**NEW MINERAL NAMES**

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**Benauite**


Electron microprobe analysis gave SrO 12.35, PbO 2.79, BaO 4.32, CaO 0.07, K2O 0.07, CuO 0.03, ZnO 0.07, Al2O3 0.26, Fe2O3 40.85, P2O5 18.53, As2O5 0.78, SiO2 7.28(2), Al2O3 0.036, indicated for such compositions by Scott’s IMA-approved formula as SrFe3(PO4)2(OH,H2O)6 and the mineral was approved by the CNMMN on this basis, the composition corresponding to (Sr0.67 Ba0.16 Pb0.07 Ca0.01 K0.01)0.92(Fe2.90 Al0.03)50/3m10.218(4), Zn11.00(Fe10.10)3z71ox3s121ox110(OH,OH,OH)5.8. Occurs as yellow to brown radial aggregates, up to 3 mm in diameter, consisting of scaly crystals flattened on (0001) and >1 mm in length. Transparent to translucent, vitreous to resinous luster, yellowish streak, brittle, perfect {0001} cleavage, conchoidal fracture, H = 3½, Dmeas 3.65(5), Dcalc 3.648 g/cm3. Optically uniaxial negative or biaxial with 2V up to 20°, ε = 1.862(5), ω = 1.872(5), E = nearly colorless, O = yellow. Trigonal symmetry, space group probably R3m by analogy with beudantite; a = 7.28(2), c = 16.85(4) Å as calculated from an X-ray pattern (57 mm, FeKα radiation) with strongest lines of 5.88(100,101), 3.06(90,113), 2.96(50,105,202), 2.81(50,006), 2.53(50,204), 2.25(60,107), 1.969(50,303), and 1.820 Å (50,118,220,216).

The mineral is associated with fluohte, goethite, and kidwellite. The new name is for a locality near the Clara mine. Type material is in the Institut für Mineralogie und Kristallchemie der Universität Stuttgart, Germany, and in the Museum of Victoria, Melbourne, Australia.

**Discussion.** Although the authors give the simplified formula as SrFe3(PO4)2(OH,H2O)6, the mineral was not approved by the IMA-approved nomenclature system (Am. Mineral., 72, 178–187, 1987). Benauite is thus an intermediate member, analogous to cokrite and beudantite, and is compositionally the Sr analog of cokrite, i.e., ideally SrFe3(PO4)2(SO4)(OH,H2O)6.

**Dusmatovite**


Flame photometry (Li2O, K2O, Na2O) and electron microprobe analyses gave SiO2 64.40, ZrO2 1.55, FeO 0.45, MnO 8.78, Mn2O3 1.13 (Mn2+/Mn3+ from the crystal structure determination), ZrO 15.51, Y2O3 1.51, Yb2O3 0.54, K2O 6.16, Na2O 0.61, Li2O 1.10, sum 101.74 wt%, corresponding to K10.63(10×0.10)21.00(X Mn3+10×Mn2+)21.16 Y20.11 Zr6.01(4)3S0.103s121ox3s121ox110(OH,OH,OH)5.8. Occurs as aggregates to 40 × 50 mm, and as single grains; dark blue, dirty blue, or violet-brown color, translucent, vitreous luster, brittle, light blue streak, no cleavage, basal parting, H = 4.5, VHN100 = 423, Dmeas = 2.96(2), Dcalc = 2.978 g/cm3 for Z = 2; insoluble in hot HCl but readily soluble in warm HF. Optically uniaxial negative ω = 1.590, ε = 1.586; strongly pleochroic, from light blue (E) to light violet (O). The infrared spectrum has an intense absorption band at 1030 cm−1 attributable to Si-O bonds, and a narrow band at 795 cm−1 characteristic for ring silicates. Single-crystal X-ray structure study (R = 0.036) indicated hexagonal symmetry, space group P63mc, a = 10.218(4), c = 14.292(3) Å. The powder pattern (diffractometer, CuKα radiation, 35 lines given) has strongest lines of 4.15(45,112), 3.75(50,202), 3.25(100,211,203), and 2.545 (52,220).

The mineral was found in a boulder of pegmatite in glacial moraine at the Dara-i-Pioz alkaline massif, Tien Shan, Tajikistan. The boulder consists of quartz and microcline with minor aegirine, tadzhikite-(Y), cesium kyanite-(Y), and assemblage: quartz, plagioclase, orthoclase, biotite, muscovite, and aegirine. The new name is for V.D. Dusmatov, in recognition of his geological and mineralogical work on the relevant massif. The mineral is in the osmellite group and has a compositional similarity to darapioite, differing notably in the lower Li content and predominance of Zn over Mn. Dusmatovite may be the unnamed mineral of Nadezhina et al. (Am. Mineral., 77, 451–452, 1992). Type material is in the Museum of the Ilmen State Preserve, Miass, Russia. N.N.P.

**Ferriphlogopite**


Electron microprobe and single-crystal X-ray structure study of two mica crystals from an alkali-carbonatic com-
plex near Tapira, Minas Gerais, Brazil, gave compositions of 
K$_{0.09}$Na$_{0.03}$Ti$_{0.01}$Mg$_{2.37}$Fe$_{2.90}$Fe$^{3+}$_{0.00}$Tl$_{0.01}$O$_{0.17}$OH$_{0.04}$ and K$_{1.65}$Mg$_{2.68}$Fe$_{2.50}$Fe$^{3+}$_{0.11}$Mn$_{0.81}$Si$_{2.30}$O$_{6.13}$F$_{0.04}$OH$_{0.04}$.

The respective crystals are of the 1M polytype, space group $C2/m$, $a = 5.362$, $b = 5.3649$, $c = 9.288$, $c' = 9.2924$, $\alpha = 10.321$, $\beta = 10.3255$, $\gamma = 99.99$, $99.988^\circ$, $R = 0.031$, 0.025. Fe$^{3+}$ substitutes for Si within the tetrahedral sites, and the Fe distribution is fully ordered.

**Discussion.** The composition corresponds to the Fe$^{3+}$-analog of biotite or the Mg$^{2+}$ analog of ferri-annite. The name tetraferriphlogopite has also been used to indicate the presence of Fe$^{3+}$ in micas in this compositional range, but neither ferriphlogopite nor tetraferriphlogopite is an approved name. See also the discussion, concerning tetraferriphlogopite, in *Am. Mineral.*, 81, 1517–1518, 1996.

**Frankamenite**


Twelve electron microprobe analyses, with F and H$_2$O by wet chemistry, gave a mean of range of Na$_2$O 6.93 (6.15–7.60), K$_2$O 10.53 (9.83–11.11), CaO 21.62 (20.90–22.23), SrO 0.23 (0.05–0.40), MgO 0.07 (0.02–0.12), MnO 0.38 (0.20–0.54), FeO 0.13 (0.04–0.22), SiO$_2$ 55.06 (54.11–55.71), H$_2$O 2.00 (1.98–2.10), F 4.10 (3.72–4.20), sum 101.05 wt%, corresponding to K$_2$O Na$_2$O (Ca$_{5}$O$_{5}$) (Si$_{12}$O$_{30}$)F$_{2.83}$ (OH)$_{1.35}$·0.79 H$_2$O. Occurs as laths typically 1 cm and rarely to 15 cm in length, elongate $[001]$, showing prismatic [100], [010], and [110]. Grayish lilac, bluish gray, or light green color, white streak, vitreous luster, perfect [100] and [100] cleavages, microtwinned on [010]. Single-crystal X-ray study structure ($R = 0.059$) indicated triclinic symmetry, space group $P\overline{1}$, $a = 10.0941(3)$, $b = 12.6913(2)$, $c = 7.2405(1)$ $\AA$, $\alpha = 90.00(2)$, $\beta = 111.02(2)$, $\gamma = 110.20(2)^\circ$.


**Discussion.** Optical properties, hardness, and density are not given but are similar to those of canasite; for calculation of density, however, $Z = 1$ for frankamenite.

Strongest lines of the X-ray powder pattern (Nikishova et al., 1992) are 3.88(37,020), 470(54,210), 1.91(40,150), 3.01(25,246), 2.915(100,330), and 2.354(30,420). Numerous weaker lines, the most intense of which are at 2.94(14,040) and 2.87(6,141), distinguish the pattern from that of canasite. Data published for mineral IMA No. 94–050 indicate that frankamenite is biaxial negative, $\alpha = 1.536$, $\beta = 1.539$, $\gamma = 1.542$, $2V_{\text{mean}} = 70$, $2V_{\text{calc}} = 89.8^\circ$. N.N.

**Gottardiite**


Electron microprobe analysis gave SiO$_2$ 69.23, Al$_2$O$_3$ 9.40, FeO 0.10, MgO 1.24, CaO 2.67, SrO 0.04, BaO 0.03, Na$_2$O 0.77, K$_2$O 0.08, H$_2$O (TGA) 16.44, sum 100.00 wt%, corresponding to (Na$_{2.5}$K$_{0.17}$) (Ca$_{5.05}$Mn$_{0.07}$) (Si$_{12}$O$_{30}$)$_2$ (A$_{2}$O$_{3}$)$_2$O$_{27}$–93H$_2$O, simplified as $Na_Mg,Ca,Si_{11},Al_{17},O_{22},93H_2O$. The DTG curve shows a broad band with two peaks at 127 and 175 °C, suggesting almost continuous loss of H$_2$O, and complete rehydration occurs spontaneously in samples after heating to at least 800 °C. The mineral occurs as thin lamellae, elongate [100] or pseudohexagonal, typically in subparallel (001) or wedge-shaped aggregates. Transparent, colorless to light straw, brittle, $H$ not determinable, conchoidal to irregular fracture, perfect {001} cleavage, nonfluorescent, $D_{\text{calc}} = 2.14(4)$, $D_{\text{calc}} > 2.16$ g/cm$^3$ for Z = 1. Maximum crystal size is 0.3 × 0.2 × 0.02 mm; observed forms are {001} and minor (010), (110). Optically biaxial negative, $\alpha = 1.480(2)$, $\beta = 1.485(2)$, $\gamma = 1.486(2)$, $2V_{\text{mean}} = <60, 2V_{\text{calc}} = 48^\circ, X = b, Y = a, Z = c$. Single-crystal X-ray study indicated orthorhombic symmetry, space group Cmca, $a = 13.698(2)$, $b = 25.213(3)$, $c = 22.660(2)$ $\AA$. Strongest lines of the powder pattern (114 mm Gandolfi, CuK$_\alpha$ radiation) are 11.34(100,002), 10.64(31,111), 4.64(35,151), 4.37(79,311,204), 4.01(57,153), 3.938(36,062), and 2.382 (68,206,155).

The mineral, which is the analog of synthetic zeolite NU–87, occurs in cavities and small fractures in basaltic rocks at Mt. Adamson, Northern Victoria Land, Antarctica. The new name is for crystallographer Glauco Gottardi (1928–1988). Type material is in the British Museum of Natural History, London. J.J.L.

**Jentschite**


One of numerous electron microprobe analyses gave Tl 23.94, Pb 24.45, As 21.69, Sb 7.68, S 22.29, Cu...
Shkatulkalite*

Electron microprobe analyses of three grains gave a mean and range of Na₂O 16.14 (15.60–16.84), CaO 0.44 (0.40–0.52), SrO 0.46 (0.26–0.60), MnO 1.70 (1.54–1.81), Fe₂O₃ 0.07 (0.05–0.08), Al₂O₃ 0.24 (0.21–0.28), SiO₂ 35.70 (35.58–35.84), TiO₂ 11.12 (11.03–11.23), Nb₂O₅ 21.93 (21.72–22.22), F (wet chemistry) 0.94, H₂O (Penfield method) 11.26, H₂O by difference 11.66, O = F = 0.40, sum 100 wt%, corresponding to Na₉.03(Mn₉.67Ca₉.98Sr₉.07)(Fe₅.70Mg₇.58Mn₇.01)(Si₁₄.26Al₀.09Fe₅.12)₂O₁₂(OH)₁₂·11.90H₂O·O. Occurs as rectangular lamellae and tabular grains to 1.0 mm, as mica-like aggregates to 3 cm, and as cryptocrystalline partial pseudomorphs of vuonnemite and masses on it. Colorless, silvery white, or light pink in thin plates, creamy or yellowish in thick plates; transparent to translucent, brittle; H = 3, pearly luster on cleavage planes, waxy luster on fractured surfaces, perfect (100) and perfect micaceous {001} cleavages, Dmax = 2.70(2), Dmin = 2.72 g/cm³ for Z = 1. Unreactive with 10% HCl or HNO₃. DTA showed endothermic effects at 190 °C (dehydration) and 710 °C (melting). The infrared spectrum shows absorption bands at 3435, 1650, 1050, 970, 890, 555, and 450 cm⁻¹. Optically biaxial positive, α = 1.608(2), β = 1.630(2), γ = 1.660(2), 2Vmeas = 82(1)°, r < v, b = Y, a \(\cap\) Z = 7° in obtuse angle β. Single-crystal X-ray study indicated monoclinic symmetry, space group P2₁/m, or P2₁/n, a = 5.468(9), b = 7.18(1), c = 31.1(1) Å, β = 94.0(2)°. Strongest lines of the powder pattern (114 mm camera, FeKα, 71 lines given) are 15.56(90,002), 3.11 (100,019), 2.850(70,123), 2.665(70,125), and 2.627(70, 0.111).

The mineral occurs in ultra-apatitic pegmatite at Mount Alluaiv, Lovozero alkaline massif, Kola Peninsula, Russia. The new name is derived from the locality, the Shkatulka vein, which in Russian denotes a small box for jewelry. Type material is in the Mineralogical Museum of the Saint Petersburg Mining Institute, Russia. N.N.P.

Sigismundite*
F. Demartin, C.M. Gramaccioli, T. Pilati, E. Sciesa (1996) Sigismundite, (Ba,K,Pb)Na₃(Ca,Sn)(Fe,Mg,Mn)₉Al(OH)₉·(PO₄)₁₂, a new Ba-rich member of the arrojadite group from Splugna Valley, Italy. Can. Mineral., 34, 827–834.

Electron microprobe analysis gave BaO 5.68, K₂O 0.26, PbO 0.76, SrO 1.09, Na₂O 4.44, CaO 2.09, FeO 27.64, MgO 10.85, MnO 0.70, Al₂O₃ 2.45, SiO₂ 0.02, P₂O₅ 40.50, H₂O by crystal structure 0.86, sum 97.34 wt%, corresponding to (Ba₉.13K₂₉.12Pb₀.07Sr₀.07)₂O₁₂·9.92Na₂O₂·(Ca₅.89Sr₁.59)₂O₁₂·(Fe₁.1₂Mg₁.54Mn₂.72)₁O₁₂·Al₁.58(OH)₁₂·(PO₄)₁₂. The mineral occurs as a grayish green mass, 4 cm across, in the only specimen known. Crystals within the mass are imperfect to elongate, intensely microfractured, straight
Nb-dominant baotite


Electron microprobe analysis gave BaO 35.73, TiO 14.28, FeO 6.76, CaO 0.03, NbO 26.98, SiO 13.40, AlO 0.37, Cl 1.96, O = Cl 0.44, sum 99.07 wt%, corresponding to Ba3.514,(Nb,Fe)0.07,Ti0.82,Fe0.16,Ca0.93)0.07,Al2.81, Si2.72, O4.67. Simplified as Ba4(Nb,Fe)SiO4Cl.

The Nb-dominant mineral occurs as rare, granules, to 0.5 mm in diameter, in sulphide-rich, siderite carbonatite. The grains have a blotchy appearance attributable to irregular patches that vary from pale to dark brown, and which are optically sharply defined. The mineral is optically uniaxial positive, ω = brown or pale brown, ε = dark red-brown to black; the deeper absorption tints are in the patches rich in Nb-Fe. J.L.J.

Bafertisite-like


Electron microprobe analysis gave K 0.84, 0.51, Na 0.41, 0.48, ZnO 0.31, 0.14, CaO 0.23, 0.16, BaO 25.21, 28.13, MgO —, 0.02, MnO 0.92, 0.65, FeO 12.78, 10.30, CeO 2.97, 3.06, Al2O 3 0.46, 0.42, Nb2O 5 0.51, 0.88, SnO 0.08, 0.07, TiO 20.61, 29.84, ZrO 2 —, 0.12, SiO 26.24, 21.83, F 2.25, 1.96, O = F 0.95, 0.83, sum 92.87, 97.74 wt%, corresponding to K(0.48Na0.12Zn0.16Mn0.07)Ti1.09Fe3.04Si4.09O28Cl.

The mineral occurs in phengitic quartzite and is associated with quartz, albite, apatite, ferrous carbonates, and mica at Madesimo, Spluga Valley, northern Italy. The new name is for mineral collector Pietro Sigismund (1874–1962). Type material is in the Civic Museum of Natural History, Morbegno, Sondrio, Italy. J.L.J.

Ni-bearing minerals


Four electron microprobe analyses gave Na2O 0.37–0.68, K2O 0.05–1.39, ZnO 0.01–0.07, CaO 1.37–3.96, BaO 0.08–0.23, MgO 0–0.01, MnO 0–0.07, FeO 0.70–2.56, Y2O 3 0–1.79, CeO 2 0.16–0.74, NbO 2 0.39–1.10, SnO 2 0.12–0.29, TiO 2 5.42–9.30, ZrO 2 8.47–16.39, Al2O 3 0.24–0.88, SiO 2 47.85–59.41, F 0.01–1.04, O = F 0–0.44, sum 75.42–90.79 wt%. The mineral may be hydrous or contain additional light elements. Maximum size, illustrated as inclusions in narsarsukite, is roughly 20 × 40 μm.

Electron microprobe analysis of an optically isotropic phase, possibly metamict, gave Na2O 0.06, K2O 0.13, CaO 0.74, MnO 0.15, ZnO 0.08, FeO 3.17, BaO 0.24, PbO 0.15, CeO 2 4.26, TiO 2 6.52, UO 2 1.51, ThO 2 3.70, ZrO 2 4.00, SnO 2 0.07, Nb2O 5 0.32, SiO 2 19.15, F 0.42, O = F 0.18, sum 77.47 wt%; indications are that C is present, and by difference CO2 would amount to 22.53 wt%. Optically resembles pyrochlore, but is distinguishable from it by the absence of internal reflections in reflected light. Illustration of an inclusion in perthite indicates a size roughly 20 × 25 μm. Both unidentified minerals coexist with quartz, fluorite, pyrochlore, and perthite or two feldspars; a Li-bearing mineral (polylithionite or neptunite) is also present in the assemblages. J.L.J.

New Data

Iimorite-(Y)


Single-crystal X-ray structure study (R = 0.019) of iimorite-(Y) has specified the space group as P63/m. J.L.J.

Spirof®te


Single-crystal X-ray structure study (R = 0.017) has de®ned the space group of spirof®te, previously Cc or C2/c, to be the latter. J.L.J.