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NEW MINERAL NAMES

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Lonsdaleite

CLIFFORD FRONDEL AND URSULA B. MARVIN (1967) Lonsdaleite, a hexagonal polymorph of diamond. *Nature* **214**, 587–589.

The residue (about 200 g) from the solution of 5 kg of the Canyon Diablo meteorite was found to contain about a dozen black cubes and cubo-octahedrons up to about 0.7 mm in size. They were found to consist of a transparent substance coated by graphite. X-ray data showed the material to be hexagonal, with a 2.51, c 4.12, c/a 1.641. The strongest X-ray lines are 2.18 (4)$(10\bar{1}0)$, 2.061 (10)(0002), 1.257 (6)$(11\bar{2}0)$, and 1.075 (3)$(11\bar{2}2)$. Electron probe analysis showed only C. It is accordingly the hexagonal (2H) dimorph of diamond. Fragments under the microscope were pale brownish-yellow, faintly birefringent, n slightly higher than 2.404.

The hexagonal dimorph is named lonsdaleite for Prof. Kathleen Lonsdale, distinguished British crystallographer. It has been synthesized by the General Electric Co. and by the DuPont Co. and has also been reported in the Canyon Diablo and Goalpara meteorites by R. E. Hanneman, H. M. Strong, and F. P. Bundy of General Electric Co. [*Science*, **155**, 995–997 (1967)].

The name was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

Roseite

J. OTTEMANN AND S. S. AUGUSTITHIS (1967) Geochemistry and origin of "platinum-nuggets" in lateritic covers from ultrabasic rocks and birbirites of W. Ethiopia. *Mineralium Deposita*, **1**, 269–277.

A nugget about 5 mm in diameter consisted mainly of ferro-platinum, osmiridium, chromite, limonite, and 4 probably new minerals. One of these contained Os, Ir, and S, as shown by electron probe study. Analysis showed S 15% ("an accurate correction for the measured values of S was not possible due to lack of dependable mass absorption coefficients"), and the formula (Os, Ir)S is given. The mineral is light gray, relief and hardness approximately those of osmiridium, no noticeable reflection-pleochroism or anisotropy. Roseite is associated with osmiridium, which it often surrounds, and with silicates. The name is for Professor Hermann Rose of Hamburg University.

Mineral (a) is gray, distinctly anisotropic, contains Ni, Pd, Rh, Fe, and S. Mineral (b) is "oil-like" in color with a yellowish tint, no noticeable pleochroism and anisotropy; it contains more Ni than (a), also a little Co and Pd, and much Fe. Mineral (c) is grayish-blue and contains Rh, Pd, and Pt, but no Ni, Co, Fe.

DISCUSSION.—The data on "roseite" are inadequate to justify a name, especially in the absence of X-ray data. In addition the name roseite (Dana, 6th Ed., p. 668) has been in use since 1879 for a vermiculite-like mineral, and rosite (Dana, 6th Ed., p. 621) since 1840 for a pinite-like pseudomorph.

Unnamed Palladium-Bismuth-Lead Mineral

L. J. CABRI AND R. J. TRAILL (1966) New palladium minerals from Noril'sk, western Siberia. *Can. Mineral.*, **8**, 541–550.

A grain enclosed by zvyagintsevite (Pd_3Pb) was analysed by the electron-probe with the following results: Pd 33.1, Bi 36.4, Pb 29.0, total 98.5%. These data correspond to $Pd_{0.50}Bi_{0.28}Pb_{0.22}$ or Pd(Bi, Pb).

The mineral is white with a grayish tinge when compared to Pd_3Pb in oil. It is moderately anisotropic with colors from grey to pale brown in oil. The Vickers hardness number, estimated by means of the pseudo-Becke line, probably is between 201 and 276 kg/mm^2 at a 50 g load.

J. A. MANDARINO

Unnamed lead antimony sulfide

D. C. HARRIS, J. L. JAMBOR, G. R. LACHANCE, AND R. I. THORPE (1966) New observations on kobellite (Abstr.). *Can. Mineral.* **8,** 667.

Electron probe analyses of two Canadian "kobellites" and of kobellite from the type locality in Sweden indicate that the previous formula proposed by Nuffield in 1948 for kobellite ($6\ PbS \cdot FeS \cdot 2Bi_2S_3 \cdot Sb_2S_3$) is incorrect. The authors propose the new formula $5\ PbS \cdot 4(X)_2S_3$ where X is Bi and/or Sb. The Swedish mineral has a ratio of $Bi:Sb \simeq 1.6:1$. Material from Rossland, British Columbia, has $Bi:Sb \simeq 0.67:1$, while material from the Tintina Silver Mines, Yukon, has essentially no bismuth.

It is proposed that kobellite be retained from the bismuth member and that a new name be given to the antimony member.

J. A. MANDARINO

Irarsite

A. D. GENKIN, N. N. ZHURAVLEV, N. V. TRONEVA, AND I. V. MURAV'EVA, (1966) Irarsite, a new sulfoarsenide of iridium, rhodium, ruthenium, and plantinum. *Zap. Vses. Mineralog. Obschch.* **95,** 700–712 [in Russian].

Microprobe analysis gave Ir 23.0, Rh 7.2, Ru 9.4, Pt 12.6, As 34.5, S 11.6, sum 98.3%, corresponding to $(Ir_{1.45}Ru_{1.13}Rh_{0.84}Pt_{0.78})\ As_{5.60}S_{4.49}$, which may be simplified to (Ir, Ru, Rh, Pt)AsS. X-ray study showed the mineral to be cubic, $a = 5.777–5.778 \pm 0.005$Å. The corresponding synthetic compounds (Hulliger, *Nature* **198** [1963]) have unit cells: IrAsS 5.791, RhAsS 5.780, PtAsS 5.929Å. The strongest lines are 3.32 (10)(111), 2.87 (10)(200), 2.57 (8)(210), 2.04 (9)(220), 1.74 (10)(113), 1.29 (7)(024), 1.18 (7)(224), 1.112 (9)(115, 333), 1.021 (8)(044), 0.976 (8)(135), 0.963 (7)(006, 244), 0.913 (7)(026).

The mineral is iron-black with metallic luster. In reflected light grayish-white, with a bluish tint, isotropic Reflectivities are given for 9 wave lengths; they decrease from 48.6 at 455 mμ to 42.8 at 750 mμ. Brittle. Microhardness 976 kg./sq. mm., not scratched by a steel needle.

The mineral occurs in chromite in hortonolite dunite from the Onverwacht deposit, Union of S. Africa, intergrown with native platinum and with ruthenian hollingworthite. (Formula $(Ir_{0.07}Rh_{2.78}Ru_{1.46}Pt_{1.09})As_{5.27}S_{4.73}$, *a* 5.769–5.797A., compare *Amer. Mineral.,* **50,** 1068–1074 [1965]).

The name is for the composition. Type material is preserved at the Mineralogical Museum, Acad. Sci., USSR, Moscow. The name was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

Unnamed Iron-Titanium Oxide

PAUL R. VAN LOAN (1966) An iron-titanium oxide mineral from Hearst, Ontario (Abstr.). *Can. Mineral.* **8,** 674.

A mineral found as a minor accessory in a quartz-kaolinite sand-clay deposit north of Hearst, Ontario, is described as follows: black, submetallic (subadamantine is used later, J.A.M.), weakly magnetic, $G = 4.03 \pm 0.02$, streak olive-gray, opaque in transmitted light, very faintly anisotropic. The chemical formula is given as $Fe_2O_3 \cdot 3TiO_2 \cdot 0.6H_2O$. The X-ray powder data are virtually identical to those of "proarizonite" (*Amer. Mineral.* **49,** 1774 (1964)) and "pseudorutile" (*Amer. Mineral.* **52,** 299 (1967)).

Discussion. The discussion by Dr. Fleischer in the abstract dealing with "pseudorutile" applies equally well here.

J. A. Mandarino.

Aurorite

A. S. Radtke, C. M. Taylor, and D. F. Hewett (1967) Aurorite, argentian todorokite, and hydrous silver-bearing manganese oxide. *Econ. Geol.* **62,** 186–206.

Electron probe analyses were made of 14 grains, giving Mn 43.58-44.28, Ag 6.61-7.26, Ba 2.59-2.90, Pb 1.08-1.41, Ca 1.58-2.02, K 0.80-0.91, Cu 0.75-0.94%. Al, Fe, Si, Mg, Na, Zn, and Ni were determined spectrographically. This yields the analysis: MnO_2 59.99, MnO 7.89, CaO 2.50, SrO not detected, BaO 3.07, Na_2O 0.07, K_2O 1.11, Ag_2O 7.50, PbO 1.30, CuO 1.06, ZnO 0.25, NiO 0.03, MgO 0.12, Al_2O_3 0.15, Fe_2O_3 0.07, As_2O_3 trace, SiO_2 0.11, H_2O (by difference) 14.78%. The ratio MnO_2:MnO was assumed to be the same as the average in published analyses of chalcophanite. Calculation on the basis of seven oxygen gives the formula:

$$(Mn_{0.48}Ag_{0.28}Ca_{0.19}K_{0.10}Ba_{0.06}Cu_{0.06}Pb_{0.02}Mg_{0.01}Zn_{0.01})\overset{+4}{Mn}_{2.97}O_7\cdot 3.53H_2O,$$
or $(Mn, Ag, Ca)Mn_3O_7\cdot 3H_2O$.

This is the manganous analogue of the zinc manganese oxide chalcophanite; the name is for the end-member with Mn^{2+} dominant. The analyzed material is therefore an argentian aurorite.

X-ray powder data (33 lines) are very similar to those of chalcophanite. The strongest lines are 6.94 (10), 4.06 (5), 3.46 (7), 2.54 (5), 2.23 (5), 1.560 (5), 1.429 (5).

The mineral occurs as small irregular masses and platy or scaly grains in veinlets distributed through black calcite from the Aurora mine (Treasure Hill), Hamilton, Nevada. The largest grains are less than 8 microns. H. less than 3. In reflected light strongly birefringent and anisotropic, showing color changes from cream white to medium gray. Does not show the deep-red internal reflections characteristic of chalcophanite. Associated minerals are todorokite (argentian), cryptomelane, pyrolusite, quartz, and manganoan calcite.

The name is for the mine. The mineral was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

Protopartzite

S. Koritnig (1967) Der Thrombolith von der Veitsch, Steiermark. *Mitteilungsblatt Mus. Bergbau, Geol., Paleontol. Landesmuseums "Joanneum," Abt. Mineral,* **1967,** no. 1–2, p. 51–56.

Thrombolite was originally described from Rezbanya, Roumania, by Breithaupt in 1938. Schrauf in 1880 gave an analysis indicating that it was a copper antimonate, not a copper phosphate (pseudomalachite according to Frondel, *Dana's System,* 7th ed., 2, p. 800).

Similar material from Veitsch, Styria, referred to as thrombolite by Cornu in 1908, has now been examined. It is an olive-green to yellow-green earthy oxidation product of tetrahedrite *n* 1.72, that contains relict tetrahedrite and a network of brown veins. Electron probe analyses of the brown material gave Cu 6–10%, Fe up to 23%. Probe analyses of the mixture of green and brown material by A. Schneider gave Cu 6-47, Fe 3.7-23, Zn 0.4-0.5, As 6-12.3, Sb 19.3-34.4% (individual analyses not given). Taking Sb 33, As 9, Cu

23, Zn 0.4, Fe 4% as the composition, recalculating to oxides, and taking the difference as water, the formula $Cu(Sb, As, Fe, Zn)_{1.3}(O, OH)_{6.8}$ is derived. This resembles the formula of partzite (Mason and Vitaliano, *Mineral. Mag.* **30,** 100–112 [1955]). The Veitsch material is, however, not cubic like partzite, but X-ray amorphous. Since it is uncertain whether the Rezbanya thrombolite is like partzite, the name protopartzite is suggested for the Veitsch material.

DISCUSSION.—An unnecessary name.

Usovite

A. D. NOZHKIN, V. A. GAVRILENKO, AND V. A. MOLEVA (1967) Usovite, a new barium fluoaluminate. *Zap. Vses. Mineralog. Obshch.* **96,** 63–66 [in Russian].

Analyses by V.A.M. of material containing fluorite gave Al_2O_3 16.06, MgO 6.06, BaO 44.04, SrO 0.35, CaO 8.40, Na_2O 0.20, K_2O 0.05, H_2O^- 0.12, H_2O^+ 0.34, SO_3 0.21, F 39.80, SiO_2 1.40, total $117.03-O(=F_2)$ $16.72=100.31\%$. Spectrographic analysis showed Fe 0.03, Mn 0.03, Cu 0.001%. The analysis gives $Ba_2CaMgAl_2F_{14}$, but the Ca is deducted as fluorite (11.7%) giving the formula $Ba_2MgAl_2F_{12}$. A DTA curve shows 3 endothermic effects: a slight one at 260°C, one at 710°, and a very large one at 900° (melting). The total loss of weight at 1000° is 11.2%. Dissolves when heated in conc. HCl, HNO_3, H_2SO_4. B. B. melts easily to a white, vesicular mass.

Single crystal study could not be made; the physical and optical properties suggest orthorhombic symmetry. X-ray powder data are given (49 lines); the strongest lines are 3.41 (10), 2.04 (7), 1.747 (7), 1.626 (7), 1.560 (7), 1.205 (9), 1.154 (7), 1.132 (8), 1.093 (8), 1.025 (9), 1.012 (8), 1.005 (8), 1.000 (7).

Usovite is brown to dark brown; the color is uneven and spotty. Translucent yellowish-brown in fine fragments, streak white. Luster vitreous to greasy. Cleavage one perfect; fracture irregular. H. $3\frac{1}{2}$, microhardness 294 kg/sq. mm. Nonluminescent in uv light. Diamagnetic. Optically biaxial, positive, $\alpha=1.441$, $\beta=1.442$, $\gamma=1.444$ (all ± 0.001), $2V$ 70°. Extinction parallel to the plane of the perfect cleavage. The plane of the optic axes is perpendicular to the plane of perfect cleavage. A second cleavage at 44° to the first was noted under the microscope. Pleochroism noticeable from brownish-yellow on X and Y to pale yellow on Z; absorption $X=Y>Z$.

The mineral occurs in a fluorite vein in the Upper Noiby River area, Yenisei region, Siberia, intergrown with green and colorless fluorite. It is mainly in irregular grains, 0.5–3.0 mm., sometime as indistanct elongated platy forms up to 1.5×0.5 cm. Greenish muscovite, zeolites, and halloysite are also present.

The name is for Mikhail Antonovich Usov, geologist. Type material is preserved at Tomsk Polytechnic Institute and the Mineralogical Museum, Acad. Sci. USSR, Moscow. The mineral was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

Posnjakite

A. I. KOMKOV AND E. I. NEFEDOV, (1967) Posnjakite, a new mineral. *Zap. Vses. Mineralog. Obschch.* **96,** 58–62 [in Russian].

Microchemical tests showed only Cu, sulfate, and H_2O in the mineral, but no analysis could be made. X-ray data indicate the formula $Cu_4(SO_4)(OH)_6 \cdot H_2O$. The mineral is insoluble in ammonia. When heated gives off water, darkens, and melts to a dark enamel.

Gonimetric measurements gave values close to those for langite, but X-ray study showed that the crystals were paramorphs after langite. The mineral is monoclinic, a 9.80, b 6.32, c 7.85 (all$\pm$0.05Å), $\beta=107\pm1°$, $Z=2$, G.calc.$=3.35$, G.meas.$=3.32$. Indexed X-ray powder data are given (27 lines); the strongest lines are 7.0 (10)(10$\bar{1}$), 3.46 (8)(20$\bar{2}$), 2.70 (7)(121), 2.61 (7)(220), 2.41 (7)(022, 122), 2.015 (7) (12$\bar{3}$), 1.538 (7)(14$\bar{1}$).

Color blue to dark blue, streak bluish, luster vitreous. $H.=2-3$. Optically biaxial, negative, $\alpha=1.625$, $\beta=1.680$, $\gamma=1.706$, $2V=57°$. Pleochroic, X bluish to colorless, Y blue to dark blue, Z greenish blue to blue, absorption $Y>>Z>X$.

The mineral occurs in quartz veins of the Nura-Talkinsk tungsten deposits, central Kazakhstan, in small grains, as small tabular crystals up to 0.2–0.5 mm., and as films on fissures in quartz and fluorite. It is associated with aurichalcite and other secondary minerals near oxidized chalcopyrite.

The name is for E. W. Posnjak (1888–1949) of the Geophysical Laboratory, Washington, noted investigator of the system CuO-SO_3-H_2O. Samples are preserved at the Leningrad Mining Institute. The name was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

NOTE.—Descriptions of this mineral with different names were submitted to the Commission *on the same day* by Komkov and Nefedov and by M. E. Mrose and L. E. Reichen of the U. S. Geol. Survey. After correspondence, the Russian authors graciously agreed to use the name proposed by the American authors, who will publish their data separately.

Bertossaite

O. VON KNORRING AND M. E. MROSE (1966) Bertossaite, $(Li, Na)_2(Ca, Fe, Mn)Al_4(PO_4)_4(OH, F)_4$, a new mineral from Rwanda (Africa) (Abstr.). *Can. Mineral.* **8**, 668.

A faintly-pink mineral from the Buranga lithium pegmatite in Rwanda is the calcium analogue of the strontium mineral palermoite. The chemical formula is given as $(Li, Na)_2(Ca, Fe, Mn)Al_4(PO_4)_4(OH, F)_4$.

Bertossaite is orthorhombic, I^*aa; $a=11.48\pm0.01$, $b=15.73\pm0.02$, $c=7.23\pm0.01$ Å. $D_{meas.}=3.10$ g/cm^3, $D_{calc.}=3.10$ g/cm^3 for 4 $[Li_2CaAl_4(PO_4)_4(OH)_4]$. Strongest lines in the X-ray powder pattern are (in Å): 3.056(100)(202), 3.286(70)(022), 3.104(70)(321), 2.872 (60)(400), 2.144(60)(242), 4.628(50)(220), and 2.575(50)(251).

Cleavage $\{100\}$ good, fracture uneven to subconchoidal. Luster vitreous to glassy, $H=6$. Dissolves very slowly in HNO_3. Optically, bertossaite is colorless with $\alpha=1.624$, $\beta=1.636$, $\gamma=1.642$ (all ±0.003), $(-)2V$ moderately large (53° calc. J.A.M.), $r<v$ moderately strong, $X=a$, $Y=c$.

Bertossaite is associated with amblygonite, lazulite-scorzalite, augelite, brazilianite, apatite, crandallite, and quartz. Probably it formed during a late calcium-phase mineralization of the pegmatite.

The mineral is named for Antonio Bertossa, Director of the Geological Survey of Rwanda. The name was approved by the Commission on New Minerals and Mineral Names, I. M. A.

J. A. MANDARINO.

Asbecasite

ST. GRAESER (1966) Asbecasit und Cafarsit, zwei neue Mineralien aus dem Binnatal (Kt. Wallis). *Schweiz. Mineral. Petrog. Mitt.* **46,** 367–375.

Analysis by Laboratorium Fresenius, Wiesbaden, gave CaO 15.4, SiO_2 12.3, BeO2.3, TiO_2 6.3, SnO_2 2.1, Tl_2O_3 1.0, Al_2O_3 1.2, As_2O_3 58.7, sum 99.3%. This is compared with the "theoretical composition" $Ca_2Si_{1.5}Be_{0.75}Ti_{0.5}Al_{0.2}Sn_{0.1}Tl_{0.03}(AsO_3)_5$. Electron-probe microanalysis showed all these elements not to be admixed as impurities.

X-ray study (Weissenberg technique) shows hexagonal symmetry, space group $D^7_{3d}-C3c1$, with $a=8.33$, $c=15.29$ Å, $Z=3$. X-ray powder data (not indexed) are given; the strongest lines are 3.23 (100), 1.570 (70), 1.153 (70), 2.41 (60), 1.746 (60), 1.315 (60), 4.04 (50), 3.84 (50), 0.9927 (50), 0.9793 (50).

The mineral occurs as rhombohedral crystals up to 5 mm in size. Color lemon, transparent, high luster. Cleavage rhombohedral, $H=6\frac{1}{2}-7$, $G_{\text{meas.}}=3.70$ $G_{\text{calc.}}=3.71$. Optically uniaxial (−), $\omega = 1.86$, $\epsilon = 1.83$, $2V = 0$–$17°$.

Asbecasite was found on cleft faces in orthogneisses of the Monte Leone nappe, southern Binnatal, Switzerland.

The name is for the composition. The mineral was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

DISCUSSION.—A recalculation of the formula gives $2\times Ca_3(Ti, Sn)BeSi_2(O_3|As_6^{3+}O_{18})$, in good agreement with possible space group positions.

H. STRUNZ

Cafarsite

ST. GRAESER (1966) Asbecasit und Cafarsit, zwei neue Mineralien aus dem Binnatal (Kt. Wallis). *Schweiz. Mineral. Petrog. Mitt* **46**, 367–375.

Analysis by Thommen and Weibel gave CaO 13.0, MnO 5.0, Fe_2O_3 11.0, TiO_2 8.5, As_2O_5 60.0, H_2O 2.4, sum 99.9%. This is compared with the "theoretical composition" $Ca_{5.6}Fe_{3.3}Ti_{2.5}Mn_{1.7}(AsO_4)_{12}\cdot 4H_2O$. The homogeneity of the mineral was proved with electron-probe microanalysis.

X-ray study (Weissenberg technique) shows the mineral to be cubic, space group T_h^2-Pn3, with $a=16.01$ Å, $Z=4$. Indexed x-ray powder data are given for 24 lines; the strongest lines are 2.83 (100) (440), 2.75 (80) (530), 3.15 (70) (150), 1.683 (70) (921), 1.630 (60) (852), 3.69 (50) (330), 1.724 (50) (910).

The mineral occurs in well shaped crystals up to 3 cm in size, but with rough faces. Visually it was possible to determine {100}, {111}, {110}, and a pentagondodecahedron. Color dark brown, streak yellowish brown, in thin splinters translucent red. No cleavage, fracture conchoidal, $H=5\frac{1}{2}-6$, $G_{\text{meas.}}=3.90$, $G_{\text{calc.}}=3.82$; $n\geqq 2.0$. Cafarsite was compared by the author with magnussonite; their X-ray powder patterns are quite different.

Found on cleft faces in orthogneisses of the Monte Leone nappe, southern Binnatal, Switzerland, also from Italy.

The name is for the composition. The mineral was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

H. STRUNZ

Barium-alumopharmacosiderite

KURT WALENTA (1966) Beiträge zur Kentniss seltener Arsenatmineralien unter besonderer Berücksichtigung von Vorkommen des Schwarzwaldes. *Tschermaks Mineral. Petrog. Mitt.* **11**, 121–164.

Pale yellow cubes up to 50 microns in size from Neubulach, Schwarzwald, Germany, were found by microchemical tests to contain Al, Fe, Ba, and As; spectrographically Bi, Si, B, Cu, Zn, and traces of Be, Mn, and Ti were found. Dissolves in warm HCl (1:1). The X-ray powder data showed strongest lines at 8.00 (10), 4.58 (4), 3.97 (8, diffuse), 3.22 (8), 2.79 (10), corresponding to a cubic cell with *a* 7.89 Å. Cleavage {100}, visible under the microscope. Fracture conchoidal. H. low. Optically biaxial negative, $2V$ medium; crystals are zoned with the center having n about 1.62, the border zone with n about 1.650 (presumably due to higher Fe), birefringence very low to about 0.01, shows abnormal interference colors in blue and brown. The formula is assumed to be $Ba(Al, Fe)_4(AsO_4)_3(OH)_5\cdot H_2O$.

The compound $BaAl_4(AsO_4)_3(OH)_5 \cdot H_2O$ was synthesized hydrothermally. X-ray powder data are given, corresponding to a cubic cell with *a* 7.71 Å. It had *n*s 1.574–1.580 or higher.

Discussion.—More data, especially chemical, are needed.

Barium-pharmacosiderite

Kurt Walenta (1966) Beiträge zur Kentniss seltener Arsenatmineralien unter besonderen Berückichtigung von Vorkommen des Schwarzwaldes. *Tschermaks Mineral. Petrog. Mitt.* **11,** 121–164.

Cubic yellow-brown crystals up to 1 mm. in size occurred on limonite and barite at the Clara Mine, Schwarzwald, Germany. Microchemical tests showed Fe, As, and Ba, but no K; spectrographic analysis showed a little Zn, and traces of Al, Ca, Cu, K, Mg, P, and Si. Readily soluble in warm HCl (1:1) the X-ray pattern is very similar to that of normal K-containing pharmacosiderite, but shows lower symmetry, probably tetragonal with *a* 7.97, *c* 8.10 Å., probable space group *P4/mmm.* The strongest lines are 8.06 (9), 4.65 (6), 4.04 (8, broad), 3.28 (10), 2.85 (9). H. 2–3, G. 3.00. Optically biaxial, negative, with 2*V* variable from nearly 0° to 39°; $\alpha = 1.718$, $\gamma = 1.728$ (both ± 0.003) (higher than normal pharmacosiderite); not pleochroic. Cleavage {100} good. The formula is assumed to be $BaFe_4(AsO_4)_3(OH)_5 \cdot 5H_2O$.

Discussion.—More data, especially chemical, are needed.

Unnamed ("sulfate-free Beudantite").

Kurt Walenta (1966) Beiträge zur Kentniss seltener Arsenatmineralien unter besonderer Berücksichtigung von Vorkommen des Schwarzwaldes. *Tschermaks Mineral. Petrog. Mitt.* **11,** 121–164.

The mineral was found in pseudo-octahedral crystals 0.2–0.5 mm. in size on limonite at the Silberbrünnle mine near Hargerach, Schwarzwald, Germany. Qualitative microchemical tests showed no sulfate; spectrochemical tests showed major Pb, As, Fe, with some B, Ba, Cu, Si, and Sb. X-ray study showed a pattern similar to that of beudantite but with a larger unit cell: *a* 7.36, *c* 17.21 Å, $Z = 3$, or a_{rh} 7.14 Å., α 62°04', $Z = 1$. The strongest lines are 6.02 (8) (100), 3.69 (7) ($10\bar{1}$), 3.09 (10) (210), 2.87 (5) (222), 2.29 (6) (322), 1.990 (6) (300, $22\bar{1}$), 1.840 (6) ($20\bar{2}$). The mineral has variable optical properties, uniaxial to biaxial with 2*V* up to more than 50° (with $r > v$), ω ranged from less than 1.97 to 1.990 ± 0.005. Other beudantites are known with less than normal SO_3 content; it is suggested that the mineral may be the end member $PbFe_3(AsO_4)_2(OH)_5 \cdot H_2O$, but it is not named, as material was insufficient for an analysis.

Clinoholmquistite

I. V. Ginzburg (1965) Holmquistite and its structural variety clinoholmquistite. *Trudy. Mineral. Muz. Akad. Nauk SSSR* **16,** 73–89 [in Russian].

Analysis of material containing calcite gave SiO_2 57.68, TiO_2 none, Al_2O_3 13.52 ,Fe_2O_3 0.44, FeO 5.87, MgO 9.37, MnO 0.45, CaO 3.00, Na_2O 1.74, K_2O 0.28, Li_2O 3.37, CO_2 1.98, H_2O^+ 1.67, F 1.70, sum $101.07 - O(=F_2)\ 0.71 = 100.36\%$. Separate determinations on selected material free of calcite gave CaO 1.80, 1.75, and so the remainder of the Ca was subtracted as calcite. Small amounts of Ca, Na, K, and Li were extracted by H_2O and 2% HCl solution; these were subtracted as bicarbonates, and the remaining CO_2 was subtracted as such, giving the formula as

$$(Na_{0.45}Ca_{0.05}K_{0.04})(Li_{1.79}Ca_{0.21})(Al_{2.21}Mg_{1.93}\overset{+2}{Fe}_{0.68}Li_{0.08}\overset{+3}{Fe}_{0.05}Mn_{0.05})Si_8O_{22}(O_{0.98}F_{0.74}(OH)_{0.28})$$

X-ray study by rotation and Laue methods showed the mineral to be monoclinic, *a* 9.80 ±0.02, *b* 17.83±0.03, *c* 5.30±0.01A., β 70°54'. Space group *P2/m*, *P2* or *Pm*, probably the first. Piezoelectric effect absent. The strongest X-ray lines are 7.93 (10), 4.40 (9), 3.47 (5), 2.985 (10), 2.70 (10), 2.47 (5), 1.614 (8), 1.571 (7), 1.371 (9), 1.356 (5), 1.154 (7). Goniometric study gave a:m = 27°16′, m:m′ = 54°32′.

Optically biaxial, negative, $\alpha=1.610$, $\beta=1.627$, $\gamma=1.633$, $2V=55$–$61°$, $Y=b$, $Z=c$, $X\wedge a=15$–$16°$, not pleochroic. G. 3.00. Occurs in long prismatic crystals, partly replaced by orthohombic holmquistite. From "Siberia."

Anandite

D. B. Pattiaratchi, Esko Saari, and Th.G. Sahama, (1967) Anandite, a new barium iron silicate from Wilagedera, North Western Province, Ceylon. *Mineral. Mag.* **36,** 1–4.

The mineral is found as black, lustrous, almost opaque bands and occasionally as lenses in the iron-bearing zones of the Wilagedera iron ore prospect in the Northwestern Province of Ceylon. The ore mineral, magnetite, is associated with chalcopyrite, pyrite, and pyrrhotite. The magnetite ore zone is capped by banded magnetite-barite rock. The anandite bands are $\frac{1}{4}$ inch to 2 inches or more in thickness and are closely associated with magnetite and sulfides.

No crystals with measurable faces have been found. The mineral has a perfect {001} cleavage. Some flakes exhibited hexagonal outlines indicating poorly developed prism faces. H=3 to 4. G (corrected for pyrite contamination) = 3.94. Calculated values are 3.91 (anal. 1) and 3.94 (anal. 2). Because the mineral is nearly opaque except in very thin plates, optical data were difficult to obtain. On the cleavage flakes $\alpha'=1.85_5\pm0.01$ and $\gamma'=1.88\pm0.01$ for sodium light. The obtuse bisectrix is nearly normal to {001} and the optic normal is parallel to α'. The optical data are as follows: *b* parallel to β; $\alpha\wedge a=12°\pm4°$; (+)2V could not be measured; $\beta=1.85_5\pm0.01$; $\alpha>1.88$; pleochroic with β green and γ brown; dispersion strong.

Two chemical analyses were performed. The first, by J. P. R. Foneska and N. R. de Silva gave: SiO_2 25.22, Al_2O_3 5.86, TiO_2 0.32, Fe_2O_3 6.47, FeO 33.42, MnO 0.70, MgO 3.18, BaO 19.60, CaO 0.15, Na_2O 0.15, K_2O 0.95, H_2O^+ 2.01, H_2O^- 0.12, S 2.52, sum 100.67, less 0=S 1.26, total 99.41. The second analysis, by O. von Knorring, gave: SiO_2 25.20, Al_2O_3 4.85, TiO_2 0.28, Fe_2O_3 6.98, FeO 33.10, MnO 0.66, MgO 3.39, BaO 20.35, CaO 0.16, Na_2O 0.10, K_2O 0.93, H_2O+1.98, H_2O-0.12, S 2.96, sum 101.06, less 0=S 1.48, total 99.58. After deducting S and part of the Fe due to thin films of pyrite, the formula for anandite is derived as:

$$(Ba, K)(Fe, Mg)_3(Si, Al, Fe)_4O_{10}(O, OH)_2.$$

Anandite is monoclinic: space group *C2/c* or *Cc; a* 5.412±0.005, *b* 9.434±0.005, *c* 19.953±0.01 Å, β=94°52′±10′. The indexed x-ray powder data (15 spacings) contain the following strongest lines (in Å for filtered Fe radiation): 3.320(100)(006), 4.99_5(85)(004), 2.490(80)(008), 9.92(60)(002), and 2.716(50)(026). A complete crystal structure analysis is under way by A. Vorma who points out that the mineral resembles the $2M_1$ mica polytype. Anandite is considered one of the brittle micas.

The name is for the late Dr. Ananda Coomaraswamy, the first director of the Mineral Survey of Ceylon. The name was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

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Unnamed

G. Y. Chao and A. W. Hounslow (1966) Minerals from the Desourdy Quarry, Mt. St. Hilaire, Quebec. (Abstr.) *Canad. Mineral.* **8**, 662–663.

Among the minerals described are ten "unknown" minerals. The data are given below in the following order: designation, major elements (spectrographic), strongest spacings (Å) in X-ray powder data, space group and unit cell parameters (where known).

UK4: Ca, Al, Mn, Mg, Be, Si; 3.39(100), 3.32(70), 2.65(70), 5.32(45); P4/*mmm*? $a=7.54$ $c=7.31$ Å.
UK5: Si, Mn, Mg, Na, Ca, Fe; 3.18(100), 2.59(100), 3.10(90), 6.98(80); *C*2/*m* $a=14.256$ $b=13.813$ $c=7.804$ Å $\beta=116°44'$.
UK6: Y, Yb, Mn, Al, Si; 2.87(100), 3.05(95), 6.99(80), 4.41(75); pseudocell *Pmmb* $a=13.980$ $b=23.825$ $c=2\times 6.556$ Å.
UK12: Be, Fe, Al, Si; 3.19(100), 3.51(90), 2.55(60), 4.34(40).
UK13: Si, Na, Zr; 7.99(100), 9.04(80), 2.82(80), 3.57(75).
UK15: Na, Ca, K, Si; 8.36(100), 4.19(100), 5.58(100), 4.84(70); *Cmmm* $a=18.67$ $b=18.74$ $c=16.70$ Å.
UK17: Mn, Mg, Nb, Si, Be, Ti, Al; 3.47(100), 2.87(50), 3.19(40), 2.60(40).
UK18: Mn, Mg, Nb, Be, Ti, Si; 6.80(100), 13.86(90), 13.27(90), 6.68(90).
UK19: Mn, Mg, Na, Ti, Si; 7.12(100), 3.29(70), 6.56(50), 3.19(45).
UK20: Na, Ca, Zr, Si; 3.04(100), 5.29(85), 6.02(80), 3.17(70).

Discussion.—UK 20 has X-ray powder data almost identical to those given for a possibly new Ca, K, Zr silicate from Mont St. Hilaire (*Amer. Mineral.* **51**, 533 [1966]).

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NEW DATA

Zvyagintsevite

L. J. Cabri and R. J. Traill (1966) New palladium minerals from Noril'sk, western Siberia. *Can. Mineral.* **8**, 541–550.

A mineral which occurs as irregular grains ranging from less than 4 microns to 250 microns and as veinlets up to 120 microns long has been found in an ore sample from Noril'sk, Siberia. Associated minerals are: cubic chalcopyrite, cubanite, pentlandite, magnetite, valleriite, a silver-gold alloy, and another new mineral Pd(Bi,Pb).

Electron-probe analyses of two homogeneous grains gave the following results: Pd 57.3, 55.6; Pb 38.7, 38.0; Au 3.6, 6.0; total 99.6, 99.6. The formulas calculated from the two analyses are $Pd_{2.88}Au_{.12}Pb_{1.00}$ and $Pd_{2.84}Au_{.16}Pb_{1.00}$. The mineral is, therefore, $(Pd, Au)_3Pb$.

The X-ray powder data (10 indexed spacings) correspond closely to those of synthetic Pd_3Ph. Strongest spacings (in Å for Ni-filtered Cu radiation) are: 2.32(10)(111), 2.01(8)(200), 1.424(7)(220), and 1.214(6)(311). Pd_3Pb has the cubic Cu_3Au structure according to Nowotny, Schubert and Dettinger. The space group is *Pm3m* and $a=4.02_5$ Å. The specific gravity was determined from measurements on six grains of synthetic Pd_3Pb. The average of 13.32 indicates a value of $Z=1$, (for $Z=1$, the theoretical value of the specific gravity is 13.41).

The mineral is white in reflected light. Reflectivity values range from about 60% at 4500 Å to about 67% wt 6560 Å for the natural material. The synthetic Pd_3Pb has a reflectivity ranging from about 65% at 4500 Å to about 70% at 6560 Å. The Vickers hardness number for a 15 g load is 279.

Discussion.—The mineral is essentially the same as that described under the name Zvyagintsevite (*Amer. Mineral.* **52,** 299 [1967]). The authors point out four differences between the two descriptions, but it seems clear that the two substances are zvyagintsevite. The type material is a high tin-bearing variety, $Pd_3(Pb, Sn)$ while the material described by Cabri and Traill more closely approaches the pure Pd_3Pb material.

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Paraguanajuatite

A. A. Godovikov and V. A. Klyakhin (1966) Guanajuatite and paraguanajuatite. *Akad. Nauk SSSR, Sibirsk. Otdel., Geol. Geofiz.* no. 7, p. 67–76 [in Russian].

The name paraguanajuatite was given by Ramdohr in 1948 to a trigonal paramorph after the orthohombic mineral guanajuatite (*Amer. Mineral.* **34,** 619 [1949]). The authors state: (1) they have been unable to synthezise orthohombic Bi_2Se_3, only the trigonal form being obtained; (2) study of the system Bi_2Se_3-Bi_2S_3 shows a trigonal series of solid solutions from 0 to about 40 mole % Bi_2S_3 and an orthohombic series of solid solutions from 100 to 40 mole % Bi_2S_3; (3) x-ray study of 2 samples from the type locality, Guanajuato, Mexico, indicates the presence of a tellurium mineral (laitakarite or joseite). It is therefore suggested that the name paraguanajuatite be dropped, that the name guanajuatite be transferred to the trigonal mineral, and that the orthorhombic mineral up to Bi_2Se_2S in composition be called selenian bismuthinite.

Discussion.—Further study of analyzed samples is desirable, but none of the proposals is acceptable. Selenian bismuthinite measn the orthorhombic material $Bi_2(S, Se)_3$ with $S>Se$; orthorhombic material with $Se>S$ is guanajuatite.

Hörnesite

S. Koritnig and P. Süsse (1966) Gitterkonstanten und Raumgruppe des Hörnesit, $Mg_3[AsO_4]_2 \cdot 8H_2O$. *Neue Jahrb. Mineral., Monatsh.*, **11,** 349–351.

The precise classification of hörnesite has been uncertain because X-ray diffraction data have been lacking. Hörnesite has generally been classified with bobierrite. Now single-crystal and powder-diffraction studies of original material from Rézbanya indicate that hörnesite is isostructural with parasymplesite and is therefore the arsenate analogue of bobierrite. Like other members of the vivianite group, to which it belongs, hörnesite crystallizes in space group $C_{2h}^3 = C2/m$; F^2-values agree well with those of parasymplesite, the iron analogue. Cell-dimension, determined on single crystals of type material by rotation about [001] and [010], are a 10.26±0.02, b 13.44±0.02, c 4.74±0.01 Å, β 104.9°±0.1°. $Z=2$. D_{calc} 2.57 g cm^{-3} agrees with D_{meas}. Indexed powder diffraction data (46 lines) for type material are tabulated and compared with those for synthetic material; the strongest lines are 6.692 (100), 3.005 (50), 2.712 (50), 3.217 (30), 2.779 (30), 2.734 (30).

Kurt Servos

Weilerite

Kurt Walenta (1966) Beiträge zur Kentniss seltener Arsenatmineralien unter besonderer Berücksichtigung von Vorkommen des Schwarzwaldes. *Tschermaks Mineral. Petrog. Mitt.* 11, 121–164.

A preliminary description was abstracted in *Amer. Mineral.* **47,** 415 (1962). X-ray powder data are very similar to those for hidalgoite $[PbAl_3(AsO_4)(SO_4)(OH)_6]$ and for the synthetic compound $BaAl_3(AsO_4)_2(OH)_5 \cdot H_2O$. The strongest lines are 5.80 (8), 2.54 (7), 3.01 (10), 2.27 (5). From the powder data a 7.05, c 15.16 Å., $Z=3$, or a_{rh} 7.02 Å., α 60°18′,

$Z=1$. Major sulfate, arsenate, Al, and Ba are present, with minor Pb and Si, less Ca, Cu, Zn, very little Fe and Mg. and spectrographic traces of Cd, Mo, Ni, and Ti. The formula is probably $BaAl_3(AsO_4)(SO_4)(OH)_6$, but the ratio $AsO_4:SO_4$ could not be determined. Optically uniaxial, sign not determined, *n* min. 1.688±0.004, max. 1.698±0.004.

A closely related mineral is described from Neubulach, Schwarzwald, Germany. It contains major Ba, Ca, Cu, Al, Fe, and arsenate, but no sulfate, and spectrographic traces of Si, Bi, Mg, Ti, and Zn. The powder diagram shows strongest lines 5.82 (5), 3.55 (8), 3.00 (10), 1.769 (6), corresponding to *a* 7.08, *c* 17.26 Å., $Z=3$, or a_{rh} 7.06, α 60°12′, $Z=1$. The mineral occurs in turquoise to green crusts or sandstone, luster vitrous to waxy, *n* variable from 1.60–1.67, mostly 1.611+0.003. Easily soluble in HCl (1:1), more slowly in HNO_3 (1:1). The composition is assumed to be $(Ba, Ca, Cu)(Al,Fe)_3(AsO_4)_2(OH)_5 \cdot H_2O$.

Erionite and Offretite

J. M. Bennett and J. A. Gard (1967) Non-identity of the zeolites erionite and offretite. *Nature* **214,** 1005–1006.

X-ray single crystal and electron diffraction study show that offretite is hexagonal with *a* 13.31, *c* 7.59 Å, *i.e.* with *c* half that of erionite. The two minerals are therefore distinct, although closely related. They can be distinguished by single crystal studies, but with less certainty by X-ray powder techniques.