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New Mineral Names*

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AGARDITE-(Nd)

A.Y. Kunov, R.A. Nakov, C.D. Stanchev (2002) First agardite-(Y), -(Nd), -(La) find in Bulgaria. Neues Jahrb. Mineral. Mon., 107–116.

The mineral occurs as green radial aggregates, up to 2 mm across, consisting of hexagonal prismatic crystals. One of three listed Nd-dominant analyses has CaO 0.55, CuO 42.22, PbO 7.01, Y_2O_3 1.37, Nd_2O_3 3.12, La_2O_3 1.92, H_2O by difference [11.90], sum 100 wt%. The listed X-ray powder pattern is similar to that of agardite-(Y).

Discussion. The general formula of the agardite-type minerals is $ACu_6(AsO_4)_3(OH)_6·3H_2O$, and for AsO_4 = 3 the above analysis corresponds to $(Pb_{0.34}Nd_{0.20}Y_{0.13}La_{0.12}Ca_{0.10})_{\Sigma 0.85}Cu_{5.73}(AsO_4)_3(OH)_{4.73}·4.8H_2O$, which is the Nd-dominant analog of argardite-(Y) and agardite-(La), for which Ca is the dominant cation in A. Re-indexing of the X-ray powder pattern indicates that all of the diffraction lines can be assigned to an agardite-like unit cell. **J.L.J.**

BUSHMAKINITE*

I.V. Pekov, D.A. Kleimenov, N.V. Chukanov, O.V. Yakubovich, V. Massa, D.I. Belakovskiy, L.A. Pautov (2002) Bushmakinite $Pb_2Al(PO_4)(VO_4)(OH)$, a new mineral of the brackebuschite group from the oxidized zone of the Berezovskoye gold deposit, the Middle Urals. Zap. Vseross. Mineral. Obshch., 132(2), 62–71 (in Russian, English abs.).

O.V. Yakubovich, V. Massa, I.V. Pekov (2002) Crystal structure of the new mineral bushmakinite $Pb_2\{(Al,Cu)[PO_4][(V,Cr,P)O_4](OH)\}$. Doklady Akad. Nauk, 382, 388–393 (in Russian).

The average of four listed electron microprobe analyses is PbO 65.95, CuO 2.46, ZnO 0.08, Al_2O_3 5.75, Fe_2O_3 0.05, P_2O_5 11.67, V_2O_5 9.84, As_2O_5 0.06, CrO_3 1.99, SO_3 0.10, sum 97.95 wt%, corresponding to $Pb_{2.02}(Al_{0.77}Cu^{2+}_{0.21}Zn_{0.01})_{\Sigma 0.99}[PO_4][(V^{5+}_{0.74}Cr^{6+}_{0.14}P_{0.12}S_{0.01})_{\Sigma 1.01}O_4](OH)$. The mineral occurs as bright yellow lamellar grains, up to 0.3 × 0.2 × 0.02 mm; vitreous luster, translucent, yellowish streak, brittle, *H* = 3–3½ , perfect {001} cleavage intersected perpendicularly by two others that mutually cross at about 75°, D_{calc} = 6.21 g/cm^3 for *Z* = 2. Optically biaxial negative, α = 1.99(1), β = 2.03(1), γ = 2.06(1), $2V_{calc}$ = 80°, appreciable dispersion *r* < *v*; *Z* is perpendicular to the plane of the main cleavage, which contains *X*, *Y*. Single-crystal X-ray structure study (*R* = 0.049) indicated monoclinic symmetry, space group $P2_1/m$, *a* = 7.734(9), *b* = 5.814(6), *c* = 8.69(1) Å, β = 112.1(1)°. Strongest lines of the powder pattern (57 mm camera, Fe*K*α radiation) are 4.68(80,011), 3.57(50,111,200), 3.21(100, $21\bar{1}$), 2.91(80, 212.020, $10\bar{3}$), 2.71(70,021,122), and 2.05(50,$12\bar{3}$,$11\bar{4}$).

The mineral, which is a new member of the brackebuschite group, is associated with cerussite, bindheimite, vauquelinite, mottramite, and pyromorphite that formed by oxidation of galena and tetrahedrite in a quartz vein at the Berezovskoye gold deposit, Middle Urals, Russia. The new mineral name is for Russian mineralogist Anatoliy F. Bushmakin (1947–1999), in recognition of his work on the mineralogy of the aforementioned deposit. Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

COBALTARTHURITE*

J.L. Jambor, J. Viñals, L.A. Groat, M. Raudsepp (2002) Cobaltarthurite, $Co^{2+}Fe^{3+}_2(AsO_4)_2(OH)_2·4H_2O$, a new member of the arthurite group. Can. Mineral., 40, 725–732.

M. Raudsepp, E. Pani (2002) The crystal structure of cobaltarthurite, $Co^{2+}Fe^{3+}_2(AsO_4)_2(OH)_2·4H_2O$: a Rietveld refinement. Can. Mineral., 40, 733–737.

The mineral occurs as globular to coalesced pellet-like aggregates, up to 1.5 mm across, that locally contain dark brown massive material but consist mainly of straw-yellow to dark brown aggregates of fibrous crystals, each up to 75 μm long and 2–3 μm wide. Electron microprobe analysis (brown massive) gave MgO 0.89, MnO 1.14, CoO 7.06, CuO 0.20, Fe_2O_3 31.88, As_2O_5 42.57, P_2O_5 0.56, SO_3 0.07, H_2O (calc.) 16.64, sum 101.01 wt %, corresponding to $(Co_{0.50}Mg_{0.12}Fe^{3+}_{0.11}Mn_{0.08}Cu_{0.01}\square_{0.11})_{\Sigma 0.93}Fe^{3+}_2[(AsO_4)_{1.95}(PO_4)_{0.04}(SO_4)_{0.01}]_{\Sigma 2.00}(OH)_{1.74}·4H_2O$, ideally $Co^{2+}Fe^{3+}_2(AsO_4)_2(OH)_2·4H_2O$. Vitreous to silky luster, brittle, translucent, nonfluorescent, white to light brown streak, readily soluble in 1:1 HCl, *H* = 3½–4, D_{meas} = 3.22(2), D_{calc} = 3.179 g/cm^3 (brown massive) for the empirical formula and Z = 2. Optically biaxial positive with parallel extinction, α = 1.741, β = 1.762, γ = 1.797, $2V_{calc}$ = 77°, Z = ~*c*, distinctly pleochroic, *X* = colorless, *Z* = medium yellow, *Z* > *X*,*Y*. Rietveld-refined X-ray structure study (*R* = 0.077) indicated monoclinic symmetry, space group $P2_1/c$ (on the basis of analogy with other members of the arthurite group); *a* = 10.27, *b* = 9.72, *c* = 5.545 Å, β = 94.46° as refined from a 114 mm Debye–Scherrer

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* 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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powder pattern (Co$K\alpha$ radiation) with strongest lines of 10.2(95,100), 7.04(100,110), 4.81(65,001), 4.24(60,111), 2.89(25,221), and 2.87(55,311).

The mineral, which is the Co-dominant member of the arthurite group and is named to reflect this relationship, is closely associated with pharmacosiderite in a near-surface, sulfide-depleted lens (Dolores showing) near Pastrana (a village about 10 km east of Mazarrón), Province of Murcia, southeastern Spain. Other associated oxidation minerals are conichalcite, olivenite, jarosite, arseniosiderite, scorodite, malachite, azurite, chlorargyrite, mixite, and lavendulan. Type material is in the Canadian Museum of Nature, Ottawa. **A.C.R.**

HOGANITE*, PACEITE*

D.E. Hibbs, U. Kolitsch, P. Leverett, J.L. Sharpe, P.A. Williams (2002) Hoganite and paceite, two new acetate minerals from the Potosi mine, Broken Hill, Australia. Mineral. Mag., 66, 459–464.

Hoganite

Two atomic absorption and CHN analyses averaged C 23.85, H 3.95, Cu 31.6, Fe 0.4, O (by difference) 40.2, sum 100 wt%, which for C = 4 corresponds to $C_4H_{7.89}O_{5.07}Cu_{1.00}Fe_{0.01}$, ideally $C_4H_8O_5Cu$. The mineral forms dark bluish green prismatic crystals that are thickly tabular and up to 0.6 mm long; vitreous luster, transparent, brittle, pale blue streak, conchoidal fracture, H = 1½, perfect {001} and distinct {110} cleavages in synthetic material, nonfluorescent, soluble in water, D_{calc} = 1.910 g/cm^3 for Z = 8. Optically biaxial positive, $\alpha = 1.533(2)$, $\beta = 1.541(3)$, $\gamma = 1.554(2)$, $2V_{meas} = 85(5)$, $2V_{calc} = 76.8°$, medium dispersion $r < v$, strong pleochroism, X = blue, Y = pale bluish, Z = pale bluish green, $X > Y > Z$. Single-crystal X-ray structure study (R = 0.062) indicated monoclinic symmetry, space group $C2/c$; in the $A2/a$ setting, a = 13.845(21), b = 8.528(24), c = 13.197(21) Å, β = 117.1(1)° as refined from a powder pattern (diffractometer, Cu$K\alpha$ radiation) with strongest lines of 6.921(100,011), 6.176(14,200), 3.592(11,$\bar{1}22$), and 3.532(28,202,$\bar{4}02$), in good agreement with data for the synthetic analog. The new mineral name is for mineral collector Graham P. Hogan (b. 1957), who collected the mineral.

Paceite

The mineral occurs on some of the hoganite-bearing specimens as short prismatic tetragonal crystals, up to 1 mm across, and as thin crusts of microcrystals. The average of two chemical analyses by atomic absorption and CHN analyzer is C 21.25, H 5.3, Cu 14.1, Ca 9.0, O (by difference) 50.35, sum 100 wt%, corresponding to $C_8H_{23.77}O_{14.23}Ca_{1.02}Cu_{1.00}$, ideally $C_8H_{24}O_{14}CaCu$. Dark blue color, translucent, vitreous luster, brittle, H = 1½, uneven fracture, perfect {100} and {110} cleavages, readily soluble in water, nonfluorescent, no twinning. Morphological forms are {100}, {001}, and {111}. Synthetic crystals are uniaxial positive, $\omega = 1.439(2)$, $\varepsilon = 1.482(3)$; pleochroism O = bluish with a greenish tint, E = bluish with a grayish tint, $O \geq E$. The crystal structure of the synthetic analog is known; tetragonal, space group $I4/m$. Indexing of the X-ray powder pattern of the mineral gave a = 11.155(4), c = 16.236(17) Å; strongest lines are 9.297(6,101), 8.132(8,002), 7.896(100,110), 5.586(15,200), and 3.50(20,310,204, 312). The new mineral name is for mineral collector Frank L. Pace (b. 1948), who drew the authors' attention to the existence of the minerals now called hoganite and paceite.

Hoganite and paceite are associated with goethite, hematite, quartz, linarite, malachite, azurite, cerussite, and smithsonite in gossan containing decaying leaf litter at the Potosi open pit, Broken Hill, New South Wales, Australia. Type specimens of both new minerals are in the Museum of Victoria, Melbourne, Australia. **J.L.J.**

LAFLAMMEITE*

A.Y. Barkov, R.F. Martin, T.A.A. Halkoaho, A.J. Criddle (2002) Laflammeite, $Pd_3Pb_2S_2$, a new platinum-group mineral species from the Penikat layered complex, Finland. Can. Mineral., 40, 671–678.

One of two listed electron microprobe analyses has Pd 39.16, Ir 1.08, Pb 52.01, S 7.90, sum 100.15 wt%, corresponding to $(Pd_{2.96}Ir_{0.05})_{\Sigma 3.01}Pb_{2.02}S_{\Sigma 1.98}$, ideally $Pd_3Pb_2S_2$. The mineral occurs as subhedral platelets up to 300 m in longest dimension; opaque, metallic luster, brittle, dark gray streak, perfect cleavage that is possibly {010}, VHN_{50} = 156–185, H = 3½, finely twinned, D_{calc} = 9.41 g/cm^3 for Z = 4. Cream color with a brownish tint in reflected light, weak anisotropy, rotation tints brownish gray to grayish brown, weak bireflectance, nonpleochroic; representative reflectance percentages (WTiC standard) for R_1 and R_2 in air and in oil are respectively, 45.3, 46.2, 31.55, 32.45 (470 nm), 46.5, 47.55, 32.6, 33.75 (546), 47.7, 48.8, 33.9, 35.05 (589), and 49.6, 50.0, 36.0, 36.3 (650). Indexing of the X-ray powder pattern (114 mm Debye–Scherrer, Cu$K\alpha$ radiation) indicated monoclinic symmetry, a = 11.521(11), b = 8.294(10), c = 8.321(6) Å, β = 134.38(5)°, inferred space group $C2/m$, possibly isostructural with parkerite. Strongest lines are 5.953(60,001), 4.144(100,020), 2.917(90,220), 2.413(80,022), and 2.365(70,$\bar{4}22$).

The mineral is associated with vysotskite and other PGM in altered pyroxenite at the Kirakkajuppura PGE deposit in the Penikat layered complex, Finland. The new mineral name is for J.H. Gilles Laflamme (b. 1947) of CANMET, Ottawa, who has contributed to the characterization of numerous PGM. Type material is in the Canadian Museum of Nature, Ottawa. **J.L.J.**

MEGAKALSILITE*

A.P. Khomyakov, G.N. Nechelyustov, E. Sokolova, E. Bonaccorsi, S. Merlino, M. Pasero (2002) Megakalsilite, a new polymorph of $KAlSiO_4$ from the Khibina alkaline massif, Kola Peninsula, Russia: mineral description and crystal structure. Can. Mineral., 40, 961–970.

The mineral occurs as a corroded, anhedral grain, 2 × 3 mm, in a single hand-specimen from Mount Koashva, Khibina massif. Electron microprobe analysis gave Na_2O 0.02, K_2O 29.73, FeO 0.04, Al_2O_3 32.38, SiO_2 37.96, TiO_2 0.01, sum 100.14 wt%, corresponding to $K_{0.997}Na_{0.001}Fe_{0.001}Al_{1.003}Si_{0.998}O_4$, ideally $KAlSiO_4$. Colorless, transparent, vitreous luster, brittle, white streak, conchoidal fracture, H = 6, D_{meas} = 2.58(2), D_{calc} =

2.62 g/cm^3 for $Z = 24$, pale whitish green fluorescence in ultraviolet light at 240–400 nm. Optically uniaxial negative, $\omega = 1.538(1)$, $\varepsilon = 1.531(1)$. Single-crystal X-ray structure study ($R = 0.0382$) indicated hexagonal symmetry, space group $P6_3$; $a = 18.104(3)$, $c = 8.467(2)$ Å as refined from a Debye–Scherrer powder pattern (114 mm, Fe$K\alpha$ radiation) with strongest lines of 3.18(50,141), 3.091(100,222), 2.612(70,060), 1.674 (50,173), 1.585(50,282), 1.516(50,145,660), 1.240(60, 4.10.1,066,583), and 1.204(50,4.10.2,285).

The mineral is intergrown with cancrinite, sodalite, and natrite in a specimen of hyperagpaitic pegmatite. The new mineral name alludes to the large unit cell relative to that of kalsilite, which is the most common modification of $KAlSiO_4$ in nature. Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

MENSHIKOVITE*

A.Y. Barkov, R.F. Martin, Y.A. Pakhomovsky, N.D. Tolstykh, A.P. Krivenko (2002) Menshikovite, $Pd_3Ni_2As_3$, a new platinum-group mineral species from two layered complexes, Russia. Can. Mineral., 40, 679–692.

The mineral occurs as grains up to 200 m; brittle, no cleavage, $VHN_{40} = 501–554$, $H = \sim 5$, $D_{calc} = 5.32$ g/cm^3 for $Z = 2$, 10.65 g/cm^3 for $Z = 4$. Pink with a slight grayish tint in reflected light, no bireflectance, weak mosaic-like anisotropy that is probably related to twinning; rotation tints light gray to brownish gray. Representative reflectance percentages (Lukkulaisvaara occurrence, Russia) for R_1 and R_2 in air and in oil are, respectively, 48.4, 50.2, 38.5, 39.3 (470 nm), 51.2, 53.2, 41.0, 41.8 (546), 53.2, 55.3, 42.3, 43.3 (589), and 56.6, 58.7, 46.6, 47.8 (650). Compositional data and occurrences were abstracted in *Am. Mineral.*, 86, p. 939 (2000); an additional locality is the Oktyabr' deposit, Noril'sk, Russia. Indexing of the X-ray powder pattern (114 mm Debye–Scherrer camera, Fe$K\alpha$ radiation) indicated hexagonal symmetry, possible space group $P6_3/m$, $P6_3$, or $P6_322$; $a = 8.406(4)$, $c = 6.740(4)$ Å, and strongest lines are 2.626(100,112), 2.477(100,202), 2.429 (80,300), 2.283(70,301), 1.978(70,113), 1.818(70,400), and 1.781(70,222). Solid solution with majakite is indicated by compositional data. Type material (Lukkulaisvaara, Karelia, Russia) is in the Fersman Mineralogical Museum, Moscow. The new mineral name is for Yurii P. Men'shikov (b. 1934) of the Geological Institute of the Kola Science Center, Apatity, Russia. **J.L.J.**

MOËLOITE*

P. Orlandi, A. Meerschaut, P. Palvadeau, S. Merlino (2002) Lead-antimony sulfosalts from Tuscany (Italy). V. Definition and crystal structure of moëloite, $Pb_6Sb_6S_{14}(S_3)$, a new mineral from the Ceragiola marble quarry. Eur. J. Mineral., 14, 599–606.

The mineral occurs as needle-like crystals, elongate [010] and up to 0.1 × 0.1 × 5 mm, and as plumose aggregates of similar length. Electron microprobe analysis gave Pb 49.94, Sb 29.47, S 21.76, sum 101.17 wt%, corresponding to $Pb_{6.04}Sb_{6.06}S_{17}$, simplified as $Pb_6Sb_6S_{17}$. Metallic luster, grayish black to brownish red color, brown streak, flexible in fibers, H not determinable, $D_{calc} = 5.86$ g/cm^3 for $Z = 2$. White in reflected light, nonpleochroic, weak bireflectance, moderate anisotropy, rare red internal reflection in oil. Representative reflectance percentages (SiC standard) for R_1 and R_2 in air and in oil are, respectively, 40.0, 37.8, 26.6, 24.2 (470 mm), 38.8, 36.5, 24.9, 22.8 (546), 38.6, 36.7, 23.4, 21.4 (589), and 36.5, 34.7, 21.2, 20.1 (650). Single-crystal X-ray structure study ($R = 0.1304$) indicated orthorhombic symmetry, space group $P2_122_1$, $a = 15.328(3)$, $b = 4.0400(8)$, $c = 23.054(5)$ Å. Strongest lines of a Gandolfi powder pattern are 3.724(55,106,112), 3.427(100,403), 3.047(85,312,214), 2.844(58,503,215), 2.779(70,016,314), 2.017(80,614,020), and 1.733(50,0.1.12, 618,2.0.13,806), in good agreement with data for the synthetic analog.

The mineral is associated with sulfur, pyrite, and enargite in small cavities at the Ceragiola marble quarry near Seravezza, Tuscany, Italy. The new mineral name is for mineralogist Yves Moëlo, who synthesized and characterized the synthetic analog prior to the discovery of the natural counterpart. Type material is in the Museo di Storia Naturale e del Territorio, Università di Pisa, Italy. **J.L.J.**

TEDHADLEYITE*

A.C. Roberts, M.A. Cooper, F.C. Hawthorne, A.J. Criddle, J.A.R. Stirling, G.E. Dunning (2002) Tedhadleyite, $Hg^{2+}Hg^{1+}_{10}O_4I_2(Cl,Br)_2$, a new mineral species from the Clear Creek claim, San Benito County, California. Can. Mineral., 40, 909–914.

The mineral occurs in a quartz-lined vug as anhedral spheroidal masses, up to 0.3 mm in diameter. Dark red to black color, adamantine to submetallic luster, opaque to translucent, brittle, red streak, uneven fracture, poor {010} cleavage, $H = <3$, nonfluorescent, $D_{calc} = 9.43$ g/cm^3 for $Z = 2$. Bluish white in reflected light, no pleochroism or bireflectance, moderately anisotropic; representative reflectance percentages for R_1 and R_2 in air (SiC standard) are 27.20, 30.00 (470 nm), 24.40, 27.60 (546), 22.80, 25.40 (589), and 21.60, 23.90 (650). Electron microprobe analysis gave (with Hg partitioned on the basis of crystal structure) HgO 8.36, Hg_2O 80.50, I 11.11, Cl 2.20, Br 1.62, O ≡ Cl,I,Br 1.36, sum 102.43 wt%, corresponding to $Hg^{2+}_{1.0}Hg^{1+}_{9.8}O_{3.7}I_{2.2}(Cl_{1.6}Br_{0.5})_{\Sigma 2.1}$, ideally $Hg^{2+}Hg^{1+}_{10}O_4I_2(Cl,Br)_2$. Single-crystal X-ray structure study indicated triclinic symmetry, space group $A\overline{1}$; $a = 7.014(4)$, $b = 11.855(6)$, $c = 12.601(6)$ Å, $\alpha = 115.56(4)$, $\beta = 82.57(4)$, $\gamma = 100.57(4)°$ as refined from a Debye–Scherrer powder pattern (114 mm, Cu$K\alpha$ radiation) with strongest lines of 5.281(50,020,$\overline{1}\overline{1}$1), 3.143(90,$\overline{1}\overline{3}$1,2$\overline{2}$2), 3.005(70,$\overline{1}$22), 2.981(50,211), and 2.885(100,113).

The mineral is associated with native mercury, calomel, cinnabar, eglestonite, and montroydite in a quartz-magnesite host at a prospect pit near the former Clear Creek mercury mine, New Idria district, San Benito County, California. The new mineral name is for Ted A. Hadley (b. 1961) of Sunnyvale, California, who participated in the collection of the holotype specimen, now housed in the National Mineral Collection at the Geological Survey of Canada, Ottawa, and in The Natural History Museum, London, UK. **J.L.J.**

TISCHENDORFITE*

C.J. Stanley, A.J. Criddle, H.-J. Förster, A.C. Roberts (2002) Tischendorfite, $Pd_8Hg_3Se_9$, a new mineral species from Tilkerode, Harz Mountains, Germany. Can. Mineral., 40, 739–745.

The mineral occurs as anhedral to subhedral grains, to 100 μm in maximum dimension, within other selenides. Opaque, metallic luster, brittle, black streak, uneven fracture, polishing hardness similar to that of chrisstanleyite, $D_{calc} = 9.13$ for $Z = 2$ and the empirical formula. Electron microprobe analysis gave Pd 39.4, Pt 0.1, Ag 1.0, Cu 0.2, Hg 24.9, Pb 1.4, Se 32.0, sum 99.0 wt%, corresponding to $(Pd_{8.05}Pt_{0.01})_{\Sigma 8.06}(Hg_{2.70}Ag_{0.20}Pb_{0.15}Cu_{0.07})_{\Sigma 3.12}Se_{8.82}$, simplified as $Pd_8Hg_3Se_9$. Cream to slightly beige in reflected light, weak bireflectance, nonpleochroic, no internal reflection, weak to moderate anisotropy, rotation tints of steel blue and greenish brown. Representative reflection percentages (WTiC standard) for R_1 and R_2 in air and in oil are, respectively, 46.8, 51.3, 33.9, 38.3 (470 nm), 49.4, 53.1, 35.9, 39.5 (546), 49.9, 53.25, 36.5, 39.9 (589), and 48.95, 52.55, 35.7, 39.6 (650). Single-crystal X-ray study indicated orthorhombic symmetry, space group *Pmmm*, $P2_1mm$, or $Pm2_1n$; $a = 7.219(3)$, $b = 16.782(7)$, $c = 6.467(5)$ Å as refined from a Debye–Scherrer powder pattern (114 mm, Cu$K\alpha$ radiation) with strongest lines of 4.819(40,101), 4.373(40,130), 2.797 (60,032,122), 2.743(100,151,231,240), 2.325(40,052), 2.116(40,062), and 2.091(100,261).

The mineral is associated with clausthalite, tiemannite, chrisstanleyite, stibiopalladinite, and gold in an ankerite-calcite matrix at the Eskeborn adit near Tilkerode, eastern Harz Mountains, Germany. The new mineral name is for Gerhard Tischendorf (b. 1927), who first recognized the presence of the mineral in the deposit in 1958. Type material is in The Natural History Museum, London, UK, in the Technische Universität Bergakademie, Freiberg, Germany, and elsewhere. **J.L.J.**

$Ca_3(PO_4)_2$ POLYMORPH

X. Xie, M.E. Minitti, M. Chen, H.-K. Mao, D. Wang, J. Shu, Y. Fei (2002) Natural high-pressure polymorph of merrillite in the shock veins of the Suizhou meteorite. Geochim. Cosmochim. Acta, 66, 2439–2444.

The Suizhou L6 chondrite contains shock-produced black melt-veins, up to 0.09 mm wide, within which are ringwoodite, majorite, $NaAlSi_3O_8$ hollandite, and a phosphate mineral that is in unfractured grains, up to 10 × 20 m. Electron microprobe analysis of the phosphate gave TiO_2 0.04, FeO 0.38, MgO 3.28, CaO 46.14, NiO 0.05, Na_2O 2.80, K_2O 0.07, P_2O_5 47.16, sum 100.22 wt%, corresponding to $(Ca_{2.51}Mg_{0.28}Na_{0.28}Fe_{0.03})_{\Sigma 3.10}P_{2.02}O_8$, ideally $Ca_3(PO_4)_2$. The nine diffraction peaks [no intensities given] that were obtained by synchroton X-radiation were indexed with a hexagonal unit cell: 2.892(015), 2.628(110), 2.427(113), 2.073(108), 2.048(024), 2.008(116), 1.945(205), 1.732(1.0.10), and 1.567(125); $a = 5.258(1)$, $c = 18.727(3)$ Å, space group $R\overline{3}m$, analogous to that of synthetic γ-$Ca_3(PO_4)_2$. The Raman spectrum of the mineral is almost identical to that of the synthetic phase. **J.L.J.**

Na-Mg PYROXENE

M.T. Hutchison, M.B. Hursthouse, M.E. Light (2001) Mineral inclusions in diamonds: associations and chemical distinctions around the 670 km discontinuity. Contrib. Mineral. Petrol., 142, 119–126.

Associated with periclase and the tetragonal analog of almandine-pyrope are inclusions of pyroxene in alluvial diamonds from the Juina district, Mato Grosso State, Brazil. One of two listed electron microprobe analyses of the pyroxene has Na_2O 5.95, K_2O 0.03, MgO 16.46, CaO 5.32, FeO 3.62, MnO 1.13, NiO 0.02, Al_2O_3 10.11, Cr_2O_3 1.29, TiO_2 0.01, SiO_2 55.75, sum 99.70 wt%, corresponding to $(Mg_{0.483}Al_{0.375}Fe^{2+}_{0.027}Fe^{3+}_{0.080}Cr_{0.036})_{\Sigma 1.001}(Na_{0.405}Mg_{0.378}Ca_{0.200}Mn_{0.033}K_{0.001})_{\Sigma 1.017}(Si_{1.957}Al_{0.043})_{\Sigma 2.000}O_6$, simplified as $(Na,Mg,Ca)(Mg,Al)Si_2O_6$. Single-crystal X-ray structure study ($R = 0.0516$) indicated monoclinic symmetry, space group $C2/c$, $a = 9.587(4)$, $b = 8.699(6)$, $c = 5.247(4)$ Å, $\beta = 108.33(4)°$. **J.L.J.**

NEW DATA

BISMUTITE, BEYERITE

J.D. Grice (2002) A solution to the crystal structure of bismutite and beyerite. Can. Mineral., 40, 693–698.

Single-crystal X-ray structure study of natural bismutite ($R = 0.0206$) and beyerite ($R = 0.0145$) indicated that both are orthorhombic rather than tetragonal. For bismutite (optically biaxial), $a = 3.865(2)$, $b = 3.862(2)$, $c = 13.675(6)$ Å, space group *Imm*2, $Z = 2$. For beyerite (optically pseudo-uniaxial), $a = 3.7729(5)$, $b = 3.7742(7)$, $c = 21.726$ Å, space group *Immm*, $Z = 2$, twinned parallel to (110). **J.L.J.**

MELIPHANITE, LEUCOPHANITE

J.D. Grice, F.C. Hawthorne (2002) New data on meliphanite, $Ca_4(Na,Ca)_4Be_4AlSi_7O_{24}(F,O)_4$. Can. Mineral., 40, 971–980.

Single-crystal X-ray structure study ($R = 0.025$) of meliphanite from Arøy, Norway, indicated tetragonal symmetry, space group $I\overline{4}$, $a = 10.5257(3)$, $c = 9.8868(4)$ Å. The simplified formula is $Ca_4(Na,Ca)_4Be_4AlSi_7O_{24}(F,O)_4$, wherein Al is essential and is ordered in the layer of tetrahedra. An IR spectrum confirmed the absence of OH. The mineral may be optically uniaxial or anomalously biaxial, with the latter attributable to stress related to twinning. The essential Al distinguishes meliphanite from leucophanite $Ca_4Na_4Be_4Si_8O_{24}F_4$, the latter of which is orthorhombic (*Can. Mineral.*, 27, 193–197, 1989). The triclinic symmetry reported for leucophanite (*Am. Mineral.*, 78, p. 677, 1993) is not representative of the mineral. **J.L.J.**

MENDOZAVILITE

W.D. Birch, A. Pring, K. Wallwork (2002) Mendozavilite from the Fitzgerald River district, Western Australia. Austral. J. Mineral., 8(1), 11–15.

Electron microprobe analysis gave Na_2O 1.07, K_2O 0.35, MgO 0.42, CaO 5.12, SrO 0.36, Fe_2O_3 12.92, P_2O_5 7.70, MoO_3 62.43, H_2O (by difference) 9.63, sum 100 wt%, which for Mo

= 8 corresponds to $(Na_{0.64}Mg_{0.19}K_{0.14})_{\Sigma 0.97}(Ca_{1.68}Sr_{0.06})_{\Sigma 1.74}$ $[Mo^{6+}_{8.00}P^{5+}_{2.00}Fe^{3+}_{2.98}O_{36}(OH)]\cdot nH_2O$, where n = ~9. The formula was cast as betpakdalite-like because the X-ray powder pattern was recognized to be like that of betpakdalite and can be indexed on a monoclinic cell with a = 18.952(2), b = 11.008(2), c = 15.103(2) Å, β = 129.89°. Strongest lines are 11.51(56,001), 9.56(31,$20\bar{1}$), 8.81(100,$11\bar{1}$,110), 4.37(16,220), 3.65 (19,221,400), 3.12(16,113), and 2.993(17,222). The mineral occurs as aggregates in which the individuals are pseudohexagonal tabular crystals up to 0.05 mm across. The formula and unit cell are new. **J.L.J.**

PARANATISITE

E. Sokolova, F.C. Hawthorne (2002) Reconsideration of the crystal structure of paranatisite and the crystal chemistry of $[^{[6]}M_2{}^{[4]}T_2\Phi_{12}]$ sheets. Can. Mineral., 40, 947–960.

Single-crystal X-ray structure study (R = 0.051) of paranatisite from the holotype specimen indicated orthorhombic symmetry, space group $Pmc2_1$, a = 9.181(2), b = 4.800(1), c = 9.811(2) Å, empirical formula $Na_2[TiO(SiO_4)]$, Z = 2. **J.L.J.**