American Mineralogist, Volume 70, pages 871–881, 1985

NEW MINERAL NAMES*

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Agardite-(La)*, Agardite-(Ce)

T. Fehr and R. Hochleitner (1984) Agardite-(La). A new mineral from Lavrion, Greece, Lapis, 1/84, 22 and 37 (in German).

XRF-analyses indicated the occurrence of agardite-(La), Ce-rich agardite (called agardite-(Ce)) as well as mixed crystals of both. Identification was confirmed through comparison with Modreski's original data for type material of agardite-(La). X-ray data are nearly identical for all compositions.

Minerals occur in the oxidation zone in the mining district of Kamariza near Laurion, Greece. Both end members commonly form spherical to rosette-like aggregates (up to 3 mm dia.) of needle-like crystals occurring in limonite voids. They are usually younger than associated smithsonite, aurichalcite, hydrozincite, azurite, cuproadamite, calcite, and chrysocolla, rarely with Al-adamite on zincaluminite, gibbsite, etc. Color ranges from nearly colorless to yellowish green to commonly intense bluish green and does not correlate with composition.

Discussion

The name agardite-(La) was previously approved by I.M.A. (Am. Mineral. 67, 1041 (1982)), however, a formal description has not yet been published. The name agardite-(Ce) has not been submitted or approved. No quantitative data are given. **V.G.**

Bulaiinite

I. V. Nikolaeva (1977) Minerals of the glauconite group in sedimentary formations. Novosibirsk, Nauka, p. 46; from an abstract in Zapiski Vses. Mineralog. Obshch., 113, 379.

Name given to the Mg, Fe^{2+} end-member of the glauconite group. The name is for the Bulaisk formation, eastern Siberia.

Discussion

This name, not having been approved by the I. M. A., has no validity. **M.F.**

Chursinite*

V. I. Vasil'iev, Yu, G. Lavrent'iev, and N. A. Pal'chik (1984) Chursinite, $(Hg_2)_3(AsO_4)_3$, a new natural mercury arsenate. Zapiski Vses. Mineralog. Obshch., 113, 341–347 (In Russian).

The average of 6 microprobe analyses gave Hg 81.28 (±0.73), As 9.74 (±0.15), O 9.57 (±0.29), sum 100.59 wt.%, corresponding to $Hg_{6.00}As_{1.93}O_{8.96}$ or $Hg_6As_2^{5+}O_9$. However, the X-ray data agree with those for synthetic $(Hg_2)_3(AsO_4)_3$ (Kamener and Kaitner, Acta Cryst., 29B, 1666–1669 (1973)), and this formula is accepted. Presumably it is $Hg_3^{1+}Hg_3^{2+}(AsO_4)_3$.

Single-crystal study showed chursinite to be monoclinic, $P2_1/c$, with $a = 8.71 \pm 0.02$, $b = 5.08 \pm 0.02$, $c = 15.66 \pm 0.02$Å, $\beta = 128.27 \pm 0.11°$, Z = 2. D (calc) for the synthetic = 9.06. The strongest lines in the X-ray diffraction pattern (47 given) are: 3.05(10)(11$\bar{4}$), 2.80(7–8)(30$\bar{3}$), and 2.84(7)(210).

Color is yellow brown to orange brown; powder grayish yellow; luster nearly adamantine; transparent in fine fragments; cleavage parallel to elongation; Brittle; hardness about 3; microhardness 198–245 (ave. 219) kg/sq. mm; polishes well; sections become covered by a bluish or bluish-violet film. In transmitted light is transparent, anisotropic from dark brown to blue-gray; pleochroic from pale brownish-yellow to light brown, *n*'s above 2.0. In reflected light, gray with bluish tint, reflectances (max. and min., %): 460 nm, 22.8, 18.5; 546 nm, 20.4, 16.1; 590 nm, 19.7, 15.8; 656 nm, 18.5, 14.5.

The mineral occurs in oxidized, complex Sb–As–Hg ores of the Khaidarkan deposit, Kirgiz S.S.R., associated with calomel, eglestonite, terlinguaite, corderoite, montroydite, kuznetsovite, shakhovite, poyarkovite, and native Hg, in grains up to 0.2 mm.

The name is for the artist Lyudmila Alekseevna Chursina. Type material is at the Central Siberian Geol. Museum, Novosibirsk. **M.F.**

Earlshannonite*

D. R. Peacor, P. J. Dunn, and W. B. Simmons (1984) Earlshannonite, the Mn analogue of whitmoreite, from North Carolinia. Can. Mineral., 22, 471–474.

Microprobe analysis gave Al_2O_3 0.1, Fe_2O_3 33.8, FeO 4.6, MgO 0.8, CaO 0.6, MnO 8.2, P_2O_5 30.0, H_2O (by difference) 21.9, sum 100.0%, corresponding to $(Mn_{0.55}\,Fe_{0.30}\,Mg_{0.09}\,Ca_{0.05})_{\Sigma 0.99}(Fe^{3+}_{2.00}\,Al_{0.01})_{\Sigma 2.01}\,(PO_4)_{2.00}\,(OH)_{2.01} \cdot 4.75H_2O$, or ideally $MnFe_2^{3+}(PO_4)_2(OH)_2 \cdot 4H_2O$. There was inadequate material for the direct determination of water content. The oxidation state of Fe was determined on the basis of microchemical tests and on the known structural relationships of the Fe analogue, whitmoreite. Microprobe analysis of earlshannonite crystals from a second occurrence at Hagendorf, Germany, yielded a similar composition.

X-ray study by precession and Weissenberg methods shows the mineral to be monoclinic, space group $P2_1/c$, unit cell $a = 9.910(13)$, $b = 9.669(8)$, $c = 5.455(9)$Å, $\beta = 93.95(9)°$, Z = 2. The strongest lines (41 given; $FeK\alpha$ radiation, Si internal standard) are 9.8(100)(100); 6.9(80)(110), 4.18(60)(111), 3.45(60)(220), 2.856(60)(221), 2.789(70)(31$\bar{1}$).

The mineral occurs as prismatic euhedral crystals up to 0.5 mm in length elongate on [001] with forms {110}, {100}, and {011}. They are twinned on {100}, and typically exhibit parallel growth with [001] in common. The crystals commonly form radial, hemispherical aggregates. The mineral is reddish brown, transparent, with a vitreous luster and brittle tenacity. It does not fluoresce in ultraviolet light. H 3-4. Two poor cleavages were observed on crushed grains; one is likely {100}. Fracture even. D (heavy liquid) 2.90(4) g/cm³, 2.92 g/cm³ (calc.). Optically biaxial, negative, $\alpha = 1.696(4)$, $\beta = 1.745(4)$, $\gamma = 1.765(4)$, $2V_x = 64(4)°$. Moderate pleochroism: $X = Y =$ light yellow brown, $Z =$ yellow brown. Absorption $Z > X \simeq Y$, $Z = c$. Crystals from Hagendorf are bright yellow.

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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/85/0708–0871$02.00

Earlshannonite was found on the dumps of the Foote Mineral Company's spodumene mine near the town of Kings Mountain, Cleveland County, North Carolina. The mineral was not found in place in the pegmatite body. Associated minerals include mitridatite, laueite, rockbridgeite, a jahnsite-group mineral, quartz, and an unidentified amorphous Mn oxide. The mineral is among the last species to form in the sequence of late stage secondary phosphates. Crystals from Hagendorf occur with frondelite and rockbridgeite.

The mineral is named for the mineralogist and chemist Earl V. Shannon (1895–1981) of the U.S. National Museum. Type material is deposited in the Smithsonian Institution under catalogue #NMNH 150168. **J.E.S.**

Jaskólskiite*

M. A. Zakrzewski (1984) Jaskólskiite, A new Pb–Cu–Sb–Bi sulfosalt from the Vena Deposit, Sweden. Can. Mineral., 22, 481–485.

E. Makovicky, W. G. Mumme and R. Norrestam (1984) The crystal structures of izoklakeite, dadsonite and jaskólskiite. Acta Crystallogr. A40, Supplement, International Union of Crystallography, Thirteenth International Congress, Communicated Abstracts, p. C-246.

Jaskólskiite (ideal composition $Pb_{2+x}Cu_x(Sb, Bi)_{2-x}S_5$; Sb exceeds Bi and x = 0.2) has been found in the Vena deposit, Bergslagen, Sweden. Microprobe analysis yield Pb 50.74, Cu 1.31, Sb 15.74, Bi 14.35, S 17.51; sum 99.65%. This gives the formula $Pb_{2.22}Cu_{0.19}Sb_{1.17}Bi_{0.62}S_5$.

Powder and single crystal X-ray diffraction show the mineral to be orthorhombic, space group *Pbnm*, $a = 11.331(1)$, $b = 19.871(2)$, $c = 4.100(1)$Å, Z = 4, D calc. = 6.47 g/cm^3. The strongest X-ray lines (71 given) are 3.710(100)(310), 3.595(50)(121), 3.333(60)(131), 2.970(80)(231), 2.761(60)(241), 2.751(50)(311), 2.050(50)(002). The crystal structure determination shows that this is the fourth number of the meneghinite homologous series.

The mineral is found intergrown with izoklakeite, native bismuth, galena, pyrrhotite, and occasionally antimony to form aggregates up to a few millimeters in diameter. It is lead-gray with a dark gray streak and a metallic luster. Jaskólskiite is gray in reflected light with greenish to yellowish pleochroism. In air the reflectances are 44.9, 37.2 (470 nm); 44.2, 36.3 (546 nm); 43.7, 36.1 (590 nm); 41.9, 34.8% (650 nm). The Vickers micro-hardness VHN_{100} ranges from 165 to 179, which corresponds to a hardness of 4 on the Mohs scale.

The name is for Dr. Stanislaw Jaskólski (1896–1981). Type material is in collections of the Institute of Earth Sciences of The Free University of Amsterdam. **R.H.L.**

Jeffreyite*

J. D. Grice and G. W. Robinson (1984) Jeffreyite, $(Ca, Na)_2(Be, Al)Si_2 (O, OH)_7$, a new mineral species and its relation to the melilite group. Can. Mineral., 22, 443–446.

An average of nine analyses by electron microprobe, atomic absorption spectroscopy (for BeO), and thermal gravimetric analysis (for H_2O) gave SiO_2 46.7, Al_2O_3 2.8, CaO 37.4, BeO 8.1, Na_2O 2.3, H_2O 1.8, sum 99.4%. This corresponds to $(Ca_{1.69}Na_{0.19})_{\Sigma 1.88}(Be_{0.82}Al_{0.14})_{\Sigma 0.96}Si_{1.97}[O_{6.49}(OH)_{0.51}]_{\Sigma 7}$ or, ideally, $(Ca, Na)_2(Be, Al)Si_2(O, OH)_7$.

X-ray study and the chemical data show jeffreyite to be closely related to gugiaite, meliphanite, and leucophanite, all members of the melilite group. Jeffreyite is orthorhombic (although dimensionally pseudotetragonal with $a = b$), space group $C222_1$, unit cell $a = 14.90$, $b = 14.90$, $c = 40.41$Å, Z = 64. The strongest lines (62 given) are 5.00(40)(008,026), 2.993(90)(408), 2.774(100)(428), 2.541(60)(444,00.16), 2.360(40)(620), 1.755(50)(660).

The mineral occurs as thin pseudotetragonal plates up to 1 mm across along with colorless grossular in a cavity in a rodingitized dike exposed in the Jeffrey open pit at Asbestos, Shipton Township, Richmond County, Quebec, Canada. It is colorless, transparent, and brittle, and has a micaeous appearance so that it can be mistaken for a mica. Cleavages perfect: {001} and {110}. No reaction to UV radiation. Not readily soluble in 20% HCl. H 5. D 2.99 (hydrostatic suspension), 2.98 calculated. Optically biaxial negative, $\alpha = 1.625$, $\beta = 1.641$, $\gamma = 1.643$, $2V_x = 40°$ meas., 39° calc. Optical orientations $Y \| a$, $X \| c$. Twinning on (100).

The name is for the Jeffrey mine. Type material is preserved at the National Museum of Natural Sciences, Ottawa. **J.E.S.**

Jeppeite*

M. W. Pryce, L. C. Hodge and A. J. Criddle (1984) Jeppeite, a new K–Ba–Fe titanate from Walgidee Hills, Western Australia. Mineral. Mag., 48, 263–6.

A. N. Bagshaw, B. H. Doran, A. H. White and A. C. Willis (1977) Crystal structure of a natural potassium-barium hexatitanite isostructural with $K_2Ti_6O_{13}$. Aust. J. Chem., 30, 1195–1200.

Report of the Government Chemical Laboratories Western Australia for the year 1980, p. 24.

Jeppeite (ideal composition $(K,Ba)_2(Ti,Fe)_6O_{13}$) is found as small crystals (up to 2 × 2 mm) in a weathered lamproite at Walgidee Hills, Kimberly Division, Western Australia. The average of seven microprobe analysis yields K_2O 8.47, BaO 17.35, TiO_2 69.29, Fe_2O_3 (total Fe) 4.74; sum 99.85% with Mg, Na and Zr detected. This analysis gives the formula $(K_{1.15}Ba_{0.73})_{\Sigma 1.88}(Ti_{5.56}Fe^{3+}_{0.38})_{\Sigma 5.94}O_{13}$.

Powder diffraction data were indexed on a monoclinic cell ($C2/m$) with $a = 15.543(3)$, $b = 3.8368(7)$, $c = 9.123(2)$Å, and $\beta = 99.25(1)°$: The strongest X-ray lines (72 given) are 3.07(10)(310), 2.990(10)(003,311), 2.812(10)(311,112), 2.091(6), 2.074(6), 1.919(8), 1.412(5).

Jeppeite is black with a pale brown streak and a submetallic luster. It is brittle and has perfect {100} and $\{20\bar{1}\}$ cleavages or partings. The density is 3.94 (calculated 3.98). The hardness is 5–6 (Mohs), and is dependent on the orientation. In thin section, $X \wedge a = 10°$ blue, $Y = b$ dark greenish brown to almost black, $Z = c$ brown. Polished oriented crystals are weakly bireflectant and gray in air and have a slightly greater bireflectance in oil. Reflectance values are reported parallel to each of the crystallographic axes and are (for *a*, *b*, and *c* respectively) 14.3, 15.3–15.4, 17.5–17.8 (470 nm); 13.3, 14.3–14.4, 16.4–16.8 (546 nm); 13.0–13.1, 14.1–14.2, 16.1–16.4 (590 nm); 12.9, 14.0, 15.8–16.2 (650 nm). Refractive indices were calculated and are also reported along each crystallographic axis at four wavelengths. The values are (for *a*, *b*, and *c* respectively) 2.22, 2.28–2.29, 2.42–2.46 (470 nm); 2.15, 2.21–2.22, 2.36–2.38 (546 nm); 2.13, 2.20–2.21, 2.34–2.36 (590 nm); 2.12, 2.19–2.20, 2.32–2.34 (650 nm).

The mineral occurs as black, finely prismatic to acicular, fragile aggregates that are common in lamproite. It is associated with priderite, richterite, shcherbakovite, wadeite, perovskite, and apatite in a green and white matrix of celadonite and chlorite after olivine, pyroxene, and leucite; in addition a little secondary calcite and titanite are present.

Jeppeite is named for its discoverer, John Frederik Biccard Jeppe, geologist of Nedlands, Western Australia. Type material is in the Government Chemical Laboratories, Western Australia and in the British Museum (Natural History).

Discussion

The crystal structure of this mineral was reported in the Bagshaw et al. reference. This earlier report was abstracted as an unnamed mineral in this journal (Am. Mineral. (1978), 63, 795). **R.H.L.**

Jinyunite = a mixture of mordenite and clinoptilolite

Z. Zhoa et al. (1982) Natural zeolite of China; P. Wu and Y. H. Ma (1982) Am. Inst. Che, Eng., Symp. Ser, 78, 90; from an abstract in Zapiski Vses. Mineralog. Obshch., 113, 381 (1984).

Analysis and X-ray data are given. The name is for the locality, Jinyun, Sichuan, China. **M.F.**

Katoite* and the nomenclature of hydrogrossular minerals

E. Passaglia and R. Rinaldi (1984) Katoite, a new member of the $Ca_3Al_2(SiO_4)_3$–$Ca_3Al_2(OH)_{12}$ series and a new nomenclature for the hydrogrossular group of minerals. Bull. Minéral., 107, 605–618.

Electron microprobe and TG analyses gave SiO_2 10.58, Al_2O_3 24.01, CaO 42.27, MgO 0.07, SO_3 2.27, H_2O 20.80, sum 100.00%, for an empirical formula of $Ca_{2.96}(Al_{1.85}Mg_{0.01})_{\Sigma=1.86}(Si_{0.69}S_{0.11})_{\Sigma=0.80}O_{2.93}(OH)_{9.07}$ and an ideal formula of $Ca_3Al_2SiO_4(OH)_8$ or $Ca_3Al_2[Si(4H)_2]O_{12}$.

Single crystal and powder XRD studies showed the mineral to belong to space group *Ia*3*d*, Z = 8, with *a* = 12.358(2)Å, and strongest XRD lines (of 19 given) as follows (*d* in Å, *I*, *hkl*): 5.046(37)(211), 3.089(50)(400), 2.763(100)(420), 2.257(58)(521), 2.004(58)(611,532), 1.6507(37)(642).

The mineral is found with other hydrated calcium silicates and aluminates in the vugs of a phonolite effused through argillaceous marls in Pietramassa near Montalto di Castro, Viterbo, Italy. Katoite generally occurs as thin crusts of milky white, rounded microcrystals, 0.1–0.3 mm in diameter, but it may rarely form transparent or coarser crystals of octahedral morphology. Optically, it is colorless, free from inclusions, and weakly birefringent, with $n = 1.632(1)$. The calculated specific gravity is 2.76.

Katoite is named in honor of Dr. Akira Kato of the National Science Museum, Tokyo, long-time chairman of the IMA Commission on New Minerals and Mineral Names. Type material is deposited in the "Museo Civico di Storia Naturale", Milan, Italy.

The discovery of this first natural occurrence of such a garnet (with the grossular content below 50%) has prompted a revision of the nomenclature of the hydrogrossular group. As approved by the IMA Commission, the name *grossular* should be retained for the anhydrous end-member (100% Gr). Members of the series with 50% or more Gr (*i.e.*, $50 \leq$ Gr% < 100) should be designated *hibschite*, the name which has precedence over the alternate terms, plazolite, grossularoid, hydrogarnet, garnetoid, and hydrogrossular. *Katoite* should be adopted for members with less than 50% Gr, including the $Ca_3Al_2(OH)_{12}$ end-member (*i.e.*, $0 \leq$ Gr% < 50). The name *hydrogrossular* may still be applied to members of the series with appreciable OH content but undetermined $SiO_4/(OH)_4$ ratio. **J.A.Z.**

Kvanefjeldite*

O. Petersen, O. Johnsen, E. S. Leonardsen, and J. G. Rønsbo (1984) Kvanefjeldite, a new mineral species from the Ilímaussaq alkaline complex, southwest Greenland. Canadian Mineralogist, 22, 465–467.

O. Johnsen, E. S. Leonardsen, L. Fälth, and H. Annehed (1983) Crystal structure of kvanefjeldite: the introduction of ${}^{2}_{\infty}[Si_3O_7OH]$ layers with eight-membered rings. Neues Jahrb. Mineral., Monatsh., 505–512.

Microprobe analyses yielded SiO_2 65.0, CaO 8.49, Na_2O 22.06, MnO 1.59, FeO 0.05, Y_2O_3 0.40, Sum 97.59% and TGA gave a weight loss of about 4% at approximately 600°C. No traces of C, S, F, or Cl were detected. The calculated empirical formula, $Na_{3.96}(Ca_{0.84}Mn_{0.12}Y_{0.02})_{\Sigma 0.98}Si_{6.01}O_{14}(OH)_2$, corresponds to the ideal formula $Na_4(Ca, Mn)(Si_3O_7OH)_2$, with Ca > Mn.

Powder and Weissenberg single-crystal X-ray studies show the mineral to be orthorhombic, space group *Pcab*, with cell dimensions *a* = 10.213(2), *b* = 15.878(4), *c* = 9.058(1)Å, Z = 4, D(calc) 2.53, D(meas) 2.55 g/cm³. The strongest X-ray lines (51 given) are (*d* in Å, *I*/*Io*, *hkl*): 4.447(6)(201), 4.355(7)(012), 3.880(7)(221), 3.388(6)(202), 3.1174(10)(222). The structure, solved by direct methods and Fourier syntheses and refined to $R = 0.029$ for 1752 independent reflections, is built of highly corrugated ${}^{2}_{\infty}[Si_3O_7OH]$ layers containing rings of eight tetrahedra. The layers are connected by octahedral Ca(Mn) and by Na in seven-coordination; Na is six-coordinated within the ${}^{2}_{\infty}[Si_3O_7OH]$ layers. Kvanefjeldite represents a new type of silicate with branched anions. According to the Liebau terminology, the kvanefjeldite layer may be classified as an open branched *vierer* single layer.

Optically biaxial positive, $2V_z = 0$–$9°$, $\alpha = 1.522(1)$, $\beta = 1.522(1)$, $\gamma = 1.543(1)$, and $X = a$, $Y = c$, $Z = b$, the mineral is pink with a violet hue. It has generally vitreous luster, nearly pearly on {010}, and H 5½–6. Cleavage is good on {010}, imperfect on {101}, and habit is platy on {010}. Kvanefjeldite forms as aggregates of crystals in veinlets, streaks and patches up to 3 cm long in arfvedsonite nepheline syenite on the Kvanefjeld plateau. Associated minerals include villiaumite and analcime. Type material is deposited in the Geological Museum, University of Copenhagen, Denmark. **J.A.Z.**

Lavrentievite,* Arzakite

V. I. Vasil'ev, N. A. Pal'chik, and O. K. Grechishchev (1984) Lavrentievite and arzakite, new natural sulfohalogenides of mercury. Geol. i Geofiz., 7, 54–63 (in Russian).

Electron microprobe analyses of 4 samples from the Arzak deposit gave Hg 81.4, 77.1, 78.48, 75.3; Cl 9.13, 5.46, 6.04, 3.13; Br 1.29, 8.44, 6.94, 11.6; S 8.51, 8.32, 8.35, 7.98, sum 100.33, 99.32, 99.81, 98.01%, corresponding to $Hg_{3.01}\ S_{1.96}\ (Cl_{1.91}\ Br_{0.12})$, $Hg_{2.98}\ S_{2.01}\ (Cl_{1.20}\ Br_{0.82})$, $Hg_{3.01}\ S_{2.00}\ (Cl_{1.31}\ Br_{0.67})$, and $Hg_{3.06}\ S_{2.03}\ (Br_{1.18}\ Cl_{0.72})$. The chloride end-member is named lavrentievite for M. A. Lavrentiev, founder of the Siberian Academy of Science, the bromide end-member for the Arzak ore deposit. Lavrentievite is a dimorph of corderoite.

X-ray powder data differ from those of synthetic alpha-$Hg_3S_2Cl_2$, gamma-$Hg_3S_2Cl_2$, and corderoite. The strongest lines (28 given) are 3.96(4)(013), 3.38(5)(210), 3.01(5–6b), (213,015), 2.292(4)(207,123,008), 2.199(3–4)(124,108), 1.587(4–5)(228,232,129). The indices given correspond to a monoclinic cell, space group *P*2/*m*, *P*2, or *Pm*, for lavrentievite, *a* = 8.94, *b* = 5.194, *c* = 18.33Å, $\beta = 92.44°$, Z = 5, D calc 7.5 (for Br 8.44%) to 7.26 (for Br 1.29%). For arzakite, *a* = 8.99, *b* = 5.24, *c* = 18.45Å, $\beta = 92.28°$, Z = 5, D calc. 7.64. The minerals might, however, be triclinic; for lavrentievite, $a = 8.90$, $b = 5.207$, $c = 18.34$Å., $\alpha = 89.67°$, $\beta = 88.88°$, $\gamma = 92.28°$, Z = 5, D calc. 7.52 to 7.27; for arzakite, $a = 8.95$, $b = 5.25$, $c = 18.49$Å, $\alpha = 89.57°$, $\beta = 88.74°$, $\gamma = 92.16°$, Z = 5, D calc. 7.63.

The minerals occur in the oxidation zones of the Arzak ore showing, Tuva Autonomous S.S.R., as intergrowths (0.2 mm) of complex form, associated with cinnabar, corderoite, quartz, and kaolinite. Lavrentievite was also found in the Kadyrelskii ore showing, associated with calomel, eglestonite, and native Hg.

Type material is at the Central Siberian Geological Museum, Novosibirsk. **M.F.**

Macphersonite*

A. Livingstone and H. Sarp (1984) Macphersonite, a new mineral from Leadhills, Scotland, and Saint-Prix, France—a polymorph of leadhillite and susannite. Mineralogical Magazine, 48, 277–282.

An average of ten microprobe analyses of material from Leadhills, Scotland, gave PbO 83.4, SO_3 6.6, CuO 0.1, CdO 0.1, CO_2 8.8, H_2O^+ 1.3 (the latter two values by thermogravimetric and evolved gas analysis), sum 100.3%. The empirical formula, calculated on the basis of 12 oxygen atoms, is $(Pb_{4.08}Cu_{0.10}Cd_{0.07})_{\Sigma 4.25}S_{0.90}C_{2.18}O_{10.55}(OH)_{1.58}$, or ideally, $Pb_4(SO_4)(CO_3)_2(OH)_2$. Analyses of material from a second locality at Saint-Prix, France, yielded PbO 83.59, SO_3 7.65, CO_2 8.47, H_2O^+ 1.93, sum 101.64%, which corresponds to $Pb_{4.06}S_{1.03}C_{2.08}O_{10.15}(OH)_{2.32}$. Macphersonite is a polymorph of leadhillite and susannite. The CO_2 and H_2O^+ evolution profiles are very similar to those for leadhillite—simultaneous evolution of H_2O and approximately half the CO_2 at 300°C in a well-defined, sharp reaction, followed by gradual release of the remaining CO_2. The thermogravimetric behavior is also similar to that of leadhillite—a sharp weight loss took place between 250–320°C followed by a slower loss up to 520°C, which is consistent with the evolved gas results. The infrared spectrum corresponds to those of leadhillite and susannite. Macphersonite rapidly and completely dissolves in dilute acids accompanied by effervescence. In dilute nitric acid, a curdy white percipitate of $PbSO_4$ also forms.

X-ray study shows the mineral to be orthorhombic; space group *Pcab*; unit cell $a = 10.37$, $b = 23.10$, $c = 9.25$Å, $Z = 8$. The *b* dimension is twice that of the *c* values of leadhillite and susannite, and the *a* dimension is exactly half the *b* value of leadhillite. The strongest lines for macphersonite (41 given) are 4.533(25)(012), 3.910(25)(231), 3.234(100)(251), 2.654(90)(351,203), 2.598(30)(172, 400), 2.182(30)(263).

Macphersonite occurs as white, euhedral crystals at Leadhills Dod, Leadhills, Lanarkshire, Scotland, associated with leadhillite, susannite, cerussite, caledonite, pyromorphite, and an unidentified mineral. The material is very pale amber when massive but is colorless in thin flakes. The luster is adamantine on fresh surfaces otherwise resinous. The fracture is uneven. H $2\frac{1}{2}$–3. D 6.55 (Berman balance), 6.65 g/cm^3 (calc.). Perfect cleavage on {010}; tabular habit elongate on *b*. Strong yellow LW and SW UV fluorescence, which however is characteristic of several Leadhills minerals.

At the second locality, macphersonite is found with susannite, cerussite, pyromorphite, galena, quartz, and scotlandite in the Argentolle Mine, Saint-Prix, Saone-et-Loire, France. Here it occurs as pseudohexagonal tabular to micaeous crystals (2–5 mm). This material does not fluoresce. D 6.50 (Berman balance), 6.60 g/cm^3 (calc.). At these occurrences, polysynthetic twinning with either coarse or fine lamellae is common, as are contact twins.

Macphersonite is optically biaxial negative, $\alpha = 1.87$, $\beta = 2.00$, $\gamma = 2.01$, $2V_x = 35$–$36°$. Optic orientation is $X = b$, $Y = c$, $Z = a$. Moderate dispersion: $r > v$.

On the basis of these properties and common assemblages it is suggested that macphersonite may masquerade as leadhillite. Apart from a larger $2V$ for macphersonite, either an X-ray powder photograph or an infrared spectrum will be required to identify either leadhillite or macphersonite. All three polymorphs may occur on the same specimen.

Type material is preserved in the Royal Scottish Museum, Edinburgh (#721.34) and in the Department of Mineralogy and Petrography, Museum of Natural History, Geneva (#435/80). The mineral is named for Dr. H. G. Macpherson, Keeper of Minerals, Royal Scottish Museum. **J.E.S.**

Moganite

O. W. Flörke, U. Flörke, and U. Giese (1984) Moganite, a new microcrystalline silica-mineral. Neues Jahrb. Mineral. Abh., 149, 325–336.

O. W. Flörke, J. B. Jones, and H.-U. Schmincke (1976) A new microcrystalline silica from Gran Canaria. Zeit. Kristall., 143, 156–165.

Moganite (silica-G) is described as a new mineral closely associated with the family of microcrystalline quartz species. No chemical analyses are given, although concentrations of non-volatile impurities of 0.12 and 0.10%, and volatiles (H_2O, CO_2) totalling 2.31 and 2.66% are given. The 1976 paper gives SiO_2 97.4, H_2O 2.4, impurities 0.2, total 100.0%.

X-ray study shows the mineral to be monoclinic, space group not given, cell dimensions $a = 4.934(5)$, $b = 10.761(10)$, $c = 8.533(8)$Å, $\beta = 92.29(10)°$, $V = 452.8(6)$A^3, Z = 12. The strongest lines (35 given) are 3.33(100)(022), 3.39(50)($\bar{1}21$), 4.45(13)(110), 1.83(13)($\bar{1}43$), 1.369(11)(145). The pattern shows a close relationship with the quartz pattern. D calc. for moganite with 2% H_2O—2.56 g/cm^3. D meas. varies from 2.52 to 2.58 g/cm^3.

Due to its microcrystalline habit, optical measurements could not be made; mean refractive index ranges from 1.52–1.53. The mineral is gray, luster resembles chalcedony.

The mineral is composed of tightly bound fibers with parallel texture and thickness of 0.1–1 μm showing positive elongation ("length slow"). The space between is filled with chalcedony or opal. Goethite is also associated. Tridymite is abundant in the ignimbrite.

The mineral occurs as nodular masses 1–5 cm in diameter in pores and cavities of shear-fissures, or filling vertical and horizontal cooling cracks as platy masses 1–10 mm in thickness in rhyolitic ignimbrites near Mogan, Southern Gran Canaria. It also occurs as pebbles in the gravel-sand floors of Barranco de Tauro, Barranco de los Frailes, and Barranco Taurito. The name is for the locality. **J.A.F.**

Discussion

This mineral was *disapproved* by the I.M.A. prior to publication. This contravention of internationally adopted procedures is regrettable. **P.J.D.**

Nelenite*

P. J. Dunn and D. R. Peacor (1984) Nelenite, a manganese arsenosilicate of the friedelite group, polymorphous with schallerite, from Franklin, New Jersey. Mineral. Mag., 48, 271–275.

Nelenite (ideal composition $(Mn,Fe)_{16}Si_{12}O_{30}(OH)_{14}[As^{3+}_3O_6(OH)_3]$) has been identified in several specimens from Franklin, New Jersey. Wet chemical analysis yields SiO_2 31.12, FeO 17.12, MgO 0.12, ZnO 3.63, MnO 29.22, As_2O_3 12.46, H_2O 6.42; sum 100.09% (This analysis was reported in L. H. Bauer and H. Berman (1930) Am. Mineral., 15, 340–8). Microprobe analyses gave results near these values. In addition, the authors determined that the iron is in the divalent state. This analysis gives the formula $(Mn_{9.54}Fe_{5.51}Mg_{0.07}Zn_{1.04})_{\Sigma 16.16}Si_{12.00}As^{3+}_{2.92}O_{36.28}(OH)_{16.52}$. Analysis of a number of samples indicates that iron may substitute for manganese in up to 5.8 of the 16 octahedral cation sites. The mineral is a polymorph of schallerite and, therefore, it is a member of the friedelite group.

Powder diffraction combined with precession photographs were indexed on a hexagonal supercell ($R\bar{3}m$) with $a = 13.418(5)$ and $c = 85.48$Å. A one-layer monoclinic cell was derived from this with $a = 23.24$, $b = 13.418$, $c = 7.382$Å and $\beta = 105.21°$. This cell has $C2/m$ symmetry. The monoclinic cell was postulated from TEM studies of mcGillite and friedelite, both of which give precession photographs nearly identical to those of nelenite. The strongest X-ray lines (16 given) are 7.10(40), 3.55(60), 2.878(70), 2.552(100), 2.402(40), 2.104(40), 1.723(50), 1.677(60).

The mineral is brown and shows no fluorescent or phosphorescent activity under ultraviolet light. The luster is vitreous and it has perfect {0001} cleavage. The observed density (3.46 g/cm^3) is in good agreement with the calculated density (3.45 g/cm^3). The hardness is about 5 (Mohs). It is uniaxial negative with $\varepsilon = 1.700$ and $\omega = 1.718$ (both ± 0.004). Biaxial behavior has been observed with $2V$ near 0°. It is pleochroic with ε = colorless and ω = light brown.

Nelenite is found in several parageneses. Associations include actinolite, tirodite, albite, garnet, willemite, rhodonite, apatite, lennilenapeite and several members of the stilpnomelane group. The coarse-grained material is found in assemblages of pegmatitic texture and in a breccia apparently derived from this material (with a calcite cement).

The name is for Joseph A. Nelen, Chemist at the Smithsonian Institution. The mineral was originally called ferroschallerite, however since it is not an iron analogue of schallerite it has been renamed. Type material is at the Smithsonian Institution and at Harvard University. **R.H.L.**

Nevskite*

G. N. Nechelyustov, N. I. Christyakova, and E. N. Zav'yalov (1984) Nevskite, Bi(Se, S), a new bismuth selenide. Zapiski Vses. Mineralog. Obshch., 113, 351–355 (in Russian).

Microprobe analyses (4) gave Bi 69.1, 69.7, 71.2, 69.1; Pb 3.6, 2.8, 1.9, 3.5; Ag 0.6, 0.6, 0.5, 0.6; Se 24.7, 24.5, 24.8, 24.6; S 1.8, 1.6, 1.4, 1.7; sum 99.8, 99.2, 99.8, 99.5%, Corresponding to $(Bi_{0.90}Pb_{0.05}Ag_{0.02})(Se_{0.85}S_{0.15})$, $(Bi_{0.92}Pb_{0.04}Ag_{0.01})(Se_{0.86}S_{0.14})$, $(Bi_{0.95}Pb_{0.03}Ag_{0.02})(Se_{0.88}S_{0.12})$, $(Bi_{0.91}Pb_{0.05}Ag_{0.02})(Se_{0.85}Se_{0.15})$, or Bi(Se, S).

X-ray study showed the mineral to be rhombohedral, space group $P\bar{3}m1$, $P3m1$, or $P321$, with $a = 4.197$, $c = 22.80$Å, Z = 6, D calc. 7.85, corresponding to the synthetic compound. The strongest X-ray lines (24 given) are 3.59(4)$(\bar{1}011)$, 3.06(10)$(\bar{1}014)$, 2.24(4)$(10\bar{1}8)$, 2.10(4)$(11\bar{2}0)$.

Color lead-gray, luster metallic, cleavage (0001) very perfect, polishes well. In reflected light white with creamy tint, bireflectance not observed. Isotropic on basal sections, distinctly anisotropic in perpendicular sections, with weak color effects from brown to light gray. Reflectances (max. and min.) are given at 14 wave lengths: 440 nm, 58.0, 52.5; 480, 56.8, 51.7; 540, 55.5, 50.5; 640, 53.2, 49.1; 680, 52.5, 48.5% Hardness 60–114, av. 90 kg^2/mm.

The mineral occurs in quartz-cassiterite veins of the Nevskii tin-ore deposit, N.E. U.S.S.R., associated with wolframite, cassiterite, natanite, laitakarite, and guanajuatite, forming irregular deposits up to 1–2 mm in diameter.

The name is for the deposit. Type material is at the Fersman Mineralogical Museum, Moscow. **M.F.**

Paulkerrite*

D. R. Peacor, P. J. Dunn, and W. B. Simmons (1984) Paulkerrite, a new titanium phosphate from Arizona. Mineral. Record 15, 303–306.

A microprobe analysis gave K_2O 4.4, Al_2O_3 1.6, Fe_2O_3 12.2, MnO 7.1, MgO 4.6, TiO_2 9.8, P_2O_5 29.4, F 0.9, H_2O (by diff.) 30.5, less O = F 0.4, sum 100.0%, corresponding to an idealized formula of $KTi(Mg,Mn)_2(Fe^{2+},Al,Ti,Mg)_2(PO_4)_4(OH)_3 \cdot 15\,H_2O$.

X-ray study shows the mineral to be orthorhombic, space group $Pbca$, cell dimensions $a = 10.49(7)$, $b = 20.75(13)$, $c = 12.44(2)$Å. Z = 4. The strongest lines (27 given) are 6.20(100)(002), 10.3 (90)(020), 7.46(80)(111), 3.13(70)(004), 3.75(40)(222), 2.872(40)(233).

Paulkerrite occurs as 0.2 mm euhedral crystals which are either equant or flattened on (010), elongated parallel to [001]. The forms present are {010}, {100}, {111}. Light yellowish-brown to nearly colorless with a colorless streak. H approx. 3, D calc. 2.36, meas. 2.36(4) g/cm^3. Luster vitreous. Perfect {100} cleavage, fracture even. Optically biaxial (−), $2V \cong 80°$, $\alpha = 1.598(4)$, $\beta = 1.624$(calc.), $\gamma = 1.643(4)$. Dispersion strong, $r > v$; orientation is $X = c$, $Z = a$. Non-pleochroic.

Paulkerrite occurs on fracture surfaces in massive triplite at the 7U7 Ranch, about 40 km west of Hillside, Yavapai County, Arizona, associated with bermanite, phosphosiderite, leucophosphite, strengite and switzerite. The mineral was described as *unidentified phosphate #2* by Hurlbut (Am. Mineral., 21, 656–661 (1936)).

The name is in honor of the late Professor Paul F. Kerr of Columbia University, in recognition of his many contributions to mineralogy and the education of mineralogists. Holotype material is preserved at the Smithsonian Institution. **J.A.F.**

Penginite*

L. I. Bochek, S. M. Sandomirskaya, N. G. Chuvikina, and V.P. Khvorostov (1984) A new selenium-containing sulfide of silver, gold, and copper-penginite $(Ag,Cu)_4Au(S,Se)_4$. Zapiski. Vses. Mineralog. Obshch., 113, 356–360 (in Russian).

Microprobe analyses gave Ag 50.7, 51.0, 51.3, 51.1, Au 24.5, 24.6, 24.8, 25.4; Cu 3.3, 4.0, 3.1, 3.0; Se 6.9, 6.9, 7.1, 7.9; S 14.1, 13.3, 13.8, 12.8; sum 99.5, 100.0, 100.2%, corresponding to $(Ag_{3.57}Cu_{0.40})Au_{0.94}(S_{3.34}Se_{0.66})$, $(Ag_{3.76}Cu_{0.49})Au_{1.00}(S_{3.31}Se_{0.69})$, $(Ag_{3.65}Cu_{0.32})Au_{0.97}(S_{3.31}Se_{0.69})$, $(Ag_{3.79}Cu_{0.38})Au_{1.00}(S_{3.20}Se_{0.80})$, or $(Ag,Cu)_4Au(S,Se)_4$. The mineral is blackened by $FeCl_3$ solution, turns brown with 1:1 HNO_3, does not react with HCl or KOH. Single-crystal study could not be made because of the small size of the grains. The X-ray powder pattern was indexed on a hexagonal cell, space group $P6_322$ with $a = 13.779$, $c = 16.980$Å, Z = 18, D calc. 8.35. The strongest X-ray lines (16 given) are 2.71(9)$(21\bar{3}5)$, 2.59(10)$(30\bar{3}5)$, 2.14(9)$(51\bar{6}0,21\bar{3}7)$, 2.11(9)(0008), 1989(6)$(24\bar{6}4)$.

The mineral occurs as intergrowths of elongate or platy deposits 0.005–0.007 mm in size. In reflected light grayish-white with weak color effects of bireflection: creamy-yellow and greenish-gray. No internal reflections. Reflectances (max. and min.) are given at 8 wave lengths: (nm,%) 460, 33.5, 31.8; 540, 34.5, 31.2; 620, 33.0, 30.7; 660, 32.0, 30.19.

The mineral occurs in a near-surface Au–Ag deposit, Pengina River, eastern U.S.S.R., filling interstices in chalcopyrite. Type material is at the Fersman Mineralogical Museum, Moscow, and at the Institute for Noble Metals, Moscow.

Discussion

Apparently to be pronounced penzhinite. **M.F.**

Rankachite*

K. Walenta and P. J. Dunn (1984) Rankachite, a new mineral from the Clara Mine in the Central Black Forest. Neues Jahrb. Mineral. Monatsh., 289–295 (in German).

Microprobe analysis of the mineral gave CaO 2.7, FeO 2.3, V_2O_5 13.9, WO_3 70.2, H_2O 8.8, sum 98.8 wt.%; on the basis of 24 oxygen atoms corresponding to $Ca_{0.63}Fe_{0.56}V_{1.96}W_{3.89}H_{12.52}O_{24}$ or, ideally $FeO_{0.5} \cdot CaO_{0.5} \cdot V_2O_5 \cdot 4WO_3 \cdot 6H_2O$, a rather unusual composition.

X-ray study shows the mineral to be orthorhombic, probable space group *Pmmn*, unit cell $a = 8.17$, $b = 42.02$, $c = 5.45$Å, Z = 4. The strongest lines observed (43 given) are 10.64(100)(040), 5.44(70)(001,011), 4.57(60)(051,101), 4.35(50)(131), 4.08(60)(200), 3.51(60)(260,0.12.0), 3.26(60)(201,211,191), 3.04(60)(251), 2.63(60)(042,1.13.1,0.14.1,0.16.0), 1.920(50).

The mineral is of secondary origin and forms crusts on quartz as well as radiated and rosette-like aggregates of crystal needles, quite often associated with marcasite, pyrite and scheelite on samples from the Clara Mine mill dump near Wolfach. It is usually of dark brown, also brownish yellow color, and opaque to slightly translucent. Luster resinous to sub-adamantine. Streak brownish. Cleavage nearly perfect (100) or (010). Fracture uneven. H about 2.5. D > 4.03, 4.5 calculated. Optically biaxial, negative, $\alpha = 1.770$, $\beta = 1.925$, $\gamma = 1.970$ (all ± 0.005), $2V = 58°$, $r \ll v$, $Z = c$, $X \perp$ tabular face ((100) or (010)). Strong pleochroism with X, Y yellow brown, Z reddish brown to opaque.

The name is for the Rankach Valley, Black Forest, Germany, where the Clara Mine is located. **V.G.**

Scotlandite*

W. H. Paar, R. S. W. Braithwaite, T. T. Chen and P. Keller (1984) A new mineral, scotlandite ($PbSO_3$) from Leadhills, Scotland; the first naturally occurring sulphite. Mineral. Mag., 48, 283–8.

Scotlandite (ideal composition $PbSO_3$) has been found with lanarkite, susannite, and leadhillite, in cavities in massive barite and anglesite. Microprobe analysis yield PbO 77.85, SO_2 19.88; sum 97.73%. This gives the formula $Pb_{1.06}S_{0.94}O_{2.94}$. Secondary ion mass spectrometry showed Li, Be, B, C, N, and F to be absent, however it did detect a small amount of Br. Infrared spectroscopy showed sulfite to be the only polyatomic anion. The infrared bands assigned to the sulfite ion are: $\nu_3 = 920{,}865$; $\nu_1 = 970(?)$; $\nu_2 = 620{,}600$; $\nu_4 = 488{,}470$ cm^{-1}.

Single crystal X-ray diffraction shows the mineral to be monoclinic, space group $P2_1$ or $P2_1/m$ with $a = 4.542(2)$, $b = 5.333(2)$, $c = 6.413(2)$Å, $\beta = 106.22(4)°$, D calc. = 6.40, meas. = 6.37 ± 0.02, Z = 2. The strongest powder X-ray diffraction lines (30 given) are: 3.99(100)(011), 3.38(70)(110), 3.25(80)(3.274), 3.07(40)(002), 2.66(70)(020,012), 2.56(50)(11$\bar{2}$), 2.24(50)(12$\bar{1}$,102), 2.01(50)(210,022), 1.707(40)(031), 1.538(40)(032,004).

The mineral occurs as yellowish single crystals (up to 1 mm in length) and in fan-shaped aggregates. The color is due to minute pyromorphite inclusions. A thin coating of anglesite is usually present and probably serves to protect the material from oxidation to sulfate. A second variety of the mineral occurs as encrustations of whitish to water-clear crystals and crystal clusters less than 1 mm in size. The hardness (Mohs) is about 2. Scotlandite has perfect cleavage along {100} and good cleavage along {010}. On the cleavage planes the luster is pearly; otherwise it is adamantine. The mineral is biaxial positive with a measured $2V_\gamma = 35°24'$ (Na). Dispersion is strong with $v \gg r$. Using Cargille immersion liquids the indices of refraction are $\alpha \sim 2.035$, $\beta \sim 2.040$, $\gamma \sim 2.085$ (Na). The measured mean refractive index is 2.052 which is not far from the value 2.0349 calculated from the equation of Gladstone and Dale with the constants of Mandarino. Extinction angles are $\alpha : [001] = 20°$ and $\gamma : [100] = 4°$ in the obtuse angle; β is parallel to **b**.

The name is for Scotland. Type material is at the Universität Salzburg, the Universität Stuttgart, the British Museum (Natural History), the Royal Scottish Museum, Edinburgh, Scotland, and the Royal Ontario Museum, Toronto, Canada.

Discussion

The 2.01 X-ray diffraction line should be indexed as 210 and 022. **R.H.L.**

Silver-rhodostannite

H.-J. Bernhardt, B. Coira, M. K., de Brodtkorb (1984) A new occurrence of silver-rhodostannite. In Moh, G. (1984) Sulfosalts: observations and mineral descriptions, experiments and applications. Neues Jahrb. Mineral. Abh., 150, 25–64.

Rhodostannite from a Tertiary stratiform volcanic complex in Jujuy Province, Argentina, is Ag-dominant. Microprobe analysis yielded Ag 11.05, Cu 7.85, Fe 6.12, Sn 42.88, S 30.50, sum = 98.4 weight percent. This yields atomic proportions $Ag_{0.86}Cu_{1.04}Fe_{0.92}Sn_{3.04}S_{8.00}$, corresponding to a composition near $AgCuFeSn_3S_8$, in contrast to common rhodostannite, $Cu_2FeSn_3S_8$.

Discussion

This mineral was not submitted to the Commission on New Minerals and Mineral Names, IMA. It had been described partially in an earlier paper by Johan and Picot (Bull. Mineralogie, 105, 229–235; Am. Mineral., 69, 1249 (abs.)) and those authors responsibly did not name it. The above description is incomplete. The publication of a new name for an incompletely described phase is regrettable. **P.J.D.**

Smirnite*

E. M. Spiridonov, L. A. Demina, V. A. Dolgikh, G. M. Antonina, A. D. Rakcheev, L. V. Bulgak, S. I. Lebedeva, T. N. Chvileva (1984) Smirnite Bi_2TeO_5—a new mineral. Doklady Akad. Nauk SSSR, 278, 199–202 (in Russian).

Microprobe analysis (average of 4 grains from two specimens) gave: Bi 60.9, Pb 2.3, Sb 1.9, Fe 0.3, Cu 0.1, Ag 0.1, Te 20.7, O 12.5, sum 98.8, corresponding to $(Bi_{1.84}Pb_{0.07}Sb_{0.10}Fe_{0.03}Cu_{0.01}Ag_{0.01})_{2.06}Te_{1.02}O_{4.92}$. Spectral analysis revealed traces of Ca, Mn, Ni, Co, Ti, Zn, Cd, and Hg.

X-ray diffraction powder pattern is identical with that of synthetic Bi_2TeO_5 (orthorhombic, *Cm2a*), yielding $a = 16.447(19)$, $b = 5.513(3)$, $c = 11.579(15)$Å, Z = 8. The strongest X-ray lines (26 given) are: 3.226(10)(312), 2.890(6)(004), 1.996(3)(024), 1.992(3)(604), 1.727(3)(316). D calc. 7.72, meas. 7.78.

The mineral is colorless, light-grey or light yellow, transparent or translucent. In transmitted light similar to titanite, strongly anisotropic, biaxial, positive, $\alpha = 2.35$, $\beta = 2.36$, $\gamma = 2.46$ ($\lambda = 579$ nm), $2V = 35$–$40°$. Positive elongation, straight extinction. $Z = \mathbf{a}$, $Y = \mathbf{b}$, $X = \mathbf{c}$. In reflected light the mineral is light grey, similar to sphalerite. Reflectance measurements (in air, nm, R_γ, R_α) gave: 400, 20.7, 19.1; 420, 20.5, 18.8; 440, 20.0, 18.1; 460, 19.7, 17.8; 480, 19.4, 17.5; 500, 19.3, 17.5; 520, 19.3, 17.4; 540, 19.2, 17.4; 560, 19.1, 17.3; 580, 19.0, 17.2; 600, 18.8, 17.0; 620, 18.7, 16.8; 640, 18.5, 16.7; 660, 18.3, 16.5; 680, 18.2, 16.3; 700, 18.0, 16.3; 720, 18.0, 16.2. It darkens upon exposure to sunlight.

Perfect cleavage parallel to base, distinct cleavage in a few directions. Brittle. Great microhardness anisotropy: $\sim(001)$ H = 227, $\sim(010)$, $\|$cleavage H = 175, $\perp$cleavage H = 213, $\sim(100)$ H = 142 kg/mm^2 (20–30 g load). The mineral melts at 900°C without decomposition.

Smirnite occurs as tabular crystals up to 2 mm or their intergrowths, or crusts on quartz and tellurides. It occurs in fractures of vein quartz and chalcedony, containing the relics of tellurobismuthite, tetradymite, volynskite and galena. The mineral has been found in old, burnt mine, Zod deposit, Armenian SSSR, and has been recognized in deposits "Northern Aksu" (Kazakhstan) and "Zakharpathia".

The name is for V. I. Smirnov, Russian investigator of ore deposits.

Type material is at the A. E. Fersman Mineralogical Museum, Acad. Sci. USSR (Moscow). **J.P.**

Straczekite*

G. T. Evans, Jr., G. Nord, J. Marinenko and C. Milton (1984) Straczekite, a new calcium barium potassium vanadate mineral from Wilson Springs, Arkansas. Mineral Mag., 48, 289–93.

Straczekite (ideal Composition $(\mathrm{Ca, Ba, K, Na})_x(\mathrm{V}^{4+}_{1.6}\mathrm{V}^{5+}_{6.63}\mathrm{Fe}^{3+}_{0.1})\mathrm{O}_{20}(\mathrm{H_2O})_{4-x}$) is found at the Union Carbide Vanadium mine in Wilson Springs, Garland County, Arkansas. It is a rare secondary mineral occurring in fibrous seams in argillaceous gangue. Analysis yields V_2O_5 66.4, V_2O_4 15.3, Fe_2O_3 0.9, Na_2O 0.4, K_2O 1.8, CaO 2.5, BaO 5.5, H_2O 7.2; normalized to 100%. All analyses were wet chemical. This gives the formula $(\mathrm{Ca}_{0.39}\mathrm{Ba}_{0.31}\mathrm{K}_{0.33}\mathrm{Na}_{0.11})(\mathrm{V}^{4+}_{1.59}\mathrm{V}^{5+}_{6.31}\mathrm{Fe}^{3+}_{0.10})\mathrm{O}_{20.02}(\mathrm{H_2O})_{2.9}$.

Powder diffraction combined with electron diffraction show the mineral to be monoclinic, space group $C2/m$, $C2$ or Cm, $a = 11.679(2)$, $b = 3.6608(4)$, $c = 10.636(2)$Å, $\beta = 100.53(4)°$, D calc. = 3.21 g/cm^3. The strongest X-ray lines (24 given) are 10.449(50)(001), 3.486(100)(003), 3.255(10)$(111,\bar{2}03)$, 2.492(10)$(311,\bar{3}12)$, 1.9437(15)$(\bar{6}01,510)$, 1.8306(50)(020), 1.8030(10)(021). Crystals suitable for a crystal structure determination were not found.

Straczekite occurs with other vanadium minerals (hewettite, duttonite and fervanite). It is found in seams as fibrous, greenish-black, foliated masses up to 1 cm across. Individual fibers are opaque and up to 0.5 mm long. Very thin flakes, in transmitted light, are yellowish green. The fibers have a greenish-black streak and a greasy black luster. The fibers are separated into thin laths by a perfect cleavage parallel to (100). Density measurements gave erratic low results (3.09–3.29 g/cm^3). The indices of refraction are very high (predicted $n = 1.99$ by the Gladstone–Dale law). The laths consistently show parallel extinction. A centered acute bisectrix figure, with a moderate to large $2V$ angle, appears normal to the plane of the lath, with optic plane normal to the **b**-axis (elongation direction). The optic sign was not determined due to the dark color, but is presumed to be negative. The laths are pleochroic with apple green normal to the elongation direction and olive green parallel to this direction.

The name is for John A. Straczek, Chief Geologist at Union Carbide Corporation. **R.H.L.**

Svyazhinite*

B. V. Chesnokov, L. F. Bazhenova, I. E. Kamentsev, V. O. Polyakov, and A. F. Bushmakin (1984) Svyazhinite, $(\mathrm{Mg,Mn,Ca})(\mathrm{Al,Fe^{3+}})(\mathrm{SO_4})_2\mathrm{F}\cdot 14\mathrm{H_2O}$, a new mineral. Zapiski Vses. Mineralog. Obshch., 113, 347–351 (in Russian).

Chemical analysis by LFB on 0.8 g gave CaO 0.38, MgO 4.18, MnO 3.07, Al_2O_3 8.65, Fe_2O_3 1.90, SO_3 29.37, F 3.42, Cl 0.17, H_2O 49.40, sum = 100.54 less $(0 = F_2Cl_2)$ 1.48 = 99.06%. Small amounts of Zn and Cu were present; part of the iron is divalent. Melts in its water of crystallization in the closed tube. Soluble in H_2O. The DTA curve shows endothermic effects at 60, 135 (major), 175, 230, 375, 810, and 925°C.

X-ray study shows svyazhinite to be triclinic, $P1$ or $P\bar{1}$, $a = 6.217$, $b = 13.306$, $c = 6.255$Å, $\alpha = 90.09$, $\beta = 93.50$, $\gamma = 82.05°$, Z = 1, D calc. = 1.69. This is closely related to aubertite (Am. Mineral., 65, 205). The strongest X-ray lines (27 given) are: 5.68(7)(011), 4.91(10)(120), 4.40(5)(030), 4.15(5)$(\bar{1}20)$, and 2.824(5)(022).

The mineral occurs as yellowish nodules up to 2–3 cm in diameter in fractures cutting pyroxene-amphibole fenites, in the Ilmen Mts., Urals, U.S.S.R., associated with pyrite and fluorite. Crystals are tabular, flattened on $(0\bar{1}4)$, and exhibit 10 forms, with $(0\bar{1}4)$, (210), (110) dominant: twins on $(0\bar{1}4)$ were observed. It is colorless, optically biaxial, negative, with $\alpha = 1.423$, $\beta = 1.439$, and $\gamma = 1.444$ (all ± 0.002), $2V$ small (calc. = 57°).

The name is for Nikolai Vasil'evich Svyazhin (1927–1967), Russian Mineralogist. Type material is at the Fersman Museum, Moscow, and the Museum of the Sverdlovsk Mining Institute. **M.F.**

Tsilaisite

K. Schmetzer and H. Bank (1984) Crystal chemistry of tsilaisite (manganese tourmaline) from Zambia. Neues Jahrb. Mineral., Monatsch., 61–69.

B. Nuber and K. Schmetzer (1984) Structural refinement of tsilaisite (manganese tourmaline). Neues Jahrb. Mineral., Monatsch., 301–304.

Tsilaisite $(\mathrm{Na}(\mathrm{Mn}_{1.5}\mathrm{Al}_{1.5})\mathrm{Al}_6(\mathrm{BO_3})_3\mathrm{S}_6\mathrm{O}_{18}\mathrm{O}_{1.5}(\mathrm{OH,F})_{2.5})$ has been reported from a new occurrence in Zambia; no detailed information on the deposit was given. Analysis yielded Na_2O 2.68, CaO 0.25, Li_2O 0.64, MgO 0.01, MnO 6.72, FeO 0.05, Al_2O_3 39.26, TiO_2 0.36, SiO_2 36.75, F 0.93, H_2O 2.42, B_2O_3 10.68, $-\mathrm{O} = \mathrm{F}$ 0.36; sum 100.36 (all by microprobe except for Li, F and H_2O (wet chemical) and B calculated to B = 3.000). This gives the formula $(\mathrm{Na}_{0.845}\mathrm{Ca}_{0.044})_{0.889}(\mathrm{Li}_{0.419}\mathrm{Mg}_{0.002}\mathrm{Mn}_{0.926}\mathrm{Fe}_{0.007}\mathrm{Al}_{1.528})_{2.882}\mathrm{Al}_{6.00}\mathrm{Ti}_{0.044}\mathrm{Si}_{5.979}\mathrm{B}_{3.000}(\mathrm{O}_{27.896}\mathrm{F}_{0.478}(\mathrm{OH})_{2.626})_{31.00}$ (based on (O, OH, F) = 31).

Powder X-ray diffraction yields $a = 15.915(2)$ and $c = 7.123(1)$Å. The density is reported to be 3.13(2). The strongest X-ray lines (51 given) are: 6.35(40)(101), 4.96(40)(021), 4.21(80)(211), 3.99(80)(220), 3.45(60)(012), 2.942(80)(122), 2.572(100)(051), 2.366(40)(232), 2.339(40)(511), 2.034(60)(152), 1.912(50)(342), 1.651(40)(603), 1.638(40)(271) and 1.445(50)(642). Single crystal X-ray showed no significant differences between the tsilaisite structure and the structures of other tourmalines.

The mineral is intense yellow, greenish-yellow or yellowish-brown, and distinctly pleochroic $O > E$. Pleochroism varies with the following combinations being observed ($\parallel$c and $\perp$c): light yellow to intensive yellow, light brown to intensive brown, light yellowish-green to intensive yellow and light greenish-yellow to intensive yellowish-green. A slight variation of the refractive indices ($\varepsilon = 1.662$–1.623, $\omega = 1.645$–1.648, Δn 0.023–0.025) with manganese content was noted. The absorption spectrum has a broad band at 15,800 cm^{-1} with an absorption beginning at about 17,000 cm^{-1} and increasing towards the blue end of the spectrum. There is also a weak shoulder at about 24,100 cm^{-1}.

The samples reported in this study are members of a elbaite-tsilaisite series, containing up to 69% of the tsilaisite end member and the remainder the elbaite end member ($Na(Li_{1.5}Al_{1.5})Al_6(BO_3)_3Si_6O_{18}(OH,F)_4$). The dominant isomorphic replacement is reported to be $Li^+ + (OH)^- \rightarrow Mn^{2+} + O^{2-}$.

Discussion

The composition of tsilaisite was originally defined as $NaMn_3Al_6(BO_3)_3Si_6O_{18}(OH)_4$ (W. Kunitz (1929) Chemie d. Erde, 4, 208–251). The original definition was to a certain extent arbitrarily made. Unfortunately, the composition defined in this paper does not appear to be any more sound. It is possible to get from the $Mn_{1.5}Al_{1.5}$ composition described in this paper to Mn_3 by an $Al^{3+} + O^{2-} \rightarrow Mn^{2+} + (OH)^-$ substitution in addition to the lithium substitution. Thus stopping at only $Mn_{1.5} - Al_{1.5}$ is arbitrary, especially since the authors state that this second substitution is also thought to be present. The authors note the possibility of achieving the formula of Kunitz, but they feel that since no tourmaline near Mn_3 has been observed the originally defined composition is only hypothetical, this is not a sufficiently good reason to redefine tsilaisite. The authors do not state that this description of tsilaisite has IMA approval. It is obvious that a better definition of the members of the tourmaline group is needed, but these definitions do need IMA approval. **R.H.L.**

Vyacheslavite*

L. N. Belova, A. I. Gorshkov, O. A. Ivanova, A. V. Sivtsov, L. I. Lizorkina, and V. A. Boronikhin (1984) Vyacheslavite, $U^{4+}(PO_4)(OH) \cdot nH_2O$, a new uranium phosphate. Zapiski Vses. Mineralog. Obshch., 113, 360–365. (in Russian).

Microprobe analyses of the green variety gave UO_2 69.75, 67.63; CaO 0.5, 0.55; P_2O_5 16.9, 17.1; H_2O (by difference) 12.85, 14.72%, corresponding to $(U_{1.04}Ca_{0.04})(PO_4)_{0.96}(OH)_{1.36} \cdot 2.19H_2O$ and $(U_{1.01}Ca_{0.04})(PO_4)_{0.97}(OH)_{1.21} \cdot 2.7H_2O$. Average of 10 analyses of the dark green variety gave UO_2 76.98, CaO 0.55, P_2O_5 17.07, H_2O (by difference) 5.4%, corresponding to $(U_{1.18}Ca_{0.04})(PO_4)(OH)_{1.82} \cdot 0.35H_2O$.

Electron diffraction patterns show the mineral to be orthorhombic, *Cmcm*, *Cmc*2_1, *Cmc*2, or *C*2*cm*, with $a = 6.96$, $b = 9.10$, $c = 12.38$ (all ± 0.001)Å, Z = 6. The strongest X-ray lines are 6.19(10)(002), 4.56(6)(020), 4.13(6)(112), 3.68(5)(022), 2.71(5)(114), and 2.69(7)(221).

The mineral occurs as green to dark green tabular crystallites and aggregates on quartz and sometimes associated with octahedral pyrite. Crystals are up to 8 μm long and 1.5 μm wide. The locality is not given. Vyacheslavite is biaxial, negative, with $\alpha = 1.700$, $\beta = 1.726$–1.729, and $\gamma = 1.729$–1.731, 2*V* small, elongation positive.

The name is for Vyacheslav Gavrilovich Melkov, Russian mineralogist. Type material is at the Fersman Mineralogical Museum, Moscow.

Discussion

This mineral was partially described as an unnamed phosphate in a prior paper (Am. Mineral., 69, 1195). **M.F.**

Unnamed bismuth sulfotellurides

V. I. Grozdev, N. G. Stepanov and I. M. Romanenko (1982) Mineral associations of tellurides in one of the skarn-scheelite deposits of the Maritime Province. Tikho-okeaniskaya Geol. (Pacific Geology), 5, 113–116 (in Russian).

Sulfotelluride of bismuth #1 (anal. 2) gives $(Bi_{4.18}Fe_{0.11})(Te_{1.57}S_{0.78}Se_{0.36})$. It occurs in disseminated pyrrhotite ores as isometric grains up to 1.05 mm. in interstices of quartz and rim parts of bismuthinite, replacing pyrrhotite. Optically white with distinct pale cream tint. Reflectance higher than that of bismuthinite.

Sulfotelluride of Bi #2 (anal. 3 and 4) giving $(Bi_{4.14}Pb_{0.11}Fe_{0.03})(Te_{1.66}S_{1.03}Se_{6.03})$ and $(Bi_{4.05}Pb_{0.14})(Te_{1.78}S_{0.97}Se_{0.06})$. Occurs in intergrowths with native Bi, hessite, stuetzite, and galena. The mineral forms intergrowths of irregular form with straight-line edges and grains not exceeding 0.05 min. Optically like #1. **M.F.**

unnamed Bi–Te–Se–S minerals

E. M. Spiridonov, and A. S. Badalov (1983) New sulfo-selenotellurides and sulfoselenides of bismuth of the Kairagach deposit, eastern Uzbekistan. Uzbek Geol. Zhurnal, #6, 82–84. (in Russian).

Electron microprobe analyses are given of three minerals. *Phase I*, the most abundant, occurs as tabular or platy or irregular deposits, reminiscent of tetrahedrite, of size 1–100 μm. Birefringence distinct, *n*'s lower than those of tetradymite, higher than those of laitakarite. Four analyses gave Bi 62.58, 58.77, 56.75, 60.37; Sb 0.50, 1.09, 0.97, 0.92; Pb 1.48, 3.53, 3.47, 1.95; Te 28.08, 31.21, 31.77, 30.02; Se 6.23, 4.78, 6.40, 5.66; S 2.94, 3.67, 2.50, 3.22; totals 101.81, 103.05, 101.85, 102.14 wt.%, corresponding to: $(Bi_{3.00}Pb_{0.07}Sb_{0.04})Te_{2.19}Se_{0.79}S_{0.91}$, $(Bi_{2.72}Pb_{0.16}Sb_{0.09})Te_{2.35}Se_{0.58}S_{1.09}$, $(Bi_{2.71}Pb_{0.17}Sb_{0.08})Te_{2.47}Se_{0.80}S_{0.77}$, and $(Bi_{2.84}Pb_{0.10}Sb_{0.08})Te_{2.30}Se_{0.70}S_{0.98}$.

Phase II forms tabular deposits up to 30 μm in size, optically resembles *Phase I*. Analysis gave Bi 73.64, Sb 0.61, Pb 2.04, Te 18.16, Se 5.79, S 0.91, total 101.15 wt.%, corresponding to $(Bi_{2.89}Pb_{0.08}Sb_{0.04})Te_{1.16}Se_{0.60}S_{0.23}$, or $Bi_3Te(Se,S)$.

Phase III forms flattened deposits, mostly up to 10 μm, rarely up to 100 μm; optically anisotropic, birefringence noticeable, resembles laitakarite. Analyses gave Bi 76.61, 78.67; Sb 0.39, 0.0; Pb 0.69, 0.0; Cu 0.50, 0.84; Te none, Se 15.98, 15.33; S 5.36, 5.89; total 99.53, 100.73 wt.%, corresponding to $(Bi_{1.96}Sb_{0.01}Pb_{0.02}Cu_{0.04})Se_{1.08}S_{0.89}$, and $(Bi_{1.96}Cu_{0.07})Se_{1.01}S_{0.96}$, or Bi_2SeS.

Discussion

X-ray study is needed. **M.F.**

Unnamed calcium analog of edingtonite

M. I. Ismagilov (1977) Calcium edingtonite from pyrite deposits of the southern Urals. Doklady Earth Sci. Sect., 234, 170–172 [English trans. of Doklady Akad. Nauk SSSR, 234, 1445–1447 (1977)].

Chemical analysis (method not given) of a poikiloblastic mixture gave SiO_2 67.68, Al_2O_3 16.0, TiO_2 0.21, Fe_2O_3 0.14, FeO tr., MgO 0.35, MnO 0.01, CaO 4.35, BaO 5.15, S (given as S_{sulf}) 0.1, K_2O tr., Na_2O 3.29, P_2O_5 0.09, ignition loss 2.62, total 99.91%. This was recalculated to a mineral mixture containing 27.9% albite, 34.5% quartz, and 36.5% edingtonite. The edingtonite component corresponds to a composition, $Ca_{0.7}Ba_{0.3}Al_{1.99}Si_3O_{10}(OH)_{2.6}$, comparing favorably to a Ca-dominant edingtonite-like mineral.

Strongest X-ray lines (43 given) are: 3.38(10), 1.745(10), 3.83(9), 1.414(8), 1.324(8), 1.252(8), 1.033(7–8). No single crystal data are given.

The mineral occurs as gray, dirty yellow, and brownish pink, rarely colorless, aggregates of polygonal grains, among which are euhedral crystals with hexagonal and rhomboid cross sections. Most grains are polysynthetically twinned. Refractive indices are $\alpha = 1.548$, $\gamma = 1.55$. The twins appear to be uniaxial; biaxial negative crystals, with $2V = 53–55°$, generally are untwinned. H = 4.5–5.

The mineral occurs in brecciform sulfide aggregates in roof rocks of the Podol'skoye deposit, intergrown with sulfides, and with relic albite and quartz. It is reported to be widespread in the pyrite deposits investigated.

Discussion

Requires further study. The mineral has not been submitted to the IMA. **J.A.F.**

Unnamed Ce analog of titanite

R. A. Exley (1980) Micoprobe studies of REE-rich accessory minerals: implications for Skye granite petrogenesis and REE mobility in hydrothermal systems. Earth and Planet Sci. Letters, 48, 97–110.

Electron microprobe analysis (four given) gave: SiO_2 20.28, Al_2O_3 1.03, TiO_2 17.42, MgO 0.50, FeO 10.06, CaO 2.58, SrO n.d., ThO_2 1.09, Y_2O_3 1.54, La_2O_3 11.88, Ce_2O_3 25.40, Pr_2O_3 2.06, Nd_2O_3 5.85, Sm_2O_3 0.69, Gd_2O_3 0.65, Dy_2O_3 0.26, Er_2O_3 n.d., Yb_2O_3 n.d., total 101.29%. This analysis contains the highest Ce_2O_3 analysis of the 4 given. This corresponds to a rare-earth dominant titanite: $(Ce,La,Ca)(Ti,Fe)SiO_5$, with up to 87.2% of the Ca replaced by rare earths. No other data are given.

The mineral occurs in an orthopyroxene, amphibole and biotite granophyre as brown subhedral lozenges associated with allanite, apatite and zircon from Coire Uaigneich, Camasunary, and three other localities on the Isle of Skye, Scotland.

Discussion

More data are necessary for confirmation, but the analyses represent a new mineral species. **J.A.F.**

unnamed Cu–Fe–Bi sulfide

V. A. Atanasov, I. I. Bonev, and O. L. Dimitrov (1979–1980) A new sulfide of copper, iron, and bismuth from the Propada deposit, Strandzha Mts. Godishnik Visshiya Minno-Geol. Inst. 26, 143–150 (Bulgarian with English abstract).

Electron microprobe analyses of 200–300 μm inclusions in chalcopyrite gave Cu 55.27, 58.14; Fe 11.00, 11.93; Bi 8.76, 6.53; S 24.56, 25.69; sum = 99.59 102.09 wt.%, corresponding to $Cu_{18.10}Fe_{4.10}Bi_{0.87}S_{15.93}$ and $Cu_{18.23}Fe_{4.19}Bi_{0.62}S_{15.96}$, or $Cu_{18}Fe_4BiS_{16}$. **M.F.**

Unnamed Fe_2Co

Ryutaro Sakai and Yosmimasu Kuroda (1983) Native iron and the associated minerals from the ultramafic masses in the Sanbagawa belt, central Japan. Jour. Jap. Assoc. Mineral., Petrol., Econ. Geol., 78, 467–478 (in English).

Microprobe analyses of 2 samples gave Fe 62.87, 66.57; Ni 0.36, 1.04; Co 35.77, 33.46; Cu none, none; S 0.30, 0; Sum 99.30, 101.07%, corresponding nearly to Fe_2Co, apparently differing from wairauite, CoFe.

Discussion

X-ray data are needed. **M.F.**

Unnamed gold–lead tellurides

E. M. Spiridonov and T. N. Chvileva (1982) New minerals of gold–plumbotellurides of gold, copper, iron, and silver (bilibinskite group). Novye Dannye Mineral., 30, 140–147 (in Russian).

Average microprobe analyses are given of 5 unnamed minerals:

Mineral	1	12	2	5	8
no. of analyses	2	4	6	3	10
Au	15.17	50.1	59.8	67.8	70.3
Ag	5.52	2.00	2.64	1.54	2.76
Cu	2.68	6.46	2.83	5.24	13.33
Fe	10.79	7.47	3.78	0.18	0.25
Te	48.2	21.29	20.28	10.86	4.59
Se	—	0.12	—	—	—
Pb	16.42	13.47	10.88	13.60	7.55
Total	98.8	100.9	100.2	"99.3"	98.8

Formulas given - Mineral 1 - $(Au,Ag)Fe_2(Te,Pb)_4$; mineral 12 - Au(Fe,Cu)(Te,Pb); mineral 2 - $Au_3(Fe,Cu)(Te,Pb)_2$; mineral 5 - $Au_5Cu(Te,Pb)_2$; mineral 8 - $Au_5Cu_3(Te,Pb)$. Minerals 12, 2, and 5 are stated to resemble bilibinskite and bogdonovite under the microscope and to give X-ray patterns (not given) similar to that of gold. Mineral 8 has a yellowish-rose color and an X-ray pattern not differing from that of gold. Mineral 1 has a light gray color.

No other data, including occurrence or locality, are given. **M.F.**

Unnamed Mo–Pb sulfide

A. Kh. Turesebekov, and R. I. Koneev (1983) A new lead-molybdenum disulfide. Doklady Akad. Nauk Uzbek SSR, #12, 30–32 (in Russian).

Microprobe analysis gave S 37.6, Mo 44.5, Pb 16.0, Fe 2.4, Sb 1.4, sum = 101.9 wt.%, corresponding to $Mo_{0.74}Pb_{0.13}Fe_{0.01}Sb_{0.002}S_2$. The mineral occurs in the pyrite-polymetallic deposit of Kul'chulak, Almalyk ore region, as xenomorphic deposits and intergrowths with galena, corroded pyrite, and sphalerite. In reflected light: ash-gray with a creamy tint, reflectance less than that of galena, weakly isotropic. Brittle, H = 55–75 (ave. 65) kg/sq. mm. **M.F.**

unnamed Pb–Bi sulfosalt

B. L. Flerov, E. R. Stepanov, B. Ya. Bichus and Yu. Ya. Zhdanov (1981) Parageneses of minerals of Polar deposits. In Mineralogy and geochemistry of derivative granite magmatism. Akad. Nauk SSSR, Siber. Ofdel. Yakut, Filial Inst. Geol., 5–22 (in Russian).

The mineral occurs in quartz-cassiterite veins of Yakutia. Microprobe analysis by N. L. Leskova gave Bi 43.36, 44.48; Sb 1.32, 1.71; Pb 36.47, 37.03; Zn 0.04, ---; Fe 0.8, ---; S 19.51, 16.31; sum 100.78, 99.53 wt.%, corresponding to $Pb_{4.09}(Bi_{4.70}Sb_{0.25})S_{13.8}$ and $Pb_4(Bi_{4.72}Sb_{0.31})S_{11.9}$. X-ray powder data on the first analyzed sample showed strongest lines (21 given) 4.12(10), 3.56(7), 3.13(8), 2.98(5), 2.83(6), 2.27(5). **M.F.**

Unnamed phosphates (I), (II)

N. Sieber, W. Hofmeister, E. Tillmanns and K. Abraham (1984) New mineral data for copper phosphates and arsenates from Reichenbach/Odenwald. Fortschr. Miner., 62, Beiheft 1, 231–233 (in German).

Microprobe analyses of phosphate(I) gave CuO 19.89, As_2O_5 2.11, P_2O_5 33.24, Fe_2O_3 36.37, SiO_2 0.03, Al_2O_3 1.52, H_2O 4.40, sum 97.56 wt.%, corresponding to $Cu_{1.03}(Fe_{1.867}Al_{0.122})_{\Sigma 1.989}(P_{1.920}As_{0.075}Si_{0.002})_{\Sigma 1.997}O_8(OH)_2$, or $CuFe_2(OH)_2(PO_4)_2$. Phosphate(II) gave CuO 68.19, Al_2O_3 2.11, P_2O_5 22.25, SiO_2 0.10, H_2O 6.09, sum 98.74 wt.%, corresponding to $Cu_{5.07}(P_{1.855}As_{0.109}Si_{0.010})_{\Sigma 1.973}O_8(OH)_4$, or $Cu_5(OH)_4(PO_4)_2$.

X-ray studies showed both to be monoclinic, space groups $P2_1/n$ (I) and $P2_1/a$ (II). Unit cell for (I) is $a = 6.977(1)$, $b = 7.781(1)$, $c = 7.260(1)$Å, Z = 2, $\beta = 117.68(1)°$; D_x 3.798 calc. Unit cell for (II) is $a = 9.186(1)$, $b = 10.677(1)$, $c = 4.476(1)$, Z = 2, $\beta = 92.48(1)°$; D_x 4.358 calc.

Crystal structure determinations indicate (I) to have the structure of the lazulite group minerals, and (II) to have the same structure as one of two synthetic copper phosphates ('PPM') that is polymorphic to pseudomalachite. Atomic coordinates are listed for (I); $R = 0.031$, F_0: 1835. Cu-O distances smaller than 3A° are given for (I) and (II).

The minerals occur in a silicated quartz (originally barite, VG.) vein near Reichenbach in the Odenwald, Germany. **V.G.**

Unnamed sulfosalts

Kovalenker, V. A. and Geinke, V. R. (1984) A new Cu–Sn–Bi–Se-type of mineralization in the Kuramin subzone of central Tien-Shan. Izvest. Akad. Nauk SSSR, Ser. geol., 5, 91–104 (in Russian).

$Cu_4(Sn,Sb,As)S_5$ occurs as a single inclusion (20 × 30 microns) in tetrahedrite. Microprobe analysis gave Cu 48.08, Fe 0.61, Sn 8.43, Sb 6.19, As 4.52, S 31–38, Sum 99.21%, corresponding to $(Cu_{3.92}Fe_{0.06})(Sn_{0.37}Sb_{0.28}As_{0.31})S_{5.07}$. Birefringence high with color change from gray-olive to rose-brown, strongly anisotropic.

$Cu_{3+x}Bi_{5-x}(S,Se)_9$ occurs in small amounts, associated with emplectite, aikinite, Cu–Sn sulfides, laitakarite, native Bi, and chalcopyrite. The grains are usually less than 70–100 microns. Microprobe analyses of 6 grains gave Bi 63.95–65.59, Cu 11.60–14.05, Pb 0–1.0, As 0–1.5, Se 1.79–7.06, S 15.47–19.19, sums 98.67–100.4, giving the formula above with $Cu_{2.97-3.26}(Bi + Pb + As)_{4.61-5.11}(S + Se)_{8.97-9.16}$. The strongest X-ray lines (17 given) are 3.22(40), 3.13(100), 2.72(90), 1.967(60), 1.941(50). Distinctly birefringent, anisotropic with color effects in reddish-brown tints; anistropy less than for emplectite. Reflectance 48% at 440 nm, 50% at 540 nm (max.), decreasing to 47% at 720 nm.

$PbCu_7Bi_{11}(S,Se)_{21}$. Microprobe analysis gave Bi 60.93, Cu 12.95, Pb 5.76, Se 5.06, S 16.61, sum 101.31%, corresponding to $Pb_{1.00}Cu_{7.37}Bi_{10.55}(S_{18.75}Se_{2.32})$. The strongest X-ray lines (20 given) are 3.67(10), 3.29(10), 3.14(5), 3.05(10), 2.18(9), 2.04(5). Birefringent and anisotropic without distinct color effects; white to light gray in polished sections. Reflectances, R'g nearly constant, about 42% at 440 nm, 43% at 720 nm; R'p 36% at 440 nm to max. 42% at 580 nm, to about 38% at 720 nm. **M.F.**

Unnamed sulfosalts, "cuprocosalite"

Hurny, J. and Kristin, J. (1978) Chemical composition of bismuth minerals from some deposits of the Spissko-Gemer ore mountain, eastern Slovakia. Internatl. Mineralog. Assoc., 11th Meeting, Novosibirsk, Sulfosalt Vol., 109–121 (in Russian).

Microprobe analyses are given of 3 unnamed minerals. Mineral 1 occurs in quartz veins at Delary as acicular aggregates (1–3 mm). Three analyses gave Bi 43.68–44.54, Sb 3.17–3.39, Pb 33.38–34.26, Cu 0.60–0.63, S 17.13–17.40, Sum 96.48–98.82, corresponding to $(Pb_{2.71-2.79}Cu_{0.16-0.17})(Bi_{3.52-3.60}Sb_{0.44-0.47})S_{9.02-9.20}$, or $Pb_3Bi_4S_9$. In reflected light, white with bluish tint. Birefringence very weak, distinctly anisotropic. The X-ray powder diagram shows strongest lines 3.426, 3.544.

Mineral 2 occurs at Slovinki. Two microprobe analyses gave Bi 38.17, 33.43; Sb 7.72, 5.64; Pb 16.53, 21.90; Cu 15.17, 17.16; Fe 1.67, 2.16; S 21.23, 20.42; Sum 100.69, 100.76%, corresponding to $Pb_{4.17}Cu_{12.48}(Bi_{8.19}Sb_{2.45})S_{33.64}$ and $Pb_{5.58}Cu_{14.25}(Bi_{9.54}Sb_{3.31})S_{34.54}$(Bi + Sb = 10.64 and 12.85 resp.). No X-ray data are given.

Mineral 3 is called "cuprocosalite". Three microprobe analyses give Bi 34.91–37.00, Sb 5.67–5.83, Pb 34.35–36.05, Cu 2.84–3.18, S 16.47–16.87, sum 94.95–97.26%, corresponding to $(Pb_{1.55-1.64},Cu_{0.42-0.47})(Bi_{1.57-1.65}Sb_{0.43-0.45})S_{4.87-4.95})$ or $(Pb,Cu)_2(Bi,Sb)_2S_5$. It forms drop-like and elongated grains in chalcopyrite and tetrahedrite of the Rudnyany deposit. In reflected light white, with low birefringence and distinct anisotropy. No X-ray data are given.

Discussion

Name not acceptable without X-ray data. **M.F.**

unnamed sulfosalts

D. N. Litoshko, V. D. Bezigov, and L. A. Khoroshilova (1984) First find of lead-bismuth tellurides and sulfosalts in the Polar Urals. Trudy. Inst. Geol. Komi Filial, Akad. Nauk S.S.S.R., #45, 60–66 (in Russian).

The minerals occur in quartz veins of the Kharbeisk deposit, Polar Urals.

Unnamed $Pb_2Bi_3S_7$

The mineral occurs as irregular to tabular deposits up to 1 × 2.5 mm. Color dark gray, dull, metallic luster on fresh fracture, one perfect cleavage. Associated with chalcopyrite, native Bi, joseite-A, and joseite-B. Microprobe analysis gave Bi 50.1, Pb 32.7, S 17.9, sum = 100.7 wt.%, corresponding to $Pb_{1.98}Bi_{3.01}S_{7.01}$. The X-ray pattern (15 lines given) is said to resemble that of bismuthinite. The strongest lines are 3.56(10), 3.42(5), 3.33(7), 3.20(5), 3.11(8), 2.96(6). In reflected light, grayish white with brownish tint, weak birefringence, strong anisotropy. Curves reflectances are given, showing maxima at about 590 nm at $R_{max.}$ 46.2, $R_{min.}$ 43.0; at 460 nm, approx. 42.8, 41.6%. Microhardness at 50 g load 100–125 and 146–192 kg/sq. mm.

unnamed $Pb_3Cu_3Bi_8S_{17}$

Microprobe analysis gave Bi 55.8, Pb 20.3, Cu 6.2, S 17.9, sum 99.7 wt.%, corresponding to $Pb_{2.98}Cu_{2.97}Bi_{8.05}S_{16.98}$, close to hammarite, lindstromite, and rezbanyite. The strongest X-ray lines (12 given) are 3.47(5), 3.15(10), 2.40(5), 2.31(9), 2.17(10), 1.958(6b), 1.577(8), 1.450(6), 1.382(7). It occurs in intergrowths with chalcopyrite, joseite-A, and joseite-B. **M.F.**

Unnamed sulfotellurides

C. N. Gamyanin, N. V. Leskova, and L. I. Bochek (1978) Composition and properties of bismuth sulfotellurides from deposits of eastern Yakutia. International Mineralog. Assoc., 11th Session, Novosibirsk. 1978, Sulfosalt Vol., 127–135 (1980) (in Russian).

Minerals E, F, K, L, M, P

Mineral M: $(Bi_{2.97}Pb_{0.01})(Te_{1.48}S_{1.47}Se_{0.05})$, or $Bi_3(Te,S)_3$, strongest X-ray lines (6 given) 3.61(5), 3.09(10), 2.119(8), 1.748(6); microhardness 44.6 to 72.4 kg/sq. mm, reflectance curve given. *Mineral E*: $(Bi_{2.97}Sb_{0.02}Pb_{0.01})$ $(Te_{2.0}S_{0.96}Se_{0.04})$, or Bi_3Te_2S; Strongest X-ray lines (6 given) 3.69(5), 3.151(10), 2.296(7), 2.160(9), 1.788(6), 1.379(8). Microhardness 35.9 to 67.6 kg/sq mm; reflectance curve given. *Mineral F*: $(Bi_{3.04}Pb_{0.03})(Te_{2.27}S_{0.73})$, strongest X-ray lines (6 given) 3.69(4), 3.13(10), 2.281(7), 2.15(6), 1.779(5), 1.378(7); microhardness 27.2–51.4 kg/sq mm; reflectance curve given.

No composition stated for *K*, *L*, and *P* (*K* & *L* are on the diagram p. 130). *K* $(Bi_{8.86}Sb_{0.04}Pb_{0.01})(Te_{3.90}S_{2.10}) = Bi_9(Te_4S_2)$. *L* $(Bi_{2.00}Sb_{0.01}Pb_{0.02})(Te_{1.00}S_{2.00}) = Bi_2TeS$; X-ray data. *M* $(Bi_{1.57}Sb_{0.01}Pb_{0.15})(Te_{1.01}S_{0.99}) = (Bi,Pb)_2TeS$; X-ray data. *P* $(Bi_{14.84}Pb_{0.16})(Te_{2.16}S_{8.00}) = Bi_{15}Te_2S_8$ or Bi_6TeS_3: Godovikov et al., Zapiski, 100, #3, 257-265 (1971), gives the following data from the Sokhodno deposits, E. Transbaikal: *K* av. of 2: Bi 76.84, Pb 0.32, Sb 0.22, Te 20.56, S 2.80, sum 100.74%. *L* av. of 2: Bi 78.63, Pb 0.60, Sb 0.18, Te 17.32, S 3.70, sum 100.43%. *M* (1 anal.): Bi 63.30, Pb 6.10, Sb 0.20, Te 25.00, S 6.10, sum 100.70%. *P* (1 anal.): Bi 83.40, Pb 0.90, Sb --, Te 7.40, S 6.90, sum 98.60%.

Optics given for *K* and *M*. **M.F.**

Unnamed vanadium porphyrin

S. A. Miller, T. W. Hambley, and J. C. Taylor (1984) Crystal and molecular structure of a natural vanadyl porphyrin. Australian J. Chem., 37, 761–766.

Single-crystal X-ray study of a natural vanadyl deoxophylloerythroetioporphyrin shows it to be monoclinic, space group $P2_1/c$, unit cell: $a = 12.912$, $b = 14.151$, $c = 18.404$Å, $\beta = 70.34°$, $Z = 4$. Lattice parameters were determined by least squares fit to the setting angles of 32 high-angle reflections obtained from a four-circle diffractometer. X-ray diffraction peaks not given.

The porphyrin was extracted from a sample of oil shale from the Julia Creek deposit (Toolebuc formation) in Queensland, Australia. This deposit is known to contain high concentrations of porphyrins. Ideal chemical formula $C_{33}H_{35}Cl_3N_4OV$. Crystals of the porphyrin grown from chloroform were prismatic, dark red in color, and up to 0.26 mm in length. D. 1.37 meas., 1.353 calc. The molecular structure is shown to consist of an isocyclic five-membered ring centered on a vanadium atom in a distorted four-fold site. The similarity in structure indicates this new porphyrin is a derivative of chlorophyll. The crystal structure consists of these porphyrin molecules in planar arrangement nearly parallel to the XY plane that are separated by chloroform molecules. **J.E.S.**

BOOK REVIEWS

CARBONATES: Mineralogy and Chemistry, Reviews in Mineralogy, Vol. 11. Edited by Richard Reeder. Mineralogical Society of America, Washington, D.C., 1983. 394 pages. $13.

CARBONATES: Mineralogy and Chemistry is another excellent addition to this most useful series. Extensively annotated with approximately 1000 references, this volume covers nearly all aspects of the mineralogy, crystal chemistry and phase relations of natural carbonate minerals, together with their low temperature aqueous behavior. Each chapter is well written by an authority (or authorities) and well illustrated with copious line drawings and/or electron micrographs. Most of the illustrations are clear and in only a few cases do the labels approach illegibility. Difficult to reproduce under the best of circumstances, most of the electron micrographs have been well chosen and have been reproduced well, although a few of the high resolution lattice images are less clear than one might like.

The book progresses from a consideration of crystal chemistry, phase relations, solubility relations and low temperature kinetic considerations, to a discussion of trace elements and isotopes in low temperature carbonates, and finally to the comparatively new field of microstructure characterization made possible by the advent of modern high voltage electron microscopes. Most chapters end with suggestions for future work, a humbling exposure of how much more we need to know.

Richard Reeder summarizes the crystal chemistry of the rhombohedral carbonates in Chapter 1, and although he concentrates on calcite and dolomite (as do most other authors), other phases are not neglected. Julian Goldsmith succinctly summarizes what we know (and how much we don't) about phase relations among the rhombohedral carbonates. His scholarly summary should send the experimentalists running to their laboratories and points to the need for a "rebirth" of hydrothermal work. Eric Essene summarizes solid solutions in metamorphic carbonates and concludes that essentially only the calcite-dolomite solvus is presently useful in metamorphic rocks between about 400 and 600°C, if applied carefully. Considerable potential exists in other systems, however, particularly those which contain $FeCO_3$. Again, the need for additional experimental work is indicated. Fred Mackenzie and five co-authors summarize some views of this same solid solution at low temperature, namely the behavior of Mg-calcites in aqueous solution. Considerable controversy exists over how to handle the behavior of this metastable system in a rigorous thermodynamic framework. Mackenzie et al. summarize what is known and what is thought. But the last word has yet to be written!

Chapter 5, by J. Alexander Speer, summarizes crystal chemistry and phase relations in the orthorhombic carbonates, a group about which a considerably smaller body of knowledge exists. Bill