

New Mineral Names*

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AURIVILLIUSITE*

A.C. Roberts, J.A.R. Stirling, A.J. Criddle, G.E. Dunning, J. Spratt (2004) Aurivilliusite, Hg²⁺Hg¹⁺OI, a new mineral species from the Clear Creek claim, San Benito County, California, USA. *Mineral. Mag.*, 68, 241–245.

Electron microprobe analysis gave HgO 40.10, Hg₂O 38.62, I 22.76, Br 0.22, Cl 0.06, O ≡ I, Br, Cl 1.46, sum 100.30 wt%, corresponding to Hg_{1.00}²⁺Hg_{1.00}¹⁺O_{1.01}(I_{0.97}Br_{0.01}Cl_{0.01})_{Σ0.99} for O + I + Br + Cl = 2 and with Hg²⁺ and Hg¹⁺ partitioned in accordance with the synthetic analog. The mineral occurs as irregular, patchy coatings, each up to 0.5 mm, and with individual grains up to 200 μm in length, showing {100}. Dark gray-black color, metallic luster, opaque, brittle, dark red-brown streak, uneven fracture, {100} cleavage, nonfluorescent, *H* uncertain (<5), *D*_{calc} = 8.96 g/cm³ for the empirical formula and *Z* = 8. Similar to cinnabar in reflected light, extremely light-sensitive, twinned, average *n* = 2.35–2.38, no internal reflection but red highlights gradually appear and coalesce. Single-crystal X-ray study indicated monoclinic symmetry, space group *C2/c* (synthetic analog); *a* = 17.580(6), *b* = 6.979(1), *c* = 6.693(3) Å, β = 101.71(4)° as refined from a Debye–Scherrer powder pattern (114 mm, CuKα radiation) with strongest lines of 8.547(70,200), 3.275(100,002), 2.993(80,221), and 2.873(80,600).

The mineral, which is chemically the I-dominant analog of terlinguaite but is not isostructural with it, is associated with an undefined Hg mineral, native mercury, cinnabar, and edgarbaileyite that occur on a quartz veinlet in magnesite-bearing serpentine from a prospect pit near the former Clear Creek mercury mine, San Benito County, California. The new mineral name is for Karin Aurivillius (1920–1982) of the University of Lund, Sweden, who synthesized and determined the crystal structures of many Hg compounds. Type material is in the Systematic Reference Series housed at the Geological Survey of Canada, Ottawa. **J.L.J.**

FILATOVITE*

L.P. Vergasova, S.V. Krivovichev, S.N. Britvin, P.C. Burns, V.V. Ananiev (2004) Filatovite, K[(Al,Zn)₂(As,Si)₂O₈], a new

mineral species from the Tolbachik volcano, Kamchatka Peninsula, Russia. *Eur. J. Mineral.*, 16, 533–536.

S.K. Filatov, S.V. Krivovichev, P.C. Burns, L.P. Vergasova (2004) Crystal structure of filatovite, K[(Al,Zn)₂(As,Si)₂O₈], the first arsenate of the feldspar group. *Eur. J. Mineral.*, 16, 537–543.

The mineral forms colorless prismatic crystals, each to 0.3 mm and showing {001} and {010}, that are commonly intergrown. Electron microprobe analysis gave Na₂O 0.63, K₂O 12.85, FeO 0.28, CuO 0.83, ZnO 3.85, Al₂O₃ 27.33, SiO₂ 12.35, As₂O₅ 40.60, P₂O₅ 1.63, sum 100.35 wt%, corresponding to (K_{0.92}Na_{0.07})_{Σ0.99} [(Al_{1.81}Zn_{0.16}Cu_{0.04}Fe_{0.01})_{Σ2.02}(As_{1.20}Si_{0.70}P_{0.08})_{Σ1.98}O₈], simplified as K[(Al,Zn)₂(As,Si)₂O₈]. Vitreous luster, transparent, brittle, white streak, *H* = 5–6, good {100} cleavage, *D*_{calc} = 2.92 g/cm³ for *Z* = 8, nonfluorescent. Optically biaxial negative, α = 1.532(1), β = 1.535(1), γ = 1.537(1), 2*V*_{meas} = 60(10)°, orientation *Y* normal to {001}, *Z* normal to {010}. Single-crystal X-ray structure study (*R*₁ = 0.033) indicated monoclinic symmetry, space group *I2/c*, *a* = 8.772(1), *b* = 13.370(2), *c* = 14.690(2) Å, β = 115.944(6)°, isostructural with celsian. Strongest lines of the powder pattern (114 mm Debye–Scherrer, CuKα radiation) are 4.329(70,202), 3.897(70,130), 3.364(100,220,204,040), 3.300(50,004), and 2.981(60,042).

The mineral is associated with alumokluhevskite, lammerite, johillerite, sylvite, hematite, tenorite, and especially As-bearing orthoclase, which formed as products of fumarolic activity on the second cinder core of the North Breach of the Great Fissure Tolbachik eruption, Kamchatka Peninsula, Russia; fumarole gases at the time of mineral collection were at 410–420 °C. The new mineral name is for Stanislav K. Filatov (b. 1940) of Saint Petersburg State University, who has contributed extensively to studies of exhalation minerals. Type material is in the museum of the Department of Mineralogy, Saint Petersburg State University, Saint Petersburg, Russia. **J.L.J.**

HAPKEITE*

M. Anand, L.A. Taylor, M.A. Nazarov, J. Shu, H.-K. Mao, R.J. Hemley (2004) Space weathering on airless planetary bodies: Clues from the lunar mineral hapkeite. *Proc. Nat. Acad. Sci.*, 101, 6847–6851.

The mineral is the more abundant phase in a single anhedral particle ~35 μm in diameter. An average of five electron microprobe analyses gave Fe 75.3, Si 18.4, Co 0.12, Ni 3.14, P 1.85,

* Before publication, minerals marked with an asterisk were approved by the Commission on New Minerals and Mineral Names, International Mineralogical Association.

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Cr 0.37, sum 99.2 wt%, corresponding to $(\text{Fe}_{1.27}\text{Ni}_{0.05}\text{Cr}_{0.01})_{\Sigma 1.33}(\text{Si}_{0.62}\text{P}_{0.06})_{\Sigma 0.68}$ for 2 atoms, ideally $\frac{2}{3}\text{Fe}_2\text{Si}$. Yellowish white in reflected light, isotropic. Reflectance values (method and standard not given) are 47.1 (470 nm), 48.8 (546), 50.0 (589), and 50.9 (650). $D_{\text{calc}} = 6.83 \text{ g/cm}^3$ for the empirical formula and $Z = 1$. Single-crystal X-ray diffraction study using an in-situ synchrotron technique gave cubic symmetry, space group $Pm\bar{3}m$, $a = 2.831(4) \text{ \AA}$. The observed diffraction lines and indices (intensities could not be measured) are 2.831(100), 2.000(110), 1.631(111), 1.415(200), 1.267(210), 1.157(211), and 1.000(220).

The mineral occurs in a regolith-breccia clast in the lunar meteorite Dhofar 280 from Oman. The matrix is mainly vitrified plagioclase ("maskelynite"). The less abundant mineral in the $\sim 35 \mu\text{m}$ -diameter particle is FeSi; the particle also has areas enriched in P and Ti. Other minerals in the clast are Fe-Ni metal and FeSi₂. The new mineral is interpreted to have formed by impact-induced, vapor-phase deposition in lunar soil. The new name is for Bruce Hapke (emeritus, University of Pittsburgh), who first predicted the presence of vapor-deposited elemental Fe as coatings on lunar soil grains.

Discussion. The optical properties and reflectance values are from the listing of new minerals approved in 2003 (IMA No. 2003-014, *Can. Mineral.*, 42, p. 907); density was calculated from the given composition and cell volume. The mineral closely resembles the high-temperature phase Fe₂Si(*h*) synthesized by Khalaff and Schubert (1974, *J. Less-Common Metals*, 35, 341-345); its structure is of the CsCl type. Analyses are also given for FeSi and FeSi₂, minerals still of questionable status insofar as they have not had an explicit CNMMN approval (e.g., *Am. Mineral.*, 54, p. 1737; 79, p. 188). **E.S.G.**

HERBERTSMITHITE*

R.S.W. Braithwaite, K. Mereiter, W.H. Paar, A.M. Clark (2004) Herbertsmithite, Cu₃Zn(OH)₆Cl₂, a new species, and the definition of paratacamite. *Mineral. Mag.*, 68, 527-539.

The mineral forms coatings of dark-green, complex rhombohedra, mostly 0.5-1 mm in diameter, or larger flattened crystals and aggregates at the type locality. Electron microprobe analysis of the type specimen gave CuO 56.1, ZnO 18.2, Cl 17.2, H₂O 12.5 (TGA loss from between 300 and 340 °C), O \equiv Cl 3.9, sum 100.1 wt%, corresponding to Cu_{3.02}Zn_{0.96}(OH)_{5.91}H_{0.03}Cl_{2.08} for Cu + Zn + Cl + H = 12, ideally Cu₃Zn(OH)₆Cl₂. Transparent, color green to blue-green, luster vitreous, $H = 3-3\frac{1}{2}$, good {10 $\bar{1}$ 1} cleavage, $D_{\text{meas}} = 3.75-3.95$, $D_{\text{calc}} = 3.75 \text{ g/cm}^3$ for $Z = 3$. Optically uniaxial negative, $\epsilon = 1.817(2)$, $\omega = 1.825(2)$. Dichroism is green to greenish blue, weak, with $O > E$. The infrared spectrum includes features at 3410, 3380, 3320, 970, 945, 753, 597, and 460 cm⁻¹. Single-crystal X-ray structural study ($R = 0.011$) showed the mineral to have trigonal symmetry, space group $R\bar{3}m$, $a = 6.834(1)$, $c = 14.075(2) \text{ \AA}$. The strongest lines of the powder pattern (37 lines listed; diffractometer, CuK α radiation) are 5.466(55,101), 4.702(14,003), 2.899(11,201), 2.764(100,113), 2.730(13,202), 2.266(36,204), 1.820(13,303), and 1.709(18,220).

The mineral occurs on a white quartzite at Mina Los Tres Presidentes, Sierra Gorda, Chile (type locality), in association with gypsum, opal pseudomorphs after a radiating acicular min-

eral, and diopside. Other occurrences are at the Kali Kafi and Chah Khouni mines, Anarak, Iran ("anarakite") in "limonite" gossan and metamorphosed dolomitic limestone, respectively. Associated minerals include wulfenite, hemimorphite, chrysocolla, rosasite, iranite, and diabolite. The new name is for G.F. Herbert Smith (1872-1953), late of the British Museum (Natural History), who discovered paratacamite. Type material is in the Natural History Museum, London, UK.

Discussion. The formula and density were calculated from the data in the paper. Paratacamite, which forms a solid solution with herbertsmithite, is defined as Cu₃(Cu,M²⁺)(OH)₆Cl₂, with $M^{2+} = \sim 0.33-0.5$, space group $R\bar{3}$, $Z = 24$, with pronounced $R\bar{3}m$ substructure. **E.S.G.**

JACQUESDIETRICHITE*

A.R. Kampf, G. Favreau (2004) Jacquesdiétrichite, Cu₂[BO(OH)₂](OH)₃, a new mineral from the Tachgagalt mine, Morocco: Description and crystal structure. *Eur. J. Mineral.*, 16, 361-366.

The mineral occurs as bright blue blades, intergrowth tablets, and scales, with the blades up to 0.5 mm long and 0.02 mm in thickness; {001} is dominant and is bounded by {100} and {010}. Vitreous luster, pale blue streak, irregular fracture, blades slightly flexible, $H = 2$, perfect {100} and good {010} and {001} cleavages, nonfluorescent, rapidly soluble in dilute HCl, $D_{\text{meas}} = 3.28(5)$, $D_{\text{calc}} = 3.303 \text{ g/cm}^3$ for $Z = 4$. Optically biaxial negative, $\alpha = 1.627(2)$, $\beta = 1.699(2)$, $\gamma = 1.769(2)$, $2V_{\text{calc}} = 86^\circ$, no dispersion, orientation $X = a$, $Y = c$, $Z = b$; pronounced pleochroism, $X =$ deep blue, $Y =$ medium blue, $Z =$ pale blue. Electron microprobe analysis gave CuO 72.68, CaO 0.11, SiO₂ 1.00 wt%, but the mineral is unstable and no empirical formula was calculated. Single-crystal X-ray structure study ($R = 0.0657$) showed the mineral to be identical to synthetic Cu₂[BO(OH)₂](OH)₃; orthorhombic, space group $Pnma$, $a = 9.455(2)$, $b = 5.866(2)$, $c = 8.668(2) \text{ \AA}$. Strongest lines of a Gandolfi powder pattern (114 mm, CuK α radiation) are 4.734(100,200), 3.941(90,102), 2.545(45,302), 2.489(50,220), and 1.922(50,322).

The mineral, which is thought to be of hydrothermal origin, is associated with henritermierite, gaudefroyite, and calcite in the Tachgagalt vein Mn deposit near Ouarzazate, Morocco, at which the occurrences are in small cavities in gaudefroyite-calcite rock and as inclusions in calcite. The new mineral name is for French geologist Jacques Emile Dietrich (b. 1926), who collected the specimens. Type material is in the Natural History Museum of Los Angeles County, California. **J.L.J.**

LARISAITE*

N.V. Chukanov, D.Yu. Pushcharovsky, M. Pasero, S. Merlino, A.V. Barinova, S. Möckel, I.V. Pekov, A.E. Zadov, V.T. Dubinchuk (2004) Larisaite, Na(H₂O)(UO₂)₃(SeO₃)₂O₂·4H₂O, a new uranyl selenite mineral from Repete mine, San Juan County, Utah, U.S.A. *Eur. J. Mineral.*, 16, 367-374.

The mineral occurs as canary-yellow lamellar crystals, with {010} dominant and up to 1 mm long, and as radial aggregates up to 2 mm across. Most crystals are rough and corrugated. Electron microprobe analysis gave Na₂O 2.04, K₂O 0.69, CaO 0.23, UO₃

72.19, SeO₂ 18.12, H₂O (Penfield method) 7.64, sum 100.91 wt%, corresponding to Na_{0.81}K_{0.18}Ca_{0.05}(H₃O)_{0.73}(UO₂)_{3.09}(SeO₃)₂O₂·4.1H₂O, idealized as in the title. Transparent to translucent, vitreous luster, pearly on cleavage faces, yellow streak, $H = 1$, uneven fracture, perfect {010} cleavage, green fluorescence in UV light at 250 nm, $D_{\text{calc}} = 4.46 \text{ g/cm}^3$ for the empirical formula and $Z = 2$. The mineral is sectile, and grinding destroys the structure. Optically biaxial negative, $\alpha = 1.597(2)$, $\beta = 1.770(5)$, $\gamma = 1.775(5)$, $2V_{\text{meas}} = 20^\circ$, strong dispersion $r < v$, orientation $X = b$, Z parallel to the elongation; pleochroism $Y, Z = \text{yellow} > X = \text{light greenish yellow}$. Single-crystal X-ray structure study ($R = 0.067$) indicated monoclinic symmetry, space group $P11m$; $a = 6.968(2)$, $b = 7.670(5)$, $c = 17.254(6) \text{ \AA}$, $\gamma = 90.29(3)^\circ$ as refined from a Gandolfi powder pattern (114 mm, CuK α radiation) with strongest lines of 8.63(43,002), 7.67(100,010), 3.85(40,113,020,113), 3.107(77,211), and 2.874(53,006,115). The structure has similarities to that of guilleminite.

The mineral is a supergene product associated with montmorillonite, quartz, haynesite, wölsendorfite, andersonite, uranophane, gypsum, and calcite in Upper Jurassic sedimentary rocks at the Repete mine near Blanding, San Juan County, Utah. The new mineral name is for Russian mineralogist Larisa N. Belova (1923–1998). Type material is in the Freiberg University of Mining and Technology, Freiberg, Germany. **J.L.J.**

MANGANOKUKISVUMITE*

R.A. Gault, T.S. Ercit, J.D. Grice, J. Van Velthuisen (2004) Manganokukisvumite, a new mineral species from Mont Saint-Hilaire, Quebec. *Can. Mineral.*, 42, 781–785.

The mineral forms fan-shaped to radial groups in which crystals are sword-shaped, flattened on {100}, elongate [001] to 0.5 mm, showing {100}, {010}, and a prism. Colorless, transparent, vitreous luster, white streak, splintery fracture, $H = 5\frac{1}{2}$ –6, no cleavage, sectile and slightly flexible, no twinning, nonfluorescent, $D_{\text{meas}} = 2.86(1)$, $D_{\text{calc}} = 2.88 \text{ g/cm}^3$ for the empirical formula and $Z = 2$. Optically biaxial negative, $\alpha_{\text{calc}} = 1.657$, $\beta = 1.744(3)$, $\gamma = 1.792(3)$, $2V_{\text{meas}} = 70^\circ$, no dispersion, orientation $X = a$, $Y = b$, $Z = c$. Electron microprobe analysis gave Na₂O 15.61, K₂O 0.21, CaO 0.08, MgO 0.26, MnO 5.48, FeO 0.57, ZnO 0.00, Al₂O₃ 0.16, Ce₂O₃ 0.18, TiO₂ 26.90, SiO₂ 41.74, Nb₂O₅ 0.68, H₂O (calc.) 6.25, sum 98.12 wt%, corresponding to (Na_{5.81}K_{0.05}Ca_{0.02}Ce_{0.01})_{Σ5.89}(Mn_{0.89}Fe_{0.09}Mg_{0.01}Al_{0.04})_{Σ1.09}(Ti_{3.88}Nb_{0.06})_{Σ3.94}Si_{8.01}O₂₈·4H₂O, ideally Na₆MnTi₄Si₈O₂₈·4H₂O, which is the Mn-dominant analog of kukisvumite (orthorhombic, space group $Pccn$). Indexing of a Debye–Scherrer powder pattern (114 mm, CuK α radiation) gave $a = 29.05(2)$, $b = 8.612(6)$, $c = 5.220(4) \text{ \AA}$; strongest lines are 14.47(100,200), 6.43(20,310), 3.025(40,910,421), and 2.881(20,521).

The mineral formed in small cavities in an albite-rich syenite breccia at the Poudrette quarry, Mont Saint-Hilaire, Rouville County, Quebec. Among the associated minerals are aegirine, microcline, albite, annite, pyrite, pyrrhotite, natrolite, and calcite. Two analyses are also listed for zoned crystals from Mount Kukisvumchorr, Khibiny massif, Russia, which have a manganokukisvumite core and a kukisvumite (i.e., Zn-dominant) rim. Type manganokukisvumite is in the Canadian Museum of Nature, Ottawa. **J.L.J.**

MONALBITE

Xiuling Wu, Dawei Meng, Yiyang Han (2004) Occurrence of “monalbite” in nature: a TEM study. *Earth Planet. Sci. Lett.*, 222, 235–241.

The monoclinic Na-dominant analog of sanidine is known as a synthetic compound referred to as “monalbite.” The compound has been detected, on a submicrometer scale, coexisting with albite in jadeite quartzite in an ultra high-pressure terrane at Shuanghe, Dabie Mountains, China (long. 116° 24' 16" E, lat. 30° 39' 02" N). The average composition of the “monalbite” is stated to be about Na_{0.74}Fe_{0.04}Al_{0.94}Si_{3.08}O₈, with the Fe a contaminant from the sample holder. SAED patterns gave $a = 8.29(3)$, $b = 12.97(3)$, $c = 7.15(3) \text{ \AA}$, $\beta = 116.2(1)^\circ$, systematic extinctions consistent with space group $C2/m$; the results are in good agreement with data for the synthetic analog. **J.L.J.**

NESKEVAARITE-Fe*

N.V. Chukanov, V.V. Subbotin, I.V. Pekov, A.E. Zadov, A.I. Tsepin, K.A. Rozenberg, R.K. Rastsvetaeva, G. Ferraris (2003) Neskevaarite-Fe — NaK₃Fe(Ti,Nb)₄(Si₄O₁₂)₂(O,OH)₄·6H₂O, a new labuntsovite group mineral. *New Data on Minerals*, 38, 9–14.

The mineral occurs as brownish to yellowish brown prismatic crystals, up to 1.8 cm long and 1 mm thick, some showing longitudinally striated prisms {201}, with {100}, {101}, and less commonly {010} and {021}. Vitreous luster, translucent, brittle, white streak, $H = 5$, uneven fracture, no cleavage, microtwinning on (001) and (401), $D_{\text{meas}} = 2.88(3)$, $D_{\text{calc}} = 2.90 \text{ g/cm}^3$ for $Z = 2$. Optically biaxial positive, $\alpha = 1.677(1)$, $\beta = 1.684(2)$, $\gamma = 1.790(5)$, $2V_{\text{meas}} = 25(10)^\circ$, almost nonpleochroic, orientation $Y = b$. Electron microprobe analysis gave Na₂O 3.10, K₂O 88.3, BaO 3.37, MgO 0.75, MnO 0.50, FeO 1.82, SiO₂ 39.29, TiO₂ 15.08, Nb₂O₅ 17.96, H₂O (TGA) 9.26, sum 99.96 wt%, which for [Si₄O₁₂]₂(O,OH)₄ corresponds to Na_{1.22}K_{2.29}Ba_{0.26}(Fe_{0.31}Mg_{0.23}Mn_{0.09})_{Σ0.63}(Ti_{2.31}Nb_{1.65})_{Σ3.96}(Si₈O₂₄)[O_{2.78}(OH)_{1.22}]_{Σ4}·5.68H₂O, simplified as NaK₃Fe(Ti,Nb)₄(Si₄O₁₂)₂(O,OH)₄·6H₂O. Single-crystal X-ray structure study (*Am. Mineral.*, 89, p. 1829, 2004) indicated monoclinic symmetry, space group Cm , $a = 14.450(6)$, $b = 13.910(6)$, $c = 7.836(4) \text{ \AA}$, $\beta = 117.42(1)^\circ$, gutkovaite structural type in the labuntsovite group. Strongest lines of the X-ray powder pattern (FeK α radiation) are 6.93(100,020,001), 4.93(80,021), 3.21(100,400,421,402), 3.11(90,041,022), 2.62(60,151,241, 242,202), and 2.49(50,441,401,403).

The new mineral is associated with dolomite, calcite, phlogopite, fluorapatite, pyrite, pyrrhotite, chalcopyrite, serpentine, and nenadkevichite that occur in carbonatite veins at Neskevaara Hill, in the central part of the Vuoriyarvi complex, Northern Karelia, Russia. The new mineral name is for the holotype locality and the prevalence of Fe at the indicated crystal-structure site. The mineral also occurs with calcite, labuntsovite-Fe, donnayite-(Y), and bitumen within a vein of K-feldspar and calcite at the Kirovskii apatite mine, Mount Kukisvumchorr, Khibiny alkaline massif, Kola Peninsula, Russia. Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

NEVADAITE*

M.A. Cooper, F.C. Hawthorne, A.C. Roberts, E.E. Foord, R.C. Erd, H.T. Evans Jr., M.C. Jensen (2004) Nevadaite, $(\text{Cu}^{2+}, \square, \text{Al}, \text{V}^{3+})_6[\text{Al}_8(\text{PO}_4)_8\text{F}_8](\text{OH})_2(\text{H}_2\text{O})_{22}$, a new phosphate mineral species from the Gold Quarry mine, Carlin, Eureka County, Nevada: description and crystal structure. *Can. Mineral.*, 42, 741–752.

The mineral occurs as pale green to turquoise radial clusters, spherules, and drusy prismatic crystals, elongate [001] and up to 1 mm long. Electron microprobe analysis gave CuO 9.24, ZnO 0.11, Al_2O_3 27.07, Fe_2O_3 0.07, V_2O_5 4.24, P_2O_5 32.54, H_2O (calc.) 23.48, F 9.22, O = F 3.88, sum 102.09 wt%, corresponding to $(\text{Cu}_{2.00}^{2+}\text{Zn}_{0.02}\text{Al}_{1.15}\text{V}_{0.98}^{3+}\text{Fe}_{0.01}^{3+})_{\Sigma 4.16}\text{Al}_8\text{P}_{7.90}\text{O}_{32}[\text{F}_{8.37}(\text{OH})_{1.63}]_{\Sigma 10}(\text{H}_2\text{O})_{21.65}$, with the end-member composition $\text{Cu}_2^+\square_2\text{Al}_2(\text{OH})_2(\text{H}_2\text{O})_{22}[\text{Al}_8(\text{PO}_4)_8\text{F}_8]$. Vitreous luster, pale blue streak, brittle, conchoidal fracture, no cleavage or parting, $H = 3$, nonfluorescent, $D_{\text{meas}} = 2.54$, $D_{\text{calc}} = 2.55$ g/cm³ for $Z = 1$. Optically biaxial positive, $\alpha = 1.540$, $\beta = 1.548$, $\gamma = 1.553$, $2V_{\text{meas}} = 76$, $2V_{\text{calc}} = 76^\circ$, orientation $X = c$, $Y = a$, $Z = b$, moderate pleochroism, $X =$ pale greenish blue, $Y =$ very pale greenish blue, $Z =$ blue, $Z \gg X > Y$. Single-crystal X-ray structure study ($R = 0.040$) indicated orthorhombic symmetry, space group $P2_1mn$; $a = 12.122(4)$, $b = 18.961(8)$, $c = 4.951(2)$ Å as refined from a Debye–Scherrer powder pattern (114 mm, $\text{CuK}\alpha$ radiation) with strongest lines of 9.535(80,020), 6.077(100,200), 5.618(90,130), 3.430(40,041), 2.983(60,241), 2.661(40,061), 1.844(40,352), and 1.740(40,641).

The mineral formed as supergene coatings in association with fluellite, wavellite, strengite–variscite, hewettite, torbernite, and other minerals at the open-pit Gold Quarry mine near Carlin, Eureka County, Nevada (hence the new mineral name). Type material is in the Systematic Reference Series housed at the Geological Survey of Canada, Ottawa. **J.L.J.**

ZINCOSPIROFFITE*

Pei-Hua Zhang, Jin-Chu Zhu, Zhen-Hua Zhao, Xiang-Ping Gu, Jin-Fu Lin (2004) Zincospiroffite, a new tellurite mineral species from the Zhongshangou gold deposit, Hebei Province, People's Republic of China. *Can. Mineral.*, 42, 763–768.

Three homogeneous aggregates of the mineral, amounting to $400 \times 4000 \mu\text{m}^2$ and with the largest area $15 \times 350 \mu\text{m}$, were observed in a polished section of oxidized gold ore. Electron microprobe analysis gave CaO 0.02, MnO 0.01, MgO 0.24, FeO 0.20, ZnO 24.57, PbO 1.64, Au_2O 0.11, SO_2 0.03, SeO_2 0.17, TeO_2 71.90, sum 98.89 wt%, corresponding to $(\text{Zn}_{1.97}\text{Pb}_{0.05}\text{Mg}_{0.04}\text{Fe}_{0.02})_{\Sigma 2.08}(\text{Te}_{2.95}\text{Se}_{0.01})_{\Sigma 2.96}\text{O}_8$, ideally $\text{Zn}_2\text{Te}_3\text{O}_8$, which is the Zn-dominant analog of spiroffite. Gray color, vitreous luster, translucent, dark green streak, soft, brittle, uneven fracture, $D_{\text{calc}} = 5.57$ g/cm³ for $Z = 4$. Weakly anisotropic in reflected light, no internal reflection, weakly birefractant and pleochroic. Representative reflectance percentages (SiC standard, air) for R_{min} and R_{max} are 7.0, 7.5 (470 nm), 7.1, 7.3 (546), 6.1, 6.2 (589), and 4.4, 5.0 (650). Raman spectra indicate an absence of H_2O , and are in good agreement with the spectrum of synthetic $\text{Zn}_2\text{Te}_3\text{O}_8$. An X-ray powder pattern (114 mm Debye–Scherrer, $\text{CuK}\alpha$ radiation) yielded six weak lines and one of medium

intensity: 4.758(110), 3.240(11 $\bar{1}$), 2.928(m,113), 2.820(20 $\bar{4}$), 2.155(023,511), 1.985(223), and 1.599(42 $\bar{5}$), from which $a = 12.72$, $b = 5.15$, $c = 11.82$ Å, $\beta = 99.2^\circ$.

The mineral contains blebs of gold and occurs as a rim on, or a replacement of, calaverite. One of the three aggregates in the section is coated by hematite. The new mineral was discovered in ore from the Zhongshangou gold deposit (115° 05' E, 40° 55' N), wherein the Au occurs in Te-bearing quartz veins. The new mineral name recognizes the relationship to spiroffite. Type material is in the Geological Museum of China, Beijing. **J.L.J.**

AuS, RhI₃, (Cu,Au,Ag)₄Zn

O.A. Bogatikov, A.V. Mokhov, P.M. Kartashov, A.I. Gorshkov, L.O. Magazina, N.A. Ashikhmina, E.V. Koporulina (2004) Microparticles of ore minerals in the lunar regolith from Mare Fecunditatis: $(\text{Cu,Au,Ag})_4\text{Zn}$, Ag, Au, Sn, Pb, Sb, Re, MoS_2 , CdS, AuS, and RhI_3 . *Doklady Earth Sci.*, 395A, 445–452.

SEM energy-dispersion analyses of the finest fraction of lunar regolith recovered by Luna-16 revealed the presence of numerous native minerals, such as iron, silver, gold, tin, and others as indicated in the title of the paper. One of three analyses listed for an alloy that occurs as 1–2 μm particles corresponds to $(\text{Cu}_{2.77}\text{Au}_{0.89}\text{Ag}_{0.35})_{\Sigma 4.01}\text{Zn}_{0.99}$, generalized as $(\text{Cu,Au,Ag})_4\text{Zn}$. Another particle, 0.5 μm in size, gave Au 84.85, Cu 1.51, S 13.64 wt%, corresponding to $(\text{Au}_{0.98}\text{Cu}_{0.05})\text{S}_{0.9}$, ideally AuS, which is known as a synthetic compound. Analysis of a micrometer-size particle on a silicate fragment gave, after normalization and deduction of Al assumed to be from the aluminum stub, Rh 22.39, I 78.61 wt%, corresponding to $\text{Rh}_{1.04}\text{I}_{2.96}$, ideally RhI_3 . **J.L.J.**

SODIUM-STRONTIUM MICA

N.I. Bryanchaninova, A.B. Makeyev, N.V. Zybikova, V.N. Filipov (2004) Sodium-strontium mica— $\text{Na}_{0.50}\text{Sr}_{0.25}\text{Al}_2(\text{Na}_{0.25}\square_{0.75})\text{Al}_{1.25}\text{Si}_{2.75}\text{O}_{10}(\text{OH})_2$ from Rubinovyy Log. *Doklady Akad. Nauk*, 395, 101–107 (in Russian).

The mineral forms flakes, scales, and finely scaly aggregates in margins roughly 0.1 mm thick around corundum (ruby). Sixteen electron microprobe analyses gave SrO contents ranging from 3.06 to 6.02 wt%, and the analysis with the highest SrO content is SiO_2 38.27, Al_2O_3 40.57, Cr_2O_3 2.71, FeO 0.62, CaO 1.32, SrO 6.02, Na_2O 3.04, K_2O 0.54, sum 93.09 wt%, corresponding to $(\text{Na}_{0.40}\text{Sr}_{0.24}\text{Ca}_{0.10}\text{K}_{0.05})_{\Sigma 0.79}(\text{Al}_{1.91}\text{Cr}_{0.15}\text{Fe}_{0.04})_{\Sigma 2.10}(\text{Si}_{2.63}\text{Al}_{1.37})_{\Sigma 4.00}\text{O}_{10}(\text{OH})_2$ for 12 anionic charges, but the ideal formulation, $\text{Na}_{0.50}\text{Sr}_{0.25}\text{Al}_2(\text{Na}_{0.25}\square_{0.75})\text{Al}_{1.25}\text{Si}_{2.75}\text{O}_{10}(\text{OH})_2$ was chosen because of crystallographic evidence for Na in the octahedral sheet. Transparent, light emerald-green color, $H = 4$, $VHN = 217(37)$, perfect {001} cleavage, uneven fracture, $D_{\text{meas}} = 3.07(3)$, $D_{\text{calc}} = 2.99$ g/cm³ for $Z = 4$, not fluorescent or cathodoluminescent. Optically biaxial negative, $\alpha = 1.642(2)$, $\beta = 1.635(2)$, $\gamma = 1.598(2)$, $2V_{\text{meas}} = 60$ – 80° , $2V_{\text{calc}} = 70^\circ$. Pleochroism $X =$ pale green, $Z =$ yellowish green. Positive elongation; straight extinction. The infrared spectrum has features at 3625, 3450, 1008, 716, 544, and 488 cm^{-1} . There are endothermic effects at 850 and 1100 °C. Single-crystal X-ray structure study ($R = 0.073$) showed the mineral to have monoclinic symmetry, space group $C2/c$, polytype $2M_1$, $a = 5.161(4)$, $b = 8.907(7)$, $c = 19.31(2)$ Å,

$\beta = 94.83(8)^\circ$. The strongest lines of powder pattern (camera) are 9.63(30), 4.34(100), 3.13(90), 2.50(100), 2.07(80), 1.893(80), 1.591(80), 1.469(100), 1.018(80), and 1.008(80).

The mineral occurs in plagioclase in the Rubinovyy Log (Ruby Ravine) prospect, which is on the left bank of the Markar-Ruz' River, Polar Urals, Russia. This area has economic Cr deposits associated with the Rayizskiy ultramafic massif. Associated minerals include corundum (ruby), albite, phlogopite, pargasite, and chromite.

Discussion. Loss on ignition at 1000 °C of a bulk sample was 6.02 wt%, but the ideal H₂O content calculated for the above analysis is 4.37 wt%, giving a total of 97.46 wt%. No specifics are provided on the structural refinement or the crystallographic evidence for Na in the octahedral sheet. Because wt% SrO exceeds wt% Na₂O, the authors propose that the mineral is new. However, Na > Sr in the interlayer site no matter how the formula is written, and the mineral is not a distinct species. The authors quote Milan Rieder as naming the mica a "strontian octa-sodian brammallite", which would be an appropriate name for a mineral having the formula calculated for the composition highest in SrO and assuming the division between true and interlayer-deficient micas is based on total interlayer cations, not interlayer positive charges. However, the other three analyses given in the paper correspond to strontian paragonite because total interlayer cations are 0.85–0.89. The hardness and significant proportion of divalent cations on the interlayer site suggest that this mineral is intermediate between true and brittle micas. **E.S.G.**

NEW DATA

CAVOLINITE

J. Binon, E. Bonaccorsi, H.-J. Bernhardt, A.-M. Fransolet (2004)

The mineralogical status of "cavolinite" from Vesuvius, Italy, and crystallochemical data on the davyne subgroup. *Eur. J. Mineral.*, 16, 511–520.

A controversial mineral first described in 1825, "cavolinite" had not been accepted as a valid species by several investigators, who equated it with nepheline, microsommite, and davyne. Powder and Weissenberg X-ray diffraction data of 15 museum specimens (supplemented by single-crystal refinement of one specimen) from the only known locality of the mineral, given as Monte Somma or Vesuvius, Italy, showed six specimens to be quadridavyne, six to be davyne, and three to be scapolite, plagioclase, and anorthoclase. Electron microprobe analyses and Raman spectroscopy of the 12 specimens in the cancrinite group confirmed the identifications of quadridavyne and davyne. **E.S.G.**

CLINOBARYLITE

S.V. Krivovichev, V.N. Yakovenchuk, T. Armbruster, Yu. Mikhailova, Ya.A. Pakhomovsky (2004) Clinobarylite, BaBe₂Si₂O₇: structure refinement, and revision of symmetry and physical properties. *Neues Jahrb. Mineral. Monatsh.*, 2004, 373–384.

Re-investigation of the optical and X-ray diffraction properties of crystals from the type locality showed the mineral to be

orthorhombic rather than monoclinic (*Am. Mineral.*, 89, p. 249, 2004; *Doklady Chem.*, 388, 23–25, 2003). Optically biaxial negative, $\alpha = 1.695(5)$, $\beta = 1.702(5)$, $\gamma = 1.708(8)$, $2V_{\text{calc}} = 85(5)^\circ$, $X = b$, $Y = c$. Single-crystal X-ray structure study ($R_1 = 0.03$) gave orthorhombic symmetry, $Pmn2_1$, with $a = 11.650(10)$, $b = 4.922(4)$, $c = 4.674(4)$ Å, $D_{\text{calc}} = 4.01$ g/cm³ for $Z = 2$. Strongest lines of the powder pattern (57 given, diffractometer, CuK α radiation) are 4.529(20,110), 3.388(56,011), 3.042(26,310), 2.986(28,301), 2.929(58,211), 2.458(100,020), 2.404(22,120), 2.336(31,002), 2.265(20,220), 2.206(20,411), 2.171(20,202), 2.077(23,501,320,112), and 1.532(21,131). Clinobarylite and barylite are framework silicates consisting of chains of BeO₄ tetrahedra parallel to [001] and cross-linked by Si₂O₇ groups. The BeO₄ tetrahedra in a given chain point either up or down [001], as do also the SiO₄ tetrahedra. In clinobarylite all of the structural units have the same orientation, whereas in barylite up-and-down orientations alternate in [100]. Units of like orientation constitute sheets parallel to (100) in barylite, equivalent to (010) in clinobarylite, so that these minerals can formally be considered as the 2O and the 1O polytypes of BaBe₂Si₂O₇, respectively. **E.S.G.**

GAITITE

P. Keller, F. Lissner, T. Schleid (2004) The crystal structures of zincroselite and gaitite: Two natural polymorphs of Ca₂Zn[AsO₄]₂·2H₂O from Tsumeb, Namibia. *Eur. J. Mineral.*, 16, 353–359.

Single-crystal X-ray structure study ($R_1 = 0.018$) of gaitite gave triclinic symmetry, space group $P\bar{1}$, $a = 5.899(1)$, $b = 6.978(1)$, $c = 5.755(1)$ Å, $\alpha = 97.41(3)$, $\beta = 109.08(3)$, $\gamma = 108.09(3)^\circ$, $D_{\text{calc}} = 3.708$ g/cm³ for $Z = 1$. Gaitite is isotypic with collinsite, and zincroselite is isotypic with roselite. **J.L.J.**

PARANATROLITE

Yu.V. Seryotkin, V.V. Bakakin, I.A. Belitsky (2004) The crystal structure of paranatrolite. *Eur. J. Mineral.*, 16, 545–550.

Single-crystal X-ray structure study ($R_1 = 0.0352$) of paranatrolite of composition Na_{1.88}K_{0.22}Ca_{0.06}[Si_{2.76}Al_{2.24}O₁₀]·3.1H₂O, from the Khibiny massif, Kola Peninsula, Russia, indicated the mineral to be monoclinic, space group Cc , $a = 6.5952(12)$, $b = 19.204(3)$, $c = 9.955(2)$ Å, $\beta = 107.737(12)^\circ$, $Z = 4$. **J.L.J.**

DISCREDITED MINERAL

ELFSTORPITE

F. Fontan, D. Holtstam, P. de Parseval, F. Permingeat, B. Mason (2004) Elfstorpite synonymy with allactite; mineral and name discredited. *Mineral. Mag.*, 68, 523–526.

Elfstorpite was originally described in 1893 as a hydrous, pale yellow, transparent Mn arsenate, but re-investigation of the type material and of a specimen from the type locality has shown that the composition, powder X-ray diffraction pattern, and unit-cell parameters of the mineral are very close to those of allactite. The historical priority belongs to allactite, which was described in 1884, and the CNMMN has therefore approved the discreditation of elfstorpite. **E.S.G.**