The Canadian Mineralogist
Vol. 40, pp. 1001-1020 (2002)

NEW MINERALS

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Bigcreekite

$BaSi_2O_5 \bullet 4H_2O$

ORTHORHOMBIC

Locality: The type locality is the Esquire #7 claim (Section 27, T11S, R25E, Mount Diablo Meridian, Lat. 36° 55' N, Long. 119° 14'42" W), along the west side of Big Creek, eastern Fresno County, California, U.S.A. Also found along the northwestern slope of Trumbull Peak, Mariposa County, California, U.S.A. (NE¼ Section 9, T3S, R19E, Mount Diablo Meridian).

Occurrence: In fractures in gneissic rocks composed of sanbornite, quartz, diopside, pyrrhotite and barium-bearing minerals. Other minerals from the type locality are: alforsite, walstromite, anandite, bazirite, benitoite, celsian, gillespite, fresnoite, macdonaldite, muirite, pellyite, titantaramellite and verplanckite.

General appearance: Subhedral crystalline masses mm in length.

Physical, chemical and crystallographic properties: *Luster*: vitreous to pearly. *Diaphaneity*: probably transparent to translucent. *Color*: white to colorless. *Streak*: white. *Luminescence*: nonfluorescent. *Hardness*: 2 to 3. *Tenacity*: brittle. *Cleavage*: {010} and {001} perfect. *Fracture*: uneven. *Density*: 2.66 g/cm^3 (meas.), 2.76 g/cm^3 (calc.). *Crystallography*: Orthorhombic, *Pnma*, *a* 5.038, *b* 9.024, *c* 18.321 Å, *V* 833 Å^3, *Z* = 4, *a*:*b*:*c* = 0.5583:1:2.0303. Morphology: no forms were mentioned; habit tabular, elongate on [100]. Twinning: none mentioned. *X-ray powder-diffraction data*: 5.068(100)(013), 4.054(85)(022), 2.974(45)(031), 2.706(60)(124), 2.327(40)(035), 2.257(75)(126). *Optical data*: Biaxial (+), α 1.537, β 1.538, γ 1.541, 2*V*(meas.) 59.2°, 2*V*(calc.) 60°; dispersion *r* < *v*, moderate; nonpleochroic; orientation, *X* = *b*, *Y* = *a*, *Z* = *c*. *Chemical analytical data*: Mean of four sets of electron-microprobe data (with H_2O calculated to give $4H_2O$): Na_2O 0.11, CaO 0.03, BaO 48.88, SrO 0.02, SiO_2 38.16, H_2O (22.94), Total (110.14) wt.%. Empirical formula: $(Ba_{1.00}Na_{0.01})_{\Sigma 1.01}Si_{1.99}O_{5.00} \bullet 4.00H_2O$. *Relationship to other species*: Its structure has similarities to those of sanbornite and gillespite.

Name: After the locality.

Comments: IMA No. 1999–015.

BASCIANO, L.C., GROAT, L.A., ROBERTS, A.C., GAULT, R.A., DUNNING, G.E. & WALSTROM, R.E. (2001): Bigcreekite: a new barium silicate mineral species from Fresno County, California. *Canadian Mineralogist* **39**, 761-768.

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Brandholzite

$Mg[Sb(OH)_6]_2 \cdot 6H_2O$

TRIGONAL

Locality: The former Brandholz–Goldkronach mining district in the western part of the Fichtelgebirge, Bavaria, Germany. Specifically, it was found in the Schmidten-Schacht and Jakobi-Schacht pits of the master lode.

Occurrence: An alteration product of stibnite in the oxidation zone, found in a stibnite matrix with "antimony-ochers".

General appearance: Tabular hexagonal crystals up to ~1 mm in diameter (most are <0.5 mm) forming rose-like aggregates.

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: transparent. *Color*: colorless. *Streak*: white. *Luminescence*: nonfluorescent. *Hardness*: VHN (load not specified) 60 kg/mm^2, Mohs 2 to 3. *Tenacity*: brittle. *Cleavage*: none. *Fracture*: conchoidal. *Density*: 2.65 g/cm^3 (meas.), 2.57 g/cm^3 (calc.). *Crystallography*: Trigonal, *P*3, *a* 16.119, *c* 9.868 Å, *V* 2220.4 Å^3, *Z* = 6, *c*:*a* = 0.6122. Morphology: the forms are listed as {100} and {001}, but the tabular hexagonal habit requires {010} and {00$\bar{1}$} also. Twinning: on {100}. *X-ray powder-diffraction data*: No table of data is given, but the strongest lines are listed as 4.636(100)(300), 3.392(70)(302), 4.946(50)(002), 2.356(40)(332). *Optical data*: Uniaxial (–), ω 1.570, ϵ 1.569, nonpleochroic. *Chemical analytical data*: There was insufficient material for a complete analysis, but the synthetic equivalent was analyzed for Sb (by atomic absorption spectroscopy), Mg (by flame emission spectroscopy) and H_2O (by TGA) and gave: MgO 6.7, Sb_2O_5 55.0, H_2O 39.0, Total 100.7 wt.%. Empirical formula: $Mg_{0.94}[Sb(OH)_6]_{1.92} \cdot 6.49H_2O$. *Relationship to other species*: It is the Mg-dominant analogue of bottinoite, $Ni[Sb(OH)_6]_2 \cdot 6H_2O$.

Name: After the locality.

Comments: IMA No. 1998–017. It is unfortunate that the complete set of X-ray powder-diffraction data was not published.

FRIEDRICH, A., WILDNER, M., TILLMANNS, E. & MERZ, P.L. (2000): Crystal chemistry of the new mineral brandholzite, $Mg(H_2O)_6[Sb(OH)_6]_2$, and of the synthetic analogues $M^{2+}(H_2O)_6[Sb(OH)_6]_2$ (M^{2+} = Mg, Co). *American Mineralogist* **85**, 593-599.

Carmichaelite

$(Ti,Cr)O_{1.5}(OH)_{0.5}$

MONOCLINIC

Locality: Garnet Ridge, Navajo volcanic field, Colorado Plateau, Arizona, U.S.A.

Occurrence: In pyrope crystals in an ultramafic diatreme. Associated minerals are: rutile and srilankite. Other minerals in the host crystals are: ilmenite, crichtonite-group minerals, spinel and olivine.

General appearance: Anhedral to subhedral elongated platy crystals (up to 30 μm).

Physical, chemical and crystallographic properties: *Luster*: metallic. *Diaphaneity*: opaque; translucent under high magnification. *Color*: black, but cinnamon brown in transmitted light. *Streak*: not given. *Hardness*: ~6, based on its similar polishing quality to rutile. *Tenacity*: brittle. *Cleavage*: none observed. *Fracture*: not given. *Density*: not measured, 4.13 g/cm^3 (calc.). *Crystallography*: Monoclinic, $P2_1/c$, *a* 7.706, *b* 4.5583, *c* 20.187 Å, β 92.334°, *V* 708.5 Å^3, *Z* = 22, *a*:*b*:*c* = 1.6905:1:4.4286. Morphology: no forms were mentioned. Twinning: none observed. *X-ray powder-diffraction data*: 3.773(94)(013), 2.842(100)($\bar{1}$15), 2.664(70)(213), 1.688(54)($\bar{3}$22), 1.679(44)(226), 1.661(44)($\bar{1}$28), 1.648(34)(1.1.11). *Optical data*: In reflected light: gray to white. *R* about 18%. *Chemical analytical data*: Mean of six sets of electron-microprobe data: TiO_2 62.16, Cr_2O_3 18.43, Al_2O_3 1.88, FeO 7.61, MgO 2.80, Nb_2O_5 0.37, V_2O_3 0.87, H_2O (5.76), Total (99.88) wt.%. The amount of H_2O was calculated by stoichiometry; its presence was confirmed by IR spectroscopy. Empirical formula: $(Ti_{0.62}Cr_{0.19}Fe_{0.08}Mg_{0.06}Al_{0.03}V_{0.01})_{\Sigma 0.99}O_{1.49}(OH)_{0.51}$. *Relationship to other species*: None apparent.

Name: After Prof. Ian S.E. Carmichael (b. 1930), University of California, Berkeley, for his contributions to petrology.

Comments: IMA No. 1996–062. Details of the crystal structure are given in the paper.

WANG, L., ROUSE, R.C., ESSENE, E.J., PEACOR, D.R. & ZHANG, Y. (2000): Carmichaelite, a new hydroxyl-bearing titanate from Garnet Ridge, Arizona. *American Mineralogist* **85**, 792-800.

Chromceladonite

$KCrMg[Si_4O_{10}](OH)_2$

MONOCLINIC

Locality: Srednyaya Padma uranium–vanadium deposit, southern Karelia, Russia.

Occurrence: In a metasomatic rock. Associated minerals are: dolomite, quartz, roscoelite, chromphyllite, calcite, hematite, uraninite, zincochromite, vanadium oxides, among others.

General appearance: Aggregates of thin lamellae (up to 1 cm) and as spherulites and veinlets.

Physical, chemical and crystallographic properties: *Luster*: vitreous to silky. *Diaphaneity*: transparent. *Color*: emerald green to dark green. *Streak*: light green. *Luminescence*: nonfluorescent. *Hardness*: 1½ to 2. *Tenacity*: flexible but not elastic. *Cleavage*: {001} perfect. *Fracture*: platy. *Density*: 2.90 g/cm^3 (meas.), 2.97 g/cm^3 (calc.). *Crystallography*: Monoclinic, *C*2, *a* 5.267, *b* 9.101, *c* 10.162 Å, β 100.67°, *V* 479 Å^3, *Z* = 2, *a*:*b*:*c* = 0.5787:1:1.1166. Morphology: probably only {001}. Twinning: none observed. *X-ray powder-diffraction data*: 4.54(93)(020), 4.36(40)(11$\bar{1}$), 3.638(64)(11$\bar{2}$), 3.097(51)(112), 2.588(100)(13$\bar{1}$), 2.409(87)(13$\bar{2}$), 1.518(56)(33$\bar{1}$). *Optical data*: Biaxial (–), α 1.605, β 1.648, γ 1.654, 2*V*(meas.) 12°, 2*V*(calc.) 40°; dispersion not observed; pleochroism: *X* colorless to pale green, *Y* = *Z* green; $X \wedge (001) < 5°$. *Chemical analytical data*: Ten electron-microprobe analyses were carried out, with Li, Fe^{2+} and Fe^{3+} determined by wet-chemical means. Data for the holotype specimen are: Li_2O 0.13, Na_2O 0.14, K_2O 10.42, MgO 7.82, MnO 0.19, FeO 0.73, ZnO 0.22, Al_2O_3 3.25, V_2O_3 1.79, Cr_2O_3 17.01, Fe_2O_3 0.58, SiO_2 53.20, TiO_2 0.16, H_2O 3.38, F 0.57, sum 99.59, less O = F 0.24, Total 99.35 wt.%. Empirical formula: $(K_{0.95}Na_{0.02})_{\Sigma 0.97}(Cr_{0.97}V_{0.10}Al_{0.09}Fe^{3+}_{0.03}Ti_{0.01})_{\Sigma 1.20}(Mg_{0.84}Fe^{2+}_{0.04}Li_{0.04}Zn_{0.01}Mn_{0.01})_{\Sigma 0.94}[(Si_{3.82}Al_{0.18})_{\Sigma 4.00}O_{10.00}][(OH)_{1.62}O_{0.25}F_{0.13}]_{\Sigma 2.00}$. *Relationship to other species*: A member of the mica group.

Name: Reflects the composition of the mica and its relationship to celadonite.

Comments: IMA No. 1999–024.

PEKOV, I.V., CHUKANOV, N.V., RUMIANTSEVA, E.V., KABALOV, YU.K., SCHNEIDER, J. & LEDENEVA, N.V. (2000): Chromceladonite $KCrMg[Si_4O_{10}](OH)_2$ – a new mineral of the mica group. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* **129**(1), 38-44.

Clearcreekite

$Hg^{1+}_3(CO_3)(OH)\bullet 2H_2O$

MONOCLINIC

Locality: A small prospect pit near the long-abandoned Clear Creek mercury mine, New Idria district, San Benito County, California, U.S.A.

Occurrence: In a brecciated rock consisting mainly of ferroan magnesite and quartz. Associated minerals are cinnabar and edoylerite.

General appearance: A small cluster of subhedral crystals (up to 0.17 mm).

Physical, chemical and crystallographic properties: *Luster*: given as vitreous but optical data indicate adamantine. *Diaphaneity*: transparent. *Color*: pale greenish yellow. *Streak*: pale greenish yellow. *Luminescence*: nonfluorescent. *Hardness*: could not be measured, but probably is low. *Tenacity*: brittle. *Cleavage*: {001} good. *Fracture*: uneven. *Density*: could not be measured, 6.82 g/cm^3 (calc.). *Crystallography*: Monoclinic, $P2_1/c$, a 6.760, b 9.580, c 10.931 Å, β 105.53°, V 682.1 Å^3, Z = 4, a:b:c = 0.7056:1:1.1410. Morphology: {001} major and {010} minor. Twinning: none mentioned. *X-ray powder-diffraction data*: 7.09(70)(011), 5.40(30)(110), 5.32(40)($\bar{1}$11), 4.62(90)(012), 3.058(30)(031), 2.831(100)(023), 2.767(100)(211,$\bar{2}$21), 2.486(30)(202), 2.391(40)(040,$\bar{2}$04), 1.692(30)($\bar{2}$44,$\bar{4}$02). *Optical data*: No data could be measured. Indices of refraction probably are higher than 2. *Chemical analytical data*: An electron-microprobe analysis gave Hg_2O 84.65%; values of CO_2 and H_2O of 6.16 and 6.30%, respectively, were calculated from the crystal-structure data, for a total 97.11 wt.%. Empirical formula: $Hg^{1+}_{2.92}(CO_3)_{1.01}(OH)_{0.90}\bullet 2.07H_2O$. *Relationship to other species*: It is the monoclinic polymorph of $Hg^{1+}_3(CO_3)(OH)\bullet 2H_2O$, peterbaylissite being orthorhombic.

Name: After the locality.

Comments: IMA No. 1999–003. The crystal structure has been solved.

ROBERTS, A.C., GROAT, L.A., RAUDSEPP, M., ERCIT, T.S., ERD, R.C., MOFFATT, E.A. & STIRLING, J.A.R. (2001): Clearcreekite, a new polymorph of $Hg^{1+}_3(CO_3)(OH)\bullet 2H_2O$, from the Clear Creek claim, San Benito County, California. *Canadian Mineralogist* **39**, 779-784.

Edgarite

$FeNb_3S_6$

HEXAGONAL

Locality: Khibina alkaline complex, Kola Peninsula, Russia (Lat. 67° 43' N, Long. 33° 47' W).

Occurrence: In a fenitized xenolith (approximately 0.2 km across) enclosed by nepheline syenite. Associated minerals are: pyrrhotite (Ti- and V-rich), ferroan alabandite, marcasite (Ti- and V-rich), wurtzite-2*H* (Mn- and Fe-rich), corundum, phlogopite, rutile, monazite-(Ce) and a graphite-like mineral.

General appearance: Platy inclusion (up to 0.15 mm) in pyrrhotite and alabandite and as aggregates of platy grains on pyrrhotite.

Physical, chemical and crystallographic properties: *Luster*: metallic. *Diaphaneity*: opaque. *Color*: dark gray. *Streak*: not given. *Hardness*: VHN_5 135 kg/mm^2 and VHN_{10} 205 kg/mm^2, soft. *Tenacity*: not given. *Cleavage*: {001} perfect. *Fracture*: not given. *Density*: not measured, 4.99 g/cm^3 (calc.). *Crystallography*: Hexagonal, most probably $P6_322$, *a* 5.771, *c* 12.190 Å, *V* 351.6 Å^3, *Z* = 2, *c*:*a* = 2.1123. Morphology: no forms were observed. Twinning: none mentioned. *X-ray powder-diffraction data*: 6.11(8)(002), 3.04(6)(004), 2.606(8)(112), 2.096(10)(114), 1.665(8)(300), 1.524(6)(008), 1.126(7)(322), 1.027(6)(414). *Optical data*: In reflected light: gray, strong anisotropism from almost white to dark brown, distinct bireflectance, pleochroic from light gray with a bluish tint to gray. R_1, R_2; $^{im}R_1$, $^{im}R_2$: (28.1, 40.2; 13.0, 24.2%) 470 nm, (27.4, 39.3; 12.3, 22.2%) 546 nm, (27.0, 38.5; 12.2, 21.7%) 589 nm, (27.0, 36.9; 12.4, 20.3%) 650 nm. *Chemical analytical data*: Mean of four sets of electron-microprobe data: Nb 52.87, Fe 10.12, V 0.36, Mn 0.10, Ti 0.04, S 35.86, Total 99.35 wt.%. Empirical formula: $(Fe_{0.96}V_{0.04}Mn_{0.01})_{\Sigma 1.01}Nb_{3.03}S_{5.95}$. *Relationship to other species*: It is the natural analogue of synthetic $FeNb_3S_6$.

Name: After Prof. Alan D. Edgar (1935–1998), University of Western Ontario, London, Ontario, Canada, in recognition of his important contributions to the petrology and mineralogy of alkaline rocks.

Comments: IMA No. 1995–017.

BARKOV, A.Y., MARTIN, R.F., MEN'SHIKOV, Y.P., SAVCHENKO, Y.E., THIBAULT, Y. & LAAJOKI, K.V.O. (2000): Edgarite, $FeNb_3S_6$, first natural niobium-rich sulfide from the Khibina alkaline complex, Russian Far North: evidence for chalcophile behavior of Nb in a fenite. *Contributions to Mineralogy and Petrology* **138**, 229-236.

Gladiusite

$Fe^{3+}_2(Fe^{2+},Mg)_4(PO_4)(OH)_{11}(H_2O)$

MONOCLINIC

Locality: The Kovdor alkaline-ultramafic complex, southwestern Kola Peninsula, northwestern Russia (Lat. 67° 35'N, Long. 30° 20'E).

Occurrence: In hydrothermal assemblages in vugs in cataclastic and mineralized dolomite carbonatite. Associated minerals are: pyrite, rutile, a ternovite-like phase, catapleiite, rimkorolgite, bobierrite, collinsite, juonniite, strontiowhitlockite, pyrrhotite and strontian collinsite.

General appearance: Acicular masses and free-standing radiating clusters (up to 2 mm in diameter) of arrow-head crystals. Crystals have subtly curved faces and a habit similar to a double-edged sword. Acicular crystals are 0.5 to 7 μm thick and 10 to 500 μm long.

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: opaque in aggregates and translucent in thin needles. *Color*: dark green to almost black. *Streak*: olive-green, but changes to brownish red in 10 to 12 hours. *Luminescence*: nonfluorescent. *Hardness*: VHN_{20} 300 kg/mm^2, Mohs 4 to 4½. *Tenacity*: brittle. *Cleavage*: not observed. *Fracture*: uneven. *Density*: 3.11 g/cm^3 (meas.), 3.10 g/cm^3 (calc.). *Crystallography*: Monoclinic, $P2_1/n$, a 16.959, b 11.650, c 6.266 Å, β 90.00°, V 1238 Å^3, Z = 4, a:b:c = 1.4557:1:0.5379. Morphology: no forms were mentioned. Twinning: extensive on [001], causing pseudo-orthorhombic symmetry. *X-ray powder-diffraction data*: 9.61(53)(110), 6.87(77)(210), 5.83(89)(020), 4.805(100)(220), 3.787(62)(130), 3.533(84)(230), 2.868(66)(140). *Optical data*: Biaxial (–), α 1.722, β 1.730, γ 1.737, 2V not measured, 2V(calc.) 86° (given erroneously as 78.3° in the paper's abstract); dispersion not given; pleochroism: X olive green, Y grayish blue, Z dark green with a blue tint, absorption $X > Y > Z$; orientation not given. *Chemical analytical data*: Means of twenty-three sets of electron-microprobe data: MgO 11.16, MnO 0.78, FeO 25.00, Fe_2O_3 29.90, TiO_2 0.04, P_2O_5 12.46, H_2O 20.18, Total 99.52 wt.%. Empirical formula: $Fe^{3+}_{2.00}(Fe^{2+}_{2.02}Mg_{1.61}Fe^{3+}_{0.17}Mn^{2+}_{0.06})_{\Sigma 3.86}(PO_4)_{1.02}(OH)_{10.83}\bullet 1.08H_2O$. *Relationship to other species*: None apparent.

Name: Refers to the appearance of the crystals, which resemble double-edged swords (*gladius* in Latin).

Comments: IMA No. 1998–011. The Gladstone–Dale compatibility is given as –0.0062, superior; the actual value is 0.087, poor.

LIFEROVICH, R.P., SOKOLOVA, E.V., HAWTHORNE, F.C., LAAJOKI, K.V.O., GEHÖR, S., PAKHOMOVSKY, YA.A. & SOROKHTINA, N.V. (2000): Gladiusite, $Fe^{3+}_2(Fe^{2+},Mg)_4(PO_4)(OH)_{11}(H_2O)$, a new hydrothermal mineral species from the phoscorite–carbonatite unit, Kovdor complex, Kola Peninsula, Russia. *Canadian Mineralogist* **38**, 1477-1485.

SOKOLOVA, E.V., HAWTHORNE, F.C., MCCAMMON, C. & LIFEROVICH, R.P. (2001): The crystal structure of gladiusite, $(Fe^{2+},Mg)_4Fe^{3+}_2(PO_4)(OH)_{11}(H_2O)$. *Canadian Mineralogist* **39**, 1121-1130.

Kampfite

$Ba_6[(Si,Al)O_2]_8(CO_3)_2Cl_2(Cl,H_2O)_2$

HEXAGONAL

Locality: Esquire #1 claim, Rush Creek, eastern Fresno County, California, USA (NE¼ NW¼ Section 16, T11S, R25E, Mount Diablo Meridian, Lat. 37° 05'N, Long. 119° 16'20"W). Kampfite has been found also at the Esquire #7 claim, along Big Creek, Fresno County, California, USA (SE¼ SE¼ Section 27, T11S, R25E, Mount Diablo Meridian, Lat. 36° 56'40"N, Long. 119° 14'28"W).

Occurrence: In a quartz–sanbornite outcrop. Associated minerals are: celsian, fresnoite, macdonaldite, pyrrhotite, titantaramellite, traskite, witherite, two new minerals and a hydrated form of SiO_2.

General appearance: Irregular masses up to 1 cm.

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: translucent. *Color*: light blue-gray. *Streak*: white. *Luminescence*: nonfluorescent. *Hardness*: 3. *Tenacity*: brittle. *Cleavage*: {001} well-developed. *Fracture*: uneven. *Density*: could not be measured because of the presence of numerous inclusions, 3.51 g/cm^3 (calc.). *Crystallography*: Hexagonal, $P6_3/mmc$, $P\bar{6}2c$, $P6_3mc$, $P\bar{3}_1c$ or $P3_1c$, a 5.244, c 29.83 Å, V 710.5 Å^3, Z = 1, c:a = 5.6884. Morphology: no forms were observed . Twinning: none observed. *X-ray powder-diffraction data*: 14.67(100)(002), 3.883(100)(104), 3.357(50)(106), 2.988(60)(00.10), 2.887(50)(108), 2.616(70)(110), 1.969(50)(1.1.10). *Optical data*: Uniaxial (–), ω 1.642, ϵ 1.594, nonpleochroic. One grain is biaxial (–), α 1.641, β 1.642, γ(calc.) 1.642, $2V$(meas.) 20°, dispersion $r < v$ slight. *Chemical analytical data*: Mean of three sets of electron-microprobe data (with CO_2 and H_2O calculated by stoichiometry): Na_2O 0.08, CaO 0.06, BaO 57.72, Al_2O_3 7.76, CO_2 (5.69), SiO_2 20.14, H_2O (1.16), Cl 5.60, sum 98.21, less O = Cl 1.27, Total (96.94) wt.%. Empirical formula: $(Ba_{5.83}Na_{0.04}Ca_{0.02})_{\Sigma 5.89}[(Si_{5.19}Al_{2.36})_{\Sigma 7.55}O_{15.08}](CO_3)_{2.00}Cl_{2.00}[(H_2O)_{1.00}Cl_{0.45}]_{\Sigma 1.45}$. *Relationship to other species*: The only other barium silicate carbonate mineral is fencooperite, $Ba_6Fe^{3+}{}_3Si_8O_{23}(CO_3)_2Cl_3 \bullet H_2O$.

Name: After Anthony Robert Kampf (b. 1948), Curator and Section Head of Minerals, Los Angeles County Museum of Natural History, for his many contributions to the crystallographic study of new and rare minerals.

Comments: IMA No. 2000–003.

BASCIANO, L.C., GROAT, L.A., ROBERTS, A.C., GRICE, J.D., DUNNING, G.E., FOORD, E.E., KJARSGAARD, I.M. & WALSTROM, R.E. (2001): Kampfite, a new barium silicate carbonate mineral species from Fresno County, California. *Canadian Mineralogist* **86**, 1053-1058.

Londonite

$(Cs,K,Rb)Al_4Be_4(B,Be)_{12}O_{28}$

CUBIC

Locality: The type locality is Antandrokomby granitic pegmatite, near Mt. Ibity, south of the Sahatany Valley, Madagascar. Also from the Ampanivana and Antsongombato pegmatites.

Occurrence: In the pocket zone of the pegmatite. Associated minerals are: quartz, albite, red tourmaline, microcline and danburite.

General appearance: Two well-formed crystals 1 cm across (type locality). Also up to 7 cm across at Antsongombato.

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: translucent to transparent. *Color*: milky white to yellow. *Streak*: white. *Luminescence*: weak yellow-green fluorescence under short-wave ultraviolet light. *Hardness*: 8. *Tenacity*: brittle. *Cleavage*: none. *Fracture*: conchoidal. *Density*: 3.34 g/cm^3 (meas.), 3.42 g/cm^3 (calc.). *Crystallography*: Cubic, *P*3*m*, *a* 7.3205 Å, *V* 392.30 Å^3, *Z* = 1. Morphology: dodecahedron {110}, tristetrahedron {211}, tetrahedron {111}, deltoid dodecahedron {221} and rare cube {100}. Twinning: none mentioned. *X-ray powder-diffraction data*: 7.320(20)(100), 3.274(50)(210), 2.9898(100)(211), 2.4410(50)(300,221), 2.2072(20)(311), 2.1132(35)(222), 1.9565(20)(321), 1.8301(20)(400), 1.7755(25)(410,322). *Optical data*: Isotropic, *n* 1.693. *Chemical analytical data*: Mean of five sets of electron-microprobe data (with BeO and B_2O_3 calculated to give 5.00 Be and 11.00 B, respectively): Li_2O 0.04, Na_2O 0.11, K_2O 2.21, Cs_2O 8.37, Rb_2O 1.04, BeO (15.49), MgO n.d., CaO 0.14, MnO 0.05, B_2O_3 (47.39), Al_2O_3 25.10, Fe_2O_3 0.06, SiO_2 0.07, Total (100.07) wt.%. Empirical formula: $(Cs_{0.48}K_{0.38}Rb_{0.09}Na_{0.03}Ca_{0.02}Mn_{0.01})_{\Sigma 1.01}(Al_{3.97}Li_{0.02}Fe_{0.01})_{\Sigma 4.00}Be_{4.00}[(B_{10.99}Si_{0.01})_{\Sigma 11.00}Be_{1.00}]_{\Sigma 12.00}O_{28.00}$. *Relationship to other species*: It is the Cs-dominant analogue of rhodizite, $(K,Cs)Al_4Be_4(B,Be)_{12}O_{28}$.

Name: After David London (b. 1953), Professor of Geology and Geophysics at the University of Oklahoma.

Comments: IMA No. 1999–014.

SIMMONS, W.B., PEZZOTTA, F., FALSTER, A.U. & WEBBER, K.L. (2001): Londonite, a new mineral species: the Cs-dominant analogue of rhodizite from the Antandrokomby granitic pegmatite, Madagascar. *Canadian Mineralogist* **39**, 747-755.

Lulzacite

$Sr_2Fe^{2+}(Fe^{2+},Mg)_2Al_4(PO_4)_4(OH)_{10}$

TRICLINIC

Locality: A quartzite quarry near Saint-Aubin-des-Châteaux, about 8 km west of Châteaubriant, Loire-Atlantique, France.

Occurrence: In veinlets at the contact between quartzite and pyrite-rich limestone. Associated minerals are: goyazite, "apatite", siderite, quartz, calcite, marcasite, pyrrhotite and pyrite.

General appearance: Anhedral aggregates (up to several cm long); rarely as pseudopyramidal euhedral crystals (up to 4 mm).

Physical, chemical and crystallographic properties: *Luster*: probably vitreous. *Diaphaneity*: transparent to translucent. *Color*: dark grayish green to yellowish green. *Streak*: not given. *Luminescence*: nonfluorescent. *Hardness*: 5½ to 6. *Tenacity*: not given. *Cleavage*: not given. *Fracture*: not given. *Density*: 3.55 g/cm^3 (meas.), 3.56 g/cm^3 (calc.). *Crystallography*: Triclinic, $P\bar{1}$, *a* 5.457, *b* 9.131, *c* 9.769 Å, α 108.47°, β 91.72°, γ 97.44°, *V* 465.5 Å^3, *Z* = 1, *a*:*b*:*c* = 0.5976:1:1.0699. Morphology: No forms were mentioned. Twinning: none mentioned. *X-ray powder-diffraction data*: 4.47(41)(02$\bar{1}$), 3.591(50)(111), 3.218(100)(1$\bar{2}$2), 3.132(62)(120), 3.016(56)(12$\bar{2}$), 2.878(42)(03$\bar{2}$), 2.8119(58)(11$\bar{3}$), 2.6526(44)(1$\bar{3}$2), 2.6635(43)(013). *Optical data*: Biaxial (–), α 1.654, β 1.674, γ 1.684, 2*V*(meas.) 45° to 65°, 2*V*(calc.) 70°, dispersion *r* < *v*, distinct; pleochroism distinct from brown-yellow to pale blue-violet; orientation not given. *Chemical analytical data*: Mean of fifteen sets of electron-microprobe data: MgO 2.97, SrO 21.79, BaO 1.20, FeO 16.13, MgO 2.97, Al_2O_3 19.16, P_2O_5 28.50, V_2O_5 0.64, H_2O 10.29, Total 100.68 wt.%. Empirical formula: $(Sr_{2.05}Ba_{0.08})_{\Sigma 2.13}Fe^{2+}{}_{1.00}(Fe^{2+}{}_{1.18}Mg_{0.71})_{\Sigma 1.89}Al_{3.66}[(PO_4)_{3.91}(VO_4)_{0.07}]_{\Sigma 3.98}(OH)_{11.11}$. The ideal formula requires: MgO 3.31, FeO 16.20, SrO 21.25, Al_2O_3 20.91, P_2O_5 29.09, H_2O 9.24, Total 100.00 wt.%. *Relationship to other species*: It is isotypic with jamesite, whose revised formula is $Pb_2ZnFe^{3+}{}_2(Fe^{3+}{}_{2.8}Zn_{1.2})(AsO_4)_4(OH)_8[(OH)_{1.2}O_{0.8}]$.

Name: After Y. Lulzac (b. 1934), mining geologist of the BRGM, who discovered the mineral.

Comments: IMA No. 1998–039. Note that the crystal structure has been solved and published.

MOËLO, Y., LASNIER, B., PALVADEAU, P., LÉONE, P. & FONTAN, F. (2000): La lulzacite, $Sr_2Fe^{2+}(Fe^{2+},Mg)_2Al_4(PO_4)_4(OH)_{10}$, un nouveau phosphate de strontium (Saint-Aubin-des-Châteaux, Loire-Atlantique, France). *Comptes Rendus, Académie des Sciences de la terres et des planètes* **330**, 317-324.

LÉONE, P., PALVADEAU, P. & MOËLO, Y. (2000): Structure cristalline d'un nouvel hydroxyphosphate naturel de strontium, fer et aluminium (lulzacite), $Sr_2Fe(Fe_{0.63}Mg_{0.37})_2Al_4(PO_4)_4(OH)_{10}$. *Comptes Rendus de l'Académie des Sciences de Paris, Série IIc* **3**, 301-308.

Nickellotharmeyerite

$Ca(Ni,Fe^{3+})_2(AsO_4)_2(H_2O,OH)_2$

MONOCLINIC

Locality: The Pucher shaft, Schneeberg–Neustädtel, Saxony, Germany.

Occurrence: Found in the oxidation zone of the deposit, associated with quartz on the type specimen. Associated minerals on other samples are: lukrahnite, Ni- and Co-bearing ferrilotharmeyerite, mawbyite, arseniosiderite, zeunerite and barium-pharmacosiderite.

General appearance: Tiny aggregates (up to 0.5 mm) and crusts grown in small cavities; single crystals are usually less than 50 μm across.

Physical, chemical and crystallographic properties: *Luster*: subadamantine. *Diaphaneity*: transparent. *Color*: brown to yellow. *Streak*: light brown to yellow. *Luminescence*: nonfluorescent. *Hardness*: VHN_{25} 500 kg/mm^2, Mohs 4½. *Tenacity*: brittle. *Cleavage*: none observed. *Fracture*: conchoidal. *Density*: could not be measured, 4.45 g/cm^3 (calc.). *Crystallography*: Monoclinic, *C*2/*m*, *a* 9.005, *b* 6.205, *c* 7.411 Å, β 115.31°, *V* 374.4 Å^3, *Z* = 2, *a*:*b*:*c* = 1.4512:1:1.1944. Morphology: no forms were mentioned. Twinning: none mentioned. *X-ray powder-diffraction data*: 3.393(55)($20\bar{2}$), 3.182(76)($11\bar{2}$), 2.962(100)(201), 2.816(66)(021), 2.703(66)($31\bar{1}$), 2.538(75)($22\bar{2}$), 1.697(53)($33\bar{1}$,420,$51\bar{1}$,$40\bar{4}$). *Optical data*: Biaxial (+), α 1.80 (calc.), β 1.81, γ 1.87, 2*V*(meas.) 40°, dispersion not determined; pleochroism strong, *X* yellow, *Y* brown, *Z* pale yellow; $X \approx c$, $Y = b$, $Z \wedge a \approx 25°$ in obtuse angle β. *Chemical analytical data*: Mean of eleven sets of electron-microprobe data: CaO 9.29, NiO 12.86, CoO 3.83, CuO 0.11, ZnO 0.62, PbO 0.90, Al_2O_3 <0.05, Fe_2O_3 12.88, Bi_2O_3 8.56, P_2O_5 0.23, V_2O_5 <0.05, As_2O_5 45.32, SO_3 0.12, H_2O (5.35), Total (100.07) wt.%. Empirical formula: $(Ca_{0.83}Bi_{0.18})_{\Sigma 1.01}$ $(Ni_{0.86}Fe^{3+}_{0.81}Co_{0.26}Zn_{0.04}Pb_{0.02}Cu_{0.01})_{\Sigma 2.00}$ $[(AsO_4)_{1.98}(PO_4)_{0.02}(SO_4)_{0.01}]_{\Sigma 2.01}[(H_2O)_{1.00}(OH)_{0.99}]_{\Sigma 1.99}$. *Relationship to other species*: It is a member of the tsumcorite group, specifically, the nickel-dominant analogue of lotharmeyerite.

Name: After the relationship with lotharmeyerite.

Comments: IMA No. 1999–008.

KRAUSE, W., BERNHARDT, H.-J., EFFENBERGER, H. & MARTIN, M. (2001): Cobalttsumcorite and nickellotharmeyerite, two new minerals from Schneeberg, Germany: description and crystal structure. *Neues Jahrbuch für Mineralogie, Monatshefte*, 558-576.

Obertiite

$NaNa_2(Mg_3Fe^{3+}Ti^{4+})Si_8O_{22}O_2$

MONOCLINIC

Locality: The Bellerberg quarry, Laacher See district, Eifel region, Germany.

Occurrence: In cavities in basaltic flows. Associated minerals are: tridymite, fluororichterite, hematite, rutile, aegirine-augite, kinoshitalite and fluorapatite.

General appearance: Elongate blades (up to 10 × 40 × 200 μm) and divergent aggregates.

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: presumably transparent to translucent. *Color*: pale pink. *Streak*: white. *Luminescence*: nonfluorescent. *Hardness*: 5. *Tenacity*: brittle. *Cleavage*: {110} perfect. *Fracture*: conchoidal. *Density*: could not be measured, 3.17 g/cm^3 (calc.). *Crystallography*: Monoclinic, *C*2/*m*, *a* 9.776, *b* 17.919, *c* 5.292 Å, β 104.05°, *V* 899.3 Å^3, *Z* = 2, *a*:*b*:*c* = 0.5456:1:0.2953. Morphology: no forms were mentioned. Twinning: none mentioned. *X-ray powder-diffraction data*: 8.414(10)(110), 4.467(5)(040), 3.39(6)(131), 3.117(5)(310), 2.705(7)(331,151), 2.531(5)(202). *Optical data*: Biaxial (–), α 1.643, β 1.657, γ 1.670, 2*V*(meas.) 81°, 2*V*(calc.) 87° (given as 93°); dispersion not visible; pleochroism slight in shades of pink to red-orange, absorption $X \approx Y \approx Z$; $X \wedge a = 2°$ (in obtuse angle β), $Y \wedge c = 12°$ (in obtuse angle β), $Z = b$. *Chemical analytical data*: Mean of ten sets of electron-microprobe data: Li_2O 0.05, Na_2O 9.51, K_2O 0.98, MgO 14.13, CaO 0.52, FeO 3.36, ZnO 0.08, Al_2O_3 0.15, Mn_2O_3 3.27, Fe_2O_3 2.61, SiO_2 54.53, TiO_2 7.75, H_2O 0.20, F 0.55, sum 97.69, less O = F 0.23, Total 97.46 wt.%. The Mn^{3+}:Mn^{2+} and Fe^{3+}:Fe^{2+} ratios are not known, so calculations were carried out expressing all manganese as Mn^{3+} and also as Mn^{2+}. Fe^{3+} and Fe^{2+} were adjusted for each of these assumed valence states of manganese, and the site occupancies are based on the crystal-structure refinement. The empirical formula derived in this manner is: $(Na_{0.82}K_{0.18})_{\Sigma 1.00}(Na_{1.84}Ca_{0.08}Fe^{2+}_{0.06})_{\Sigma 1.98}(Mg_{3.09}Ti_{0.86}Mn^{3+}_{0.37}Fe^{2+}_{0.35}Fe^{3+}_{0.30}Al_{0.03})_{\Sigma 5.00}Si_{8.00}O_{22.00}[O_{1.54}F_{0.26}(OH)_{0.20}]_{\Sigma 2.00}$. *Relationship to other species*: It is the second anhydrous member of the amphibole group; the first is ungarettiite.

Name: After Roberta Oberti (b. 1951), Pavia, Italy, for her contributions to the understanding of the crystal chemistry of the amphibole group.

Comments: IMA No. 1998–046.

HAWTHORNE, F.C., COOPER, M.A., GRICE, J.D. & OTTOLINI, L. (2000): A new anhydrous amphibole from the Eifel region, Germany: description and crystal structure of obertiite, $NaNa_2(Mg_3Fe^{3+}Ti^{4+})Si_8O_{22}O_2$. *American Mineralogist* **85**, 236-241.

Orthojoaquinite-(La)

$Ba_2NaLa_2Fe^{2+}Ti_2Si_8O_{26}(O,OH)\bullet H_2O$

ORTHORHOMBIC

Locality: The Ilímaussaq alkaline complex, on the right bank of the Narsaq River, at the foot of Kvansfjeld Mountain, south Greenland.

Occurrence: In the intermediate zone of nepheline syenite pegmatites. Associated minerals are: riebeckite, analcime, sodalite and steenstrupine-(Ce).

General appearance: Banded gneissic masses (up to 4 × 3 × 1 cm) consisting of bent flakes 1 mm long.

Physical, chemical and crystallographic properties: *Luster*: silky. *Diaphaneity*: transparent. *Color*: brown. *Streak*: unknown. *Luminescence*: not reported. *Hardness*: VHN 350–430 kg/mm^2, Mohs about 5. *Tenacity*: unknown, probably brittle. *Cleavage*: {001} good. *Fracture*: not given. *Density*: 4.1 g/cm^3 (meas.), 4.14 g/cm^3 (calc.). *Crystallography*: Orthorhombic, *Ccmm*, *a* 10.539, *b* 9.680, *c* 22.345 Å, *V* 2280 Å^3, *Z* = 4, *a*:*b*:*c* = 1.0887:1:2.3084. Morphology: no forms were mentioned. Twinning: none mentioned. *X-ray powder-diffraction data*: 5.58(67.5)(004), 3.00(8.8)(224), 2.95(17.0)(206), 2.91(10.5)(117), 2.80(100)(313,008,225), 2.232(7.5)(0.0.10), 1.596(12.8)(0.0.14,602). *Optical data*: Biaxial (+), α 1.754, β 1.760, γ 1.797, 2*V*(meas.) 40°, 2*V*(calc.) 45°; dispersion not given; pleochroism strong, *Z* > *X*; orientation, *Z* = *c*. *Chemical analytical data*: A wet-chemical analysis gave: Na_2O 2.41, K_2O 0.22, CaO (+ SrO) 0.03, MnO 0.70, FeO 4.78, BaO 21.46, Fe_2O_3 0.39, La_2O_3 10.05, Ce_2O_3 9.40, Pr_2O_3 0.99, Nd_2O_3 2.15, SiO_2 33.82, TiO_2 9.20, ThO_2 0.38, Nb_2O_5 2.31, H_2O 1.50, F 0.38, sum 100.17, less O = F 0.16, Total 100.01 wt.%. Empirical formula: $(Ba_{1.99}Ca_{0.01})_{\Sigma 2.00}$ $(Na_{1.11}K_{0.07})_{\Sigma 1.18}(La_{0.88}Ce_{0.81}Nd_{0.18}Pr_{0.09})_{\Sigma 1.96}(Fe^{2+}_{0.95}Mn_{0.14})_{\Sigma 1.09}$ $(Ti_{1.64}Nb_{0.25}Fe^{3+}_{0.07}Th_{0.02})_{\Sigma 1.98}Si_{8.01}O_{26.00}[(OH)_{0.37}O_{0.35}F_{0.28}]_{\Sigma 1.00}\bullet 1.00H_2O$. *Relationship to other species*: A member of the joaquinite group.

Name: After the relationship to other members of the joaquinite group.

Comments: IMA No. 00–D.

MATSUBARA, S., MANDARINO, J.A. & SEMENOV, E.I. (2001): Redefinition of a mineral in the joaquinite group: orthojoaquinite-(La). *Canadian Mineralogist* **39**, 757-760.

Orthominasragrite

$V^{4+}O(SO_4)(H_2O)_5$

ORTHORHOMBIC

Locality: The North Mesa mine group (west ½, southwest ¼ of section 35, Township 24 South, Range 11 East), Temple Mountain mining district, Emery County, Utah, U.S.A.

Occurrence: In a silicified tree, approximately 46 cm wide by 30 cm high by an undetermined length. Associated minerals are: pyrite, "various iron sulfates", sulfur, minasragrite and an as-yet undescribed vanadium sulfate.

General appearance: Rounded aggregates (up to 200 μm across).

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: not mentioned. *Color*: pale blue to bright blue. *Streak*: pale blue. *Luminescence*: nonfluorescent. *Hardness*: approximately 1. *Tenacity*: not mentioned. *Cleavage*: none observed. *Fracture*: not mentioned. *Density*: could not be measured, 2.00 g/cm^3 (calc.). *Crystallography*: Orthorhombic, $Pmn2_1$, a 7.246, b 9.333, c 6.210 Å, V 420.0 Å^3, Z = 2, a:b:c = 0.7764:1:0.6654. Morphology: no forms were mentioned. Twinning: none mentioned. *X-ray powder-diffraction data*: 4.699(100B)(101), 3.734(20)(021), 3.622(20)(200), 3.322(50)(121), 3.108(20)(002), 2.865(40)(220), 2.602(30)(221), 2.363(20)(230,202), 2.030(20)(321). *Optical data*: Biaxial (–), α 1.529, β 1.534, γ 1.534, 2V(meas.) +2°, 2V(calc.) 0°; dispersion not mentioned; nonpleochroic; orientation: $X = b$, $Y = c$, $Z = a$. *Chemical analytical data*: Electron-microprobe data (with H_2O calculated to give 5 H_2O): VO_2 33.88, SO_3 31.97, H_2O (36.30), Total (102.15) wt.%. Empirical formula: $V_{1.01}O_{1.04}(SO_4)_{0.99}\bullet 5.00H_2O$. *Relationship to other species*: It is the orthorhombic polymorph of $V^{4+}O(SO_4)(H_2O)_5$, minasragrite being monoclinic.

Name: After the relationship with minasragrite.

Comments: IMA No. 2000–018.

HAWTHORNE, F.C., SCHINDLER, M., GRICE, J.D. & HAYNES, P. (2001): Orthominasragrite, $V^{4+}O(SO_4)(H_2O)_5$, a new mineral species from Temple Mountain, Emery County, Utah, U.S.A. *Canadian Mineralogist* **39**, 1325-1331.

Oswaldpeetersite

$(UO_2)_2CO_3(OH)_2 \bullet 4H_2O$

MONOCLINIC

Locality: The Jomac uranium mine, Brown's Rim, San Juan County, Utah, U.S.A.

Occurrence: In the Tertiary Shinarump conglomerate, which is rich in organic material such as black coal-bearing smears and logs of partially petrified wood. Associated minerals are: gypsum, cuprite, antlerite, goethite, lepidocrocite, mbobomkulite, hydrombobomkulite, sklodowskite and two undefined uranium minerals.

General appearance: Micrometric prismatic crystals (approximately 0.1 × 0.01 × 0.002 mm) arranged in radiating groups.

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: transparent. *Color*: canary yellow. *Streak*: pale yellow. *Luminescence*: nonfluorescent. *Hardness*: between 2 and 3. *Tenacity*: weak. *Cleavage*: parallel to the elongation. *Fracture*: uneven. *Density*: greater than 4.10 g/cm^3 (meas.), 4.55 g/cm^3 (calc.). *Crystallography*: Monoclinic, $P2_1/c$, a 4.1425, b 14.098, c 18.374 Å, β 103.62°, V 1042.8 Å^3, Z = 4, a:b:c = 0.2938:1:1.3033. Morphology: {100}, {010}, {001}, acicular and heavily striated parallel to the length. Twinning: none mentioned. *X-ray powder-diffraction data*: 8.95(65)(002), 7.54(63)(012), 4.55(96)(031), 4.26(60)(014), 3.46(62)(015), 3.32(100)($\bar{1}$14), 3.029(85)(043), 2.273(62)(062). *Optical data*: Biaxial (–), α 1.583, β 1.669, γ 1.712, 2V not measured, 2V(calc.) 67°; dispersion not observed; pleochroism: X and Y very pale yellow to colorless, Z pale yellow; $Z \approx a$, elongation is positive. *Chemical analytical data*: Mean of ten sets of electron-microprobe data: UO_3 81.47, H_2O 12.30 (by TGA), CO_2 (6.23) (by difference), Total (100.00) wt.%. Empirical formula: $(UO_2)_{2.03}(CO_3)_{1.01}(OH)_{2.04} \bullet 3.85H_2O$. *Relationship to other species*: None apparent.

Name: After Maurice Oswald Peeters (b. 1945), structural crystallographer at the University of Leuven, Belgium, and researcher in the field of uranium mineralogy.

Comments: IMA No. 2000–034. The mineral was discovered by Patrick Haynes of Cortez, Colorado, U.S.A.

VOCHTEN, R., DELIENS, M. & MEDENBACH, O. (2001): Oswaldpeetersite, $(UO_2)_2CO_3(OH)_2 \bullet 4H_2O$, a new basic uranyl carbonate mineral from the Jomac uranium mine, San Juan County, Utah, U.S.A. *Canadian Mineralogist* **39**, 1685-1689.

Pararsenolamprite

As

ORTHORHOMBIC

Locality: The dump of the Mukuno mine (Lat. 33° 28'47"N, Long. 131° 26'15"E), Yamagocho, Oita Prefecture, Kyushu, Japan.

Occurrence: In a hydrothermal Sb–As–Ag–Au ore deposit. Associated minerals are: arsenic, stibnite and quartz. Other minerals in the deposit are: pyrite, miargyrite, argentian tetrahedrite, gold, löllingite, claudetite and kankite.

General appearance: Radial or parallel aggregates of bladed crystals (up to 0.8 mm long).

Physical, chemical and crystallographic properties: *Luster*: metallic. *Diaphaneity*: opaque. *Color*: lead gray. *Streak*: black. *Hardness*: VHN_{25} 66 to 91 kg/mm^2, Mohs 2 to 2½. *Tenacity*: sectile and brittle. *Cleavage*: {001} perfect. *Fracture*: not mentioned. *Density*: 5.88 g/cm^3 (meas.), 5.99 g/cm^3 (calc.). *Crystallography*: Orthorhombic, $Pmn2_1$ or $P2_1nm$, a 3.663, b 10.196, c 10.314 Å, V 382.1 Å^3, Z = 18, a:b:c = 0.3563:1:1.0116. Morphology: {001}, elongate on [100] and flattened on {001}. Twinning: none mentioned. *X-ray powder-diffraction data*: 5.17(100)(002), 4.60(24)(012), 3.259(58)(013), 2.840(27)(032), 2.580(22)(004), 2.299(23)(024), 1.794(26)(105). *Optical data*: In reflected light: white with a slightly greenish blue tint, strong anisotropism (dark brown, greenish gray), distinct bireflectance (cream parallel to elongation and brown, gray, green perpendicular to elongation). R_1, R_2; $^{im}R_1$, $^{im}R_2$: (49.0, 44.0; 33.6, 29.3%) 470 nm, (47.0, 42.1; 31.5, 28.0%) 546 nm, (44.8, 39.9; 29.7, 26.9%) 589 nm, (44.9, 40.3; 29.2, 26.0%) 650 nm. *Chemical analytical data*: Mean of eight sets of electron-microprobe data: As 91.89, Sb 7.25, S 0.48, Total 99.62 wt.%. Empirical formula: $(As_{0.94}Sb_{0.05}S_{0.01})_{\Sigma 1.00}$. *Relationship to other species*: It is the third polymorph of As; the others are arsenic (trigonal) and arsenolamprite (orthorhombic).

Name: After the relationship with arsenolamprite.

Comments: IMA No. 1999–047.

MATSUBARA, S., MIYAWAKI, R., SHIMIZU, M. & YAMANAKA, T. (2001): Pararsenolamprite, a new polymorph of native As from the Mukuno mine, Oita Prefecture, Japan. *Mineralogical Magazine* **65**, 807-812.

Remondite-(La)

$Na_3(La,Ce,Ca)_3(CO_3)_5$

MONOCLINIC

Locality: Koashva Mountain, Khibina alkaline massif, Kola Peninsula, Russia.

Occurrence: In the aegirine core of a small hyperagpaitic pegmatite. Associated minerals are: cancrisilite, microcline, sodalite, villiaumite, natrolite, pectolite, lomonosovite, barytolamprophyllite, catapleiite, natron, thermonatrite, sazykinaite-(Y), "Nb-rinkite", vitusite-(Ce) and fluorcaphite.

General appearance: Rough prismatic segregations (up to 2 × 0.8 × 0.5 mm) made up of tiny (up to 5 μm) irregular grains.

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: translucent. *Color*: bright orange yellow. *Streak*: white. *Luminescence*: nonfluorescent. *Hardness*: ~3. *Tenacity*: brittle. *Cleavage*: none. *Fracture*: conchoidal. *Density*: 3.5 g/cm^3 (meas.), 3.56 g/cm^3 (calc.). *Crystallography*: Monoclinic, $P2_1$ (?), *a* 10.49, *b* 6.417, *c* 10.50 Å, β 119.8°, *V* 613 Å^3, *Z* = 2, *a*:*b*:*c* = 1.6347:1:1.6363. Morphology: no forms were observed. Twinning: none observed. *X-ray powder-diffraction data*: 5.28(5)(101,011, 20$\bar{1}$,110), 3.70(7)(012), 3.036(9)(211,31$\bar{1}$), 2.740(5)(310,121), 2.623(10)(20$\bar{4}$,022, 40$\bar{2}$,220), 2.143(8)(014,410), 2.041(6)(222), 1.985(5)(401,21$\bar{5}$), 1.939(6)(032, 230). *Optical data*: Biaxial (–), α 1.615, β 1.619, γ 1.622, 2*V*(meas.) 80°, 2*V*(calc.) 82°; dispersion not observed; nonpleochroic; orientation not given. *Chemical analytical data*: Mean of eleven sets of electron-microprobe data: Na_2O 15.48, K_2O 0.58, CaO 5.13, SrO 2.93, BaO 0.18, La_2O_3 19.75, Ce_2O_3 16.67, Pr_2O_3 0.99, Nd_2O_3 2.27, Sm_2O_3 0.37, CO_2 32.97, ThO_2 1.34, Total 98.66 wt.%. Empirical formula: $Na_{3.00}(La_{0.81}Ce_{0.68}Ca_{0.61}Na_{0.33}Sr_{0.19}Nd_{0.09}K_{0.08}Pr_{0.04}Th_{0.03}Sm_{0.01}Ba_{0.01})_{\Sigma 2.88}(CO_3)_{4.99}$. *Relationship to other species*: The La-dominant analogue of remondite-(Ce).

Name: After the relationship with remondite-(Ce).

Comments: IMA No. 1999–006. The subscripts derived here for the empirical formula are somewhat different to those given in the paper.

PEKOV, I.V., CHUKANOV, N.V., KONONKOVA, N.N., ZADOV, A.E. & BELOVITSKAYA, YU.V. (2000): Remondite-(La), $Na_3(La,Ce,Ca)_3(CO_3)_5$ – a new mineral of the burbankite family from the Khibina Massif, Kola Peninsula. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* **129**(1), 53-60 (in Russ.).

Theoparacelsite

$Cu_3(OH)_2As_2O_7$

ORTHORHOMBIC

Locality: The old copper mines of Roua (North and South group) in the upper part of the Var valley (the Daluis gorge) at the western margin of the Barrot dome, Alpes-Maritimes area, about 50 km from Nice, France.

Occurrence: Associated minerals are: dolomite, calcite, aragonite, copper, cuprite, domeykite, algodonite, koutekite, gold, silver, olivenite, cornubite, clinotyrolite, connellite, brochantite, malachite, trippkeite, pharmacosiderite, strashimirite and gilmarite.

General appearance: Aggregates in cuprite cavities 1 mm in diameter. The aggregates consist of crystals (up to 0.2 × 0.1 × 0.05 mm), rectangular elongate crystals (up to 90 × 10 × 5 μm), perfect rectangular crystals (10 × 7 × 2 μm), equidimensional crystals (~20 μm), pseudomorphs after thin acicular crystals of olivenite and also as powder.

Physical, chemical and crystallographic properties: *Luster*: vitreous to adamantine. *Diaphaneity*: translucent. *Color*: dark pistachio green. *Streak*: yellowish green. *Luminescence*: nonfluorescent. *Hardness*: could not be measured. *Tenacity*: brittle. *Cleavage*: {001} perfect. *Fracture*: conchoidal. *Density*: could not be measured, 4.73 g/cm^3 (calc.). *Crystallography*: Orthorhombic, *Pmma*, *a* 8.3212, *b* 2.9377, *c* 4.6644 Å, *V* 114.02 Å^3, *Z* = 2/3, *a*:*b*:*c* = 2.8326:1:1.5878. Morphology: {001}, {010}, {100}, {110} and {101}. Twinning: none. *X-ray powder-diffraction data*: 4.065(15)(101), 3.104(100)(201), 2.486(70)(011), 2.400(25)(210), 2.330(15)(002), 1.672(30)(212), 1.596(25)(411), 1.330(25)(601,221). *Optical data*: Biaxial (+), α 1.81, β 1.82, γ 1.86, 2*V*(meas.) 57°, 2*V*(calc.) 54°; dispersion *r* > *v*, moderate; pleochroism *X* light olive green, *Y* olive green, *Z* dark pistachio green; orientation, *X* = *a*, *Y* = *c*, *Z* = *b*. *Chemical analytical data*: Mean of five sets of electron-microprobe data (with H_2O by difference): CuO 48.77, As_2O_5 47.68, H_2O (3.55), Total (100.00) wt.%. Empirical formula: $Cu_{2.99}(OH)_{1.92}As_{2.02}O_{7.08}$. *Relationship to other species*: None apparent.

Name: After Philippus Aureolus Bombastus von Hohenheim (1493–1541), called Paracelse, which is a Greco-Roman translation of Hohenheim meaning "close to the sky". Paracelse was an important physician, chemist, alchemist and doctor who also worked in mineralogy (*De Mineralibus*, *De Elemento Aquae* & *Fructibus eius*). He is known in toxicology for having said "All is poison, nothing is poison, it is the dosage which makes the poison".

Comments: IMA No. 1998–012.

SARP, H. & ČERNÝ, R. (2001): Theoparacelsite, $Cu_3(OH)_2As_2O_7$, a new mineral: its description and crystal structure. *Archives des Sciences de Genève* **54**(1), 7-14.

Tumchaite

$Na_2(Zr,Sn)Si_4O_{11}•2H_2O$

MONOCLINIC

Locality: The Vuoriyarvi massif on the north shore of Vuoriyarvi Lake, northern Karelia, Murmansk region, Russia.

Occurrence: In a sample from a borehole that crosscuts veined dolomite–calcite carbonatites. Associated minerals are: calcite, dolomite, a serpentine-group mineral and pyrite.

General appearance: Tabular crystals (up to 0.2 × 1.2 × 2.5 mm).

Physical, chemical and crystallographic properties: *Luster*: vitreous. *Diaphaneity*: transparent to translucent. *Color*: colorless to white. *Streak*: white. *Luminescence*: nonfluorescent. *Hardness*: VHN_{40} 410 kg/mm^2, Mohs close to 4½. *Tenacity*: very brittle. *Cleavage*: {100} perfect. *Fracture*: uneven. *Density*: 2.78 g/cm^3 (meas.), 2.77 g/cm^3 (calc.). *Crystallography*: Monoclinic, $P2_1/c$, a 9.144, b 8.818, c 7.537 Å, β 113.22°, V 558.49 Å^3, Z = 2, a:b:c = 1.0370:1:0.8547. Morphology: {100}, {$h0l$}, {hkl}; tabular on {100} and elongate along [001]. Twinning: on {100}. *X-ray powder-diffraction data*: 8.40(10)(100), 5.38(9)(11$\bar{1}$), 4.00(8)(111), 3.401(9)(20$\bar{2}$), 2.902(9)(211), 2.772(7)(30$\bar{2}$), 2.691(9)(13$\bar{1}$), 2.190(7)(31$\bar{3}$, 41$\bar{1}$). *Optical data*: Biaxial (–), α 1.570, β 1.588, γ 1.594, 2V(meas.) 60°, 2V(calc.) 59°; pleochroism X greenish gray, Y = Z colorless; Y = b, $Z \wedge c$ = 3°. *Chemical analytical data*: Six crystals were analyzed by electron microprobe (6 to 10 analyses per crystal). The data from one crystal are: Na_2O 13.72, CaO 0.15, MnO <0.02, FeO <0.02, Y_2O_3 <0.1, SiO_2 52.71, TiO_2 0.35, ZrO_2 20.41, SnO_2 5.73, HfO_2 0.60, Nb_2O_5 <0.05, H_2O (7.86), Total (101.53) wt.%. The amount of H_2O was calculated to give 2(H_2O). Empirical formula: $(Na_{2.03}Ca_{0.01})_{\Sigma 2.04}(Zr_{0.76}Sn_{0.17}Ti_{0.02}Hf_{0.01})_{\Sigma 0.96}Si_{4.02}O_{11.00}•2.00H_2O$. *Relationship to other species*: Isostructural with penkvilksite-1M and chemically related to vlasovite.

Name: After the Tumcha River, near the Vuoriyarvi massif.

Comments: IMA No. 1999–041.

SUBBOTIN, V.V., MERLINO, S., PUSHCHAROVSKY, D.YU., PAKHOMOVSKY, YA.A., FERRO, O., BOGDANOVA, A.N., VOLOSHIN, A.V., SOROKHTINA, N.V. & ZUBKOVA, N.V. (2000): Tumchaite $Na_2(Zr,Sn)Si_4O_{11}•2H_2O$ – a new mineral from carbonatites of the Vuoriyarvi alkali-ultrabasic massif, Murmansk region, Russia. *American Mineralogist* **85**, 1516-1520.

Zaccagnaite

$Zn_4Al_2(OH)_{12}(CO_3)\cdot 3H_2O$

HEXAGONAL

Locality: Calagio quarry, Colonnata valley, Carrara basin, Apuan Alps, northern Tuscany, Italy.

Occurrence: In cavities in calcite veins in the famous Carrara marble. Associated minerals are: hydrozincite and fraipontite. It formed as a product of the alteration of sphalerite by reaction with aluminum-rich hydrothermal fluids.

General appearance: Minute hexagonal crystals less than 0.2 mm long and 0.02 to 0.03 mm thick. These are covered by a thin crust of fraipontite and resemble so-called "Brugola" screws (*i.e.*, set-screws).

Physical, chemical and crystallographic properties: *Luster*: subvitreous. *Diaphaneity*: transparent to translucent. *Color*: white. *Streak*: white. *Luminescence*: not given. *Hardness*: not given. *Tenacity*: not given. *Cleavage*: {001} perfect. *Fracture*: not given. *Density*: could not be measured, 2.84 g/cm^3 (calc.). *Crystallography*: Hexagonal, $P6_3/mmc$, a 3.0725, c 15.114 Å, V 123.62 Å^3, Z = ⅓, c:a = 4.9191. Morphology: no forms were mentioned, but {001} and {100} probably are present. Twinning: none mentioned. *X-ray powder-diffraction data*: 7.51(vs)(002), 3.794(m)(004), 2.65(w)(100), 2.511(mw)(102), 2.175(mw)(104), 1.890(w)(008), 1.830(mw)(106), 1.542(ms)(108), 1.539(ms)(110). *Optical data*: could not be determined because of the small size, the fragility and the coatings on the crystals. *Chemical analytical data*: Mean of four sets of electron-microprobe data: CuO 0.24, ZnO 56.01, Al_2O_3 18.44, SiO_2 0.09, Total 74.78 wt.%. Here, 28.63 wt.% H_2O and 7.85 wt.% CO_2 were added to give 9(H_2O) and 1(CO_3); this raises the analytical total to 111.12 wt.%. Recalculation to give 100.00 wt.% (and ignoring SiO_2) gives: CuO 0.22, ZnO 50.40, Al_2O_3 16.59, CO_2 (7.02), H_2O (25.76), Total (100.00) wt.%. Empirical formula: $(Zn_{3.90}Cu_{0.02})_{\Sigma 3.92}\ Al_{2.05}(OH)_{11.99}(CO_3)_{1.00}\cdot 3.00H_2O$. *Relationship to other species*: It is a member of the hydrotalcite group.

Name: After the late scholar Domenico Zaccagna (1851–1940), who was born in Carrara and died in Rome. He published the first geological map of the Apuan Alps and was a competent collector of minerals from the Carrara marble. His collection is preserved in Museo di Storia Naturale e del Territorio at the University of Pisa.

Comments: IMA No. 1997–019. Because of the very small size of the crystals, many of the usual physical properties could not be determined. Prof. Merlino kindly supplied additional data. The crystal structure was determined.

MERLINO, S. & ORLANDI, P. (2001): Carraraite and zaccagnaite, two new minerals from the Carrara marble quarries: their chemical compositions, physical properties, and structural features. *American Mineralogist* **86**, 1293-1301.

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Volume 131 Number 1 2002

* This page presents the table of contents of a recent issue of ISSN 0869-6055

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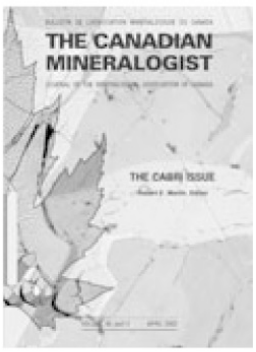

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