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NEW MINERAL NAMES*

JOHN L. JAMBOR
CANMET, 555 Booth Street, Ottawa, Ontario K1A 0G1, Canada
ERNST A. J. BURKE
Instituut voor Aardwetenschappen, Vrije Universiteite, De Boelelaan 1085, 1081 HV, Amsterdam, Netherlands

Blatterite*

G. Raade, M.H. Mladeck, V.K. Din, A.J. Criddle, C.J. Stanley (1988) Blatterite, a new Sb-bearing Mn^{2+}-Mn^{3+} member of the pinakiolite group, from Nordmark, Sweden. Neues Jahrb. Mineral. Mon., 121–136.

The empirical formula was calculated from an analysis by ICP emission spectrometry of 2.53 mg of hand-picked crystal fragments. Recalculation to conform with the general formula of the pinakiolite group yielded a MnO-Mn_2O_3 distribution, confirmed by a wet-chemical analysis on 960 μg of material. The result is MgO 13.0, Fe_2O_3 3.48, MnO 35.1, Mn_2O_3 22.2, Sb_2O_3 11.4, B_2O_3 14.4, total 99.58 wt%. The valency state of Sb is extensively discussed; Gladstone-Dale calculations indicate that a formula with Sb^{3+} is more acceptable than one with Sb^{5+}. The empirical formula of blatterite then is $(Mn^{2+}_{1.211}Mg_{0.790})_{\Sigma 2.001}(Mn^{3+}_{0.688}Sb^{3+}_{0.191}Fe^{3+}_{0.107})_{\Sigma 0.986}(B_{1.013}O_3)O_2$. Single-crystal and powder-diffraction methods revealed an orthorhombic unit cell, space group *Pnnm* or *Pnn*2, with $a = 37.693(6)$, $b = 12.620(2)$, $c = 6.2541(8)$ Å, Z = 32, $D_{calc} = 4.35$, $D_{meas} = 4.7(0.4)$ g/cm³. The strongest X-ray diffraction lines (38 listed) are 5.243(45)(420), 2.27206(40)(470), 2.6207(35)(840), 2.6047(100)(802), 2.5200(30)(940), 2.0894(40)(12.2.2), 1.5638(35)(004), and 1.5406(30)(472). The mineral is a member of the pinakiolite group. Orthorhombic structures in this group are derived from the pinakiolite structure by chemical twinning. Blatterite has an *a* dimension of 37.7 Å corresponding to the structure type 8*t*8*t* . . . , as was confirmed by a preliminary HRTEM study.

Blatterite occurs sporadically in pieces of rich manganosite in the Kittelgruvan mine of the Nordmark orefield, Värmland, Sweden. This material, however, has been dumped there from elsewhere; the Brattforsgruvan mine in the same orefield is the most probable source. Blatterite occurs as lath-shaped crystals, up to 5 mm long, in maganosite or calcite; associated minerals are katoptrite, pyrochroite, roméite(?), and hausmannite. Blatterite prisms are elongate and striated [001] and have flat, diamond-shaped cross-sections. The prism form is {110}, with interfacial angles of 37° and 143°. Color black, streak brown, luster metallic to submetallic, brittle, perfect {001} cleavage, imperfect {100} parting, H about 6, VHN_{100} = 814–940 (average 877). In reflected light, slightly to moderately bireflectant, nonpleochroic; variation in color (buff to pale buff) is due to bireflectance. Anisotropy weak to distinct, with rotation tints in shades of grayish-brown. No twinning. Orange-red internal reflections. Reflectance data are given at intervals of 10 nm from 400 to 700 nm in air and oil. Reflectance is about 11% in air. *X, Y,* and *Z* axes correspond to *a, c,* and *b* axes, with the optic plane parallel to (001). The sign of bireflectance in air changes from positive (400–450 nm) to negative (470–700 nm). The sign of birefringence is positive from 400 to 520 nm, and negative from 520 to 700 nm. Dispersion $r < v$. Color values are also given. Calculation of the Gladstone-Dale relationships with Sb^{3+} and Sb^{5+} in the analysis led to a compatibility index $[1 - (K_P/K_C)]$ of, respectively, 0.019 and −0.071 ("superior" and "fair").

The name is for the German collector Dipl.-Ing. Fritz Blatter (1943–) who first recognized the mineral and provided the material described. Type material is deposited at the Mineralogical-Geological Museum of Oslo, and as specimen BM 1986, 112; E.1168 in the British Museum (Natural History). **E.A.J.B.**

Brokenhillite

M. Czank (1987) Structure determination and HRTEM investigation of a new pyrosmalite-group mineral. Collected Abstracts, Fourteenth International Congress of Crystallography (Perth, Australia, C-155).

Electron-microprobe analysis [data not given] of crystals from Broken Hill, New South Wales, Australia, gave a composition of $(Mn_{4.79}Fe_{3.00}M_{0.15}\square_{0.06})[Si_{6.0}O_{14.88}(OH)_{0.12}](OH)_{7.19}Cl_{2.81}$ based on 6 Si and divalent Mn and Fe. The structural refinement suggests that the formula is $(Mn,Fe)_{32}[Si_{24}O_{60}](OH)_{29}Cl_{11}$. The mineral is hexagonal, space group $P6_3mc$, $a = 13.481$, $c = 14.084$ Å.

Discussion. An unapproved name that should not have been used. **J.L.J.**

Cetineite*

C. Sabelli, G. Vezzalini (1987) Cetineite, a new antimony oxide-sulfide mineral from Cetine mine, Tuscany, Italy. Neues Jahrb. Mineral. Mon., 419–425.

Tufts of orange-red acicular crystals, elongate [001] and up to 15 mm in length and 15 μm in diameter, occur in

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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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slag cavities in the dumps of the Cetine antimony deposit, 20 km southwest of Siena, Tuscany, Italy. Electron-microprobe analyses, combined with a crystal-structure study, gave K_2O 6.66, Na_2O 3.87, Sb_2O_3 81.06, S 7.15, SiO_2 0.67, H_2O (by difference) 4.16, sum 103.57, less O ≡ S 3.57 wt%, corresponding to $(K_{1.78}Na_{1.57})_{\Sigma 3.35}(Sb_2O_3)_{3.03}(SbS_3)_{0.94}(OH)_{0.53}\cdot 2.64H_2O$ based on 7 Sb atoms and omitting Si. The simplified formula (with $x = 0.5$ and K:Na = 1.86: 1.64) is $(K,Na)_{3+x}(Sb_2O_3)_3(SbS_3)(OH)_x\cdot(2.8-x)H_2O$. Orange streak, resinous luster, transparent to translucent, {100} cleavage, VHN_{20} = 127–156, nonfluorescent, optically uniaxial positive, weakly pleochroic from orange to slightly orange-brown, refractive indices much greater than 1.74. Single-crystal X-ray study indicated hexagonal symmetry, space group $P6_3$; cell dimensions refined from the powder pattern (diffractometer, Co radiation) are a = 14.230(2), c = 5.579(1) Å; D_{calc} = 4.21 g/cm³ for the empirical formula and Z = 2. Strongest lines of the powder pattern are 12.41(80)(100), 4.67(54)(120), 4.11(55)(300), 3.581(44)(121), 3.419(42)(130), 3.000(74)(221), 2.916(100)(131), and 2.690(61)(410). The infrared spectrum has absorption bands at 3400 and 1630 cm^{-1}, possibly indicative of structural water; strong absorptions present in the 450–600 cm^{-1} region reflect the presence of Sb-O bonds.

The new name is after the locality. The mineral was formed by weathering of rock and slag that were accumulated during mining operations at the beginning of this century. Type specimens are in the Museo di Mineralogia, Università di Firenze, Italy, and the Smithsonian Institution, Washington, D.C.

Discussion. The crystal structure was reported in *Am. Mineral.,* 73, 398–404, 1988. **J.L.J.**

Chekhovichite*

E.M. Spiridonov, I.V. Petrova, L.A. Demina, V.I. Dolgikh, G.M. Antonyan (1987) Vestnik Mosk. Univ., Geol., 42(6), 71–76 (English translation of Russian).

The mineral occurs in fractures in quartz and chalcedony in oxidized ores from former mines at Zod (Armenia) and at Zhana-Tyube and North Aksu (North Kazakhstan). Electron-microprobe analyses for the mineral from the respective localities gave Bi 37.2, 35.3, 36.6; Pb 0.8, 0.3, 1.4; Sb tr., 1.6, tr.; Fe 0.1, tr., 0.1; Cu tr., tr., 0.1; Te 46.3, 46.5, 46.1; O 16.0, 15.5, 16.0; sum 100.4, 99.2, 100.3 wt%; the first analysis corresponds to $(Bi_{1.96}Pb_{0.04}Fe_{0.02})_{\Sigma 2.02}Te_{3.99}O_{10.99}$ based on 17 atoms, and the others are similar to it. The mineral, which is synthesized easily, occurs as crusts on quartz, as small pockets in limonite, and as pseudomorphs after tellurobismuthite. Aggregates are up to 5 mm across; individual grains are up to 0.1 mm in size. Color grayish in shades of yellow, white, or green, streak white, luster adamantine, semitransparent, H = 4, perfect cleavage (and polysynthetic twinning) parallel to the elongation of platy grains, and a second perfect cleavage at 87° to it, D_{meas} = 6.88(15), D_{calc} = 7.002 g/cm³ (Zod) with Z = 4. Optically biaxial, negative elongation, $\alpha = 2.45$, $\beta = 2.50$, $\gamma = 2.65$, $2V_Z = 65(3)°$ (589 nm), $Z \wedge a = 25°$, $X \wedge c = 21°$, distinct dispersion $r < v$. Crystal-structure study showed the mineral to be monoclinic, space group $P2_1$; for material from Zod, a = 19.00(3), b = 7.982(9), c = 6.938(9) Å, β = 95.67(11)°, and the diffractometer powder pattern (Co radiation) has the following strongest lines: 3.29(100)($22\bar{1}$), 3.15(94)(600), 3.14(100)(202), 2.728(48)(421), 2.002(42)($82\bar{1}$), 1.998(45)(023), 1.686(32)(640), and 1.683(29)(242). The results are in good agreement with data for synthetic $Bi_2Te_4O_{11}$.

The new name is for Professor S. K. Chekhovich of the Polytechnical Institute of Alma-Ata, Kazakchskaya SSR. Type specimens of the mineral are in the Fersman Mineralogical Museum, Moscow. **J.L.J.**

Chernikovite*

D. Atencio (1988) Chernikovite, a new mineral name for $(H_3O)_2(UO_2)_2(PO_4)_2\cdot 6H_2O$ superseding "hydrogen autunite." Mineral. Record, 19, 249–252.

This note is a compilation of data published in 1958, 1971, and 1979 in rather inaccessible sources on three occurrences of a mineral that had been given the misleading name "hydrogen autunite" after synthetic material of the same properties and that now is to be called chernikovite. Chemical data are listed for synthetic material [Ross, *Am. Mineral.,* 40, 917–919 (1955)]: UO_3 65.08, P_2O_5 16.03, H_2O 19.33, total 100.44 wt%, consistent with the ideal formula $(H_3O)_2(UO_2)_2(PO_4)_2\cdot 6H_2O$. Of the total water of hydration, 9.28 wt% is lost at 110 °C. Only spectrographic data are available for natural material. X-ray powder-diffraction data can be indexed on a tetragonal unit cell, probable space group $P4/nmm$, but possibly also $P4/ncc$ or $P4_222$. Cell parameters of type material of Chernikov (1958) on the basis of $P4/nmm$ are a = 7.030(6), c = 9.034(8) Å, Z = 1, D_{calc} = 3.258 g/cm³. The strongest X-ray diffraction lines (41 listed) are 5.51(90)(101), 4.99(100)(110), 3.82(80)(102), 3.54(100)(200), 3.26(100)(201), 2.96(60)(211), 2.16(70)(104,213, 222,311), and 2.09(70)(302). The pattern of chernikovite has a strong reflection at about 9 Å, between the 002 peak of autunite and the 001 peak of meta-autunite: when the three minerals occur together, identification is easy. The mineral is probably isostructural with meta-ankoleite, uramphite, and abernathyite. Type chernikovite (no exact location given) occurs as thin, transparent, mica-like plates, elongate [010], cleavages perfect {001} and imperfect {100}, color pale yellow, luster vitreous, ultraviolet fluorescence intense yellow-green. H not indicated. Optically uniaxial negative, $\epsilon = 1.569$, $\omega = 1.583$. Brazilian material (Camargo, 1971) is optically lemon-green and slightly pleochroic; it occurs with other secondary uranium minerals at Perus (Sao Paulo) as oriented inclusions in autunite and meta-autunite, which line fractures in granites and granitic pegmatites. Calculation of the Gladstone-Dale relationships with the ideal formula, the calculated density, and the recorded refractive indices of the type material lead to a compatibility index $[1 - (K_P/K_C)]$ of -0.0536, "good."

The proposal to discard the name "hydrogen autunite" has been made because the mineral contains $(H_3O)^+$ ions and not simply H^+, because the degree of hydration is not that of an autunite-group mineral, and because the term "hydrogen autunite" has been used for other natural and artificial compounds. The name honors Dr. A. A. Chernikov of the Institute of Mineralogy, Geochemistry and Crystallochemistry of Rare Elements (IMGRE) of the Academy of Sciences, Moscow, USSR, who described the first natural occurrence (1958). A specimen of the type material is deposited in the Fersman Mineralogical Museum in Moscow.

Discussion. It is to be regretted that a number of easily obtainable data, e.g., chemistry and single-crystal measurements, have not been newly acquired on the type material. **E.A.J.B.**

Sieleckiite*

W.D. Birch, A. Pring (1988) Sieleckiite, a new copper aluminum phosphate from Mt [sic] Oxide, Queensland, Australia. Mineral. Mag., 52, 515–518.

Electron-microprobe analysis gave CuO 32.39, Al_2O_3 26.57, P_2O_5 19.42, H_2O (CHN analyzer) 18.6, CO_2 1.6, sum 98.1 wt%, corresponding to $Cu_{3.11}Al_{3.98}(PO_4)_{2.09}(OH)_{12}\cdot 1.7H_2O$, ideally $Cu_3Al_4(PO_4)_2(OH)_{12}\cdot 2H_2O$ assuming CO_2 is an impurity. The mineral occurs as slightly translucent spheres, up to 0.5 mm in diameter, with a smooth outer surface and a finely fibrous radiating structure made up of crystals 20–100 μm long and 1–2 μm in diameter. Color deep sky-blue to royal blue, streak pale blue, $D_{meas} = 3.02(2)$ g/cm³ by suspension, $D_{calc} = 2.94$ g/cm³ for the ideal formula and Z = 1. No cleavage, twinning, or fluorescence; subconchoidal fracture and H = 3 for the aggregates. Refractive indices are between 1.63 and 1.66, length slow, weakly pleochroic from colorless to pale blue. Electron-diffraction data and refinement of the Guinier X-ray powder pattern (Cu radiation) gave triclinic symmetry, $a = 9.41(8)$, $b = 7.56(5)$, $c = 5.95(6)$ Å, $\alpha = 90.25(12)$, $\beta = 91.27(12)$, $\gamma = 104.02(7)°$. Strongest lines of the powder pattern are 9.120(50)(100), 5.036(100)(101), 3.852(100)(111), 3.276(30)($\bar{2}20$), 2.827(50)($\bar{1}02$,102), and 2.460(50)($\bar{3}21$).

The mineral occurs at the dormant Mt. Oxide copper mine, 150 km north of Mt. Isa, Queensland, Australia, where oxidation of a massive pyrite body containing minor chalcopyrite and chalcocite led to enrichment in supergene chalcocite accompanied by malachite, brochantite, and lesser amounts of cuprite, tenorite, azurite, atacamite, turquoise, and libethenite. The new mineral was collected by geologist Robert Sielecki, for whom it is named, from a narrow fracture in a boulder in the open pit; associated minerals are well-crystallized variscite, turquoise, libethenite, and minor pseudomalachite. Type specimens are in the Museum of Victoria and the South Australian Museum. **J.L.J.**

Unnamed Tl sulfide

A. El Goresy, M.K. Pavicevic (1988) A new thallium mineral in the Alshar deposit in Yugoslavia. Naturwiss., 75, 37–39.

Dump samples from the Crven Dol mine in the Alshar thallium deposit, Kozuf metallogenic province, Yugoslavia, contain realgar, orpiment, lorandite, arsenic-bearing pyrite and marcasite, and an unnamed mineral for which electron-microprobe analyses gave Tl 72.9, Fe <0.05, Zn 0.14, Cu 0.16, Ni 0.09, As 9.40, Sb 0.22, S 15.8, sum 98.71 wt%, corresponding to $Tl_{2.90}Zn_{0.016}Cu_{0.024}Ni_{0.016}As_{1.024}Sb_{0.016}S_{4.00}$, ideally Tl_3AsS_4. The mineral is pale gray in reflected light and has yellow internal reflection and slightly lower reflectivity than orpiment. Occurs as thin rinds on lorandite, realgar, and orpiment. Known as a synthetic phase. **J.L.J.**

Pb-Bi-Hg-Cu sulfosalts

E.E. Foord, D.R. Shaw, N.M. Conklin (1988) Coexisting galena, PbS_{ss} and sulfosalts: Evidence for multiple episodes of mineralization in the Round Mountain and Manhattan gold districts, Nevada. Can. Mineral, 26, 355–376.

At the Outlaw prospect, Round Mountain gold district, Nevada, a quartz vein contains several rare Pb-Bi-Ag-Cu sulfosalts, two of which are unidentified. *Phase X,* present as veinlets that cut aikinite, is similar in color and reflectivity to aikinite. Electron-microprobe analyses of five grains gave an average of Cu 1.3, Sb 0.1, S 15.9, Pb 31.2, Bi 40.6, Ag 3.1, Mo 0.1, Hg 8.2, Te 0.1, sum 100.6 wt%, corresponding to $(Hg_{2.23}Ag_{1.40}Cu_{1.05}Pb_{0.32})_{\Sigma 5.00}Pb_{8.0}(Bi_{10.71}Mo_{0.06}Pb_{0.05}Sb_{0.02})_{\Sigma 10.84}S_{27}$, simplified as $(Hg,Ag,Cu,Pb)_5Pb_8Bi_{11}S_{27}$. It is concluded that single-crystal studies will be necessary to determine whether the mineral is a new species, possibly a Hg-substituted heyrovskyite or eskimoite, or a new member of the lillianite series.

Phase Y, which forms the bulk of an area about 200 by 200 μm, contains lathlike intergrowths of phase X, blebs and irregular masses of galena, and coloradoite. Two electron-microprobe analyses gave Sb 0.02, 0.03, Te 0.04, 0.07, Cu 1.60, 1.61, Hg 10.13, 9.14, S 15.40, 15.42, Pb 35.04, 34.71, Bi 36.79, 36.95, Ag 2.59, 2.43, sums 101.61, 100.37 wt%. The mineral may be a Hg- and Cu-substituted ourayite, but single-crystal X-ray studies are necessary to characterize the mineral. **J.L.J.**

Unnamed mineral of the crichtonite group

H.A. Stalder, Ch. Bühler (1987) Geochemistry of crichtonite group minerals from Alpine fissures. Schweiz. Mineral. Petrogr. Mitt., 67, 93–102 (in German).

Electron-microprobe analyses gave TiO_2 50.48–51.12, Fe_2O_3 27.90–29.41, Al_2O_3 0.18–0.21, V_2O_5 0.95–1.06, MnO 1.02–1.13, ZnO 1.09–1.20, As_2O_5 0.66–1.07, Nb_2O_3 1.22–1.87, SnO_2 0.31–0.88, Y_2O_3 1.12–1.53, CaO 0.08–0.10, SrO 0.21–0.31, BaO 0–0.16, PbO 3.91–4.56, UO_2 6.06–7.82, ThO_2 0–0.04, sum 98.15–99.26 wt%, leading to an average empirical formula $[U_{0.49}Pb_{0.37}(Sr,Ca,Ba,Th)_{0.09}]_{\Sigma 0.95}$ $[Ti_{12.39}\,Fe^{3+}_{4.69}\,Fe^{2+}_{2.34}\,(Mn, Zn, Nb, Y, V, As, Al, Sn)_{1.53}]_{\Sigma 20.95}O_{38}$. X-ray powder and single-crystal methods show the mineral to belong to the crichtonite group with $a = 10.456(3)$, $c = 21.098(6)$ Å. The mineral, provisionally designated as a REE-free davidite, occurs on the Pizzo Cervandone, Alpe Devero, Italy, as crystals up to 2 mm in diameter in fissures in gneiss, associated with dark smoky quartz, rutile, chernovite, and hematite. The dominant crystal form is a rhombohedron, which gives the crystals an isometric appearance. **E.A.J.B.**

Unnamed mineral of the pinakiolite group

S. Hansen, U. Hålenius, B. Lindqvist (1988) Antimony-rich pinakiolite from Långban, Sweden: a new structural variety. Neues Jahrb. Mineral. Mon., 231–239.

Electron-microprobe analysis and ICP emission spectrography (for B) with subsequent recalculation to pinakiolite stoichiometry gave (average of 16 measurements) MgO 32.02, MnO 7.81, Mn_2O_3 26.48, Sb_2O_3 16.30, Fe_2O_3 0.06, Al_2O_3 0.22, B_2O_3 15.74, total 98.65 wt%, consistent with a formula $(Mg_{7.0}Mn^{2+}_{1.0})(Mn^{3+}_{3.0}Al_{0.04}Sb^{3+}_{1.0})(BO_5)_4$. The Sb has been assumed to be trivalent because it is in better accordance with the measured B content and also gives rise to a striking stoichiometry, suggesting ordered sites for Sb and Mn^{2+}. X-ray diffraction studies show the mineral to be monoclinic, possible space groups *Pa* or *P2/a* with a = 21.808(4), b = 6.162(1), c = 5.331(1) Å, β = 94.73°, Z = 2; neither D nor the strongest X-ray diffraction lines are given. Electron-diffraction and lattice images indicate that the structure of the mineral is derived from pinakiolite by a structural mechanism operating on the (100) plane instead of the well-known (201) chemical twinning of other pinakiolite-group minerals. Structural complexities are indicated by diffuse scattering effects in all three directions and satellite reflections in one direction. The mineral occurs as flaky crystals, rarely to 1 mm in size, in a hausmannite-impregnated calcite-dolomite rock as a fissure filling. Associated minerals are manganberzeliite, Ba-bearing hedyphane, and manganoan phlogopite. Color variable from light olive-green to yellowish-brown and bronzelike, streak yellowish-gray, translucent to semimetallic luster; larger crystals have an almost black internal reflection. Fairly brittle, H about 3. Most perfect cleavage {100}. Most individual tabular crystals are strongly curved. Optically strongly pleochroic, dark reddish-brown approximately perpendicular to the cleavage (= X) and yellow parallel to the cleavage; biaxial negative with $2V$ = 50–55°.

The mineral probably fulfills the requirements for being considered as a new species, but no proposal has been put forward to the IMA Commission on New Minerals. The authors have stated that future investigations will elucidate the most complex chemical and structural variations and their interrelationships within the pinakiolite group: this will result in a later need for revision of the nomenclature of the pinakiolite minerals.

Discussion. This decision of the authors is to be highly esteemed by the professional community. **E.A.J.B.**

Unnamed Mn analogue of gordonite

P.B. Leavens, A.L. Rheingold (1988) Crystal structures of gordonite, $MgAl_2(PO_4)_2(OH)_2(H_2O)_6 \cdot 2H_2O$, and its Mn analog. Neues Jahrb. Mineral. Mon., 265–270.

Electron-microprobe analysis (not given) of a mineral in specimen NMNH 162695 from the National Museum of Natural History, Smithsonian Institution, Washington, D.C., gave the composition $(Mn_{0.73}Fe_{0.23}Mg_{0.04})Al_{2.08}(PO_4)_2(OH)_2(H_2O)_6 \cdot 2H_2O$, with the water inferred from the structural analysis. The mineral is colorless, triclinic, space group $P1$, a = 5.257(3), b = 10.363(4), c = 7.040(3) Å, α = 105.44(3), β = 113.07(3), γ = 78.69(4)°, Z = 2. The mineral is the Mn analogue of gordonite and is isostructural with paravauxite and laueite. **J.L.J.**

Unnamed arsenate

A.C. Roberts, P.J. Dunn (1988) Mineralogical data for a new, unnamed arsenate from the Långban Mine, Värmland, Sweden. Geol. Fören. Stockholm Förh., 110, 181–182.

On a seam surface of magnetite-calcite ore from the Långban mine, Sweden, are very thin, irregularly shaped patches of a dark reddish-brown, almost black mineral consisting of platy crystals having {100} dominant. The mineral, which is intimately associated with pyroaurite, has a vitreous to resinous luster, perfect {100} cleavage, H = 3 to 4, D_{meas} = 3.6(3) g/cm³ by suspension. Soluble in 1:1 HCl, nonfluorescent in ultraviolet light. Electron-microprobe analysis gave Fe_2O_3 9.4, MgO 13.2, ZnO 5.0, CuO 0.4, MnO 35.3, As_2O_5 22.1, H_2O (by difference) 14.6 wt%, corresponding to $Mn_{4.88}(Mg_{3.21}Zn_{0.60}Cu_{0.05})_{\Sigma 3.86}Fe^{3+}_{1.16}As_{1.89}O_{7.26}(OH)_{15.89}$, ideally $Mn_5Mg_4Fe^{3+}(AsO_4)_2(OH)_{15}$; with Z = 6 and the ideal formula, D_{calc} = 3.53 g/cm³. Poor-quality single-crystal photographs indicate monoclinic symmetry, pseudohexagonal, space group *A2/a* or *Aa*; cell dimensions refined from the powder pattern gave a = 24.97(5), b = 8.09(1), c = 14.04(2) Å, β = 106.85(14)°. Strongest lines from the 114-mm Gandolfi powder pattern (Fe radiation) are 12.0(80)(200), 5.99(80)(011), 4.02(100)(020,600), 3.35(40)(420), 3.006(40)(several), 2.618(50)(404,$\bar{4}$15), and 2.368(50). The specimen studied is in the Smithsonian Institution, Washington, D.C. **J.L.J.**

New Data

Cannizzarite, Bursaite

N.N. Mozgova, N.I. Organova, Yu.S. Borodaev, E.G. Ryabeva, A.V. Sivtsov, T.I. Getmanskaya, O.V. Kuzmina (1988) New data on cannizzarite and bursaite. Neues Jahrb. Mineral. Abh., 158, 293–309.

Cannizzarite and bursaite occur as platy, elongate grains up to 1 mm long with other Pb-Bi sulfosalts, native bismuth, tetradymite, and joseite-B in the Shumilovskoe Sn-W greisen deposit, West Transbaikal, USSR.

Cannizzarite

Electron-microprobe analysis gave Pb 35.65, Ag 0.45, Bi 46.92, Sb 0.61, S 16.00, Se not present, total 99.63 wt%, leading to a formula $(Pb_{3.90}Ag_{0.09})_{\Sigma 3.99}(Bi_{5.09}Sb_{0.11})_{\Sigma 5.20}S_{11.31}$, close to that of low-Bi cannizzarite $Pb_4Bi_5S_{11.5}$. This is the first support for the existence of Se-free low-Bi cannizzarite. Optical and crystallochemical properties of this variety are similar to those of Se-bearing cannizzarite.

Bursaite

Electron-microprobe analysis of four optically homogeneous grains gave an average formula of $(Pb_{4.91}Ag_{0.24})_{\Sigma 5.15}(Bi_{3.99}Sb_{0.06})_{\Sigma 4.05}S_{10.82}$, close to the initially (1955) described formula $Pb_5Bi_4S_{11}$ for bursaite from Uludag, Turkey. The average composition of the Shumilovskoe material corresponds to $^{3.83}Gu_{13.49}$ in the nomenclature of Makovicky and Karup-Møller (1977), and its composition field in the $(Bi,Sb)_2S_3$-Pb_2S_2-Ag_2S diagram is similar to that for bursaite from the type locality. Electron-diffraction and X-ray powder patterns are lillianite-like; the powder pattern, which contains more lines than the lillianite standard, can be indexed as a mixture of two orthorhombic *Bbmm* phases with respectively a = 13.42, b = 20.37, c = 4.12 Å, and a = 13.55, b = 19.79, c = 4.04 Å. These phases seem to be the exsolution products of the nonstoichiometric phase III of Otto and Strunz (1968), because their bulk composition falls into the high-temperature field of this phase. Material from the type locality, either described as $^{3.82}Gu_{12.2}$ by Makovicky and Karup-Møller (1977) or indexed on lillianite cell dimensions by Friedrich (1983), is likewise considered to have been two-phase mixtures. The data obtained by different authors show that "bursaite" covers lillianite-like phases with a composition close to $Pb_5Bi_4S_{11}$. It is proposed that the name bursaite should be retained for this variety of lillianite.

Discussion. Assuming that the authors do not intend to retain a mineral name for a mixture of two exsolved phases, it is not clear which phase is to be named bursaite. The name certainly cannot be applied to two different phases, however difficult it may be to distinguish them by chemical or optical methods. **E.A.J.B.**

Dumontite

P. Piret, J. Piret-Meunier (1988) New crystal-structure determination of dumontite $Pb_2[(UO_2)_3O_2(PO_4)_2]\cdot 5H_2O$. Bull. Minéral., 111, 439–442.

Crystal-structure determination of dumontite showed the space group to be $P2_1/m$ and the formula to be as stated above. The revised formula presumably also applies to hügelite, formerly $Pb_2(UO_2)_3(AsO_4)_2(OH)_4\cdot 3H_2O$. **J.L.J.**

Eskebornite

Z. Johan (1988) Crystal symmetry of eskebornite, $CuFeSe_2$. Neues Jahrb. Mineral. Mon., 337–343.

Electron-microprobe analyses of eskebornite confirm that its ideal formula is $CuFeSe_2$; Ag, and probably also Hg, may partly replace the Cu. Single-crystal X-ray study established that the mineral is tetragonal, space group $P4mc$ or diffraction-equivalent, a = 5.518(4), c = 11.048(6) Å. The structure of eskebornite may be related to that of the sulvanite-type rather than the chalcopyrite-type. **J.L.J.**

Godlevskite

M.E. Fleet (1987) Structure of godlevskite, Ni_9S_8. Acta Crystallogr., C43, 2255–2257.

M.E. Fleet (1988) Stoichiometry, structure and twinning of godlevskite and synthetic low-temperature Ni-excess nickel sulfide. Can. Mineral., 26, 283–291.

New electron-microprobe data for godlevskite from Noril'sk, northern Siberia, USSR, indicate a metal:sulfur ratio of 9:8. This result is consistent with the determination of the godlevskite structure in space group $C222$ and formula of $(Ni_{8.7}Fe_{0.3})S_8$. The formula was thought previously to be Ni_7S_6. **J.L.J.**

Hydrocalumite

E. Passaglia, M. Sacerdoti (1988) Hydrocalumite from Montalto di Castro, Viterbo, Italy. Neues Jahrb. Mineral. Mon., 454–461.

M. Sacerdoti, E. Passaglia (1988) Hydrocalumite from Latium, Italy: its crystal structure and relationship with related synthetic phases. Neues Jahrb. Mineral. Mon., 462–475.

Hydrocalumite is known to occur both with monoclinic and rhombohedral symmetries. A new chemical analysis and comparison with published chemical data indicate that hydrocalumite has the general formula $Ca_2Al(OH)_6[X]\cdot nH_2O$, where X consists of (OH), Cl, and $\frac{1}{2}(CO_3)$, and n ranges from 2 to 2.75. Hydrocalumite compositions are members of a solid-solution series in the ternary system $Ca_2Al(OH)_6[Cl]\cdot 2H_2O$–$Ca_2Al(OH)_6[OH]\cdot 3H_2O$–$Ca_2Al(OH)_6[(CO_3)_{0.5}]\cdot 3H_2O$.

Discussion. In addition to the mineral's having monoclinic and rhombohedral symmetries, (OH)-dominant and Cl-dominant natural members are known. The nomenclature needs re-examination. **J.L.J.**

Munirite

H.T. Evans, Jr. (1988) The crystallography of munirite, $NaVO_3 \cdot (2 - x)H_2O$. Mineral. Mag., 52, 716–717.

On the basis of a cell derived by indexing of its X-ray powder pattern, munirite was thought to be orthorhombic. The mineral is monoclinic, space group $P2_1/a$, $a = 16.72$, $b = 3.636$, $c = 8.015$ Å, $\beta = 111.0°$. Because the mineral is slightly water-deficient relative to the formula $NaVO_3 \cdot 2H_2O$, and it is not known how much water can be lost without destroying the structure, it is suggested that the composition be defined as $NaVO_3 \cdot (2 - x)H_2O$, where x may vary from 0 to about 0.2. **J.L.J.**

Robertsite

S.J. van Kauwenbergh, M. Cooper-Fleck, M.R. Williams (1988) The occurrence of robertsite in a sedimentary phosphate ore from Thailand. Mineral. Mag., 52, 505–508.

Robertsite occurs as pore fillings, as layers and coatings on phosphate particles and between apatite layers, and rarely as submicrometer-sized crystals in apatite, in a guano-derived sedimentary phosphate ore from the Lamphun area of northwestern Thailand. Wet-chemical analysis gave Mn_2O_3 36.31, CaO 16.08, Fe_2O_3 1.10, Al_2O_3 2.41, K_2O 0.22, SiO_2 0.01, TiO_2 0.25, BaO 0.08, SrO 0.04, P_2O_5 33.28, H_2O^+ (L.O.I.) 9.85, sum 99.63 wt%. The formula ratios are $Ca_{5.59}Mn^{3+}_{8.97}P_{9.14}(OH)_{21.32}$, similar to those in the formula $Ca_6Mn^{3+}_9O_6(PO_4)_9(H_2O)_6 \cdot 3H_2O$ proposed by J. O. Nriagu (*Phosphate Minerals*, J. O. Nriagu and P. B. Moore, eds., Springer-Verlag, New York, 1–136, 1984). The analysis is the first one published for this mineral. **J.L.J.**

Sabatierite, Crookesite

R.A. Berger (1987) Crookesite and sabatierite in a new light—A crystallographer's comment. Zeits. Kristallogr., 181, 241–249.

Electron-microprobe analyses, synthesis, and X-ray data for crookesite indicate that the mineral is tetragonal, space group $I\bar{4}$, and has the composition $TlCu_7Se_4$. Attempts to synthesize $TlCu_6Se_4$, the proposed composition of sabatierite, yielded three-phase mixtures. Although no specimen of sabatierite was examined, comparison of the X-ray powder data for this mineral and synthetic $TlCu_4Se_3$ suggests that they are identical and are best indexed with a tetragonal cell of about $a = 3.997$, $c = 9.841$ Å. It is recommended that sabatierite be reinvestigated.

Discussion. The tentative composition and cell for sabatierite are new. The proposal for crookesite agrees with data recently abstracted (*Am. Mineral.*, 73, 933, 1988). **J.L.J.**

Sigloite

F.C. Hawthorne (1988) Sigloite: The oxidation mechanism in $[M^{3+}_2(PO_4)_2(OH)_2(H_2O)_2]^{2-}$ structures. Mineral. Petrology, 38, 201–211.

Sigloite is isostructural with the laueite-group minerals and is the oxidized equivalent of paravauxite. The simplified formula of paravauxite is $Fe^{2+}Al_2(PO_4)_2(OH)_2 \cdot 8H_2O$, whereas that of sigloite as determined by crystal-structure analysis is $Fe^{3+}Al_2(PO_4)_2(OH)_3 \cdot 7H_2O$. **J.L.J.**

Tinticite

J.C. Melgarejo, S. Gali, C. Ayora (1988) Tinticite: New structural and chemical data. Neues Jahrb. Mineral. Mon., 446–453.

Tinticite forms monomineralic centimeter-wide veinlets, and nodules up to 5 cm in diameter, in jarosite-rich shales at Bruguers, 15 km southwest of Barcelona, Spain. The veinlets and nodules consist of cream-to-brown aggregates of platy crystals generally less than 1 μm in size. Wet-chemical analysis gave Fe_2O_3 48.9, P_2O_5 29.4, V_2O_5 4.0, H_2O (TGA) 17.9, sum 100.2 wt%, corresponding to $2.02Fe_2O_3 \cdot 1.42(P_2O_5 + V_2O_5) \cdot 6.56H_2O$, simplified as $Fe^{3+}_4(PO_4)_3(OH)_3 \cdot 5H_2O$. Indexing of the X-ray diffractometer powder pattern (Cu radiation) gave monoclinic symmetry, $a = 13.65(1)$, $b = 6.542(5)$, $c = 12.31(1)$ Å, $\beta = 91.2(1)°$, possible space group $P2$, Pm, or $P2/m$. Strongest lines of the pattern are 4.6037(40)(202), 3.9504(95)($\bar{1}03$), 3.3070 (100) ($\bar{4}01$), 3.0270 (95) (410), 2.9836 (60) (104), 2.3610(40)(420), and 1.9464(40)($\bar{3}31, \bar{1}16$). With the simplified formula, $D_{calc} = 2.97$ g/cm³ for Z = 3; $D_{meas} = 2.94$ g/cm³ (pycnometer). The cell dimensions, symmetry, and formula are new. **J.L.J.**

Xitieshanite

Jingliang Zhou, Jiaju Li, Wei Dong (1988) The crystal structure of xitieshanite. Kexue Tongbao, 33(6), 502–505 (foreign language edition, in English).

Xitieshanite originally was assigned the formula $Fe^{3+}(SO_4)(OH) \cdot 7H_2O$ [see *Am. Mineral.*, 69, 1194, 1984], but a new chemical analysis of material from the type locality gave a Cl content of 10.05 wt%. X-ray crystal-structure analysis gave monoclinic symmetry, space group $P2_1/c$, and cell dimensions similar to those reported previously but with a and c interchanged; $R = 0.0297$ was obtained with the new formula $Fe^{3+}(SO_4)Cl \cdot 6H_2O$. **J.L.J.**