closely associated with ralstonite, malladrite, hieraitie, and other potentially new mineral phases in fumarolic encrustations and is found intergrown with malladrite and possibly with the cubic polymorph of hieraitie.

Analyses with an electron microprobe-EDS (average of five point analyses) gave: Na 11.98, K 18.29, Si 13.91, F 55.66, sum 99.84 wt% corresponding to Na1.03,Ka0.95Si1.00Fe0.37F5.17 based on 9 apfu. The ideal formula is KNaSiF5. Heklaite possibly forms through the following reactions caused by F-rich gases being released in fumarols:

\[
\text{SiO}_2(s) + 6\text{HF(aq)} \rightarrow \text{H}_2\text{SiF}_6(aq) + 2\text{H}_2\text{O(l)}
\]

\[
\text{H}_2\text{SiF}_6 + 2\text{MeCl} \rightarrow \text{Me}_2\text{SiF}_6 + 2\text{HCl}, \text{where Me} = \text{Na}, \text{K}
\]

Solving the structure using single-crystal X-ray data was not attempted due to the small crystal size, but Rietveld refine-
The simplified formula for hermannroseite is $K\text{NaSiF}_6$.

The grain size varied for all minerals from microcrystalline to medium grained (3 mm). The mean grain size of 0.7 µm made the new mineral difficult to study. Hermannroseite is grassy green with a pale green streak; its crystals are transparent and have a vitreous luster. Cleavage was not observed and hardness could not be measured. Density and mean refractive index were calculated based on the empirical formula and unit-cell data: 4.08 g/cm$^3$, 1.77, respectively. Hermannroseite should be biaxial. Pleochroism was not observed but should be similar to that of conichalcite; yellow-green to emerald green to blue-green.

Quantitative electron microprobe analysis by Cameca SX 100 gave an average (150 analyses) of CaO 22.80, CuO 34.52, ZnO 0.58, P$_2$O$_5$ 15.16, As$_2$O$_5$ 21.88, V$_2$O$_5$ 1.02, H$_2$O (by difference) 4.04, total 100.00 wt% giving an empirical formula, based on five O atoms pfu, of Ca$_{0.96}$Cu$_{1.00}$Zn$_{0.01}$P$_{0.51}$As$_{0.49}$V$_{0.03}$O$_{2.95}$OH$_{1.05}$. Analyses with higher P contents give an empirical formula of Ca$_{0.96}$Cu$_{1.00}$Zn$_{0.01}$P$_{0.66}$As$_{0.34}$V$_{0.01}$O$_{2.95}$OH$_{1.12}$. The simplified formula for hermannroseite is CaCu$_2$(PO$_4$As$_2$)$_2$(OH); the ideal end-member formula is CaCu$_2$PO$_4$OH. An X-ray powder diffraction pattern (Stoe STADI P powder diffractometer, CuK$_\alpha$ radiation, 42 lines given) include the strongest lines $[d_{hkl},L_{\alpha\beta\gamma},k/h]$: 5.710(56,110), 4.057(37,111), 3.663(21,200), 3.092(63,201), 2.854(29,220), 2.808(100,130), 2.571(73,112), 2.525(36,131). The powder was a mixture ofapatite, conichalcite, hermannroseite, and whitlockite. Hermannroseite is isostructural with conichalcite, therefore orthorhombic; its unit-cell parameters are $a = 7.328(7), b = 9.123(7), c = 5.769(6)$ Å, $V = 385.7(6)$ Å$^3$, and $Z = 4$ with space group $P2_12_12_1$.

The mineral and name have been approved by the IMA CNMNM. Hermannroseite was collected by Bruno Geier in the 1960s. The original sample (no. 16862) was passed from one of Geier’s heirs to Georg Gebhard to be studied. It is named in honor of mineralogist Professor Dr. Hermann Rose (1883–1976), honorary member of the German Mineralogical Society since 1973 and head of the Mineralogical Institute at the University of Hamburg (1922–1954). The holotype specimen (TS 637) is deposited in the Mineralogical Museum’s collection, University of Hamburg, Germany. A.P.-R.