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NEW MINERAL NAMES*

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Doyleite*

G.Y. Chao, J. Baker, A.P. Sabina, A.C. Roberts (1985) Doyleite, a new polymorph of $Al(OH)_3$, and its relationship to bayerite, gibbsite, and nordstrandite. Can. Mineral., 23, 21–28.

Doyleite is a new polymorph of $Al(OH)_3$ that occurs at Mont St. Hilaire and at the Francon quarry, Montreal, Quebec, Canada. Wet chemical analysis gave Al_2O_3 65.2, CaO 0.48, H_2O (TGA to 1100°C) 35.76, sum 101.44 wt%, corresponding to $Al_{0.99}Ca_{0.01}(OH)_{3.00}$. Trace amounts of Na, Fe, Mg, and Si were detected by electron-microprobe analysis. The mineral is not attacked by 1:1 HCl, H_2SO_4, or HNO_3 at room temperature. TGA showed a weight loss of 25.63% between 280 and 410°C and a further gradual loss to 1000°C, giving a total weight loss of 35.76%. The infrared spectrum showed bands due to OH-stretching (3300–3700 cm^{-1}), OH-bending (700–1100 cm^{-1}), and AlO-stretching (200–600 cm^{-1}) and is similar to but simpler than those of gibbsite or nordstrandite.

Single-crystal X-ray study shows the mineral to be triclinic, space group $P1$ or $P\bar{1}$ ($P\bar{1}$ from morphology), unit cell $a = 5.002(1)$, $b = 5.175(1)$, $c = 4.980(2)$ Å, $\alpha = 97.50(1)°$, $\beta = 118.60(1)°$, $\gamma = 104.74(1)°$, Z = 2. The strongest lines (35 given) are 4.794(100)(010), 2.360(40)(101), 1.972(30)($\bar{2}21$), 1.857(30)(111), and 1.842(30)($\bar{1}22$).

At Mont St. Hilaire, doyleite occurs as rosettes of platy crystals with calcite and pyrite in a vug in albitite veins in nepheline syenite. At the Francon quarry, it is found sparingly in vugs with weloganite, calcite, cryolite, quartz, and other minerals in silicocarbonatite sills. Here it is finely granular. Crystals of doyleite are tabular on (010), showing forms {010}, {101}, {$10\bar{1}$}, and occasionally {100} and {001}. They are white, creamy white to bluish white, transparent or translucent to opaque with a white streak. Luster vitreous, pearly or dull. H, 2½–3. D, 2.48(1) (hydrostatic suspension), D_{calc} 2.482 g/cm³. Cleavage is perfect on {010}, fair on {100}. Inert to LW or SW fluorescent light. Optically biaxial, positive, $\alpha = 1.545(1)$, $\beta = 1.553(1)$, $\gamma = 1.566(1)$, $2V = 77°$ (Na light). Moderately strong dispersion, $r > v$.

The structure of doyleite is similar to gibbsite, bayerite, and nordstrandite, with layers of $Al(OH)_6$ octahedra. The polymorphism in $Al(OH)_3$ is a result of different ways of stacking octahedral layers.

The name is for Mr. E. J. Doyle who first found the mineral at Mont St. Hilaire. Type material is preserved at the National Museum of Natural Sciences, Ottawa, Ontario (NMNS 48932), at the Royal Ontario Museum, Toronto, Ontario (M41025), and at the Geological Survey of Canada, Ottawa, Ontario. **J.E.S.**

Gerdtremmelite*

K. Schmetzer, O. Medenbach (1985) Gerdtremmelite, $(Zn,Fe)(Al,Fe)_2\ \{(AsO_4)|(OH)_5\}$, a new mineral from Tsumeb, Namibia. N. Jb. Miner. Mh., no. 1, 1–6.

An average of three typical microprobe analyses gave ZnO 19.75, CuO 0.02, Fe_2O_3 10.81, Al_2O_3 24.97, As_2O_5 31.91, MoO_3 1.08, H_2O (TGA) 11.25, sum 99.79 wt%, corresponding to $(Zn_{0.85}Fe_{0.15})(Al_{1.70}Fe_{0.30})\ \{(AsO_4)|(OH)_5\}$, or ideally $(Zn,Fe)(Al,Fe)_2\{(AsO_4)|(OH)_5\}$. Isomorphous replacement of (Zn,Fe) and (Al,Fe) is indicated. The valence state of Fe is uncertain owing to the small amount of pure material available. The mineral is insoluble in HCl. TGA shows a dehydration reaction between 460 and 520°C with a weight loss of approximately 11 wt%.

Indexing of the X-ray powder data (Guinier camera) led to a small triclinic cell with lattice constants $a = 5.169(5)$, $b = 13.038(9)$, $c = 4.931(4)$ Å, $\alpha = 98.78(7)°$, $\beta = 100.80(6)°$, $\gamma = 78.73(6)°$, Z = 2. The space group is uncertain owing to the lack of suitable single crystals for X-ray study. The strongest lines (38 given) are 12.771(010)(100), 4.801(001)(40), 4.220(030)(40), 3.878($11\bar{1}$)(50), 3.631(021,$12\bar{1}$), and 3.140(111)(50).

The mineral occurs as a secondary phase in deeply oxidized ore specimens from Tsumeb, Namibia. It forms spherulitic aggregates of tabular crystals up to 3 μm in size and approximately 1 μm in length. Associated minerals include hematite, quartz, scorodite, powellite, betpakdalite, and kaolinite. Gerdtremmelite is yellowish brown to dark brown. It is transparent with an adamantine luster, a white streak, and no fracture or visible cleavage. Mean refractive index 1.73–1.74, high birefringence. No fluorescence under ultraviolet light. D_{calc} 3.66 g/cm³.

The name is for Dr. Gerd Tremmel who first recognized the mineral. Type material is preserved at the University of Heidelberg, Germany. **J.E.S.**

Arsenogoyazite*

K. Walenta, P.J. Dunn (1984) Arsenogoyazit, ein neues Mineral der Crandallitgruppe aus dem Schwarzwald. Schweiz. Mineral. Petrogr. Mitt., 64, 11–19.

Arsenogoyazite, a member of the crandallite group and the arsenate analogue of goyazite, is a new mineral of secondary origin from the Black Forest region of Germany. Microprobe analysis gave SrO 10.1, CaO 2.8, BaO 6.5, FeO 0.2, Al_2O_3 30.9, As_2O_5 25.3, P_2O_5 8.9, F 3.6, H_2O (by difference) 13.2, total 101.5, less O = F 1.5, sum 100.0%. This corresponds to $(Sr_{0.49}Ca_{0.25}Ba_{0.21}Fe_{0.01})_{\Sigma 0.96}Al_{3.04}[(AsO_4)_{1.10}(PO_4)_{0.63}]_{\Sigma 1.73}[(OH)_{4.90}F_{0.95}]_{\Sigma 5.85}\cdot 1.22H_2O$, or ideally, $SrAl_3(AsO_4)_2(OH)_5\cdot H_2O$.

X-ray study shows the mineral to be hexagonal, space group $R\bar{3}m$ or $R3m$, unit cell $a = 7.10$, $c = 17.16$ Å, Z = 3, or $a_{rh} = 7.04$ Å, $\alpha = 60.60°$, Z = 1 (calculated from the powder pattern). The strongest X-ray lines (22 given) are 5.84(70)($10\bar{1}1$), 3.56(80) ($11\bar{2}0$), 3.03(100)($02\bar{2}1$,$11\bar{2}3$), 2.31(40)($21\bar{3}1$), 1.933(50) ($30\bar{3}3$,$03\bar{3}3$).

The mineral forms crusts on quartz and barite in association with malachite, brochantite, olivenite, barium-pharmacosiderite, and sulfate-free weilerite. The crusts have a reniform appearance. Indistinct rhombohedron-like crystal faces can be observed on the surface of the crusts. In the case of small tabular crystals,

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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.

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(0001) is also present. Arsenogoyazite is intimately intergrown with the weilerite in one instance. The mineral occurs at the Clara mine near Oberwolfach in the Central Black Forest. It is white, yellowish, or pale green to grayish green; translucent; luster vitreous; with no cleavage but conchoidal fracture. H about 4. D_{meas} 3.35 ± 0.05 g/cm³ (hydrostatic suspension), D_{calc} 3.33 g/cm³. Mean index of refraction 1.64 (variations within range of ±0.03); isotropic or weakly birefringent.

The name is for the chemical composition and the relationship with goyazite. Type material is at the University of Stuttgart. **J.E.S.**

Phyllotungstite*

K. Walenta (1984) Phyllotungstit, ein neues sekundäres Wolframmineral aus der Grube Clara im mittleren Schwarzwald. N. Jb. Miner. Mh., 1984, no. 12, 529–535.

Microprobe analysis gave CaO 1.8, PbO 2.1, Fe_2O_3 13.3, WO_3 72.7, H_2O (by difference) 10.1, sum 100.0%, corresponding to $Ca_{0.61}Pb_{0.18}Fe^{3+}_{3.15}W_{5.93}H_{21.41}O_{34}$, or ideally, $CaFe_3H(WO_4)_6 \cdot 10H_2O$.

X-ray study shows the mineral to be orthorhombic, space group *P*222, *Pmm*2, or *Pmmm*, unit cell $a = 7.29$, $b = 12.59$, $c = 19.55$ Å, Z = 3. The strongest X-ray lines (50 given) are 6.33(70)(110,020), 3.25(80)(006), 3.13(100)(220,040,221,041), 2.92(70)(204,134,116), 2.45(70)(225,045,008,052), and 1.822(80)(?).

Phyllotungstite occurs as a secondary mineral at the Clara mine near Oberwolfach, Black Forest, Germany. It forms as crusts on quartz and is associated with ferritungstite, scheelite, and pyrite. The crusts are composed of tabular orthorhombic crystals and scaly, in part radial, aggregates. Crystals are up to 0.25 mm in size and display forms (100), (010), (110); flattened along (001). Sometimes twinned. Yellow color, translucent, yellowish streak, pearly luster, perfect (001) cleavage, irregular fracture. H about 2. D_{calc} 5.26 g/cm³. Optically uniaxial to weakly biaxial negative ($2V < 18°$, $r \ll v$), $\alpha = 2.10(\pm 0.01)$, $\gamma = 2.185(\pm 0.01)$, $Z = \mathbf{c}$.

The name is from the crystal habit. Type material is at the University of Stuttgart. **J.E.S.**

Unnamed member of the osumilite group

L.N. Govorov, N.S. Bogdareva, N.I. Kiriukhina, A.D. Kharkiv, A.D. Scheglov (1984) Primary potassium minerals in abyssal eclogites of Yakutia. Doklady Akad. Nauk SSSR, 276, 1208–1212 (in Russian).

Microprobe analyses (3 given) of potassium phase occurring in eclogite xenoliths from Yakutia kimberlite pipes gave SiO_2 47.22, TiO_2 0.32, Al_2O_3 14.12, Cr_2O_3 1.26, FeO 7.61, MnO 0.27, MgO 12.08, CaO 9.57, Na_2O 0.54, K_2O 7.40, sum 100.39, corresponding to $(K,Na)_{1.94}Ca_{1.90}Mg_{2.00}(Cr,Mg,Fe,Mn,Ti)_{2.66}(Si,Al,Mg)_{12}O_{30}$. The authors term this phase "terrestrial yagiite," but almost complete occupancy of 9- and 12-coordinated sites and high K and Ca content suggest that this is not the case.

Discussion. An incomplete description suggesting the existence of a new member of the osumilite group. **J.P.**

Yushkinite*

A.B. Makeev, T.L. Evstigneeva, N.V. Troneva, L.N. Vyalsov, A.I. Gorshkov, N.V. Trubkin (1984) Yushkinite $V_{1-x}S \cdot n[(Mg,Al)(OH)_2]$—A new mineral. Mineralog. Zhurnal, 6(5), 91–97 (in Russian).

Microprobe analysis (3 given) gave V 32.48, S 32.93, Mg 10.17, Al 5.66, O 19.89, H 1.26, sum 102.48 (O and H calculated on the basis of structure).

Electron diffraction study shows the mineral to have hybrid structure consisting of brucite [$a = 3.06(1)$, $c = 11.3(1)$ Å] and sulfide [hexagonal, $a = 3.20(1)$, $c = 11.3(1)$ Å] layers, analogous to valleriite.

X-ray diffraction pattern of the mineral was indexed on a hexagonal cell (*P*3*m*1?, $a \approx 3.21$, $c \approx 11.3$ Å). The strongest X-ray lines (16 given, most of them broad) are 5.68(10)(0002), 2.76(6)($10\bar{1}0$), 1.596(4)($11\bar{2}0$), 1.575(6)($11\bar{2}1$,$10\bar{1}6$). IR spectrum of the mineral is discussed. The formula $V_{1-x}S \cdot n[(Mg,Al)(OH)_2]$ ($n = 0.612$) is given by analogy with valleriite.

The color is pinkish violet; in reflected light, anisotropic; strong bireflectance. Isotropic sections and fragments are orange red with weak lilac tint. Anisotropic fragments have tints from red lilac to pinkish dark gray. No internal reflections. In polarized light, strong red anisotropic effects, similar to those of covellite. Reflectance measurements (nm, R_O%) gave 440, 26.0; 460, 22.4; 480, 19.0; 500, 17.6; 520, 17.8; 540, 18.7; 560, 20.7; 580, 23.3; 600, 26.4; 620, 29.6; 640, 32.8; 660, 35.7; 680, 38.2; 700, 40.1; 720, 41.5; 740, 42.3.

Very soft, plastic. Microhardness 2–6·9.81 MPa (9.81 mN load), Mohs hardness < 1. D_{meas} 2.94(2), D_{calc} 3.00. Becomes dark and decomposes in concentrated HCl and HNO_3; quickly becomes brown in 10% $FeCl_2$.

The mineral occurs with cadmian sphalerite, fluorite, and sulvanite in quartz-carbonate veins within carbonate rocks of Pay-Khoy, in the middle stream of Silova-Yakha River. It forms fine flaky, scaly aggregates up to 2–8 mm or 5–12-mm-long veins within quartz and calcite.

The name is for Russian mineralogist N. P. Yushkin.

Type material is at the A. E. Fersman Mineralogical Museum Acad. Sci. USSR (Moscow), Institute of Geology, Petrography, Mineralogy and Geochemiistry of Ore Deposits (Moscow) and in the Komi Branch of Acad. Sci. USSR. **J.P.**

Unnamed Fe titanate

V.D. Tyan, V.V. Lopatnikov, M.K. Vorontsova, T.A. Anikiha, E.M. Sapargaliev (1985) Native metals in Kalbin mica granites, E. Kazakhstan. Zapiski Vses, Mineralog. Obshch., 114, 34–42 (in Russian).

Microprobe analysis of a grain around native Fe and adjacent to ilmenite and magnetite yielded FeO 22.39, TiO_2 41.20, Cr_2O_3 0.15, MnO 12.14, CaO 3.92, Al_2O_3 7.18, SiO_2 11.12, sum = 98.1 wt%. Without additional data, this is suggested to be a garnet of calculated composition $(Ca_{0.28}Mn_{0.94}Fe^{2+}_{1.62})_{\Sigma 2.94}(Fe^{3+}_{2.28}Al_{0.77}Ti^{3+}_{0.95})_{\Sigma 2}(Ti_{1.99}Si_{1.01})_{\Sigma 3}O_{12}$.

Discussion. Without data on the oxidation state of Fe and Ti (3+ ?), this analysis is difficult to interpret as a garnet. If a true garnet, it is a titanate garnet, with Ti > Si. The analysis is simply calculated, on the assumption of Fe^{2+} and Ti^{4+}, as $(Mn,Fe,Ca)_2(Ti,Si,Al,Cr)_3O_8$. **P.J.D.**

Unnamed $AgInS_2$ and $(Zn,Fe)_2Cu_3In_3S_8$

P. Cantinolle, C. Laforet, C. Maurel, P. Picot, J. Grangeon (1985) Contribution to the mineralogy of indium: Discovery of two new indium sulfides and of two new occurrences of roquesite in France. Bull. Minéral., 108, 245–248 (in French).

$AgInS_2$. Electron-microprobe analysis yielded Ag 36.3, In 40.2, S 21.4, sum = 97.9. It is anisotropic and shows twin lamellae with red internal reflections. It occurs as minute (30 μm) brownish-gray inclusions (reflectance data given) in galena.

$(Zn,Fe)_2Cu_3In_3S_8$. Electron-microprobe analysis yielded Zn 8.39, Fe 4.84, Cu 20.3, In 37.1, S 28.3, sum = 98.63; which corresponds to $(Zn_{1.18}Fe_{0.79})Cu_{2.94}In_{2.97}S_{8.09}$. It occurs as isotropic, small (20 μm) gray-brown inclusions in galena.

Discussion. The unnamed $AgInS_2$ mineral was described in 1980 by Ohta (see Am. Mineral., 68, 851). **J.D.G.**

Unnamed goldfieldite-like mineral

E.M. Spiridonov, V.M. Okrugin (1985) Selenious goldfieldite—A new variety of fahl ores. Doklady Akad. Nauk SSSR, 280, 476–478 (in Russian).

Microprobe analysis (4 given) of fahl-ore from Ozerhnoe deposit, Kamchatka Peninsula, USSR, gave Cu 44.4, Ag 0.1, Au 0.1, Te 15.9, As 6.0, Sb 3.5, Bi 0.1, S 19.5, Se 11.5, total 101.1. This corresponds to $(Cu^{1+}_{9.97}Ag_{0.02}Au_{0.01})_{10.00}$ $Cu^{2+}_{2.03}(Te_{2.13}As_{1.38}$-$Sb_{0.50}$ $Bi_{0.01})_{4.02}$ $(S_{10.45}$ $Se_{2.50})_{12.95}$, supposed by the authors to be not-described-earlier selenious goldfieldite.

Discussion. Because goldfieldite has the formula $Cu_{12}(Sb,As)_4(Te,S)_{13}$ and the site assignments in the Ozerhnoe deposit are ambiguous, this mineral might be a new species, but requires additional work. **J.P.**

Unnamed Bi-Cu-Pb-Se-Te sulfides

R. Miller (1981) Kawazulite Bi_2Te_2Se, related bismuth minerals and selenian covellite from the Northwest Territories. Can. Mineral., 19, 341–348.

Three unmamed bismuth sulfide minerals identified as Minerals A, B, and C with the general formula $Bi_2(S,Se,Te)_3$ have been found at Mazenod Lake, Northwest Territories, Canada.

An average of three electron-microprobe analyses of Mineral A gave Bi 47.53, Cu 6.30, Pb 10.43, Fe 1.31, Ag 0.11, Se 33.33, Te 0.87, sum 99.88 wt%, corresponding to an ideal formula of $Bi_9Cu_4Pb_2Se_{18}$. The mineral is found in one veinlet in blebs up to 100 μm or more in diameter interstitial to primary hematite. These blebs contain exsolved covellite; the reverse relationship is occasionally observed. Hardness (VHN_{50}) = 199–205. Reflectance (nm, %) 547, 51.1; 591, 51.6.

An average of two microprobe analyses of Mineral B yielded Bi 54.35, Cu 2.92, Fe 1.31, S 0.74, Se 19.45, Te 17.5, sum 96.27 wt%, corresponding possibly to Bi_2Se_2Te. It occurs as minor exsolution blebs about 2 × 10 μm in Mineral A; the low analysis totals are likely due to contamination by surrounding phases. Mineral B was observed to turn brown under the electron beam. It has rather higher reflectivity than Mineral A. Other associated minerals include hematite and covellite.

Mineral C occurs as a few single grains up to 4 μm in diameter, intergrown with uraninite or primary hematite. Microprobe analysis of one such grain gave Bi 55.1, Cu 0.69, Fe 1.63, Se 14.6, Te 25.1, sum 97.25 wt%, or $Bi_4Se_3Te_3$.

All three minerals occur at the Dianne mineral claims of the Noranda Exploration Company, Ltd., at Mazenod Lake. The minerals are found with kawazulite, tellurobismuthite, selenian covellite, uraninite, and hematite in a mineralized breccia pipe. The pipe cuts through dacitic ignimbrites of the Great Bear plutonic-volcanic suite. **J.E.S.**

New Data

Lammerite

S.K. Filatov, I.M. Gaidamako, S.F. Glavatskikh, G.L. Starova, N.D. Sorokin (1984) Exhalation lammerite Cu_3 $[(As,P)O_4]_2$ (Kamchatka). Doklady Akad. Nauk SSSR, 279, 197–200 (in Russian).

Microprobe analyses of lammerite from cavity on the area of Great Tolbachinsk Fissure Extrusion, Kamchatka Peninsula, USSR, gave CuO 59.21, 56.23, 54.64; ZnO 0.14, 0.18, 0.11; FeO 0.04, 0.11, 0.06; As_2O_5 13.04, 26.83, 32.64; P_2O_5 27.26, 16.68, 12.40; sum 99.69, 100.13, 99.85; corresponding to $Cu_3[(As_xP_{1-x})O_4]_2$, $x = 0.23$–0.62.

Discussion. This suggests that previously described lammerite $Cu_3[AsO_4]_2$ (TMPM, 28, 157–164) is the endmember of $Cu_3[AsO_4]_2$–$Cu_3[PO_4]_2$ series. One of the given analyses has P > As and is therefore a new endmember in the series. **J.P.**