

NEW MINERAL NAMES*

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Argentocuproaurite

L. V. Razin (1975) Minerals—natural alloys of gold and copper in ores of copper–nickel deposits of Noril'sk. *Trudy Mineral. Muzeya Akad. Nauk SSSR*, 24, 93–106 (in Russian).

Microprobe analyses of two grains from Noril'sk and Talnakh, respectively, gave Au 67.7, 66.5; Cu 9.2, 11.2; Ag 12.8, 19.4; Pd 4.2, 2.2; Rh 4.3, –; Pb 1.6, –; Pt 0.9, –; Sn –, 0.5; totals 100.7, 99.8, with idealized formulae of $\text{Au}_{50}\text{Cu}_{21}\text{Ag}_{17}\text{Rh}_6\text{Pd}_6$ and $\text{Au}_{47}\text{Ag}_{28}\text{Cu}_{24}\text{Pd}_3$. The X-ray powder pattern (8 lines) was indexed as primitive cubic with $a = 4.073(2)\text{\AA}$. The mineral is light reddish-rose in reflected light, isotropic, with no observed birefringence. Reflectance at 580 nm = 64.3 percent. $\text{VHN}_{50} = 214(211-216)$. Negative to standard etch agents, except for KCN and aqua regia.

Discussion

Compositionally, the mineral is argentoan CuAu or cuproan argentoan gold. The mineral can be indexed as face-centered cubic (hence cuproan argentoan gold), except for the weakest reflection in the pattern reported at 1.673Å. Confirmation by single-crystal methods of this single weak extra reflection in the powder pattern is necessary to justify characterization as a new mineral species. The name is unnecessary. L.J.C.

Aurocuproite

L. V. Razin (1975) Minerals—natural alloys of gold and copper in ores of copper–nickel deposits of Noril'sk. *Trudy Mineral. Muzeya Akad. Nauk SSSR*, 24, 93–106 (in Russian).

Microprobe analyses of two grains gave Au 61.6, 64.5; Cu 28.4, 28.0; Ag 0.9, –; Pd 7.7, 6.9; Pt 2.3, –; Rh 1.9, –; Bi 0.6, –; totals 103.4, 99.4, with idealized formulae of $\text{Cu}_{63}\text{Au}_{38}\text{Pd}_8$ and $\text{Cu}_{63}\text{Au}_{38}\text{Pd}_8$. The X-ray powder pattern (8 lines) was indexed as primitive cubic with $a = 3.862(2)\text{\AA}$. The mineral, found in ores of the Talnakh deposit, is light orange-yellow in reflected light, isotropic, with no birefringence observed. Reflectance at 580 nm = 63.1 percent. $\text{VHN}_{50} = 199(189-206)$. Negative to standard etch reagents except for KCN and aqua regia.

Discussion

Compositionally the mineral is palladian AuCu or auroan palladian copper. The powder pattern may be indexed as face centered cubic (hence auroan palladian copper) except for the weakest reflection at 1.070Å. Confirmation by single-crystal methods of this single extra weak reflection in the powder pattern is necessary to justify characterization as a new mineral species. The name is unnecessary. L.J.C.

Bracewellite,* grimaldiite,* guyanaite,* mcconnellite*

Charles Milton, D. E. Appleman, M. H. Appleman, E. C. T. Chao, Frank Cuttitta, J. I. Dinnin, E. J. Dwornik, B. L. Ingram and H. J. Rose, Jr. (1976) Merumite, a complex assemblage of chromium minerals from Guyana. *U. S. Geol. Surv. Prof. Pap.*, 887, 1–29.

Merumite, supposedly $\text{Cr}_2\text{O}_3 \cdot \text{H}_2\text{O}$ [*Am. Mineral.*, 34, 339 (1949)] is shown to consist of fine-grained intergrowths of eskolaite (Cr_2O_3) (predominant) with 4 new minerals. It occurs as black rounded grains in alluvial gravels of the drainage basin of the Merume River, Guyana.

Guyanaite, $\text{CrO}(\text{OH})$ is orthorhombic, space group *Pnmm*, a 4.857, b 4.295, c 2.958Å, $Z = 2$, G calc 4.53; synthetic material has closely agreeing unit-cell dimensions. Analysis on 37 mg by B.L.I. gave Cr_2O_3 71.7, Al_2O_3 4.0, Fe_2O_3 4.4, Mn_2O_3 0.98, Ti_2O_3 0.86, H_2O + 8.7, sum 90.7 percent. The strongest X-ray lines (21 given) are 3.224 (VVS) (110), 2.432 (S)(200), 1.719 (MS)(211), 1.636 (S)(121), 1.609 (MS)(220), 1.516 (MS)(310). Color reddish-brown, golden-brown, greenish-brown, green (synthetic).

Bracewellite, also $\text{CrO}(\text{OH})$, is orthorhombic, space group *Pbnm*, a 4.492 ± 0.003, b 9.860 ± 0.005, c 2.974 ± 0.002Å, $Z = 4$, G 4.45–4.48. It is isostructural with goethite and diaspore. Analysis of a mixture containing 70 percent bracewellite + 30 percent eskolaite gave Cr_2O_3 70.6, Fe_2O_3 15.1, Al_2O_3 6.2, V_2O_5 0.64, Ti_2O_3 0.17, H_2O 6.9, sum 99.6 percent. The strongest X-ray lines (14 given) are 4.065 (VVS) (110), 2.648 (VS)(130), 2.404 (VS)(111). Color deep red to black, streak dark brown. The mineral has not been synthesized.

Grimaldiite, $\text{CrO}(\text{OH})$, and mcconnellite, CrOOCu , occur as intergrowths of tabular deep-red rhombohedral crystals up to 1 mm in size. Analysis of such an intergrowth (containing 80–86% grimaldiite) gave on 9.35 mg Cr_2O_3 77.3, Al_2O_3 34.3, Fe_2O_3 0.85, CuO 5.5, SiO_2 0.42, ignition loss 11.5, sum 99.9 percent. X-ray study shows that both minerals are rhombohedral, space group *R3m*. Grimaldiite has a 2.973 ± 0.002, c 13.392 ± 0.01Å; mcconnellite has a 2.983 ± 0.004, c 17.160 ± 0.031Å. The strongest lines for grimaldiite (14 given) are 4.47 (VVS)(003), 2.401 (VS)(012), 1.857 (VS)(015), 1.486 (MS)(009); for mcconnellite, the strongest lines (14 given) are 2.860 (006), 2.474 (012), 2.213 (104), 1.650 (018), 1.492 (110). These both agree with data in the literature on synthetic $\text{CrO}(\text{OH})$ and CrOOCu .

Synthetic grimaldiite has been reported in the literature to have ω 2.155, ϵ 1.975, G 4.11, 4.12. Optical properties were not measured for mcconnellite; it has G meas (synthetic) 5.49, calc 5.61.

Guyanaite is named for the locality, bracewellite for Smith Bracewell, formerly director, British Guiana Geological Survey, who first described merumite, mcconnellite for Dr. R. B. McConnell, former director, British Guiana Geological Survey, grimaldiite for Dr. Frank S. Grimaldi, former chief chemist, U.S. Geological Survey. Type material is at the Smithsonian Institution, Washington, D.C. M.F.

* Minerals marked with an asterisk after the name were approved before publication by the Commission on New Minerals and Mineral Names, International Mineralogical Association.

Kankite*

F. Cech, J. Jansa and F. Novak (1976) Kankite, $\text{FeAsO}_4 \cdot 3 \frac{1}{2} \text{H}_2\text{O}$, a new mineral. *Neues Jahrb. Mineral. Monatsh.*, 426–436.

Analysis by M. Mrazek gave As_2O_5 43.92, SO_3 0.44, Fe_2O_3 31.84, CaO 0.02, $\text{H}_2\text{O} +$ 13.91, $\text{H}_2\text{O} -$ 9.91, insol. 0.36, sum 100.40 percent (given as 100.46), corresponding to $2\text{FeAsO}_4 \cdot 6.74 \text{H}_2\text{O}$. Spectrographic analysis showed traces of N, B, Cu, Mg, Mn, Ti, and Zn. The DTA curve shows 2 endothermic peaks at 190 and 290° and an exothermic peak at 605°. The loss in weight is 9.0 percent at 200°, 23.81 percent at 500°. The infrared absorption spectrum is given. The mineral is insoluble in water, but dissolves readily in 10 percent HCl.

X-ray powder data (51 lines) are given; the strongest are 12.8 (100)(110), 7.56 (25)(001), 7.22 (21)($\bar{1}01$), 6.97 (19)(011), 4.764 (34)($\bar{3}11$), 4.258 (25)(140), 3.697 (22B)($\bar{4}21$, 141), 2.630 (29)($\bar{6}31$), 2.553 (22)(550, 631), 2.520 (21)(013). These are indexed on a monoclinic cell with a 18.803, b 17.490, c 7.633 Å, β 92.71°, $Z = 16$, G calc 2.732, meas 2.70 (pycnometer).

The mineral forms yellowish-green botryoidal coatings and crusts several tenths mm to 7 mm thick. Luster dull. H 2–2 $\frac{1}{2}$. Fracture uneven. Mean n about 1.666, birefringence about 0.02, fibers are length-fast. The mineral was found in old dumps (13th to 15th century) near Kank, Kutna Hora district, Czechoslovakia. It is an alteration product of arsenopyrite and is associated with quartz, scorodite, pitticite, gypsum, and a new mineral with formula $\text{Fe}^{3+}(\text{AsO}_4)_2(\text{SO}_4)(\text{OH}) \cdot 15\text{H}_2\text{O}$.

The name is for the locality. The mineral was compared with ferrisymplectite (Dana's System, 7th Ed., vol. 2, p. 753); type material of the latter was amorphous to X-rays. M.F.

Masutomilite*

Kazuo Harada, Mariko Honda, Kozo Nagashima and Satoshi Kanisawa (1976) Masutomilite, manganese analogue of zinnwaldite, with special reference to masutomilite–lepidolite–zinnwaldite series *Mineral. J. (Japan)*, 8, 95–109 (in English).

Analyses of masutomilite gave SiO_2 46.85, 47.67; Al_2O_3 19.81, 22.17; TiO_2 0.13, 0.09; Fe_2O_3 0.38, 0.35; FeO 1.53, 1.12; MnO 8.12, 4.27; MgO 0.00, 0.02; Li_2O 4.45, 5.78; CaO 0.00, 0.08; Na_2O 0.54, 0.61; K_2O 9.88, 9.78; Rb_2O 1.54, 1.20; F 7.04, 6.84; $\text{H}_2\text{O} +$ 1.27, 1.95; $\text{H}_2\text{O} -$ 1.36, 0.45; sum 102.90, 102.38 – ($0 = F_2$) 2.96, 2.88 = 99.94, 99.50 percent. These correspond to the formulas $(\text{K}, \text{Na}, \text{Rb})_{2.08}(\text{Li}_{2.54}\text{Mn}_{0.99}\text{Fe}_{0.18}^{2+}\text{Fe}_{0.06}^{3+}\text{Al}_{1.96})(\text{Si}, \text{Al})_8\text{O}_{19.64}(\text{F}, \text{OH})_{4.37}$ and $(\text{K}, \text{Na}, \text{Rb})_{1.98}(\text{Li}_{3.17}\text{Mn}_{0.49}\text{Fe}_{0.13}^{2+}\text{Fe}_{0.04}^{3+}\text{Al}_{2.07})(\text{Si}, \text{Al})_8_{19.27}(\text{F}, \text{OH})_{4.73}$, i.e. the Mn-analogue of zinnwaldite, with $\text{Mn}^{2+} > \text{Fe}^{2+}$.

X-ray data show the mineral to be monoclinic, space group Cm or $C2/m$, unit cells corresponding to the 2 analyzed samples respectively a 5.253, 5.248; b 9.085, 9.087; c 10.107, 10.090 Å; β 100.15°, 100.10°, $Z = 1$. The strongest X-ray lines (33 given) of the material of the first analysis are 10.10 (72)(001); 3.64 (43)($\bar{1}12$); 3.35 (65)(022); 3.32 (100)(0003); 3.09 (58)(112); 2.589 (46)(200, $\bar{1}31$); 1.982 (46)(005).

The first sample is pale purplish pink, transparent even in thick flakes. H 2.5, G 2.94. Cleavage {001} perfect. Optically biaxial, negative, $2V = 29$ – 31° , α 1.534, β 1.569, γ 1.570, $r > v$ very weak, pleochroic with X and Z colorless to pale pink, Y purple, abs. $X < Z < Y$, elongation positive, $Y = b$, $Z : a$ 3° . The second sample is purple, translucent in thick flakes. H 2.5–3, G 2.90, optically biaxial neg., α 1.536, β 1.570, γ 1.571, $2V = 28^\circ$, $r > v$ very weak,

$Y = b$, $Z < a$ 2– 4° , elong. pos., pleochroic with X and Z colorless to pale purple, abs. $X < Z < Y$.

The first sample forms the core of a zoned single crystal, the outer part being brown manganoan zinnwaldite, from a druse of granite pegmatite at Tanakamiyama, Japan, associated with topaz, black tourmaline, albite, and quartz. The second is a pseudohexagonal crystal, 3 cm across and 1 cm thick from Tawara, Gifu Prefecture, associated with cassiterite, topaz, black tourmaline, albite, and quartz.

Unit-cell determinations and optics on 8 lithium micas show that complete solid solutions exist in the title ternary system.

The name is for Dr. Kazunosuke Masutomi, amateur mineralogist and mineral collector. Type material is preserved at Kanazawa Univ. (anal. 1) and at Tohoku University (anal. 2). M.F.

Nakauriite*

Jujin Suzuki, Masahira Ito and Tsutomu Sugiura (1976) A new copper sulfate–carbonate hydroxide hydrate mineral, $(\text{Mn}, \text{Ni}, \text{Cu})_6(\text{SO}_4)_4(\text{CO}_3)(\text{OH})_6 \cdot 48\text{H}_2\text{O}$, from Nakauri, Aichi Prefecture, Japan. *J. Japan Assoc. Mineral. Petrol. Econ. Geol.*, 71, 183–192 (in English).

Chemical analysis was made of a mixture of the mineral with chrysotile, from which it could not be separated. Examination by X-ray fluorescence and electron microprobe analysis showed that the mineral did not contain Mg or Si; these were deducted as chrysotile, (about 60% of the sample), leaving Fe_2O_3 0.06, MnO 0.09, CuO 32.12, ZnO 0.03, NiO 0.88, SO_3 16.23, CO_2 2.28, H_2O^+ 45.31, H_2O^- 3.01 percent, corresponding to $\text{Cu}_6(\text{SO}_4)_4(\text{CO}_3)(\text{OH})_6 \cdot 48\text{H}_2\text{O}$. DTA curves show strong endothermic breaks at 330° and 396° and weak ones at 78°, 150°, and 186°.

X-ray powder data (34 lines) are given for Type I and Type II crystals. For Type I the strongest lines (those marked * may be in part chrysotile): 7.314*(100), (200); 7.081(14)(102); 4.840(14)(300); 3.936(14)(222, 023, 312), 3.652*(20)(400); 3.552(13)(401), 2.397(14)(243); 2.367(16)(504); 2.332(14)(602); 1.915(16)(713). For type II, 7.823(12)(111); 7.308*(100)(200); 4.827(12)(121); 3.929(14)(301); 3.654*(26)(310, 122); 2.365(10)(026). These are indexed by A. Kato on an orthorhombic cell, with a 14.585, b 11.47, c 16.22 Å, $Z = 2$, G (calc) 2.35, (meas) (flotation in Clerici solution) 2.39 ± 0.02 .

The mineral is clear sky-blue. It occurs as aggregates of slender to fibrous crystals less than 0.2 mm long, 0.006 mm wide. Optically biaxial, negative $2V$ 65°(calc), α (Na) 1.585, β 1.604, γ 1.612, elongation positive, pleochroic, X colorless, Y very light greenish-blue, Z pale sky-blue to very light blue. The infrared absorption spectrum is given. Type I occurs as veins cutting massive serpentinite; it is associated with chrysotile and magnetite, rarely with brochantite and malachite. Type 2 occurs along fractures in sheared serpentinite, associated with chrysotile, magnetite, artinite, and pyroaurite.

The name is for the locality. M.F.

Petrovicite*

Zdenek Johan, Milan Kvacek and Paul Picot (1976) Petrovicite, $\text{Cu}_3\text{HgPbBiSe}_6$, a new mineral. *Bull. Soc. fr. Mineral. Cristallogr.*, 99, 310–313 (in French).

Microprobe analyses by E. Joseph and R. Giraud, using Cu, HgS, PbS, Bi, and Se as standards, gave Cu 16.0, 15.3; Hg 17.4,

17.9; Pb 16.7, 17.3; Bi 16.6, 17.4; Se 34.4, 32.6; sum 101.1, 100.5 percent, corresponding to Cu:Hg:Pb:Bi:Se = 2.97:1.02:0.95:0.93:5.13 and 2.91:1.08:1.01:1.01:4.99.

Weissenberg and rotation photographs showed it to be orthorhombic, space group *Pnam* or *Pna2₁*, a 16.176 \pm 0.005, b 14.684 \pm 0.005, c 4.331 \pm 0.003 Å, $V = 1029 \text{ \AA}^3$, $Z = 4$, G calc 7.707. The strongest X-ray lines (27 given) are 3.621 (7) (330), 3.546 (8) (420), 3.186 (8) (131), 3.120 (10) (430), 2.961 (10) (520,401), 2.720 (5) (440), 2.262 (5) (611), 2.109 (5) (161), 2.061 (5) (122, 261).

Petrovite is cream-colored with strong metallic luster in reflected light. Reflectances are given at 15 wave lengths: 480 nm, 45.7 percent; 540, 46.5 (max.); 580, 46.2; 660, 45.7. Weakly anisotropic, with polarization colors dark green to violet. The mineral polishes well. Microhardness 102 kg/sq. mm (~ 3 Mohs). Cleavage poor, parallel to flattening of crystals.

The mineral forms tabular crystals up to a few tenths mm in size in hydrothermal dolomite-calcite veins of the Petrovice deposit, western Moravia, Czechoslovakia. It is almost completely replaced by umangite and eskebornite; 12 other selenides occur in the deposit.

The name is for the deposit. Type material (2 polished sections) are in the Ecole Natl. Supérieure des Mines, Paris. M.F.

Rozhkovite = palladian cuproauride

L. V. Razin, A. I. Gomonova, V. P. Bykov and V. I. Meshchankina (1971) A new natural intermetallic of gold, copper, and palladium from ores of the Talnakh deposit. *Zapiski Vses Mineral. Obshch.*, 100, 66–76 (in Russian).

Microprobe analyses of five grains gave a range in composition and (average) for Au 60.8–65.6(61.8); Cu 23.0–28.4(24.9); Pd 7.1–8.6(7.6); Rh 1.9–3.4 (2.5); Pt 0.0–2.3 (1.9); Ag 0.6–0.9(0.7); and Bi 0.6–0.8(0.6). Another sample (No.2) gave Au 65.6, Pd 7.1, Rh 3.4, Ag 0.6, Bi 0.6, Ni 0.15, Cu 23.0, total 100.45, which the authors calculated on 5 atoms to $(\text{Cu}_{2.248}\text{Pd}_{0.413}\text{Rh}_{0.205}\text{Ag}_{0.035}\text{Ni}_{0.017})(\text{Au}_{2.065}\text{Bi}_{0.017})$. X-ray powder data (24 lines) were indexed as orthorhombic with $a = 3.86(1)$, $b = 39.00(1)$,¹ $c = 3.84(1)$ Å when indexed as for synthetic CuAu(II), and with $a = 3.88(1)$, $b = 42.68(1)$,² $c = 3.84(1)$ Å when indexed as for synthetic Cu₃Au₂.

The mineral was found in the sulfide ores of the Talnakh deposit, consisting mainly of talnakhite, chalcopyrite, and cubanite. It is frequently intergrown with gold alloys, native gold, and minerals such as zvyagintsevite, polarite, Pt-Fe, galena, sphalerite, and rarely sperrylite. The mineral occurs mainly as irregular grains 1–10 μm in size, but it has been found up to 0.25 \times 0.45 mm. In reflected light the mineral has a pale rose color with lilac or red shade. Birefringence is sometimes observed (rose to rose-gray), and it is variably anisotropic from grain to grain and in differently oriented sections of a single grain.

The color under crossed nicols varies from bright to very weak, changes from yellowish to dark gray, and sometimes has reddish-brown tints. The mineral tarnishes brown a few days after polishing. Reflectance measurements with a pyrite standard for sample No. 2 gave: 460nm 46.0, 49.6; 480nm 46.9, 50.5; 500nm 49.0, 52.8; 540nm 53.0, 57.1; 580nm 59.0, 63.5; 620nm 64.0, 68.5; 660nm 67.4, 71.6; 700nm 72.4, 76.4; and 750nm 76.2, 80.5. Values are also given up to 1100nm. Microindentation hardness gave $\text{VHN}_{20} =$

204.6(195.4–213.8), $\text{VHN}_{50} = 188.9(173.6–204.6)$, $\text{VHN}_{100} = 198.2(195.8–200.6)$, $\text{VHN}_{200} = 183.4(180.5–186.3)$ for No. 35; and $\text{VHN}_{20} = 163.3(159.7–165.8)$, $\text{VHN}_{50} = 178.7(161.0–199.2)$ for No. 27. The mineral is negative to standard etching reagents, except for KCN and sometimes with aqua regia (after 1 min).

Samples of the mineral are preserved in the Mineralogical Museum, Academy of Sciences, Moscow, USSR.

Discussion

The authors refer to the work of Johansson and Linde (1936, *Ann. Physik.*, 25, 1–48) for comparison with a presumed Cu₃Au₂ synthetic phase. Hansen and Anderko (1958, *Constitution of Binary Alloys*, p. 199), however, state that Johansson and Linde were unable to find any clear indication of Cu₃Au₂ as a distinct phase by X-ray investigations. Hansen and Anderko further state that recent investigations by several other authors, using either X-rays, resistivity, emf, or combinations, found no support for the existence of Cu₃Au₂ as a separate phase. In view of the lack of single-crystal data for this mineral, its indexing must be considered tentative, but if any likeness to synthetic phases is to be made, it must rather be to CuAu(II). It can be also demonstrated that the one complete analysis given may be recalculated on the basis of 2 atoms to give $(\text{Cu,Rh,Ni,Bi,Ag})_{1.007}(\text{Au,Pd})_{0.993}$ or, simply CuAu.

L. V. Razin (1975) Minerals—natural alloys of gold and copper in ores of copper-nickel deposits of Noril'sk. *Trudy Mineral. Muzeia Akad. Nauk SSSR*, 24, 93–106 (in Russian).

The mineral described as palladian cuproauride by Razin *et al.* (1971) is now referred to as rozhkovite with a footnote that the name rozhkovite was considered and recommended by the Commission on New Minerals and Mineral Names, I.M.A., in May 1970.

Discussion

The uncertainties regarding the ideal composition of palladian cuproauride and the indexing of its powder pattern apply equally to rozhkovite. The unexplained appearance of this second name four years later has created an unfortunate and confusing precedent. Though the text and Table 2 show the mineral to be orthorhombic, tetragonal cell parameters are given in Table 3. Both names are unnecessary pending reexamination and better data for characterization as a unique mineral species. L.J.C.

Senegalite*

Zdenek Johan (1976) La senegalite, $\text{Al}_2(\text{PO}_4)(\text{OH})_3 \cdot \text{H}_2\text{O}$, un nouveau mineral. *Lithos*, 9, 165–171.

Microprobe analysis by E. Joseph gave P_2O_5 31.83, Al_2O_3 46.23, Fe_2O_3 0.28, H_2O 21.00, sum 99.34 percent, (H_2O by thermal analysis), corresponding closely to the formula above. The DTA curve shows small endothermic breaks at 250° and 370° and a very large one at 440°. The final product of dehydration gave the X-ray pattern of AlPO_4 (tridymite type). The infrared spectrum shows the presence of hydroxyl and H_2O .

X-ray study (Weissenberg and rotation) showed the mineral to be orthorhombic, *Pna2₁*, a 9.678, b 7.597, c 7.668 (\pm 0.002 Å), $Z = 4$, $G(\text{calc})$ 2.551, (meas) 2.552 \pm 0.007. Goniometric data are in close agreement. Forms present a (100), c (001), b (010), m (110), l (210), h (011), e (502), p (111). The strongest x-ray lines (42 given)

¹ The authors report this as $b/10 = 3.90(1)$.

² The authors report this as $b/11 = 3.88(1)$.

are 5.41 (7)(011), 4.089 (9)(201), 3.834(10)(002), 3.610(8)(211), 2.990 (9)(220), 2.348 (8)(113, 312), 2.070 (7)(123,322), 1.505 (7)(143, 342, 404).

Crystals are colorless to pale yellow, luster vitreous. H.5.5. Cleavage {100} imperfect, observed only under the microscope. Not fluorescent. Optically biaxial, positive, n_s (Na) α 1.562, β 1.566, γ 1.587 (all \pm 0.002), $2V$ $53 \pm 4^\circ$ (meas), 48° (calc), dispersion $r > v$, weak., $Z = a$, $Y = c$.

The mineral occurs in the zone of oxidation, Kourondicko iron ore deposit, Senegal, associated with turquoise, augelite, wavellite, and crandallite.

The name is for the country of origin. *Note*—Bolivarite is the $5H_2O$ analogue. **M.F.**

Sugilite*

Nobuhide Murakami, Toshio Kato, Yasunori Miura and Fumitoshi Hirowatari (1976) Sugilite, a new silicate mineral from Iwagi Islet, southwest Japan *Mineral. J. (Japan)*, 8, 110–121 (in English).

Recalculation of an analysis by N. M. and H. Mitsunaga of a sample estimated to contain 8.1 percent pectolite gave (all CaO allotted to pectolite) SiO_2 71.38, TiO_2 0.51, Al_2O_3 2.97, Fe_2O_3 12.76, FeO 0.19, Li_2O 3.14, Na_2O 4.37, K_2O 3.76, $H_2O + 0.81$, $H_2O - 0.12$, sum 100.06 percent; corresponding to $K_{0.81}Na_{1.42}Li_{2.12}Fe_{0.08}^{2+}Fe_{1.61}^{3+}Al_{0.59}Ti_{0.06}Si_{12.00}O_{29.64}(H_2O)_{0.91}$. This is formulated, in accord with the X-ray data, as a member of the osumilite group as: $(K_{0.81}Na_{0.19})[Na_{0.64}(H_2O)_{0.91}](Fe_{1.35}Na_{0.59}Ti_{0.06})(Li_{2.12}Al_{0.59}Fe_{0.29})Si_{12}O_{30}$. Infrared study showed the absence of hydroxyl.

Hexagonal, space group $P6/mcc$, a 10.007, c 14.000A, $Z = 2$. The strongest X-ray lines (36 given) are 4.32 (100)(2020), 4.06 (57)1122, 3.19 (81) (2131), 2.876b (51)(3030), 1124.

The mineral occurs (3–8%) as aggregates of subhedral grains in aegirine syenite forming a small (0.20 \times 0.15 km) stock in Late Mesozoic biotite granite, N.E. Iwagi Islet, Ehime Prefecture, Japan. Associated minerals are albite, aegirine, pectolite, an unidentified K–Ca–Ti–silicate, sphene, allanite, andradite, zircon, and apatite.

Color light brownish-yellow, nearly colorless in section, luster vitreous. Cleavage {0001} weak. G 2.74, calc 2.80, H 6–6 1/2. Optically uniaxial, neg., ω 1.610, ϵ 1.607.

The name is for Professor Ken-ichi Sugi (1901–1948), Japanese petrologist, who first found the mineral. Type material is at Yamaguchi University, National Museum (Tokyo), Sakurai Museum (Tokyo), and Smithsonian Institution, Washington, D.C. **M.F.**

Unnamed Ag₃Pd₃Te₄

Louis J. Cabri and J. H. Gilles Laflamme (1976) The mineralogy of the platinum-group elements from some copper–nickel deposits of the Sudbury area, Ontario. *Econ. Geol.*, 71, 1159–1195.

Two grains of this unknown Ag–Pd telluride occurred in a microvein of sperrylite, kotulskite, and hessite within chalcopyrite and silicates in a sample from Leveack West mine, Sudbury, Ontario. The mineral is gray with brownish tones, not bireflectant, weakly anisotropic (air) and weakly bireflectant, anisotropism weak to moderate, with colors from dull reddish-brown to extinction (oil). Electron-probe analyses gave: Pd 25.2, Ag 33.6, Te 40.1, As 0.29, total 99.19 percent, corresponding to $Ag_{3.97}Pd_{3.02}Te_{4.00}$, the As being assigned to contamination from adjacent sperrylite. **L.J.C.**

Unnamed (Cu,Ni,Fe,Co)₉S₄

M. E. McCallum, R. R. Loucks, R. R. Carlson, E. F. Cooley and T. A. Doerge (1976) Platinum metals associated with hydrothermal copper ores of the New Rambler mine, Medicine Bow Mountains, Wyoming. *Econ. Geol.*, 71, 1429–1450.

A pale gray-white, optically isotropic mineral enclosed in and scattered along the margins of granoblastic secondary pyrite–marcasite masses occurs in disseminated sulfide ore. Electron probe analyses of a homogeneous grain showed that $Cu > Ni > Fe > Co$ with a stoichiometry very near $(Cu,Ni,Fe,Co)_9S_4$.

Discussion

May be a new mineral. X-ray data and quantitative probe data are required. **L.J.C.**

Unnamed hydrous magnesium carbonate

Jujin Suzuki and Mashahiro Ito (1973) A new magnesium carbonate hydrate mineral, $Mg_5(CO_3)_4(OH)_2 \cdot 8H_2O$, from Yoshikawa, Aichi Prefecture, Japan. *J. Japan Assoc. Mineral. Petrol. Econ. Geol.*, 68, 353–361.

Analysis of material containing chrysotile gave SiO_2 5.01, MgO 38.38, CaO 0.12, Fe_2O_3 0.21, CO_2 28.93, $H_2O + 20.90 H_2O - 6.39$, sum 99.94 percent. After subtracting SiO_2 as chrysotile, the analysis gives $MgO:CO_2:H_2O = 5.09:4.04:8.81 H_2O$, corresponding to the formula above (a hydromagnesite + $4H_2O$). The mineral is slightly soluble in water. The DTA curve gives endothermic breaks at 40° , 114° , 270° , 410° , and 515° and exothermic breaks at 495° , 637° (chrysotile), and 808° (chrysotile). The DTA pattern above 150° is like that of hydromagnesite. The infrared absorption spectrum is similar to that of hydromagnesite. The X-ray powder pattern of the mineral has strongest lines (44 given) 33.2 (62), 16.36 (33), 10.82 (55), 6.454 (55) (plus nesquehonite), 5.887 (100), 4.206 (38), 2.933 (57). After being heated to 150° , the mineral gives an X-ray pattern close to that of hydromagnesite. The mineral occurs as snow-white to gray oolitic, botryoidal, or reniform aggregates. Scanning electron microscope photographs show that it consists of aggregates of flaky crystals.

Under the microscope, very fine-grained, colorless, α 1.515, β 1.521, γ 1.522, $2V = 44.5^\circ$, extinction nearly parallel, elongation positive.

Discussion.

Not certainly distinct from dypingite [55, 1457–1465 (1970)]; the latter is however optically biaxial positive. It occurs on the weathered surface of a brucite-bearing serpentinite mass. Associated minerals are chrysotile, nesquehonite, brugnattellite, pyroaurite, artinite, and hydromagnesite. **M.F.**

Unnamed dimorph of lazurite

A. P. Sapozhnikov and V. G. Ivanov (1976) Occurrence of a triclinic (pseudo-orthorhombic) modification of lazurite. *Soveshch. Molodykh Uchen. Mineral. Geokhim., Primorsk Ot-del., Vses. Mineral Obshch., Dal'nevost. Geol. Inst., Vladivostok*, 81–82 (in Russian).

A sample from the lazurite deposits of Cis-Baikal has $ns \alpha$ 1.503, β 1.510, γ 1.514, biaxial positive, $2V$ 62° (Note—the ns correspond to a negative mineral, M.F.). Color, pale green to dark blue; deeply

colored varieties are strongly pleochroic with absorption $Z > Y > X$. Oscillation and rotation photographs led to a unit cell with a 9.08 ± 0.01 , b 12.85 ± 0.01 , c $25.70 \pm 0.02 \text{ \AA}$, $\alpha = \beta = \gamma = 90^\circ$ ($a_0 = a_{\text{cub.}}$, $b_0 = a_{\text{cub.}}$, $x\sqrt{2}$, $c_0 = 2a_{\text{cub.}}$, $x\sqrt{2}$). All grains are twinned, some show complex polysynthetic twinning.

The composition is stated to be similar to that of cubic lazurite.

Discussion—Data insufficient as to composition and symmetry; X-ray powder data are not given. M.F.

Unnamed lead-bismuth tellurides

A. G. Lipovetskii, Yu. S. Borodaev and E. N. Zav'yalov (1976) New lead-bismuth tellurides of the Alekseev ore prospect (Sano-voy Range). *Geol. Rudnykh. Mesotorozhdanii*, 111-115 (in Russian).

Quartz veins in Archean granitic rocks contain pyrrhotite and other sulfides, with small amounts of gold, hessite, altaite, tellurobismuthite, and tetradymite, and 4 minerals:

Electron microprobe analyses gave:

	Ag	Pb	Bi	Te	S	Sum
Mineral A	1.2	13.0	40.2	44.9	—	99.3
Mineral B	1.3	20.5	33.11	43.0	—	97.9
Mineral C	—	10.7	52.2	30.9	5.5	99.3
Mineral D	—	20.3	46.0	27.3	6.3	99.9

These correspond respectively to the formulas: $(\text{Ag}_{0.15}\text{Pb}_{0.72}\text{Bi}_{2.19})\text{Te}_{24}$, $(\text{Ag}_{0.15}\text{Pb}_{1.17}\text{Bi}_{1.86})\text{Te}_4$, $(\text{Pb}_{0.50}\text{Bi}_{2.42})(\text{Te}_{1.33}\text{S}_{1.67})$, and $(\text{Pb}_{0.96}\text{Bi}_{2.15})(\text{Te}_{2.08}\text{S}_{1.92})$. Reflectances are given for Minerals A, B, and D, X-ray powder data for Minerals A and D.

Mineral A is similar in optical properties to tellurobismuthite, but the reflectance is lower (57-65%). It has a pale cream tint. Cleavage {001} perfect, microhardness 65-80, av. 75 kg/sq mm. The strongest lines of the pattern (22 given) are 3.21 (10), 2.35 (5), 2.21 (3); the data resemble those published for synthetic PbBi_4Te_7 . Mineral B was found as a grain 0.1 mm., bordering mineral A. It resembles mineral A in appearance and optics, but has a slightly lower reflectance. Mineral C occurs as veinlets 0.05 mm wide associated with gold and tellurobismuthite. It has a light gray color, with a slight greenish tint. Mineral D is light gray with slightly greenish tint. Reflectance 48.5-53 percent, and it differs in dispersion of reflectance from tetradymite. Cleavage {001} perfect, microhardness 40-65, average 51 kg/sq mm. Birefringence weak; anisotropic with color effect in pale brownish-red. The strongest X-ray lines (34 given) are 3.09 (10), 2.25 (4), 2.12 (4), 1.304 (4); the pattern somewhat resembles but differs from that of joseite-A. M.F.

Unnamed palladium telluride

M. E. McCallum, R. R. Loucks, R. R. Carlson, E. F. Cooley and T. A. Doerge (1976) Platinum metals associated with hydrothermal copper ores of the New Rambler mine, Medicine Bow Mountains, Wyoming. *Econ. Geol.*, 71, 1429-1450.

An unnamed cream-colored, weakly anisotropic mineral of composition PdTe_2 occurs as discrete grains intergrown with bismuthian merenskyite.

Discussion

Insufficient data on the unnamed mineral and the bismuthian merenskyite. L.J.C.

Unnamed nickel-bismuth telluride

T. A. Häkli, E. Hänninen, Y. Vuorelainen and Heikki Papunen (1976) Platinum-group minerals in the Hitura nickel deposit, Finland. *Econ. Geol.*, 71, 1206-1213.

A mineral that optically resembles melonite in the Hitura deposit, Finland, was analyzed with the electron probe: Ni 20.1, Pd 1.1, Te 61.6, Bi 16.1, Sb 0.5, total 99.4 percent, corresponding to $(\text{Ni}_{4.86}\text{Pd}_{0.15})\Sigma = 5.01$ $(\text{Te}_{6.85}\text{Bi}_{1.09}\text{Sb}_{0.06})\Sigma = 8.00$ (recalculated by L.J.C.)

Discussion

Until more extensive analyses are made, preferably with synthetic standards, the proposed stoichiometry may be treated with caution. X-ray data also needed. The mineral may be bismuthian and palladian melonite. L.J.C.

Unnamed $\text{Pd}_5(\text{Bi,Sb})_2\text{Te}_4$

M. E. McCallum, R. R. Loucks, R. R. Carlson, E. F. Cooley and T. A. Doerge (1976) Platinum metals associated with hydrothermal copper ores of the New Rambler mine, Medicine Bow Mountains, Wyoming. *Econ. Geol.*, 71, 1429-1450.

A pale apricot-yellow, moderately anisotropic mineral is reported to correspond closely to $\text{Pd}_5(\text{Bi,Sb})_2\text{Te}_4$. It occurs as anhedral grains, 50-250 microns across, enclosed in chalcopyrite and supergene replacements of chalcopyrite and pyrrhotite.

Discussion

Insufficient data to assess whether the stoichiometry is realistic. No X-ray or analytical data are given. L.J.C.

Unnamed Pd-Bi-Te mineral

M. E. McCallum, R. R. Loucks, R. R. Carlson, E. F. Cooley and T. A. Doerge (1976) Platinum metals associated with hydrothermal copper ores of the New Rambler mine, Medicine Bow Mountains, Wyoming. *Econ. Geol.*, 71, 1429-1450.

A light coffee-brown, extremely anisotropic Pd-Bi-Te mineral whose stoichiometry has not been determined occurs as thin rims replacing michenerite in weakly oxidized ore. L.J.C.

Unnamed $\text{Pd}_5(\text{Te,Bi,Sb})_2$

M. E. McCallum, R. R. Loucks, R. R. Carlson, E. F. Cooley and T. A. Doerge (1976) Platinum metals associated with hydrothermal copper ores of the New Rambler mine, Medicine Bow Mountains, Wyoming. *Econ. Geol.*, 71, 1429-1450.

The unnamed $\text{Pd}_5(\text{Bi,Sb})_2\text{Te}_4$ mineral contains tiny inclusions of a slightly darker, peach-buff-colored mineral with a composition reported to conform exactly to $\text{Pd}_5(\text{Te,Bi,Sb})_2$ stoichiometry.

Discussion

No X-ray or analytical data are given. L.J.C.

Unnamed Pd(Te,Sb,Bi)

Louis J. Cabri and J. H. Gilles Laflamme (1976) The mineralogy of the platinum-group elements from some copper-nickel deposits of the Sudbury area, Ontario. *Econ. Geol.*, 71, 1159-1195.

E. F. Stumpfl and M. Tarkian (1976) Platinum genesis: New mineralogical evidence. *Econ. Geol.*, 71, 1451–1460.

Three grains found as small inclusions in samples from the old Vermilion and the Creighton mine, Sudbury, Ontario. The mineral is pinkish cream in reflected light (air). No reflection pleochroism, but weakly anisotropic. Reflectance $R'g$ and $R'p$ = 53.7, 52.7 (470 nm), 58.1, 57.0 (546 nm), 61.3, 60.4 (589 nm), 64.8, 64.7 (650 nm). Electron-probe analyses of these grains gave: Pd 40.3, 42.3, 37.4; Bi 32.3, 17.8, 45.9; Te 11.1, 18.8, 10.4; Sb 16.2, 22.0, 6.1; totals 99.9, 100.9, 99.8 percent corresponding to $\text{Pd}_{1.0}(\text{Bi}_{0.41}\text{Sb}_{0.35}\text{Te}_{0.23})\Sigma_{-0.99}$, $\text{Pd}_{1.0}(\text{Sb}_{0.45}\text{Te}_{0.37}\text{Bi}_{0.21})\Sigma_{-1.03}$ and $\text{Pd}_{1.00}(\text{Bi}_{0.62}\text{Te}_{0.23}\text{Sb}_{0.14})\Sigma_{-0.99}$.

A small ($\sim 17 \times 30 \mu\text{m}$) inclusion was found in a sample from Bissersk, Urals, associated with hollingworthite, chalcopyrite, pyrrhotite, and michenerite in a sperrylite grain. The mineral is white, estimated to have 60 percent reflectance and strongly anisotropic. Probe analysis gave: Pd 37.6, Te 19.0, Bi 39.0, Sb 3.8, total 99.4 percent corresponding to $\text{Pd}_{1.0}(\text{Bi}_{0.53}\text{Te}_{0.42}\text{Sb}_{0.09})\Sigma_{-1.04}$ (re-calculated by L.J.C.).

Discussion

These four analyses plot within the PdSb (sudburyite, hexagonal)—PdTe (kotulskite, hexagonal)—PdBi (polarite, orthorhombic) composition triangle. Synthesis experiments reported by Cabri and Laflamme indicate a wide solid-solution field (hexagonal NiAs-type) and a restricted field of orthorhombic symmetry. Any proposed nomenclature for minerals with compositions in the hexagonal solid-solution field, other than at the PdSb and PdTe corners, will have to take account of the phase relations in the PdSb–PdBi–PdTe system. L.J.C.

Unnamed rhodium sulfide

Clive E. Feather (1976) Mineralogy of platinum-group minerals in the Witwatersrand, South Africa. *Econ. Geol.*, 71, 1399–1428.

Small ($< 20 \mu\text{m}$) inclusions occur in platinum-group element alloy grains, especially in isoferroplatinum. Electron probe analyses gave: Rh 65.7, 54.9, 71.7, 33.7, 53.2, 35.2; Pt 3.0, 13.3, 2.5, 10.0, 11.2, 19.3; Ru 8.5, 4.5, 3.8, 27.0, 5.6, 3.2; Ir < 0.1 , < 0.1 , < 0.1 , < 0.1 , < 0.1 , 11.1; Os < 0.1 , < 0.1 , < 0.1 , < 0.1 , 3.3; Ni 4.7, 0.5, 0.2, 0.2, 0.4, 0.1; Fe < 0.1 , 1.8, < 0.1 , 1.1, 3.1, 1.8; S 19.3, 18.7, 18.5, 27.5, 19.5, 22.0; As –, –, –, –, 2.9; totals 101.2, 93.7, 96.7, 99.5, 93.0, 98.9 percent. These correspond to approximately (Rh,Pt,Ru,Os,Ir,Pt,Ni,Fe) (S,As) or RhS.

Discussion

This is apparently a new mineral. Poor totals and hence uncertain stoichiometry are probably due to small size. X-ray data are required to confirm whether this is equivalent to synthetic $\text{Rh}_{17}\text{S}_{18}$ which is cubic, $a = 9.9103(23)\text{\AA}$, probably $Pm\bar{3}m$, [S. Geller (1962) *Acta Crystallogr.*, 15, 713–721 and 1198–1201]. RhS is not known in the Rh–S system. L.J.C.

Unnamed ruthenium sulfarsenide

Clive E. Feather (1976) Mineralogy of platinum-group minerals in the Witwatersrand, South Africa. *Econ. Geol.*, 71, 1399–1428.

Electron probe analyses of hollingworthite from Witwatersrand gold mines revealed two grains with Ru $>$ Rh. Analyses are: Pt 10.3, 2.8; Ir 7.5, 0.4; Rh 15.1, 20.3; Ru 20.4, 27.4; As 38.1, 29.6; Cu < 0.1 , < 0.1 ; Ni < 0.1 , 6.4; Fe 0.8, 1.7; S 7.8, 13.7; totals 100.0,

102.3 corresponding to $(\text{PGE} + \text{Cu}, \text{Ni}, \text{Fe})_{0.378}\text{As}_{0.423}\text{S}_{0.199}$ and $(\text{PGE} + \text{Cu}, \text{Ni}, \text{Fe})_{0.434}\text{As}_{0.274}\text{S}_{0.292}$. Grains are too small for X-ray diffraction but are considered to represent varieties of a mineral with ideal RuAsS composition for the end member.

Discussion

This is probably a new sulfarsenide of the platinum group with RuAsS as end member. X-ray data are required. L.J.C.

New Data Brongniardite, ramdohrite

O. L. Sveshnikova (1975) Chemical composition and classification of sulfoantimonites of lead and silver *Trudy Mineral. Muz., Akad. Nauk SSSR*, 24, 107–119 (in Russian).

New microprobe analyses are given of “brongniardite,” ramdohrite, andorite, and fizelyite, mostly on samples from various museum collections. Analysis of material from the Ust-Teremkov deposit, Transbaikal, gave Pb 25.2, Ag 26.8, Sb 31.8, S 18.0, sum 101.8 percent, corresponding to $\text{Ag}_2\text{PbSb}_{2.1}\text{S}_{4.3}$, near to the formula of the discredited mineral brongniardite, which is therefore considered to be reestablished.

Material labelled ramdohrite from the type locality, Potosi, Bolivia, was found to be a mixture of two phases, one with the composition of andorite, the other containing Ag 9.6, Pb 35.7, Sb 36.1, S 19.4, sum 100.8 percent, corresponding to $\text{Ag Pb}_{1.9}\text{Sb}_{3.9}\text{S}_{8.8}$, or $\text{AgPb}_2\text{Sb}_3\text{S}_7$. It is suggested that the name ramdohrite be transferred to this compound.

Discussion

In the absence of X-ray data, the proposals are not acceptable, especially for the “brongniardite,” for which material from the type locality was not examined. M.F.

Ceruleite

K. Schmetzer, W. Berdesinski, H. Bank and E. Krovcek (1976) New studies of ceruleite *Neues Jahrb. Mineral. Monatsh.*, 418–425 (in German).

Ceruleite (coeruleite) was described by Dufet (1900) (*Dana's System*, 7th Ed., vol. 2, p. 927). The present study was made on samples from southern Bolivia (exact locality unknown); their identity with type material (British Museum of Natural History) was proved by X-ray study.

Chemical analysis of 7 samples gave (range and average) CuO 10.74–12.31, 11.79; Al_2O_3 26.12–27.52, 26.85; Fe_2O_3 0.11 in 1, not determined in others; As_2O_5 36.61–40.63, 38.01; P_2O_5 traces; H_2O 22.18–23.75, 23.24; sum 99.51–100.35 percent, the average corresponding to the ratio $\text{CuO}:\text{Al}_2\text{O}_3:\text{As}_2\text{O}_5:\text{H}_2\text{O} = 1.79:3.18:2:15.6$. The formula proposed is $\text{Cu}_2\text{Al}_7(\text{OH})_{13}(\text{AsO}_4)_4 \cdot 11.5\text{H}_2\text{O}$. X-ray patterns of heated ceruleite show no change up to 230° , at 250° (14.7% loss in weight) a new phase is formed, as also shown by the infrared spectrum. At 290° the material turns green and becomes amorphous. The DTA curve shows a sharp endothermic effect at 365° . The mineral is insoluble in water, but soluble in HCl, HNO_3 , or KOH.

X-ray powder data are given; the strongest lines (40 given) are 7.296(75)(020), 5.926 (70)(111), 5.650 (100)(111), 4.877 (50)(211), 4.760 (70)(121), 3.545 (60)(321), 3.235 (50)(411), 2.984 (50)(312), 2.650 (60)(402). These are indexed on a triclinic unit cell, a 14.359

± 0.003 , b 14.687 ± 0.003 , c 7.440 ± 0.001 Å α 9606 ± 0.03 , β 93.19 ± 0.040 , γ $91.63 \pm 0.04^\circ$, $V = 1556.9$ Å³, $Z = 2$, G calc 2.734, meas 2.70 ± 0.02 .

The mineral consists of deep blue concretions up to 10 cm in diameter, seen under the electron microscope to consist of rod-like crystals up to 5 microns long and 2 microns thick. H 5–6, mean $n \sim 1.60$. Associated minerals include quartz, barite, goethite, and mansfieldite, M.F.

Chudobaite

R. Dorner and K. Weber (1976) The crystal structure of chudobaite, $(Mg,Zn)_6H_2(AsO_4)_4 \cdot 10 H_2O$ *Naturwissenschaften*, 63, 243.

Chudobaite is triclinic, space group $P\bar{1}$, a 7.797, b 11.440, c 6.616 Å, α 115.31° , β 95.77° , γ 93.87° , $Z = 1$, G meas 2.94, calc 2.90. Analysis (not given) by Ch. Zaminer by electron microprobe gave the formula above.

Discussion

Highly unsatisfactory. Nothing is said of the original analysis with Na_2O 5.0, K_2O 2.0, CaO 1.0 percent, and why Na and K are not in the formula. M.F.

Julgoldite

A. Livingstone (1976) Julgoldite, new data and occurrences; a second recording. *Mineral. Mag.*, 40, 761–763.

Material from two localities in Scotland, hitherto labelled aenigmatite and goethite, is now identified as julgoldite. A microprobe analysis is reported for material from Auchinstarry previously considered to be goethite. The calculated density for this is 3.56 g/cm³, whereas the determined density for the other julgoldite from a Ratho quarry near Edinburgh is 3.58. 15 additional lines are now recorded in the powder pattern of julgoldite in the interval 9.71 to 1.269 Å, all strong lines being in excellent agreement with those previously recorded [*Am. Mineral.*, 56, 2157 (1971)]. A.P.

Orthorhombic lavenite

A. M. Portnov and G. A. Sidorenko (1975) New data on orthorhombic lavenite. *Trudy Mineral. Muz., Akad. Nauk S.S.S.R.*, 24, 203–206.

The name "orthorhombic lavenite" was first introduced by Portnov *et al.* (1966). At the time, this reviewer (Nickel, 1966) regarded the data as not being sufficiently conclusive to warrant the introduction of a new mineral name, and this opinion was subsequently supported by a vote of the I.M.A. Commission on New Minerals and Mineral Names, which rejected the proposal. Nickel's chief objection then was that the evidence for orthorhombic symmetry of the mineral, as opposed to the monoclinic symmetry of lavenite, was not established beyond doubt. The mineral was reported to be polysynthetically twinned, and such a twinned crystal, if monoclinic, could give an apparently orthorhombic "single-crystal" X-ray diffraction pattern, as had been reported for niocalite (Nickel *et al.*, 1958), a mineral belonging to the same group as lavenite.

In their new submission, Portnov and Sidorenko provide little new data. Using the chemical analysis reported by Portnov *et al.* (1966), they propose the generalized formula $Na_3Ca_2Zr_2(Si_2O_7)_2(F,OH)_4$ for their mineral, as contrasted with the

lavenite formula, $(Na,Ca,Mn)_6Zr_2(Si_2O_7)_2(O,F,OH)_4$. However, their proposed formula is not electrostatically balanced, and their detailed empirical formula departs even further from electrostatic neutrality.

The x-ray powder diffraction data have been re-done, giving a pattern with the following strongest lines: 2.960 (10)(402), 2.881 (7)(710), 1.791 (7)(832), 1.680 (7)(224, 060), 2.242 (6)(622), and 1.820 (6)(840), which are substantially different from those reported in the earlier publication. The pattern has been indexed on an orthorhombic unit cell with $a = 20.97$, $b = 10.10$, and $c = 7.21$ Å. An IR spectrum shows an absence of the splitting of the main bands exhibited by lavenite and titano-lavenite.

Discussion

For some inexplicable reason, Portnov and Simonov do not give the space group of their orthorhombic cell. Also, they do not indicate how they overcame the problem (if, indeed, they did) of the polysynthetic twinning. They stress that the d values calculated from their orthorhombic cell give better agreement with the measured values than do the d values calculated from the monoclinic lavenite cell. However, equally good agreement is obtained if one employs a monoclinic unit-cell transformed directly from their orthorhombic parameters according to $a = \frac{1}{2}[101]$, $b = [010]$, $c = [001]$, giving $a = 11.09$, $b = 10.10$, $c = 7.21$ Å, $\beta = 108.97^\circ$. The IR spectrum, itself, is not conclusive in distinguishing between an orthorhombic and monoclinic unit cell, since the absorption peaks are a function of site symmetry rather than unit-cell symmetry. In conclusion, this reviewer feels that the evidence favoring the existence of an orthorhombic polymorph of lavenite has not been appreciably strengthened by this latest report. E.H.N.

References

- Nickel, E. H. (1966) Orthorhombic lavenite. *Am. Mineral.*, 51, 1549–1550.
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 Portnov, A. M., V. I. Simonov and G. P. Sinyugina (1966) Orthorhombic lavenite, a new variety of lavenite. *Dokl. Akad. Nauk S.S.S.R.*, 166, 1199–1202.

Woodwardite

E. H. Nickel (1976) New data on woodwardite. *Mineral. Mag.*, 40, 644–647.

Samples labelled woodwardite from Cornwall and Carnarvonshire both appear to be hydrated sulfates of Cu and Al but with differing Cu:Al ratios, X-ray powder patterns, and behavior on heating. Since the type locality is in Cornwall, only the Cornish material can be regarded as true woodwardite. Unfortunately X-ray powder data for the Carnarvonshire mineral have found their way into the JCPDS file under the number 17-132 as representing woodwardite. These data should be replaced by newly reported powder diffraction data for woodwardite from Cornwall (no. BM 40035); 9.1 vs. 4.43 w (very broad, diffuse), 2.58 m, 1.50 m. A.P.

Glockerite

B. Fojt (1975) On the problem of glockerite as a secondary mineral of ore deposits. *Scripta Fac. Sci. Nat., Univ. Purkynianae Brunensis, Geol.*, 5, 5–20.

Many samples were studied of dripstones from Zlata Hory (formerly Zuckmantel), Czechoslovakia, the type locality (Dana's System, 7th Ed., vol. 2, p. 587-588). Five complete analyses are given; they show Fe_2O_3 61.2-66.7, SO_3 8.15-11.45, H_2O 8.43-12.79, $\text{H}_2\text{O} +$ 12.42-16.96 percent. DTA curves show a small endothermic peak at 260-280° (loss of H_2O), a sharp exothermic maximum at 550° (recrystallization), and a large endothermic peak at 700° (loss of SO_3). Some samples are isotropic with $n(\text{Na})$ 1.730-1.736; some

are partly anisotropic. G 2.47-2.51. Infrared data are given. X-ray study showed no measurable lines. After being heated at 250°, samples gave lines at 6.3, 3.28, 2.467Å., indicating lepidocrocite. Samples heated at 350° gave the pattern of maghemite, those heated above 500° the pattern of hematite.

Glockerite is therefore, a cryptocrystalline variety of lepidocrocite with SO_3 and H_2O . **M.F.**