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NEW MINERAL NAMES*

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Bastnaesite group minerals

Z. Maksimovic, Gy. Panto (1983) Mineralogy of yttrium and lanthanide elements in karstic bauxite deposits. Trav. Comite Internatl. Etude Bauxites, Alumine, et Aluminum, 13, 191–200 (in English).

Electron-microprobe analyses are given of secondary phosphates from the lower parts of karstic bauxites from Hungary and Yugoslavia, including bastnaesite-(Ce), bastnaesite-(La), synchysite-(Nd), monazite-(Nd) (see Am. Mineral., 68, 849), neodymian goyazite, and two new members of the bastnaesite group. The minerals occur as fine-grained fracture fillings. The analyses of hydroxyl-bastnaesite-(La) and hydroxyl-bastnaesite-(Nd), yield the following calculated formulas (CO_2 and H_2O calculated, not determined).

$(La_{0.51}Ce_{0.01}Pr_{0.10}Nd_{0.37}Sm_{0.06}Eu_{0.02}Gd_{0.03}Ca_{0.06})_{1.12}(CO_3)_{1.00}(F_{0.11}(OH)_{0.55})$,

$(La_{0.41}Pr_{0.12}Nd_{0.49}Sm_{0.07}Eu_{0.03}Gd_{0.02})_{1.09}(CO_3)_1(F_{0.14}(OH)_{0.57})$,

$(La_{0.30}Ce_{0.05}Pr_{0.08}Nd_{0.37}Sm_{0.07}Eu_{0.03}Gd_{0.05}Dy_{0.01}Er_{0.01}Y_{0.08}Ca_{0.05})_{1.10}(CO_3)_{1.00}(F_{0.28}(OH)_{0.38})$,

$(La_{0.25}Ce_{0.03}Pr_{0.08}Nd_{0.51}Sm_{0.09}Eu_{0.02}Gd_{0.05}Y_{0.04}Ca_{0.03})_{1.10}(CO_3)_{1.00}(F_{0.17}(OH)_{0.52})$.

Discussion. The new varieties are referred to as bastnaesite-(Nd), and bastnaesite-(La) in one place, and as hydroxyl-bastnaesite in another, within the paper. With the calculated values of CO_2 and H_2O, the first-given formula corresponds to hydroxyl-bastnaesite-(La), and the remaining three to hydroxyl-bastnaesite-(Nd). Complete analyses, X-ray data, and physical properties are needed to validate these as species. **M.F.**

Cuproiridsite*

N.S. Rudashevskii, Yu.P. Men'shikov, A.G. Mochalov, N.V. Trubkin, N.I. Shumskaia, V.V. Zhdanov (1985) Cuprorhodsite $CuRh_2S_4$ and cuproiridsite $CuIr_2S_4$—New natural thiospinels of platinum elements. Zapiski Vses. Mineralog. Obshch., 114, 187–195 (in Russian).

Analysis of the mineral (one of 26 given) by electron microprobe gave Rh 6.05, Ir 48.9, Pt 10.5, Cu 7.41, Fe 3.17, Ni 0.27, S 24.6, sum 100.9%, corresponding to $(Cu_{0.61}Fe_{0.30}Ni_{0.02})(Rh_{0.31}Ir_{1.33}Pt_{0.28})S_4$. Ideally, $CuIr_2S_4$. The mineral is not corroded by warm aqua regia.

X-ray study (powder method) shows the mineral to be cubic, space group *Fd*3*m*, a = 9.92(1) Å, Z = 8, D_{calc} = 7.24. The strongest lines (20 given) are 3.00(100)(311); 2.489(90)(400); 1.912(70)(333,511); 1.760(100)(440); 1.011(70)(844).

The mineral occurs as small (to 300 μm) inclusions in angular isoferroplatinum host grains that are, in turn, the result of Pt mineralization within alluvial deposits, found in the Aldan shield and in Kamchatka, eastern USSR. Other associated mineral inclusions are cuprorhodsite, malanite, native Os, iridosmine, laurite, erlichmanite, cooperite, sperrylite, chalcopyrite, and bornite. No cleavage. Color is iron black, metallic luster, gray in reflected light. Microhardness is 578 ± 140 kg/mm², with 30-g load. Very brittle. Reflectances are [nm(%)] 460(35.0–37.5), 480(34.4–37.2), 500(34.0–37.1), 520(34.0–37.1), 540(33.6–37.2), 560(33.4–37.2), 580(33.1–37.5), 600(32.8–37.7), 620(32.6–37.8), 640(32.4–37.8), 660(32.2–37.8), 680(32.1–38.1), 700(32.0–38.4), 720(32.0–38.7), 740(32.0–38.8).

The name is for the chemical composition. Polished thin sections containing the mineral are at the Mining Museum, Leningrad Mining Institute. **D.A.V.**

Cuprorhodsite*

N.S. Rudashevskii, Yu.P. Men'shikov, A.G. Mochalov, N.V. Trubkin, N.I. Shumskaia, V.V. Zhdanov (1985) Cuprorhodsite $CuRh_2S_4$ and cuproiridsite $CuIr_2S_4$—New natural thiospinels of platinum elements. Zapiski Vses. Mineralog. Obshch., 114, 187–195 (in Russian).

Analysis of the mineral (one of ten given) by electron microprobe gave Rh 39.6, Ir 10.3, Pt 6.8, Cu 7.55, Fe 5.31, S 29.8, sum 99.36%, corresponding to $(Cu_{0.51}Fe_{0.41})(Rh_{1.66}Ir_{0.23}Pt_{0.15})S_4$. Ideally, $CuRh_2S_4$. The mineral is not corroded by warm aqua regia.

X-ray study (powder method) shows the mineral to be cubic, space group *Fd*3*m*, a = 9.88(1) Å, Z = 8, D_{calc} = 6.74. The strongest lines (18 given) are 3.00(100)(311); 2.480(70)(400); 1.904(80)(333,511); 1.758(100)(440); 1.009(90)(844).

The mineral occurs as small (to 300 μm) inclusions in angular isoferroplatinum host grains that are, in turn, the result of Pt mineralization within alluvial deposits, found in the Aldan shield and in Kamchatka, eastern USSR. Other associated mineral inclusions are cuproiridsite, malanite, native Os, iridosmine, laurite, erlichmanite, cooperite, sperrylite, chalcopyrite, and bornite. No cleavage. Color is iron black, metallic luster, gray in reflected light. Microhardness is 498 ± 30 kg/mm², with a 50-g load. Very brittle. Reflectances are [nm(%)] 460(35.6–39.5), 480(35.8–39.3), 500(36.4–39.3), 520(36.6–39.2), 540(36.7–39.2), 560(36.8–39.1), 580(36.9–39.1), 600(37.0–39.1), 620(37.0–39.0), 640(37.0–38.9), 660(36.9–38.8), 680(36.8–38.8), 700(36.7–38.7), 720(36.6–38.6), 740(36.6–38.5).

The name is for the chemical composition. Polished thin sections containing the mineral are at the Mining Museum, Leningrad Mining Institute. **D.A.V.**

Imitérite*

J.-J. Guillou, J. Monthel, P. Picot, F. Pillard, J. Protas, J.-C. Samama (1985) Imitérite, Ag_2HgS_2, a new mineral species:

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* Minerals marked with asterisks were approved before publication by the Commission on New Minerals and Mineral Names of the International Mineralogical Association.

0003–004X/86/0910–1277$02.00

Properties and crystal structure. Bull. Minéral., 108, 457–464 (in French).

The average of 20 electron-microprobe analyses gave Ag 42.89, Hg 42.64, S 13.34, total 98.87%, which yields the empirical formula $Ag_{1.91}Hg_{1.02}S_{2.00}$.

A single-crystal, X-ray diffraction structure analysis shows the mineral to be monoclinic, space group $P2_1/c$, a = 4.039(1), b = 8.0052(6), c = 6.580(1) Å, β = 107.11(2), V = 203.3(1) Å^3, Z = 2, D_{calc} = 7.85g/cm^3. The refined structure (R = 0.035 for 552 independent observed reflections) shows S atoms having a distorted hexagonal close packing with Hg linearly co-ordinated and Ag trigonal-planar co-ordinated. The strongest X-ray diffraction lines (23 given) are 4.88(30)(011), 3.466(50)($110,11\bar{1}$), 3.138(30)(002), 2.768(100)($102,12\bar{1}$), 2.746(100)(111), 2.461(80)(022,031), 1.959(30)($132,21\bar{1}$), 1.467(35)(142,202,024).

Imitérite occurs as anhedral grains up to 1 mm, with VHN_{100} = 86. In reflected light, it is light gray, pleochroic from bluish to pinkish and strongly anisotropic from blue to red-brown. The reflectance values range from 38.3 and 33.4 for λ = 440 nm to 27.4 and 25.3 for λ = 800 nm.

The new mineral is associated with chalcopyrite, sphalerite, polybasite, galena, and arsenopyrite in the Imiter mine, Jbel Sarhro, Anti-Atlas, Morocco. It derives its name from the mine locality; type material, consisting of polished sections, is at the Ecole des Mines de Paris and at the Bureau de Recherches Géologiques et Minières à Orléans-la-Source. **J.D.G.**

Khatyrkite,* Cupalite,* unnamed $ZnAl_2$, unnamed Zn_2Al

L.V. Razin, N.S. Rudashevskij, L.N. Vyalsov (1985) New natural intermetallic compounds of aluminum, copper and zinc—khatyrkite $CuAl_2$, cupalite CuAl and zine aluminides—from hyperbasites of dunite-harzburgite formation. Zapiski Vses. Mineralog. Obshch., 114, 90–100 (in Russian).

The minerals occur in black slick washed from greenish-gray cover weathering from serpentinite, Listvenitovij stream, Khatirskij ultrabasic zone of the Koriakskho-Kamchatskaya fold area, eastern USSR (Koriakskhiye Mts.). They are intimately intergrown, forming small (up to 1.5 mm) irregular, angular, metallic, steel gray–yellow grains, similar to native Pt. Type material is preserved at the Mining Museum of the Leningrad Mining Institute, Leningrad, USSR.

Khatyrkite

Microprobe analyses (9 grains) gave Cu 53.4–54.9, Al 44.4–45.9, Zn 0.87–1.91, sum 99.51–100.95%, with a negative correlation between Cu and Zn, corresponding to $(Cu,Zn)Al_2$.

X-ray study (Debye-Scherrer method) showed the mineral to be identical with synthetic $CuAl_2$, tetragonal, space group $I4/mcm$, a = 6.07(1), c = 4.89(1) Å, Z = 4, D_{calc} = 4.42. The strongest X-ray lines (20 given) are 4.27(10)(110), 3.04(5)(200), 2.372(7)(121), 2.119(8)(112), 1.920(7)(130).

The mineral is steel gray–yellow, opaque. Luster metallic. Malleable. Nonmagnetic. Hardness 511–568 kg/mm^2 (20- and 50-g load), 433–474 kg/mm^2 (100-g load).

In reflected light, the mineral is anisotropic with distinct bireflectance. Isotropic sections are bluish, anisotropic sections are blue to creamy pink. In polarized light, there are strong anisotropic effects: completely crossed nichols, grayish brown to red; incompletely crossed nichols, greenish yellow to raspberry red. Reflectance measurements (nm,R_o,R'_e): 440,75.8,70.1; 460,75.6,70.3; 480,75.9,71.5; 500,76.5,73.0; 520,76.4,74.5; 540,76.1,76.1; 560,75.3,77.4; 580,74.3,78.4; 600,73.2,79.2; 620,72.0,79.7; 640,70.7,79.8; 660,69.5,79.9; 680,68.5,79.8; 700,67.5,79.5; 720,66.5,79.2; 740,65.9,78.7%.

The mineral forms prismatic crystals from 100 × 100–120 up to 200 × 300 or 60 × 400 μm, with cleavage parallel to {100}.

The name is for the locality.

Cupalite

Microprobe analyses (nine grains) gave Cu 59.9–61.7, Al 29.3–30.4, Zn 7.66–9.35, sum 98.61–100.45%, with negative correlation between Cu and Zn, corresponding to (Cu,Zn)Al.

X-ray study (Debye-Scherrer method) showed the mineral to be orthorhombic, a = 6.95(1), b = 4.16(1), c = 10.04(1) Å, Z = 10, D_{calc} = 5.12. The X-ray pattern is similar to that of synthetic $CuAl_2$, which has a centered orthorhombic cell. The strongest X-ray reflections (seven given) are 5.07(10)(002), 4.12(8)(010), 3.59(2)(110).

Cupalite is opaque, steel yellow. Luster metallic. Hardness 272–318 kg/mm^2 (20- and 50-g load).

In reflected light, the mineral has very weak bireflectance from light gray to gray; under crossed nichols, it is weakly anisotropic from gray to dark gray. Reflectance measurements (R_m, %, 20 nm steps from 440 to 740 nm): 66.8, 66.1, 65.3, 64.5, 63.7, 62.9, 62.1, 61.3, 60.4, 59.7, 58.9, 58.2, 57.7, 57.2, 56.9, 56.5.

The mineral occurs as myrmekitic and dendritic droplike grains from 1 × 4 to 5 × 35 μm within khatyrkite (first generation) and as rounded or irregular grains from 1 × 5 to 10 × 20 μm in cracks and interstices in khatyrkite (second generation; this is usually intergrown with unnamed zinc aluminides).

The name is for the composition.

Unnamed $ZnAl_2$

Microprobe analyses of anhedral, elongated grains and veinlets (from 1 × 5 up to 8 × 40 μm) filling interstices of cupalite II or (rarely) occurring within khatyrkite masses, gave (average of 11): Cu 8.4 ± 1.2, Zn 50.1 ± 1.9, Al 46.1 ± 1.8, sum 100.1%, corresponding to $(Zn,Cu)Al_2$. The mineral has corrosive contacts with khatyrkite and cupalite.

In reflected light, pale-gray, anisotropic (light-gray tints), bireflectance not observed, reflectance lower than that of khatyrkite and greater than that of cupalite. Negative relief relative to khatyrkite and cupalite.

Unnamed Zn_2Al

Microprobe analyses of droplike, rounded, sometimes slightly elongated grains (from 1 × 2 up to 7 × 15 μm), intergrown with khatyrkite or cupalite II situated within khatyrkite, gave (average of 5): Cu 4.84 ± 0.47, Zn 80.12 ± 1.21, Al 17.36 ± 0.40, sum 102.32%. The mineral has corroded contacts with surrounding phases.

In reflected light, grayish white, without bireflectance, very weakly anisotropic from grayish white to light gray; reflectance slightly greater than that of unnamed $ZnAl_2$, slight negative relief relative to unnamed $ZnAl_2$. **J.P.**

Kirkiite*

Y. Moëlo, E. Oudin, E. Makovicky, S. Karup-Møller, F. Pillard, M. Bornuat, E. Evanghelou (1985) Kirkiite, a new mineral species homologous to jordanite. Bull. Minéral., 108, 667–677 (in French).

The average of six electron-microprobe analyses gave Pb 59.4, Bi 15.2, Sb 0.5, As 6.2, S 17.4, sum 98.7%, which yields the formula $Pb_{10.08}Bi_{2.55}Sb_{0.13}As_{2.91}S_{19}$, on the basis of S = 19, or ideally $Pb_{10}Bi_3As_3S_{19}$.

X-ray single-crystal and powder-diffraction studies show the mineral to be pseudohexagonal, space group $P6_322$, with a = 8.69(5) and c = 26.06(10) Å and Z = 2. Optically the mineral appears polysynthetically twinned, and its true symmetry is likely orthorhombic or monoclinic. The strongest X-ray diffraction lines (30 given) are 3.65(50)(022,114), 3.475(60)(023), 3.260(100)(024,008), 3.070(70)(116,025), 2.854(60)(120,026), 2.190(50)(220), 2.014(40)(02.11), 1.815(50)(044,228).

In plane-polarized, reflecting light, kirkiite appears as white, subhedral grains to 200 μm. In crossed polars, it is weakly anisotropic and displays fine, lamellar twinning. Reflectance data are given for the range 420 to 760 nm for which (R_1,R_2) decrease smoothly from (45.3,40.2) to (39.1,35.4%). Hardness (VHN_{100}) = 150 kg/mm^2 and D_{calc} = 6.82 g/cm^3.

The new mineral was found in the Pb-Zn deposit of Aghios Philippos, near Kirki (hence its name), Thrace, Greece. It is associated with cosalite, bismuthinite, Bi-jordanite, galena, and seligmannite in a matrix of sphalerite and pyrite. **J.D.G.**

Mongolite*

N.V. Vladykin, V.A. Drits, V.I. Kovalenko, M.D. Dorfman, V.S. Malov, A.I. Gorshkov (1985) A new silicate of niobium—Mongolite $Ca_4Nb_6[Si_5O_{20}]O_4(OH_{10})\cdot nH_2O$ [sic]. Zapiski Vses. Mineralog. Obshch., 114, 374–377 (in Russian).

Two analyses (electron microprobe, except for H_2O, for which the method is not specified) gave SiO_2 22.05 ± 0.71, 22.34 ± 0.49; Al_2O_3 0.81 ± 0.13, 0.86 ± 0.11; Nb_2O_3 [sic] 53.13 ± 0.84, 51.77 ± 1.09; TiO_2 0.02 ± 0.02, 0.07 ± 0.02; MnO 1.15 ± 0.05, 0.86 ± 0.53; MgO 0.07 ± 0.02, 0.12 ± 0.02; CaO 12.38 ± 0.32, 11.97 ± 0.34; BaO 0.71 ± 0.08, 0.73 ± 0.08; ZnO 0.41 ± 0.03, 0.90 ± 0.04; SrO 2.11 ± 0.14, 1.83 ± 0.16, Na_2O 0.72 ± 0.08; 0.26 ± 0.08; K_2O 0.49 ± 0.03, 0.38 ± 0.04; H_2O 6.70, 8.74; sums 100.76, 100.82%. The analyses recast on a cation basis for Si = 5 correspond to $(Ca_{3.01}Na_{0.31}Sr_{0.28}K_{0.14}Ba_{0.06})_{3.80}(Nb_{5.45}Al_{0.22}Mn_{0.22}Zn_{0.07}Mg_{0.03})_{5.98}[Si_{5.00}O_{27.84}]\cdot 5.07H_2O$ and $(Ca_{2.87}Na_{0.11}Sr_{0.24}K_{0.11}Ba_{0.06})_{3.39}(Nb_{5.24}Al_{0.23}Mn_{0.16}Zn_{0.15}Mg_{0.04})_{5.82}[Si_5O_{27.07}]\cdot 6.83H_2O$. In addition, 0.7% Ta was found in preliminary analyses.

The mineral is insoluble in acid except HF. The DTA curve shows a broad endothermic effect between 100 and 350°C, corresponding to loss of water, and an exothermic effect at 700°C. The mineral does not melt below 1100°C.

X-ray study (supported by electron diffraction study) shows the mineral to be tetragonal, unit cell a = 7.00(5), c = 29.0(1) Å. The strongest lines (19 measured) are 9.67(45)(003); 5.82(45)(005); 3.163(100)(204); 3.087(65)(122); 2.974(70)(123); 2.664(40)(126).

The mineral, which formed as a late alteration product of an unknown niobium silicate, occurs in the quartz-rich core zone of an alkalic pegmatite at the "Dorozhnyy" site in the northern part of the Khan-Bogdinskiy Massif, Gobi, Mongolia (5 km south of Khan-Bogd). Other minerals in the core zone are niobium and rare-earth silicates, polylithionite and Zn-bearing montmorillonite. Mongolite is pale-lilac or grayish-lilac and has a silky luster. It forms a fine mica-like aggregate of scales with a good cleavage in one direction. H = 2. D = 3.147 g/cm^3 (possibly lowered from admixed quartz impurity). Optically uniaxial negative, ω = 1.80, ϵ = 1.74.

The name is for the country, Mongolia, in which it was discovered. A sample is at the A. E. Fersman Mineralogical Museum of the USSR Academy of Sciences, Moscow. **E.S.G.**

Philipsburgite*

D.R. Peacor, P.J. Dunn, R.A. Ramik, B.D. Sturman, L.G. Zeihen (1985) Philipsburgite, a new copper zinc arsenate hydrate related to kipushite, from Montana. Can. Mineral., 23, 255–258.

Microprobe and TGA-EG analysis gave CuO 46.3, ZnO 18.2, P_2O_5 8.7, As_2O_5 16.3, H_2O 9.9, sum 99.4%, corresponding to $Cu_{17.18}Zn_{6.60}\ (AsO_4)_{4.19}\ (PO_4)_{3.62}\ (OH)_{24.13}\cdot 4.16H_2O$, or ideally $(Cu,Zn)_6(AsO_4,PO_4)_2\ (OH)_6\cdot H_2O$ with Z = 4. This is the arsenate analogue of kipushite.

X-ray study by precession and Weissenberg methods shows the mineral to be isostructural with kipushite, monoclinic, space group $P2_1/c$, cell dimensions a = 12.33(8), b = 9.20(4), c = 10.69(3) Å, β = 96.92(35)°. The strongest lines (56 given) are 12.2(80)(100), 4.05(90)(300,$12\bar{1}$), 3.405(50)($12\bar{2}$, 311,221), 2.666(60)($41\bar{2}$,123,$10\bar{4}$,032), 2.559(100)(132,$11\bar{4}$,014).

Morphologically, philipsburgite crystals are slightly curved with chisel-like terminations, elongate on [010] with composite large faces {100} as the dominant form. The mineral commonly occurs as microscopic spherules with crystal terminations providing a rough exterior surface, and as druses varying from sparse to thick (0.5 mm) coatings. It is bright emerald green with a light-green streak, transparent in small crystals but semiopaque in massive aggregates, vitreous luster and no discernible cleavage or parting. It does not fluoresce in ultraviolet light. H = 3–4. Not particularly brittle. D_{meas} (Berman balance, temperature, corrected) 4.07(1) g/cm^3, D_{calc} (empirical formula) 4.04 g/cm^3. Optically biaxial negative, α = 1.729(2), β = 1.774(2), γ = 1.775(2), $2V_X$ = 16(2)°. Moderate pleochroism: $Y = Z$ = medium green, X = pale green. Absorption $Y = Z > X$. Dispersion strong, $r > v$; orientation is $\mathbf{b} = Z$, $\mathbf{c} \wedge Y$ = 7°. An anomalous blue interference color is observed when (100) lies in the plane of the microscope stage.

Philipsburgite occurs sparingly in a secondary assemblage of unusual Cu-Pb-Zn arsenates and phosphates from the Black Pine mine, located in the Flint Creek Valley, John Long Mountains, approximately 14.5 km northwest of Philipsburg, Montana. Associated minerals include arthurite, bayldonite, duftite, tsumebite, and veszelyite as well as more common carbonates, arsenates, phosphates, sulfates, silicates, and antimonates.

The name is for the town of Philipsburg, near which the Black Pine mine is located. Type material is preserved at the Smithsonian Institution (NMNH 161201) and the Royal Ontario Museum (M 41000). **A.C.R.**

Srebrodolskite*

B.V. Chesnokov, L.F. Bazhenova (1985) Srebrodolskite $Ca_2Fe_2O_5$—A new mineral. Zapiski Vses. Mineralog. Obshch., 114, 195–199 (in Russian).

Analysis of the mineral gives CaO 41.69, Fe_2O_3 56.50, MgO 1.19, MnO 0.90, Al_2O_3 not detected, sum 100.28%, corresponding to $Ca_{2.01}(Fe^{3+}_{1.91}Mg_{0.08}Mn_{0.03})_{2.02}O_{5.00}$ (Ti and Be were detected in a laser microspectroscopic analysis). It is soluble in HCl. No thermal effects were observed on the DTA curve (to 1000°C). Fusibility is about 4.5.

The powder pattern corresponds closely to that for synthetic $Ca_2Fe_2O_5$ and by analogy with the synthetic compound, the mineral was assigned orthorhombic symmetry and space group $Pnma$; unit cell a = 5.420(3), b = 14.752(3), c = 5.594(3) Å, V = 447.27 Å^3, Z = 4. The strongest lines (39 given; 0h0 intensities enhanced by preferred orientation) are 7.381(10)(020), 3.690(10)(040), 2.797(6)(002), 2.710(6)(200), 2.676(10)(141), 1.946(7)(202), and 1.844(10)(080).

Srebrodolskite occurs in petrified wood baked by burning coal in mines of the town Kopeyska (Chelyabinskiy coal basin in the southern Urals). The baked petrified wood consists of an anhydrite shell enclosing earthy masses of portlandite, carbonates, and aggregates of srebrodolskite in grains generally less than 0.1 mm across. Srebodolskite is derived from the calcining of ankerite. The mineral is black in aggregate and its streak is grayish-brown. It transmits brown red in thin slivers. Crystals are platy on (010), cleavage noted on (*h*0*l*). Luster of crystals is adamantine, that of aggregates, metallic. Weakly magnetic. H = 5.5. D = 4.04(1) g/cm³ (pycnometric), 4.03 g/cm³ (calculated from X-ray data). Optically biaxial negative (?), pleochroism weak. Optical properties are hard to measure because mineral is strongly colored brown yellow and brown red; $\alpha \approx 2.24$, $\beta \approx 2.25$, $\gamma \approx 2.27$. Faces of the square (010) tablets intersect at angles of about 92°30′ and 87°30′; optic plane is perpendicular to (010), and X is parallel to [010] and bisects the larger angle. Not fluorescent in ultraviolet.

The mineral is named in honor of the Soviet Ukrainian mineralogist B. I. Srebodolskiy (born in 1927). Samples are at the A.E. Fersman Mineralogical Museum of the USSR Academy of Sciences, Moscow. **E.S.G.**

Turneaureite*

P.J. Dunn, E.U. Peterson, D.R. Peacor (1985) Turneaureite, a new member of the apatite group from Franklin, New Jersey, Balmat, New York and Långban, Sweden. Can. Mineral., 23, 251–254.

Microprobe analysis (holotype, Långban) gave CaO 43.8, PbO 0.7, MnO 1.9, As_2O_5 44.9, P_2O_5 6.1, Cl 3.2, F 1.2, less O = Cl, F 1.2, sum 100.6%, corresponding to $(Ca_{9.70}Mn_{0.33}Pb_{0.04})_{\Sigma 10.07}$-$[(AsO_4)_{4.85}(PO_4)_{1.07}]_{\Sigma 5.92}(Cl_{1.12}F_{0.78})_{\Sigma 1.90}$, or ideally $Ca_5[(As,P)O_4]_3Cl$ with Z = 2. Similar analyses are reported for Franklin and Balmat localities. The mineral is the Cl analogue of svabite $Ca_5(AsO_4)_3F$ and johnbaumite $Ca_5(AsO_4)_3(OH)$, the arsenic analogue of chlorapatite $Ca_5(PO_4)_3Cl$, and the Ca analogue of morelandite $Ba_5(AsO_4)_3Cl$ and mimetite $Pb_5(AsO_4)_3Cl$.

X-ray study by precession and Weissenberg methods shows the mineral to be hexagonal, space group $P6_3/m$ (by analogy with other members of the apatite group), unit cell a = 9.810(4), c = 6.868(4) Å. No deviations from hexagonal symmetry were detected. The strongest lines (38 given) are 3.98(50)(111), 3.43(60)(002), 2.907(100)(211), 2.826(90)(300,112), 2.670(50)(202), 1.864(40)(213).

Turneaureite occurs at Långban as colorless, slightly turbid, prismatic crystals up to 1.5 mm long. The forms present are {10$\bar{1}$0} and {0001}. The mineral has a white streak and a vitreous to slightly greasy luster. H = 5. Fracture uneven, cleavage not observed. D_{meas} (heavy liquids) = 3.60(5), D_{calc} = 3.63 g/cm³. Fluoresces bright orange in shortwave ultraviolet radiation. Phosphorescence is weakly discernible in massive material from Franklin, but not observed on crystals from the other two localities. Optically uniaxial negative, ω = 1.708(3), ϵ = 1.700(3) (sodium light).

Turneaureite occurs sparingly at the Långban mine, Varmland, Sweden, as euhedral crystals associated with calcite and andradite on massive andradite-magnetite ore. At Franklin, New Jersey, it occurs as abundant grayish-white anhedral masses up to 5 × 3 × 2 cm in size, associated with magnetite, andradite, and manganoan calcite. The mineral is also found in manganese-rich siliceous marble exposed on the 2500 level of the Balmat #4 mine, New York, where it occurs as subhedral, isolated crystals intimately associated with donpeacorite, tirodite, ferrian braunite, dravite, anhydrite, and manganoan dolomite. All three occurrences are in high-grade marble terranes, and turneaureite may be a metamorphic mineral confined to the amphibolite and granulite facies.

The mineral is named for Dr. Frederick Steward Turneaure, Professor Emeritus at the University of Michigan, in recognition of his contributions to the mineralogy and geology of economic mineral deposits. Type material is preserved at the Smithsonian Institution under catalogue numbers C6270-1 and C6270-2 (Franklin), 134981 (Långban), and 159862 (Balmat). **A.C.R.**

Usonite*

V.I. Popova, V.O. Pol'akov (1985) Usonite As_4S_5—A new arsenic sulfide from Kamchatka. Zapiski Vses. Mineralog. Obshch., 114, 369–373 (in Russian).

Microprobe analyses (average of 3) gave As 64.65, S 34.09, total 98.74%, corresponding to $As_{4.03}S_{4.97}$. The mineral melts at 310 ± 5°C, decomposes with 5-mol KOH to dark-brown powder, which dissolves during boiling. No reaction with HCl and HNO_3. Heating in a closed tube produces a white to yellowish (in greater distance) sublimate.

X-ray data showed the mineral to be monoclinic, $P2_1/m$, a = 7.98(1), b = 8.10(1), c = 7.09(1) Å, β = 100.14(3)°, Z = 2, D_{calc} = 3.385. The strongest lines (30 given) are 5.81(10)($\bar{1}$01), 5.31(6)(011), 3.602(8)(120), 3.100(6)(121), 2.905(8)($\bar{2}$02), 2.820(6)(220).

Crystals of usonite are up to 0.3 (max. 0.5) mm long, yellow, transparent, prismatic parallel to [001]; dominant forms are {110}, {001}, {$\bar{1}$01}, with fine [1$\bar{1}$1] striations on {110}. Crosslike twins occur (twinning plane (011), axis [100]). In some samples, the crystals of usonite are intergrown with prismatic realgar and isometric α–arsenic sulfide crystals.

Luster pearly, slightly greasy. Distinct cleavage parallel to {001}. H (Mohs) = 1.5, microhardness 66–71 kg/mm² (8-g load). D_{meas} = 3.37 ± 0.02. In transmitted light, bright yellow, biaxial, positive, ω' = 2.68(1), ϵ' = 2.38(1) (immersion, white light). In reflected light, grayish white with bright yellow internal reflections. R'_ω = 20.8, R'_ϵ = 16.6% (white light). Reflectance measurements (nm, R'_1, R'_2): 400,20.1,18.8; 425,20.0,18.8; 450,19.9,18.7; 475,19.7,18.3; 500,19.2,18.1; 525,19.8,19.0; 550,20.0,19.4; 575,19.9,19.4; 600,19.7,19.3; 625,19.4,19.2; 650,19.3,19.1; 675,19.2,19.0; 700,19.0,18.8%.

The mineral occurs with realgar and α–arsenic sulfide in realgar-enriched sand-gravel and gravel-pebble tuff sediments at 10–30 cm depth, Uson caldera, Kamchatka (USSR). Usonite was found in artificial slicks. The name is for the locality.

Type specimens are at the A. E. Fersman Mineralogical Museum, Acad. of Sci. (Moscow) and at the Laboratory of Mineralogy of the Ilmenskij National Park (Miask). **J.P.**

Vinciennite*

F. Cesbron, R. Giraud, P. Picot, F. Pillard (1985) Vinciennite, $Cu_{10}Fe_4Sn(As,Sb)S_{16}$, a new mineral species from Chizeuil, Saône-et-Loire. Paragenetic study of the type deposit. Bull. Minéral., 108, 447–456 (in French).

The average of six electron-microprobe analyses gave Cu 40.90, Fe 14.63, Sn 7.33, As 3.43, Sb 1.60, S 31.85, total 99.74%, which yields the empirical formula $Cu_{10.19}Fe_{4.15}Sn_{0.98}(As_{0.73},Sb_{0.21})S_{15.74}$ on the basis of a total of 32 atoms.

Single-crystal and X-ray powder-diffraction studies show the mineral to be tetragonal (pseudocubic), possible space groups $P4/mmm$, $P422$, $P4mm$, or $P4_122$, $a = c = 10.697(6)$ Å, Z = 2, $D_{calc} = 4.29$ g/cm^3. The strongest X-ray diffraction lines (25 given) are 4.37(30)(121), 3.088(100)(222), 2.676(50)(400), 1.895(90)(404), 1.614(70)(622), 1.338(30)(800), 1.227(40)(266), 1.091(40)(448).

Vinciennite occurs as orange, metallic, opaque grains up to 1 mm. It is brittle with a conchoidal fracture, $VHN_{25} = 280$. The reflectance values (λ in nm,R_{max},in%, R_{min}, in %) are 420,19.4,19.4; 460,21.8,20.6; 500,23.9,22.8; 540,27.7,26.5; 580,30.7,29.5; 620,33.6,32.1; 660,35.9,34.3; 700,37.8,36.0; 740,38.8,36.8; 780,39.5,36.6.

The new mineral is associated with pyrite, chalocopyrite, colusite, stannite, bornite, enargite, tetrahedrite, tennantite, and others in a matrix of quartz and/or albite. It has also been found at Huaron, Peru. The name honors Prof. Henri Vincienne (1898–1965). Type material is at the Ecole National Supérieure des Mines de Paris. **J.D.G.**

Unnamed (Ag,Cu)$_4$TeS

T.I. Gadzheva (1985) A mineral (Ag,Cu)$_4$TeS from the Shadiytsa deposit, Central Rodopes. Compt. Rend. Acad. Bulgare Sci., 38, 211–213 (in Russian).

Microprobe analyses (4 given) gave Ag 68.30, Cu 3.29, Te 23.37, S 5.47, total 100.43%, corresponding to $(Ag_{3.79}Cu_{0.30})_{4.09}Te_{1.09}S_{1.02}$. It is suggested that the mineral is similar to earlier-described unnamed Ag_4TeS.

In reflected light, the mineral is grayish-white, anisotropic, pleochroic with bluish-green and yellowish tints. Reflectance measurements on nonoriented grains (20-nm steps from 440 to 660 nm) yield 34.4–40.0% (R_{min}), 36.0–42.0% (R_{max}).

The strongest X-ray reflections (36 given) are 4.49(7), 4.11(10), 3.65(8), 3.17(9). Symmetry and structure were not determined.

The mineral forms small (up to 200 × 50 m) irregular or rounded grains, microgranular aggregates or myrmekitic forms, closely associated with hessite. It occurs as a member of rhodochrosite–sericite–native gold association in the vein ore deposit Shadiytsa in Central Rodopes (Bulgaria). **J.P.**

Unnamed Pb-Sb-chlorosulfosalt

G.B. Gigiadze, V.D. Guniava, N.N. Mozgova, A.I. Tsepin, Yu.S. Borodaev (1984) On the first occurrence of chlorosulfosalts in the U.S.S.R. Doklady Akad. Nauk SSSR, 277, 1464–1467 (in Russian).

Analysis by electron microprobe (range of three analyses by three labs on material from two deposits) gave Pb 59.2–61.5, Sb 17.0–20.8, S 15.0–18.0, Cl 4.7–5.7, sum 99.9–100.7%. This gives the formula $Pb_{1.80-1.96}Sb_{0.98-1.10}S_{3.01-3.48}Cl_{0.89-1.04}$, or Pb_2SbS_3Cl.

X-ray study is hampered by the fine grain size. Microdiffraction techniques gave two unit-cell parameters, $a = 26.0$, $c = 4.15$ Å.

The mineral occurs as very fine (1–3 μm) acicular grains and aggregates (to 20 μm) enclosed in galena and sphalerite of the Kvaisinsk lead-zinc ores, South Osetinsk ore district. Associated minerals include freibergite, chalcopyrite, native silver and antimony, arsenopyrite, and tetrahedrite. In the microscope, the chlorosulfosalt has a green-gray tint, strong anisotropy and double reflection, and carmine-red internal reflections both in immersion oil and in air. Reflectances are (nm, R_1,R_2) (400)36.3,35.1; (420)36.2,34.9; (440)36.1,34.6; (460)35.9,34.2; (480)35.5,33.7; (500)35.1,33.3; (520)34.7,32.8; (540)34.1,32.3; (560)33.6,31.7; (580)33.0,31.2; (600)32.4,30.6; (620)31.8,30.1; (640)31.1,29.7; (660)30.5,29.2; (680)30.0,28.7; (700)29.5,28.3. **D.A.V.**

Unnamed Pb-Sb-Te sulfosalt

R. Sen, D.J. Spottiswood (1984) A new mineral in the geocronite-jordanite family and its implications in differential flotation. Proc. Australas. Inst. Mining Metall., no. 289, 309–311.

Galena, geocronite, jordanite, sphalerite, arsenopyrite, and a Te-bearing lead sulfosalt occur in ore from the main lode of the Precambrian Rajpura-Dariba deposit, Udaipur, Rajasthan, India. A 114.6 mm Debye-Scherrer powder pattern and a microprobe analysis (av. of five with ranges and standards unstated) are the only data given for the tellurian mineral. Strongest lines of the powder pattern are 3.43(100), 2.98(90), 3.20(85), 3.55(40), 2.24(40), 2.91(35), approximating those of geocronite. The microprobe average composition is Pb 60.14, Sb 12.78, As 1.10, Te 9.47, S 17.33, total 100.82%, reported as $Pb_{0.29}Sb_{0.10}As_{0.015}Te_{0.07}S_{0.54}$ with Te in substitution for S.

Discussion. Possibly a tellurian-bearing geocronite, but data are insufficient to characterize the mineral. Cell dimensions calculated from the powder pattern are only slightly larger than those of geocronite. If geocronite is taken as $Pb_{14}(Sb,As)_6S_{23}$, the tellurian mineral is $Pb_{12.4}(Sb,As)_{5.1}Te_{3.2}S_{23}$—not close enough to assume the two are related. **J.L.J.**

Unnamed uranium silicate

F.G. Simova (1984) Uranosilicate phases of homological order pitchblende-coffinite in the Balkan metallogenic zone. Doklady Bulgarskoi Akad. Nauk, 37, 1359–1361.

Analysis by electron microprobe gave UO_2 83.60, SiO_2 7.17, TiO_2 1.03, CaO 3.76, PbO 1.34, FeO 0.07, MnO 0.07, Al_2O_3 1.20, Na_2O 0.01, SO_3 0.16, sum 98.41%. This gives the formula $(U_{2.48}Ca_{0.54}Pb_{0.05})(Si_{0.95}Al_{0.05})O_8$, or U_3SiO_8.

The mineral occurs in the Balkan metallogenic zone mainly in uranium silicate spherulites intergrown with pitchblende (uraninite), coffinite, and two other unnamed uranium silicates, apparently as an alteration of uraninite. In reflected light, the mineral is dark gray, reflectance 12 to 13%. Microhardness 620 to 650 kg/mm^2. No X-ray data are given.

Discussion. The mineral is apparently a new species. The two other unnamed uranium silicates with which it occurs were previously reported from Yugoslavia and Austria, in an article that was recently abstracted (Am. Mineral., 68, 1040–1041). **D.A.V.**

Unnamed uranium-titanium silicate

F. Simova, G. Kurat, A. Kracher, F. Brandstetter, L. Pabst (1984) Uranium-titanium silicates from different types of uranium deposits. Geochemistry, Mineralogy and Petrology (Bulgarian Academy of Sciences), 18, 43–55 (in Russian).

Analysis by electron microprobe gave UO_2 67.00, ThO_2 0.43, SiO_2 4.97, TiO_2 18.90, CuO 0.27, PbO 0.27, MgO 0.06, CaO 1.11, BaO 0.34, Na_2O 0.21, K_2O 1.25, sum 94.81%. Regarding Ba, Na, K, and possibly Ca as impurities, and normalizing to 100% (justified by assuming the mineral to be metamict), this analysis gives $U_{2.94}Th_{0.01}Ti_{2.81}Si_{0.97}O_{14}$, or ideally $U_3Ti_3SiO_{14}$. No X-ray data are available.

The mineral occurs as fine-grained aggregates of less than 10 μm, disseminated in tinguaite of the Campoc dec Cerkadoc alkaline massif, Brazil. It is associated with coffinite, zircon, monazite and Ce-La-U oxides. No optical data are given.

Discussion. The paper also describes three other uranium-titanium silicates from various uranium deposits (Dog Mine, Ambrosia Lake deposit, U.S.A.; Mitterberg deposit, Austria; Witwatersrand deposit, South Africa). These other phases were previously described and abstracted (Am. Mineral., 68, 1041). No new data are given except the following: in reflected light their color is gray, similar to brannerite, with increased Si content giving a blue tint and increased Ti giving a weak reddish tint. Reflectances are 9–12%, indistinguishable from brannerite. Luminescence intensity increases with U content and decreases with increased Ti and Si content. **D.A.V.**

New Data

Lithium-hydrorhodonite

J. Ito (1972) Synthesis and crystal chemistry of Li-hydro-pyroxenoids. Mineralogical Journal, 7, 45–65.

T. Murakami, Y. Takéuchi, T. Tagai, K. Koto (1977) Lithium-hydrorhodonite. Acta Crystallographica, B33, 919–921.

Lithium-hydrorhodonite was systematically described by Ito (1972), and the structure determination was presented by Murakami et al. (1977). Crystals from the same locality (from a high-grade regional metamorphic rock from India) were used in both studies.

The empirical formula, $Li_{0.85}Na_{0.07}Mn_{3.61}Mg_{0.33}Ca_{0.03}Fe^{2+}_{0.02}Al_{0.01}$-$Si_5O_{14}(OH)$, corresponds to an ideal formula, $LiMn_4Si_5O_{14}(OH)$, for endmember Li-hydrorhodonite, and to a structural formula of $M^{I}M^{II}HSi_5O_{15}$ (where $M^{I} = Li_{0.85}$, $Na_{0.07}$, M^{II} = the remaining cations).

X-ray analyses show the natural crystals to be triclinic, $P\bar{1}$, a = 7.530(3), b = 11.736(5), c = 6.710(3) Å, α = 92°58(3)′, β = 95°14(3)′, γ = 106°16(3)′, Z = 2, D_x = 3.52 g/cm³. Powder XRD data (obtained only for synthetic $LiMn_4Si_5O_{14}OH$) yielded the following strongest lines (57 given; d in Å, I/I_0, hkl): 3.166(60)($\bar{1}02$), 3.048(50)($2\bar{2}1$), 2.952(70)($1\bar{1}2$), 2.922(100)($\bar{1}40$), 2.700(90)(220), 2.219(50)($0\bar{1}3$).

The structure, refined from 4292 reflections to $R = 0.038$ (R_w = 0.045), was found to be isotypic with the nambulite structure. However, the M^{I} atom is essentially coordinated by six oxygen atoms that form a distorted octahedron. The mean M^{I}–O bond length is 2.261 Å. Of five independent octahedral positions per cell, Mg is preferentially located at a specific position, M(3). **J.A.Z.**

Roubaultite

D. Ginderow, F. Cesbron (1985) Structure de la Roubaultite, $Cu_2(UO_2)_3(CO_3)_2O_2(OH)_2 \cdot 4H_2O$. Acta Crystallogr., C41, 654–657.

The crystal structure of roubaultite was solved and refined to R = 4.1% for 2246 observed reflections; the correct formula is $Cu_2(UO_2)_3(CO_3)_2O_2(OH)_2 \cdot 4H_2O$, the presence of $(CO_3)^{2-}$ groups not having been recognized in the previously proposed formula. **F.C.H.**

Uklonskovite

C. Sabelli (1985) Uklonskovite, $NaMg(SO_4)F \cdot 2H_2O$: New mineralogical data and structure refinement. Bull. Minéral., 108, 133–138.

New data have been obtained for uklonskovite, $NaMg(SO_4)F \cdot 2H_2O$. The rare minute crystals found in the lower levels of the Cetine mine, Tuscany, Italy, comprise the second known occurrence.

The crystals are monoclinic, $P2_1/m$, with a = 7.202(1), b = 7.214(1), c = 5.734(1) Å, β = 113.23(1)°, Z = 2, and D_{calc} = 2.414 g/cm³. The strongest powder XRD lines (of 35 given) are [d in Å, I/I_0, hkl]: 6.608(78)(100), 5.270(60)(001), 3.505(100)(101), 3.309(46)(200), 3.154(56)(111), 2.970(54)($12\bar{1}$).

The structure was refined to R = 0.023 for 655 automatic diffractometer–observed data. The Mg octahedra are corner linked to form chains along **b**. The Na polyhedra and the SO_4 groups connect the chains to each other, mainly in the **c** direction, so the structure can be described as a (100) sheet structure. In this occurrence, F replaces the OH of the earlier description of the mineral. **J.A.Z.**

Discredited Minerals

Taylorite (= ammonian arcanite)

L.A. Groat, F.C. Hawthorne (1985) Taylorite discredited (= ammonian arcanite). Can. Mineral., 23, 259–260.

Examination of the published chemical, optical, and X-ray data of the potassium-ammonium sulfate mineral taylorite shows it to be an ammonium arcanite. Taylorite has been discredited as a species by the I.M.A. Commission. **A.C.R.**