NEW MINERAL NAMES*

MICHAEL FLEISCHER, ADOLF PABST, J. A. MANDARINO GEORGE Y. CHAO, AND LOUIS J. CABRI

Baumite*


Analysis by J. I. gave SiO$_2$ 33.5, Al$_2$O$_3$ 6.60, Fe$_2$O$_3$ 1.65, FeO 9.80, MgO 17.1, ZnO 6.65, CuO 0.03, MnO 12.3, CaO 0.07, Na$_2$O 0.02, K$_2$O 0.08, H$_2$O$^+$(140°) 0.2, H$_2$O$^-$ (140°) 11.9, sum 99.90 percent, corresponding to the formula

$$(\text{Mg}_{8.9},\text{Mn}_{2.2},\text{Fe}^{3+}_{1.7},\text{Zn}_{2.3},\text{Al}_{2.7},\text{Fe}^{2+}_{0.3})(\text{Si}_{1.7},\text{Al}_{0.3})\text{O}_2\text{(OH)}_4$$

X-ray powder data are given (Fe radiation). The strongest lines of 7 given are 7.23 10 001; 3.590 6 002; 2.510 3 201; hence the mineral is a member of the sepiolite group. When heated at 500° for 1 hour, the mineral gave a weak, diffuse pattern; when heated at 600° gave no pattern.

Color dull black. Found in masses up to a foot in size on the dump of the Buckwheat open pit; it contains angular fragments of willemite and calcite, and is cut by thin veinlets of greenish-black magnanosome, zinc carbonate, and calcite, and is cut by thin veinlets.

The name is for John Leach Baum, formerly chief geologist of the New Jersey Zinc Company. M.F.

Biteplatinite and Biteplapalladite

(= Moncheite-Merenskyite Series)


Biteplatinite

Electron microprobe analyses gave: Pt 39.2, Pd 1.2, Te 58.1, Bi 6.0, sum 104.5 percent. Corresponding to $$(\text{Pd}_{2.9},\text{Pt}_{0.09})(\text{Te},\text{Bi})_2$$.

White with a strong metallic luster. Mineral grains are irregular to tabular (0.09×0.18-0.11×0.165 mm). Anisotropic, white under reflected light. Reflectance Rg$: 56.1 (green), 57.8 (orange), 58.1% (red), VHN = 120-170 kg/mm$^2$, corresponding to 2.5-3.5 on Moh's scale.

Biteplapalladite

Electron microprobe analyses gave: Pt 7.0-18.2, Pd 10.9-18.6, Ni 1.1-2.1, Te 50.7-58.8, Bi 12.0-20.0, sum 95.2-102.7 percent, corresponding to $$(\text{Pd}_{1},\text{Pt}_{2-3})(\text{Te},\text{Bi})_2$$.

The mineral is hexagonal with a = 4.005(5), c = 5.244(8)Å for $$(\text{Pd}_{0.6},\text{Pt}_{0.37})(\text{Te},\text{Bi})_2$$ and a = 4.036, c = 5.259 Å for $$(\text{Pd}_{0.5},\text{Pt}_{0.39})(\text{Te},\text{Bi})_2$$. The powder pattern is similar to that of merenskyite with strongest lines (22 given, including b-lines and c lines without indices): 5.22 6 001, 2.90 10 101, 2.09 6 102, 2.01 5 110, 1.560 5 103.

Under the binoculars, the mineral is white to bright white with strong metallic luster. Mineral grains are semi-rounded, prismatic, and hexagonal tabular (0.11×0.11 mm). Under reflected light, the mineral is white with a yellow tint. Anisotropic. Reflectance Rg$: 46.7(400nm) 50.9 (500nm), 56.5 (530nm), 57.7 (590nm), 55.8% (650nm). VHN = 92-205 kg/mm$^2$.

Both minerals occur in a Cu-Ni sulfide deposit in fine-grained metagabbro and amphibolite in China (details on locality not given). The metallic minerals in the deposit are mainly pyrite, chalcopyrite, magnetite, and millerite. Other platinum group minerals present are michenerite, moncheite, and merenskyite.

The names are apparently derived from composition, according to the authors' proposed classification scheme based on Pt/Pd ratio: biteplatinite, 3:4:1; moncheite, 4:1-1:1; biteplapalladite, 1:1-1:4; and merenskyite, <1:4.

Discussion. Unnecessary names for intermediate members of the moncheite-merenskyite group. It is regrettable that the authors do not follow the generally accepted approach in dealing with a twomember solid solution series. GYC, LJC.

Caysichite*


The mineral occurs in granite pegmatite at the abandoned Evans-Lou feldspar mine, in the province of Quebec. The mine is about 22 miles north of Ottawa. Caysichite lines cavities as a dull white pulverulent coating or as a cream-colored stain. Other, rarer, occurrences are as thin incrustations with a parallel to slightly divergent columnar structure with a reniform surface; as radiating groups and terminated crystals; and as stalactites up to one cm long. Most of the following data apply to colorless crystals. The hardness is 4 and the VHN is 551. The mineral is non-fluorescent under long or short wave ultra-violet light, but shows a faint green cathodoluminescence under electron bombardment. Caysichite is colorless, white, pale yellow, and rarely greenish. It has a vitreous luster and a white streak. Caysichite effervesces slowly in cold, dilute HCl.

The rare crystals are prismatic, elongated parallel to c and terminated by [001]. A prism and dome were observed under high magnification but their Miller indices could not be determined. Caysichite is orthorombic, Ccm2, or Cmcm, a 13.30, b13.95, c 9.74 Å (N.B. If the form identified as a dome is truly a dome, the choice

* Minerals marked with an asterisk after the name were approved before publication by the Commission on New Minerals and Mineral Names of the International Mineralogical Association.
of space group is narrowed to $Ccm_2_1$. The strongest lines in the X-ray powder pattern (in Å for $CuK\alpha$ radiation) are: 6.93 100, 4.38 60, 4.22 60, 3.48 60, 4.04, and 3.32 90. and 4.00.

Caychisite is biaxial (−) with $\alpha = 1.586 \pm 0.004$, $\beta = 1.614 \pm 0.001$, $\gamma = 1.621 \pm 0.001$, $2V$ meas: 53°, 2V calc: 54°30′, $X = b$, $Y = a$, $Z = c$ for the colorless material. Yellowish crystals are biaxial (−) with $\alpha = 1.589 \pm 0.004$, $\beta = 1.616 \pm 0.001$, $\gamma = 1.626 \pm 0.001$, 2V calc: 72°45′. (For these indices the calculated 2V should be 61°46′.) In immersion mounts, fragments give nearly centered acute bisectrix figures suggesting (010) cleavage.


A preliminary report. Aegirine-riebeckite granite from Rockall Island (between Iceland and the British Isles) was reported by Sabine in 1960 to contain a colorless mineral containing Ba, Zr, B, or Al, Fe, P, BO₂, or Ca₅(PO₄)₂(OH)₂. Specroscopic analysis showed the presence of less than 0.1 percent of Ca, Cr, Ti, V, Ta, Mn, Cu, Be, and Sr. Inso. in HCl. X-ray study (precession) showed the mineral to be triclinic. The unit cell parameters, refined from X-ray powder data, gave $a = 6.014$, $b = 6.964$, $c = 4.971$ Å, $\alpha = 116.51°$, $\beta = 86.06°$, $\gamma = 112.59°$. Z = 1, G = 4.01 meas, 4.05 calc. The strongest X-ray lines (25 given) are 5.55 40 100, 3.26 60 101, 3.00 100 210, 2.94 35 710, 2.21 35 211, 1.90 35 030.


The mineral is found in crystalline masses up to one inch across in quartz veins in tension fractures in a carbonaceous argillite, 16 miles north of the Hess River, Yukon Territory, Canada. Associated minerals are pyrite and hinsdalite. The name is for the late J. A. Gower, formerly Professor of Mineralogy, University of British Columbia, where type material is preserved. M.F.
The mineral occurs in very small (30 microns, thickness/micron) pseudohexagonal plates that form spherical aggregates, intergrown with hematite and mimetite, in the deep oxidation zone at Tsumeb, S. W. Africa. Other minerals present include leadhillite, anglesite, fleischerite, melanotekite, and alamosite. Microprobe analyses (not given) give the formula Pb2ZnFe3Al2Si3O10(OH)6. Insol. in HCl.

The strongest X-ray lines are 21.06 70, 7.036 100, 3.826 75, 3.010 95, 2.594 75. Cleavage not observed.

Optically biaxial, neg., 2 V very small, n in plane of plates 1.81.

The name is for F. W. Kegel, former director of the mines operations. M.F.

Meixnerite*  

Microprobe analysis gave MgO 36.5 (36.21), Al2O3 15.0 (15.26), Fe2O3 0.55, H2O (by difference) 47.95 (48.53), sum 100.00 percent, the figures in brackets being the ideal composition corresponding to the formula.

Meixnerite occurs as a secondary mineral with talc and later aragonite in cracks of a serpentine rock near Ybb-S-Persenber, Lower Austria. The crystals are tabular, colorless, optically uniaxial with 2 V 1.517, cleavage parallel to 0001 perfect. Meixnerite is trigonal rhombohedral, space group R3m, a 3.0463 ± 0.0015, c 22.93 ± 0.02 Å, Z = 3/8; it is structurally related to hydrocalcite.

The new mineral is named in honor of Professor H. Meixner, Salzburg. Type material is preserved in the mineral collections of the Universities of Göttingen and Salzburg. A.P.

Orpheiite*  

Chemical analyses by G. Ekszenzi and L. Ivinovna gave Pb2O3 17.09, 17.38, 17.82; As2O3 0.07, 0.07, 0.07; SO3 8.32, 8.12, 7.77; Al2O3 20.20, 21.50, 19.45; PbO 40.63, 39.40, 37.71; CaO 1.27, 0.57, 2.02; CuO 0.52, 0.35, 0.441; SiO2 n.d., 1.14, n.d., H2O 0.01, 0.21; H2O 12.30 (4.02 to 3.01), 12.41 (4.04 to 3.10), 11.70; loss on ign. 0.10, 2.27, sum 100.51, 100.92, 99.43 percent. Spectrographic analysis shows up to 0.03 percent Zn, and up to 0.01 percent Ba, Cr, Fe, Mg, Mn, and Ti. The mineral is insoluble in acids, dissolves in hot 20 percent KOH solution. The DTA curves show a small endothermic peak at about 450°, a large one at about 540°, and a large exothermic peak at about 680-720°. Water is lost continuously to about 600° (12.27%); a further loss in weight (10.06%) occurs between 800° and 1000°. The analyses lead to the formulas:

\[ \text{H}_4\text{O}(\text{Pb}_{26}\text{Zn}_{26}\text{Ca}_{26})\text{Al}_{12}\text{Si}_{30}\text{(PO}_4\text{)}_{12}\text{SO}_4\text{OH}_{3a}\text{H}_{2a}\text{H}_{2a} \quad -1.10\text{H}_2\text{O} \]

\[ \text{H}_4\text{O}(\text{Pb}_{26}\text{Zn}_{26}\text{Ca}_{26}\text{Al}_{12}\text{Si}_{30}\text{(PO}_4\text{)}_{12}\text{SO}_4\text{OH}_{3a}\text{H}_{2a} \quad -1.14\text{H}_2\text{O} \]

With a 7.00, c 16.72 Å, but this gives Z = 0.32 with the formula above.

The mineral is colorless, gray, pale blue, or yellow-green. Luster vitreous. H 3.5, G 3.75 ± 0.01. Mp about 1200°C. No cleavage or an indistinct one on [0001]. Optically uniaxial, positive, zoned, \( \varphi \) ranges from 1.682 (center) to 1.704 (periphery), \( \epsilon \) from 1.670 to 1.691, birefringence 0.012-0.013 (note: the data given correspond to uniaxial, neg. M.F.). The colorless varieties do not fluoresce in U.V.; the colored varieties fluoresce in turquoise blue. Infrared spectra are given.

The mineral occurs in the oxidation zone of the Madjarova polymetallic deposit, associated with hydroxides of Fe and Mn, kaolinite, anglesite, and with pyromorphite which it replaces. The name is for Orpheus, the mythical singer in the Rhodopes. Type material is at the Museum of Mineralogy, “Kliment Ochridski” University, Sofia.

Discussion

Needs further study. The mineral of the beudantite group commonly show departures from the 1:1 ratio of PO4 (or AsO4) to SO4. I consider this mineral to be probably a variety of hinsdaitle. M.F.

Pumpellyite and julgoldite nomenclature*  

A system of nomenclature is proposed for the pumpellyite series based on the general formula \( W_X Y_2Z_4O_6(OH)_{2a} \). In the formula, \( W = Ca, K, Na; X = Mn, Fe^{2+}, Al; Y = Fe^{3+}, Al, Ti; \) and \( Z = Si \). In apportioning the constituents from an analysis, small amounts of Mn and Fe^{2+} can be shifted to the \( W \) position and some Al can be placed in the \( Z \) position. Two names are used for all the possible chemical compositions of the series: pumpellyite for those minerals with Al predominant in the \( Y \) position and julgoldite for minerals with Fe^{3+} in the \( Y \) position. Further distinctions are made by adding a suffix which denotes the predominant cation in the \( Y \) position. From eighteen analyses studied by the authors, pumpellyite-(Al) was applied to eleven specimens, pumpellyite-(Fe^{3+}) to one, pumpellyite-(Fe^{2+}) to one, pumpellyite-(Mg) to four, and julgoldite-(Fe^{2+}) to one. The authors point out two drawbacks of their scheme. First, a mineral rich in Fe^{3+} may receive a name which does not emphasize this aspect of its composition because Fe^{2+} is the most abundant cation in either \( X \) or \( Z \). Their pumpellyite-(Fe^{3+}) has Fe^{2+} > Al and Fe^{3+} > Fe^{2+}. They suggest that this mineral could be called “ferrian pumpellyite-(Fe^{3+}))”. The second drawback which they point out is that is possible to find a pumpellyite-(Al) which contains more Mg than is present in a pumpellyite-(Al).
much greater than K, Na, Mn, or Fe". However, can we be sure that this will always be the case? I prefer a system of nomenclature much greater than K, Na, Mn, or Fe”. However, can we be sure that this will always be the case? I prefer a system of nomenclature much greater than K, Na, Mn, or Fe”. However, can we be sure that this will always be the case? I prefer a system of nomenclature much greater than K, Na, Mn, or Fe”. However, can we be sure that this will always be the case? I prefer a system of nomenclature much greater than K, Na, Mn, or Fe”. However, can we be sure that this will always be the case? I prefer a system of nomenclature much greater than K, Na, Mn, or Fe”. However, can we be sure that this will always be the case? I prefer a system of nomenclature much greater than K, Na, Mn, or Fe”.

Ruthenarsenite


Ruthenarsenite

Examination of more than 75 nuggets or fragments from the Territory of Papua and New Guinea resulted in the discovery of two new minerals, ruthenarsenite and iridarsenite. These new species were found in only two of the nuggets.

Ruthenarsenite occurs as irregular inclusions up to 100 microns long with irarsite and iridarsenite in a matrix of rutheniridosmine. In reflected light (oil immersion) it is pale orange-brown to brownish grey, shows distinct bireflectance, and has strong anisotropism varying from orange-brown to light steel-grey. Maximum and minimum reflectance values (averaged for four grains) are: 48.6 and 46.1 (470 nm), 49.5 and 47.5 (546 nm), 50.9 and 49.3 (589 nm), 52.4 and 51.1 (650 nm). Micro-indentation hardness (for two grains) is 743 and 933 kg/mm² for a 100 g load.

Electron microprobe analyses for three grains are given. The average of the determinations from these analyses are: Ir 3.9, Ru 44.2, Os 0.7, Pt —, Rh 3.3, Pd 1.8, Cu —, Ni 4.0, Fe —, As —, total 98.3 wt percent. These data give an average formula of (Ru-Os-PtRh)As, or ideally, RuAs.

Single crystal data could not be obtained, but the X-ray powder pattern could be indexed on the unit cell of synthetic RuAs. Heyding and Heyding (1962) state that IrAs, is monoclinic with a 6.060, b 6.071, c 6.158Å, β 113° 16’. Least-squares refinement of the X-ray data for iridarsenite gave: a 6.05, b 6.06, c 6.18Å, β 113° 17’. For Z = 4, the calculated density of IrAs, is 10.9 g/cm³. The strongest lines in the X-ray powder pattern are (in Å, radiation not given): 3.90 10 117; 2.84 7 002; 2.61 5 127; 2.069 6 022; and 1.910 5 317.

Type material is preserved in the National Mineral Collection, Ottawa. J.A.M.

Ruthenium


A microprobe analysis of a sample from the Horokanai placer, Hokkaido, gave Ru 64.43, Ir 14.62, Pt 9.14, Rh 7.05, Os 5.29, Pd 0.49, Fe 0.21, Ni, Cu trace, sum 101.23 percent, corresponding to Ru34.8Ir2.4Pt4.6Rh1.4Os1.9Ru0.9Os0.1Pd0.1.

The mineral is probably hexagonal. It occurs as a tabular crystal 7 × 35 microns, in platy rutheniridosium. In reflected light white with creamy tint. Reflectivity 60.1 percent at 530 nm. Weakly anisotropic. Type material is at the University of Kagoshima, Japan. M.F.

Sobotkite


Analysis gave SiO2 39.68, Al2O3 20.98, Fe2O3 trace, MnO trace, MgO 16.72, NiO 0.014, CaO 1.58, K2O 0.15, Na2O trace, H2O 20.71, sum 99.83 percent, corresponding to the formula (Ca14K2O3)(Mg16Al24)(Si40Al4)(O24(OH)2)·5.18H2O, a trioc-tahedral member of the montmorillonite group. The DTA curve shows endothermic breaks at 180°, 600°, 680° (small), and 830°, and a large exothermic break 890°. The mineral loses about 10 percent H2O to 300°, 15 percent to 600°, the remainder gradually to 800°–900°. The mineral swells with glycerol. The X-ray pattern is diffuse (11 lines) with strongest lines 14.50 7 001; 4.48 9 110; 2.61 6 130; 2.51 6 202; 2.41 5 007; 2.35 5 203; 1.527 6 060; b = 9.16–9.21 Å.

The mineral is pale green, soapy, G (pycnometer) 2.31, H. about 3. Three samples had ns 1.523, 1.525, 1.528 (each ±0.002).

The mineral occurs with nickeloo man lizardite, chrysotile, and pimelite in weathered serpentinites of the Gogolow-Jordanow massif, Lower Silesia, Poland. The name is for Mt. Sobotka.

Discussion

It is a difficult problem to decide whether this name should be retained or whether it should be considered to be an aluminian saponite. M.F.
**Sudburyite**


Sudburyite has been found in polished sections of ore from the Frood mine and the Copper Cliff South mine in the Sudbury area of Ontario. Most of the data are for the Copper Cliff South occurrence. The mineral occurs as small, often elongated, inclusions (18 × 100 microns or less) in cobaltite and maucherite. Other associated minerals are: chalcopyrite, galena, breithauptite, and nickeline. Pentlandite, pyrrhotite, and michenerite also occurred in the samples.

Electron microprobe analyses are given for ten different grains. These range as follows: Pd 29.2–45.5, Ni 0.48–11.6, Sb 45.3–59.3, Bi 0.53–5.4, Te 0.07–3.9, As 0.03–2.04, total 98.73–102.18. The following analysis (No. 1) is of a grain which gave the highest Pd content: Pd 45.2, Ni 1.06, Sb 52.8, Bi 0.53, Te 0.07, As 2.04, total 101.7. All of the analyses conform to a general formula of (Pd,Ni)(Sb,Bi,As,Te) or, ideally, PdSb. For example, analysis No. 1 (given above) yields the formula (Pd0.91Sb0.09)(Sb0.12As0.07Bi0.08)2+. Under reflected light in air, sudburyite is white with a yellow tint, shows no birefringence, and is weakly to moderately anisotropic. Under oil immersion it is pale yellow, shows no birefractance, and is weakly to moderately anisotropic. The mineral is simply aeschynite-(Y) (priorite), and no reason for the name is evident. It is apparently a common practice in the People's Republic of China that compositional varieties are named in the same way as mineral species. Se appears in the calculated formula but not in the chemical analysis. G.Y.C.

**Tsavolite**


The name tsavolite (for the Tsavo National Park), near where it was found, is suggested for a bright green to dark green variety of grossular that contains Cr, V, and Mn. It has n = 1.74 ± 0.03, G. 3.68 ± 0.02.

**Discussion**

The mineral is simply aeschynite-(Y) (priorite), and no reason for the name is evident. It is apparently a common practice in the People's Republic of China that compositional varieties are named in the same way as mineral species. Se appears in the calculated formula but not in the chemical analysis. G.Y.C.

**Tsavolite**


Stromeyerite and mckinzyriste occur intimately associated in irregular patches in the ore. A third phase occurs as small, rounded, apparently exsolved drop-like bodies in the Cu-Ag sulifides. Microprobe analysis showed this phase to be an unknown Cu-Ag-Te-sulfide of formula CuAgTeS2. M.F.

**Tsavolite**


The spectrum is given; the mineral is stated to be the Ba analogue of haradaite [Am. *Mineral. 56*, 1123 (1971); 60, 340 (1975)]. M.F.

**Tsavolite**


Vaslovite from an apaititic alkaline rock complex at the Kipawa River, Villedieu Township, Temiskaming County, Quebec (Lat. 46° 47' 49"N, Long. 78° 29' 31"W), contains an alteration product identified as CaZrSi2O7. The mineral occurs as radiating sheaves of prismatic crystals 0.1 to 0.3 mm long. Aside from a very low
Unnamed Pt-Pd Minerals


Platinum-group minerals from a hydrothermal environment. Econ. Geol. 69, 257-262.

The first paper describes three minerals from the Artonvilla mine, near Messina, South Africa, occurring with bornite, chalcocite, clausenthalite, and digenite. Probe analyses and optical data are given. One mineral appears to be a bismuth-poor kotulskite. Another gave Pt 15.1, Pd 23.4, Te 63.3, Bi 0.1, sum 101.8, corresponding to \((\text{Pd}_{0.98}\text{Pt}_{0.02})\text{Te}_{0.10}\text{Bi}_{0.01}\) or \((\text{Pd},\text{Pt})\text{Te}_{0.01}\). Reflectance (min. and max.) are: 380 nm, 48.9, 546 nm, 48.2, 513.6, 589 nm, 48.5, 532.6, 656 nm, 52.2, 56.4 percent. The mineral has a pinkish tinge and is weakly anisotropic.

The second paper describes a very similar mineral that gave a probe analysis Pt 30.79, Ni 0.19, Ru 0.13, Te 51.42, Bi 15.93, sum 98.46 percent, corresponding to \((\text{Pd},\text{Pt})\text{Te}_{0.10}\text{Bi}_{0.01}\). Scanning electron microscopy showed however, that the material was an intergrowth of 3 phases, probably merenskyite and kotulskite, with inclusions of hessite. No such intergrowths were found in the material of the first paper.

The first paper also gives data on a third mineral. Probe analyses gave Pt 28.6, 24.2, 18.6; Pd 10.8, 14.8, 15.0; Te 58.3, 60.5, 64.6; Bi 0.1, sum 101.8, corresponding to \((\text{Pd}_{0.98}\text{Pt}_{0.02})\text{Te}_{0.10}\text{Bi}_{0.01}\) or \((\text{Pd},\text{Pt})\text{Te}_{0.01}\). This gives essentially the same results except for Na, O and K.


A complex bismuthian palladium telluride intergrowth from the Stillwater Complex, Montana. Econ. Geol. 69, 263-265.

Wroewolfeite*


Electron microprobe analysis by J. A. N. gave Cu 51.3 ± 0.8, Sn 6.6 ± 0.2 percent, which calculates to CuO 64.22, SO3 16.48, H2O (by diff.) 19.30 percent, corresponding to Cu3(\text{SO}_{4})(\text{OH})_{2}·2\text{H}_{2}\text{O}.

Precession photographs show the mineral to be monoclinic, space group \(\text{Pc}\) or \(\text{P2}/c\), \(a = 6.058, b = 5.656, c = 14.360 \, \text{Å}, \beta = 93°28'\), \(Z = 2\), G. calc 3.00, observed by flotation 2.97 ± 0.01. The strongest lines of 41 given are 2.30 1000, 3.581 70004, 2.628 35022, 2.004 30222, 2.215. The X-ray study shows twinning on \{010\}.

Color deep greenish blue, streak light blue, luster vitreous. Cleavages \{010\}, \{100\}, \{001\}, easy and perfect. H 2.5. Optically biaxial, negative, \(n_s = 1.637, n_c = 1.682\), 1.694, 2.\(\rho^2\)F-53\(^o\), strongly pleochroic, X light blue, Y deep greenish-blue, Z medium greenish-blue, absorption \(X \times Z = X\).

The mineral occurs in the oxidation zone of the old lead mine at Loudville, Massachusetts, as minute euhedral crystals up to 0.5 × 1.0 mm, associated with chalcocite, covellite, and langite. The mineral alters to brochantite and malachite. It has also been found at two mines in England.

Type material is in the U.S. National Museum, no. 127329. The name is for C. Wroe Wolfe, American Crystallographer. M. F.

Solid Solution of Pd and Sn in Platinum (=rustenburgite)

\(\text{Pt}_{x}\text{Pd}_{1-x}\text{Sn}_{4}\)

Probe analyses gave: Pt 58.3, Pd 19.8, Cu 1.3, Ni 0.9, Fe 0.1, Sn 19.6, Bi 2.5, Pb n.d, total 102.5 percent. Cubic, \(\text{Fm}3\text{m}\), \(a = 3.984(2)\)\,Å, \(Z = 4\), powder lines: 2.30 1011, 1.997 7200, 1.409 6220, 1.273 2h 310, 1.203 6 311, 1.150 4 222. Reflected light (air?)—bright white with rose tint against chalcopyrite and silicates, isotropic. Reflectance values in air—460 nm 56.6, 550 nm 59.7, 580 nm 55.6, 640 nm 62.8 percent \(\text{VHN}_{\text{ro}} = 304\) (301-306) and \(\text{VHN}_{\text{el}} = 384\) (367-392). No reaction with any regular etch reagents. Grains average 30-70 microns in diameter and range from 5 to 1080 microns. Occurs as skeletal metacrystals with stepped facets and rectangular cross-sections; as anhedral elongated and isometric grains. Associated minerals: polarite, sperrylite, Au, Ag-Au alloys, plumbochipoladite, Pd and Pt stannides and arsenides, chalcopyrite, talnakhite, cubanite, magnetite, valleriite, and silicates.

NEW MINERAL NAMES

3.99(1) Å. Reflected light (air?)—greyish white, creamy tinge against Pt-Fe alloys, isotropic. R percent in air 460 nm 53.6, 550 nm 59.9, 600 nm 59.9, 650 nm 59.9, 700 nm 62.6, 640 nm 64.5. Occurs as rectangular, square, or elongated grains and as platy intergrowths with the mineral (Pd,Pt)2+ (As,Sn,Pb). The grains average 50-60 microns in diameter but range from 5 to 90 microns. Associated minerals: chalcoprite, cubanite, pentlandite, magnetite, vallerite, djerfisherite, sperrylite, polarite, gold, and unnamed PGM.

Discussion. Both (a) and (b) appear to be identical to atokite (disordered PdSn) of Mihalik et al (1975) Can. Mineral. 13, 224-230, to (Pd,Pt)(Sn,Pb)2+ of Razin and Bykov (1971) (Am. Mineral., 1972, 57, 595-596) as unnamed mineral R and with some of the minerals grouped under unnamed Z of Cabri (1972). Unnecessary names and formulae. L.J.C.

Platinum-Palladium Stannide

(Pt,Pd)2+Sn

Probe analyses gave: Pd 58.6, Pt 16.3, Au 4.6, Cu 1.2, Ni 0.5, Sn 19.2-100.4 percent (Pd n.d.). Cubic Pm3m, a = 3.984(1) Å and a = 3.980(1) Å. Powder lines: 2.30 111, 1.994 200, 1.409 7 220, 1.332 222, 300, 1.200 6 311, 1.101 5 320, 0.914 6b 331, 0.891 7b 420, 0.814 6b 422. R percent in air: 460 nm 59.2, 550 nm 58.9, 580 nm 59.9, 640 nm 62.5. VHN60 = 288(269-321), VHN600 = 274 (245-318), 492. R percent in air: 460 nm 50.6, 550 nm 52.6, 580 nm 53.6, 640 nm 53.9; R'g460 nm 44.8, 550 nm 51.6, 580 nm 53.9, 640 nm 57.8. VHN60 = 295(277-344). Weakly etched by aqua regia.

Discussion. This mineral is the ordered form of PdSn. The name is unfortunate as it implies that Pt is always a requirement. The ± in the formula may be due to analytical errors. L.J.C.

Palladium-Palladium Stannide

(Pd,Pt)2+Sn

Probe analyses of 3 samples gave Pd 37.6, 41.9, 44.9; Pt 36.2, 27.1, 25.9; Cu 1.6, 1.3, 1.3; Ag 1.7, 1.4, -; Au 1.5, 1.5, 1; Ni 0.7, 0.3, 0.4; Rh n.d., 0.5; Sn 22.1, 23.2, 21.8; Pt 0.3, n.d., 3.5; Sb 0.2, -0.5; Bi n.d., 0.9: totals 101.9, 95.2, 101.0 percent. Cubic Pm3m, a = 3.984(2) Å. Strongest powder lines: 2.30 111, 1.989 200, 1.407 8 220, 1.203 10* 311, 1.151 5 222 plus some weaker reflections indicative of ordering. R percent in air for 2 samples: 460 nm 59.2, 57.6; 550 nm 61.2, 61.0; 580 nm 62.2, 61.6; 640 nm 64.0, 62.8. Reflected light (air?)—bright white with creamy tinge if next to chalcoprite, isotropic. VHN60 = 406(393-419) and 426(423-432), VHN600 = 392(387-402). Negative to etching reagents except occasionally with aqua regia. Associated minerals: talnakhite, chalcopyrite, magnetite, polarite, Au-Ag alloys, Pt-Fe alloys, and other unnamed PGM. Occurs as elongated anhedral grains as well as cubic crystals and rectangular grains with stepped facets. Grains average 300-400 microns in diameter but range from 10 microns to 2.2 millimeters.

* This intensity was omitted accidentally.

Discussion. This mineral is the ordered form of PdSn. The name is unfortunate as it implies that Pt is always a requirement. The ± in the formula may be due to analytical errors. L.J.C.

Palladium Platinum Arsenoplastannide

(Pd,Pt)2+Sn, (Sn,As)

Probe analysis of one grain gave Pd 47.0; Pt 5.2; Au 2.7; Cu 1.0; Sn 16.9; As 7.0; Bi 1.0; Pb not detected; total 100.8 percent. Indexed as tetragonal, P4/mmm, a = 3.999, c = 3.655 Å from a six line powder pattern: 2.23 10 222, 1.986 8 400, 1.906 1 401, 1.471 3 432, 1.405 1 440, 1.190 3 622.

In reflected light (air?) the mineral is light grey with creamy, occasionally yellowish tints; very weakly bireflectant in air; anisotropic with brownish grey colors. R percent in air 460 nm 50.8, 550 nm 54.3, 580 nm 55.5, 640 nm 57.5, VHN60 = 480(476-506). Occurs as anhedral grains, platy intergrowths with (Pd,Pt)2+ (As,Sn,Pb). Grains average 20 microns in diameter but range from 2 to 300 microns. Associated minerals: polarite, sperrylite, Ag-Au alloys, Au, other PGM, chalcopyrite, cubanite, talnakhite, pentlandite, magnetite, vallerite, djerfisherite, sperrylite, polarite, gold, and unnamed PGM.

Discussion. Not enough data to determine whether the formula derived from analysis represents a new species or whether this is a Pb-rich variety of ordered PdSn. Unnecessary name. L.J.C.

Palladium-Copper-Platinum Stannide

(Pd,Cu,Pt)2+Sn

Probe analyses of 3 samples gave: Pd 34.5, 40.7, 49.4, 50.8, 51.1; Pt 27.3, 12.4, 12.4, 12.4, 11.6; Cu 10.4, 8.3, 8.3, 8.3, 12.2; Rh 0.9, 0.7, 1.3, -; Au 1.1, 0.8, 0.5, -; Sn 25.9, 24.5, 25.0, 22.0, 27.5; Pb 0.4, 1.5, 1.0, 5.7, -; Sb 2.3, 1.1, 1.0, -; Bi n.d., 3.1, -; Totals: 101.2, 100.4, 100.4, 103.2, 101.4 percent. Tetragonal P4/mmm, a = 1.072, c = 3.720 Å. Strongest powder lines (twelve total) = 2.28 111, 2.04 4 200, and 1.214 4 311.

In reflected light (air?)—pale creamy grey with rose, brown, or lilac tints. Bireflectance varies from barely perceptible (cream grey) to definite (roseate); weakly to markedly anisotropic with greyish-orange color effects. Usually shows polysynthetic twinning. R percent in air for first analysis R'p 460 nm 41.2, 550 nm 48.0, 580 nm 49.8, 640 nm 53.9; R'g460 nm 44.8, 550 nm 48.5, 580 nm 51.6, 640 nm 53.6, 640 nm 57.8. VHN60 = 295(277-344). Weakly etched by aqua regia.

Occurs as oval, isometric, elongated anhedral grains and as margins at intergrowths of Pt minerals; cross sections are rectangular, pentagonal, and triangular. Grains average 40-80 microns in diameter but range from 2 microns to 4 millimeters. Associated minerals: polarite, sperrylite, Au-Ag alloys, Pt-Fe alloys, Ag, other PGM, chalcopyrite, talnakhite, magnetite, vallerite, galena, sphalerite.

Discussion. The mineral is indexed as tetragonal PdSn with reference to Schubert et al (1959). That reference does not discuss PdSn, however, and PdSn with tetragonal symmetry is unknown in the Pd-Sn system. Single crystal work is necessary. The ± in the formula may be due to analytical errors. This mineral may be the same as some of the minerals grouped under unnamed Z of Cabri (1972). The name is unfortunate as the essential nature of all the elements is yet to be proved. L.J.C.

Palladium-Platinum Arsenobistannide

(Pd, Pt)2+ (Sn,As)


**NEW MINERAL NAMES**

**Palladium-platinum Plumbostannaroarsenide**

(Pd, Pt)$_{x-z}$ (As, Sn, Pb)

Prove analysis of one grain gave Pd 60.9, Pt 5.4, Ag 2.1, Rh 0.5, Sn 13.0, As 8.8, Pb 6.0, Sb 1.6; total 98.3 percent. Cu, Au not detected. Indexed as tetragonal, \( a = 3.99, c = 3.665 \) Å from an eleven powder pattern, strongest lines 2.23 10 222, .992 5 400, 2.09 7 120, 3.38 3 003, 4.76 4 342.

**Discussion.** Not enough data to determine whether the mineral is a unique species. The name is unjustified and single crystal work is necessary. L.J.C.

**Palladium Stibiotannaroarsenide**

Pd$_{2x}$ (As, Sn, Sb)

Prove analysis of one grain gave Pd 78.2; As 12.3; Sn 6.8; Sb 6.3; total 103.6 percent. Pt, Pb not detected. Indexed as orthorhombic with powder pattern 3.20 10 121, 2.18 10 002, 1.126 4 133, 1.621 3 420. In reflected light (air?) the mineral is light grey with a roseate to reddish tinge. Polysynthetically twinned. \( R_p \) and \( R_g \) percent in air 460 nm 47.9, 550 nm 57.0, 580 nm 54.3, 640 nm 54.5. VHN$_{30}$ = 423 (396-449), VHN$_{50}$ = 515 (503-519).

**Discussion.** Appears to be the same mineral as (Pd, Pt)$_{x-z}$ (As, Sn, As) mineral, which itself is not well enough characterized to determine if it is a unique species. The name is unjustified. L.J.C.

**Nickel-Palladium Arsenides**

(Ni, Pd)$_{x-z}$ As$_{y}$ (a) \( \{Ni, Pd\}_x As_y \) Prove analysis of one grain gave Pd 44.0, 45.9, Ni 29.0, 27.5; Cu 0.2; Pt 0.4; As 28.2, 26.6; totals 101.4, 100.4 percent. Indexed as hexagonal (second analysis) with \( a = 9.910, c = 6.601 \) Å from ten powder lines of which the strongest are 2.19 10 0003, 1.989 10 2242, 2.65 8 2022, 3031, and 2.29 6 2241,1232.

In reflected light (air?) the mineral is pale lilac grey with brownish or roseate tinge. Weakly bireflectant in air, weakly anisotropic with brownish-grey tones. \( R_p \) percent in air 460 nm 42.2, 4.7, 462, 51.5; 550 nm 48.8, 54.3; 640 nm 54.5. VHN$_{30}$ = 463 (440-484) and VHN$_{50}$ = 527 (492-503) for first and second analysis, respectively. Occasional etching with 1 : 1 HCl, negative to other reagents.

**Discussion.** Not enough data to differentiate between (a) and (b). The powder pattern of (a) is very similar to synthetic Ni$_2$Sb$_3$, of Heyding and Calvert (A.S.T.M. 10-271) which was indexed as orthorhombic symmetry because powder pattern is very similar to that of palladoarsenide, Pd$_2$As (Am. Mineral., 60, 162). The name is unjustified. L.J.C.

**Palladium Bismuthide**

Pd$_{x-z}$ Bi

Prove analyses of two samples gave Pd 29.8, 31.8; Ag 1.1; Pt 50.4, 50.2; Au 0.5; Cu 0.3; Bi 61.1; Te 0.6; total 107.2 percent. Indexed as hexagonal from eleven powder lines, \( a = 4.20, c = 5.64 \) Å, strongest lines 3.05 10 101, 2.24 8 1072, 2.097 8 1120, 1.178 5 3031, 1124.

In reflected light (air?) the mineral is pale yellowish cream with noticeable bireflectance, weakly to distinctly anisotropic with yellowish-grey tones. \( R_p \) percent in air 460 nm 47.9, 550 nm 57.0, 580 nm 59.2, 640 nm 63.0. VHN$_{30}$ = 281 (272-286).

Ocurs as elongated, oval euhedral grains and as fringes which surround intergrowths of PGM. The grains average 15–20 microns in diameter and range in size from 5 to 100 microns. Associated minerals: polarite, Ag-Au alloys, sperrylite, (Pd, Cu, Pt)$_{x-z}$ Sn$_x$, electrum, chalcopyrite, cubanite, silicates, galena.

**Discussion.** Needs further study, especially single crystal work and synthesis. The name has already been used for Pd$_{x-z}$ Sn$_x$, an incompletely characterized mineral of Shernayev and Yushko-Zakharova (see unnamed mineral 0 of Cabri, 1972). L.J.C.
by HgCl₂; negative to other reagents. Occurs as isometric, almost square, and oval crystals. Grains average 70 microns in diameter and range from 40 to 150 microns, associated minerals: Ag-Au alloys, Pd₆P₁₇, (Ni,Pd)₂₅₆₀, As, (Pd,Pt)₁₆₂₅Sn, and chalcopyrite.

Discussion. Single crystal study required, especially to determine if approximate As:pb of 1:1 is significant. The uncertain stoichiometry may be due to analytical errors. L.J.C.

Newly Reported Minerals from China, I

Platinum Metal Mineral Research Group, Microprobe Analysis Laboratory, X-ray Powder Photograph Laboratory, and Mineral Dressing Laboratory, Kweiyang Institute of Geochemistry, Academia Sinica. 1974. Telluristibnide of palladium and nickel and other new minerals and varieties of platinum metals. Geochimica, 3, 169-181 (in Chinese with English abstract). (It is not stated whether or where type materials are preserved. GYC, L.J.C.).

Hexastibiopalladite, Pd₆Sb₆ (= Sudburyite)

Microprobe analysis gave: Pd 41, 40; Sb 60, 58; sum 101, 98 percent, corresponding to Pd₆Sb₆, and Pd₆Sb₆,.

The X-ray powder pattern is indexable on the basis of a hexagonal cell with a = 4.07, c = 5.57 Å. The strongest X-ray lines (19 given, including 3 b-lines) are: 2.970 8 101, 2.184 10102, 2.030 6 110, 1.644 3 112, 1.490 3 202, 1.149 5 311.

Pall brownish gray, brittle, with metallic luster. Under reflected light it is yellowish white. Weakly anisotropic. Reflectance = 66.1 percent (590 nm). VHN₆ = 210 kg/mm², corresponding to 4.0 on Moh's scale. The mineral was found as short prismatic grains in the heavy concentrates of crushed ores.

The mineral occurs in Cu-Ni-sulfide deposits in Y (see testibiopalladite) in Southwestern China.

Discussion. The name is unnecessary as the mineral is clearly identical to sudburyite (PdSb, Can. Mineral. 12, 275-279, 1974). GYC, L.J.C.

Hextastibiopanickelitite, (Ni,Pd)₅₅Sb₁₀Tē

Microprobe analysis gave: Ni 20, Pd 16, Sb 31, Bi 0.1, Te 33, sum 100.1 percent, corresponding to (Ni₀₃Pd₄₅Sb₁₀) (Sb₁₀Bi₁₀)Te₁₀.

The X-ray powder pattern is indexable on the basis of a hexagonal cell with a = 3.98, c = 5.35 Å. Strongest X-ray lines (19 given, including 3 β-lines) are: 2.890 8 101, 2.109 8 102, 1.990 7 110, 1.635 4 201, 1.580 5 103, 1.108 6, diffuse 114.

The mineral is weakly anisotropic, pale yellow to yellowish white in reflected light. Reflectance = 58.2-62.3 percent (590 nm). VHN₆ = 75 kg/mm² and VHN₇ = 108 kg/mm², equivalent to 2.0-2.2 on Moh's scale.

The mineral occurs in Cu-Ni-sulfide deposits in Y (see testibiopalladite) in Southwestern China. In heavy concentrates of crushed ores it is often found with testibiopalladite.

Discussion. The mineral appears to be a new species and may be structurally related to imigretite. (Ni₄Tē, Am. Mineral, 49, 1151). The name is awkward. GYC, L.J.C.

Testibiopalladite, Pd₁₀Sb₁₀Bi₁₀Tē

Microprobe analysis of two grains from Y, using pure metals as standards, gave: Pd 25, 26; Ni 1, 1; Sb 20, 21; Bi 19, 17; Te 35, 36; sum 100, 100 percent, corresponding to (Pd₁₀Sb₁₀Bi₁₀Tē₁₀), and (Pd₁₀Sb₁₀Bi₁₀Tē₁₀). Six analyses of material from W gave (range): Pd 27-30.3, Ni 0-0.8, Sb 23-33.9, Bi 0-20, Te 31-39.7, sum 96.6-105.1 percent corresponding to (Pd₁₀Sb₁₀Bi₁₀Tē₁₀).

The X-ray powder pattern is indexable on the basis of a cubic cell with a = 6.572 Å (also 6.557-6.581 Å, reflecting variations in Sb:Bi). The strongest X-ray lines (36 given, including 3 β-lines) are: 2.940 10 210, 211 β; 2.680 8 211; 1.983 9 311, 1.755 7 321, 1.267 6 333, 511; 1.162 6 440; 1.066 7 532, 611.

The mineral was found in concentrates of crushed ores as irregular to short prismatic grains (0.07-10 mm). Bright steel gray with a light brown tint, metallic luster. Surfaces are often tarnished yellowish-brown. Brittle with two sets of imperfect cleavage. In reflected light it is bright white with a faint blue tint. Isotropic, reflectance = 57.3 percent (590 nm). The mineral from W is white and sometimes milky yellow. Reflectance 480 nm, 54.4; 500 nm, 54.2; 520 nm, 54.0; 540 nm, 53.9; 560 nm, 54.0; 580 nm, 54.0; 600 nm, 54.0; 620 nm, 54.0; 640 nm, 54.0; 660 nm, 54.7 percent.

VHN₁₀ = 165 kg/mm² and VHN₁₀ = 267 kg/mm², equivalent to 3.5-4.0 on Moh's scale.

The mineral occurs as inclusions in gersdorffite-cobaltite, pyrrhotite, chalcopyrite, and pentlandite in Cu-Ni-sulfide deposits in Y, which is a serpentinite body intruded into a Permian formation of metamorphic rocks in Southwestern China. It is also found as a relatively common mineral in Cu-Ni-sulfide deposits in W, which is mainly a clinoxyroxene intruding into sandy shales and volcanics of Permian age in Northeastern China.

Discussion. The mineral is the anthimone analog of micheniterite (PdBiTē), with PdSbTe as an end-member. GYC, L.J.C.

Unnamed Platinum Group Minerals

1. (Pd,Ni)(Te,Sb,Bi)

Probe analysis gave Pd 41.2, Ni 1.1, Sb 23.0, Bi 4.3, Te 30.6, sum 100.2 percent, corresponding to (Pd₆Sb₆Ni₃Sb₁₀Bi₁₀Te₁₀). Bright yellow under reflected light. Isotropic, reflectance = 66.4 percent (590 nm). VHN₆ = 225 kg/mm². Only one grain has been found in Y (see testibiopalladite) as a subhedral inclusion (43 microns) in gersdorffite.

2. Pd₆Sb₁₀Te₁₀, reported as Pd₆Sb₁₀Te₁₀

Probe analysis gave: Pd 37, Sb 41, Bi 5, Te 17, sum 100 percent, corresponding to Pd₆Sb₁₀Bi₁₀Te₁₀. Bright white with a rose tint. Strongly anisotropic. Pleochroic: grayish blue-orange yellow. Distinct birefringence: white with a rose tint-white with a gray tint. R'g = 520 nm, 60.4, 52.1; 580 nm, 60.3, 57.4; 660 nm, 64.1, 62.1 percent. Hardness less than that of chalcopyrite. The mineral occurs in W (see testibiopalladite) as inclusions (46 microns) in gersdorffite.

3. Ni₃Sb₁₀Te₁₀, reported as (Ni₃Pd₆Sb₁₀Bi₁₀Te₁₀)

Probe analysis gave: Ni 22, Pd 3, Sb 26, Bi 1, Te 46, sum 98 percent, corresponding to (Ni₃Pd₆Sb₁₀Bi₁₀Te₁₀). The mineral is yellow under reflected light, isotropic, (3). Reflectance = 59.8 percent (590 nm). VHN₆ = 280 kg/mm². Only one grain has been found in Y as an inclusion intergrown with pyrrhotite and pentlandite in gersdorffite.

4. Pd₆Sb₁₀

Probe analyses gave: Pd 63.1, 60.3, 61; Sb 37.8, 37.3, 36; sum 100.8, 97.6, 97 percent, corresponding to Pd₆Sb₁₀. Pd₆Sb₁₀. The mineral is gray to pinkish gray with distinct birefringence. Strongly anisotropic, pleochroic: dull purple-grayish
under reflected light. Reflectance = 63.8 (520 nm), 62.3 (580 nm), 66.3 percent (650 nm). Hardness similar to that of chalcopyrite. The mineral occurs in both W (intergrown with native gold) and Y.

5. PdSb
   Probe analysis gave: Pd 49.9, 50.4, 46.9, 43; Ni -, -, 0.5; Sb 49.3, 50.9, 45.4, 54; Bi -, -, 4.1, -1; Te -, -, 1.5; sums 99.2, 101.3, 98.4, 101 percent, corresponding to Pd$_{1-x}$Sb$_{x}$(Pd$_{1-y}$Sb$_{y}$)$_{0.6}$(Sb$_{0.6}$B$_{0.4}$Te$_{0.6}$) and (Pd$_{0.6}$Sb$_{0.4}$)(Sb$_{0.6}$B$_{0.4}$Te$_{0.6}$). The mineral from W is rose yellow with strong bireflectance: orange-yellow—bright yellowish brown. Strongly anisotropic. Pleochroic: grayish yellow—dull purple. Reflectance: 50.0 (520 nm), 52.2 (580 nm), 53.4 percent (660 nm). Hardness moderate. The mineral occurs in both W and Y as short prismatic crystals (20–50 microns) in interstices of pentlandite and silicates or as rims around pyrrhotite. The mineral was also reported to occur in X (no details given) in Northern China, associated with chalcopyrite and electrum.

6. Pd$_2$Te
   Probe analysis gave: Pd 71.9, Te 26.7, sum 98.6 percent, corresponding to Pd$_{3-x}$Te$_{1+y}$. White with a yellow tint under reflected light. Weakly anisotropic. Reflectance greater than that of pyrite. Medium hardness. The mineral occurs in W as small grayish yellow grains intergrown with other tellurides of platinum and palладium.

7. (Pd,Pt)$_3$Te
   Probe analysis gave: Pd 62.1, Pt 12.4, Te 28.6, sum 103.1 percent, corresponding to (Pd$_{3-x}$Pt$_{x+y}$)Te$_{1+y}$. White with a pink tint. Weak bireflectance. Strongly anisotropic. Pleochroic: reddish brown—grayish blue. Reflectance similar to that of pyrite. Moderate hardness. Found in W with other tellurides, often intergrown with moncheite.

8. PdTe
   Probe analysis gave: Pd 40.2 Hg 1.1, Bi 8.5, Te 48.8, sum 98.6 percent, corresponding to (Pd$_{0.6}$Hg$_{0.4}$)(Bi$_{0.6}$Te$_{0.4}$). Pale yellow under reflected light. Weakly anisotropic. Pleochroic: yellow-gray. Reflectance = 56.3 (520 nm), 58.3 (580 nm), 58.0 percent (660 nm). Hardness similar to that of chalcopyrite. Found in W with other tellurides.

9. (Pd,Ni)(Bi,Te) (?)
   Probe analysis gave: Pd 24.4, Ni 7.7, Bi 10.9, Te 51.4, sum 94.4 percent, corresponding to (Pd$_{0.5}$Ni$_{0.5}$)(Bi$_{0.5}$Te$_{0.5}$). Isotropic, white in reflected light. Reflectance = 57.8 (520 nm), 57.9 (580 nm), 59.2 percent (660 nm). Harder than pyrrhotite. Found in W as cubic grains (5 × 7 microns) in pyrrhotite.

10. Pd$_3$Te$_5$
    Probe analysis gave: Pd 26.8, Sb 6.5, Bi 10, Te 58, sum 101.3 percent, corresponding to Pd$_{3-x}$(Sb$_{0.6}$B$_{0.4}$Te$_{0.6}$)$_2$. Isotropic, pure white under reflected light. Reflectance = 63.8 (520 nm), 62.3 (580 nm), 66.3 percent (650 nm). Harder than chalcopyrite. Only one grain has been found in W as an euhedral tabular crystal (14 × 23 microns) in the interstices between chalcopyrite and silicates.

11. Pd$_2$Te$_3$
    Probe analysis gave: Pd 21.0, Te 78.0, sum 99.0 percent, corresponding to Pd$_{3-x}$Te$_{5+y}$. Weakly anisotropic, white with a rose tint under reflected light. Pleochroic: pale blue—yellowish gray. Reflectance larger than that of pyrite. Hardness similar to that of pyrrhotite. Found in W as irregular grains (5 × 32 microns) in the interstices between pyrrhotite and silicates.

12. Pd$_4$(Te,As)
    Probe analysis gave: Pd 61.5, Hg 6.1, Te 20.4, As 11.1, sum 99.1 percent, corresponding to (Pd$_{4-x}$Hg$_{0.5}$)(Te$_{1.5}$As$_{0.5}$). Pale pink under reflected light. Strong bireflectance: pale pink—bright brownish yellow. Strongly anisotropic. Pleochroic: yellowish pink—blush pink. Reflectance approaches that of sperrylite. Found in a Cu-sulfide deposit in W, often intergrown with sperrylite.

13. Pd$_4$(As,Sb), reported as Pd$_4$(Sb,As)
    Probe analysis gave: Pd 73.2, Sb 9.1, Te 4.5, As 15.5, sum 102.3 percent, corresponding to Pd$_{4-x}$(Sb$_{0.6}$Te$_{0.4}$)$_2$. Distinctly anisotropic, gray to pale gray with a pinkish brown tint under reflected light. Pleochroic: purplish gray—pinkish gray. Reflectance = 53.6 (520 nm), 52.3 (580 nm), 51.3 percent (660 nm). Hardness approaches that of chalcopyrite. Found in W, often intergrown with native gold. Reported as a subspecies, intermediate between palladaarsenide (Pd$_4$As, Am. Mineral. 60, 162, 1975) and the mineral Pd$_4$Sb found in W and Y.

Discussion. Data for all the above minerals are insufficient for full characterization. Nos. 2, 3, 6, 12 may be compositionally unique. No. 4 may be a Pt-free variety of the unnamed mineral (Pd,Pt,Ni)$_3$(Sb,Sn) (Am. Mineral. 60, 739; 1975). No. 5 could be sudburyite (Can. Mineral., 12, 275–279, 1974). No. 7 is probably a Pt-bearing variety of No. 6. No. 8 is probably identical to kotulskite (Am. Mineral. 48, 1181). Analysis of No. 9 is too poor to establish stoichiometry. No. 10 is compositionally similar to merenskyite. No. 11 appears to be unique but the composition is not known in the synthetic Pd-Te system. No. 13 appears to be antimonian palladaarsenide (Am. Mineral. 60, 162, 1975). GYC, LJC.

Newly Reported Minerals from China, II

Comments

It is not stated whether or where type materials are preserved. The minerals are named after type localities about which there is no information given. The mineral names are derived from Chinese characters according to the Pin-Yin Romanization System which is widely used in the People's Republic of China. However, the Wade-Giles Romanization System is more widely used in the western scientific community, and to facilitate proper pronunciation, a list of the Wade-Giles equivalents is given below:

- Yixunite = Yi-hsun-ite
- Dayingite = Ta-ying-ite
- Xingzhongite = Hsing-chung-ite
- Malanite = Ma-lan-ite
- Daomanite = Tao-ma-ite
- Hongshiite = Hung-Shih-ite
- Guanglinite = Kwang-lin-ite
- Fengluanite = Feng-luan-ite
- Yanzhongite = Yen-chung-ite
- Hongshiite = Hung-chi-ite

(GYC)
Electron microprobe analysis gave: Pt 45.2, Cu 20.1, As 18.8, S 15.3, sum 99.4 percent, corresponding to Cu₁₂₃Pt₇As₉S₉₉S₉₉ or ideally (Cu,Pt)₆As₉S₉. Other analyses gave: Pt 45.0, 42.2; Cu 21.0, 19.2; As 27.4, 17.3; S 13.2, 14.1; sums 106.6, 92.8 percent. The mineral is not attacked by HCl, HNO₃, or H₃PO₄.

The mineral is orthorhombic with a = 8.085, b = 5.905, and c = 7.314 Å. Strongest X-ray lines (41 given) are: 7.327 001, 3.20 60 012, 3.01 100 211, 2.09 60 203, 1.835 100 123, 1.281 60 341, 1.079 80 443, 1.003 60 052, 152, 0.9982 60 444, 0.9906 70 605, 643.

Color steel gray with a yellow tint, silver grayish white on fresh surfaces, luster metallic, habit tabular. Grain size 0.2-0.3 mm. Four sets of cleavages, from most to least perfect, are (100), (101), (001) (110). Non-magnetic, brittle. Fracture step-like or uneven.

Under reflected light pale greenish yellow, strongly anisotropic, pleochroic: gold yellow and grayish green. Parallel extinction. Rg and Rp are: 466 nm, 40.9; 544 nm, 44.4; 656 nm, 56.0 percent. VHN₉₀ = 657-660 kg/sq mm.

The mineral was found in the Tao and Ma (apparently code names—GYC) districts in a certain region in China. In the Tao district the occurrence and mineral associations are the same as those for yixunite and dayingite. In the Ma district, the mineral occurs in the olivine pyroxenite type of platinum ores related to those for yixunite and dayingite. In the Hung district, in a certain region in China, associated with the various types of platinum ores in the basic-ultrabasic rocks, particularly in the Hung district, in a certain region in China. Occurrence and mineral associations are the same as given for hongshiite in the Hung district, and as given for yixunite, dayingite, and daomanite in the Tao district. In the Hung district the mineral is often found to replace diopside and biotite and as pseudomorphs after biotite.

**Discussion.** Unnecessary name for antimonian guanglinite (Pd₃As₉). See discussion on guanglinite. The d value (2.18 Å) of reflection 110 is apparently in error. GYC,LJC.

**Guanglinite, Pd₃As₉**

Electron microprobe analysis gave: Pd 80.3, Pt −, As 20.1, Sb −, sum 100.4 percent, corresponding to Pd₁₃As₉S₉ or ideally Pd₃As₉. The mineral is orthorhombic with a = 10.83, b = 3.33, and c = 6.07 Å. The strongest X-ray lines (26 given) are: 2.36 70 302, 2.18 100 300, 1.242 50 504, 0.8590 40, 0.8265 50, 0.8050 40, 0.7936 40, 0.7846 40.

Physical properties of guanglinite were reported to be very similar to those of fengluanite, except that guanglinite is usually massive.

**Dongyingt, Cu₉Co, Pt₇S₉**

Electron microprobe analysis gave: Cu 17.3, Co 14.6, Pt 38.2, S 29.2, sum 99.3 percent, corresponding to Cu₁₂₃Co₇Pt₇S₉₉ or ideally Cu₂(5Co,Pt)₇S₉. Two additional analyses gave: Cu 15.5, 14.0; Co 13.2, 13.0; Pt 35.1, 32.3; S 24.2, 31.7; sums 88.0, 91.0 percent. The mineral is cubic, Fm₃m with a = 9.697 Å. The strongest X-ray lines (17 given) are: 5.71 80 111, 3.06 80 311, 2.435 100 400, 1.869 50 511, 1.730 70 440, 1.490 50 533, 0.9928 50 844, 0.8495 40 970.

The mineral occurs as perfect dodecahedral crystals, sometimes modified by cube (size not given). Bright white to silver white with metallic luster. Cleavage absent, brittle. Streak steel gray. White under reflected light. Reflectances are: 466 nm, 40.5; 544 nm, 44.1; 656 nm, 42.8; 656 nm, 48.6 percent. Isotropic. VHN₉₀ = 310 kg/sq mm.

Occurrence and associated minerals are same as for yixunite.

**Discussion.** The mineral appears to be a new species. The ideal formula, based on data reported, may also be written as Cu₅Co₅Pt₇S₉. GYC,LJC.

**Yixunite, TiO**

Electron microprobe analysis gave: Ti 74.0, Fe 0.5, O 25 (theoretical), sum 99.5 percent, corresponding to (Ti₂Fe₃O₇)O (calculated by GYC) or ideally TiO. The presence of O was confirmed by probe analysis.

The mineral is cubic, Fm₃m with a = 4.293(5) Å, which is significantly larger than that of synthetic TiO (a = 4.177, ASTM 8–11) but is comparable to that of wustite (a = 4.284). The powder pattern contains seven lines: 2.479 50 111, 2.144 100 200, 1.529 70 220, 1.297 50 311, 1.081 80 400, 0.9850 10 331, 0.9600 20 420.

The mineral is bright white with metallic luster and occurs as perfect cubo-octahedral crystals (0.2–0.3 mm). Non-magnetic,

**Fengluanite, Pd₉As₉S₉**

Electron microprobe analysis gave: Pd 76.0, Pt –, As 10.1, Sb 13.2, sum 99.3 percent, corresponding to Pd₃(As₉S₉) or ideally Pd₃(As₉S₉). Other analyses gave: Pd 72.5, 79.2, 68.4; Pt –, 4.4; As 9.2, 10.0, 11.2; Sb 11.0, 9.5, 9.4; sums 92.7, 98.7, 93.4 percent.

The mineral is orthorhombic with a = 11.03, b = 3.37 and c = 6.13 Å. The strongest X-ray lines (24 given) are: 2.37 70 302, 2.18 100 500, 1.652 50 120, 1.640 30 403, 1.549 30 221, 1.259 40 504.

Color pale yellow, luster metallic. Habit platy, granular. Some grains show euhedral hexagonal crystal outline. Grain size 0.1–1 mm. The mineral has one perfect cleavage and breaks easily into perfect tabular fragments. Grain surfaces are uneven, sometimes show step-like development. Non-magnetic.

Yellow under reflected light. Weakly anisotropic. Parallel extinction. Reflectances are: 466 nm, 51.4; 544 nm, 53.6; 589 nm, 54.0; 665 nm, 56.0 percent. VHN₉₀ = 657–660 kg/sq mm.

Fengluanite and guanglinite are relatively common minerals in various types of platinum ores in the basic-ultrabasic rocks, particularly in the Hung district, in a certain region in China. Occurrence and mineral associations are the same as given for hongshiite in the Hung district, and as given for yixunite, dayingite, and daomanite in the Tao district. In the Hung district the mineral is often found to replace diopside and biotite and as pseudomorphs after biotite.

**Discussion.** Unnecessary name for antimonian guanglinite (Pd₃As₉). See discussion on guanglinite. The d value (2.18 Å) of reflection 110 is apparently in error. GYC,LJC.

Discussion. The mineral appears to be unique. GYC-LJC.

Hongshuite, PtCuAs

Electron microprobe analysis gave: Pt 61.0, Cu 15.7, As 23.0, sum 99.7 percent, corresponding to \((\text{Pt}, \text{Cu})_2\text{As}_3\) or ideally PtCuAs.

The mineral is hexagonal with \(a = 10.51\) and \(c = 4.59\) Å. The strongest X-ray lines (34 given) are: 4.52 100 200, 2.211 100 311, 1.910 100 212, 1.361 40 303, 1.344 40 512, 1.156 80 402, 0.8822 70 405 802, 0.8591 80 661.

Color bronze, luster metallic, habit irregular to massive. Grain size 0.1-0.5 mm. Cleavage not observed. Non-magnetic, relatively brittle. Polishes well. White with a yellow tint under reflected light. Reflectances are: 466 nm, 48.1; 544 nm, 65.6; 589 nm, 62.1; 656 nm, 65.3 percent. VHN<sub>100</sub> = 483-482 kg/sq mm.

The mineral occurs in the actinolitized diopsidite type of platinum deposits in the Hung (apparently a code name—GYC) district in a certain region in China, associated with diopside, actinolite, epidote, magnetite, bornite, polydymite, cooperite, sphenylite, yosotskite, and two new minerals, fengluanite and guanglinite. The mineral is often found replacing cooperite and associated with minerals similar to those given for yixunite and daomanite. The mineral occurs in platinum ores related to chromium mineralization in a certain region in China, associated with olivine, serpentine, talc, chrome, magnetite, and minor pyrite. Other platinum group minerals present are polyxene, osmiridium, iridosmine, osmiridium, iridium, erlichmanite, cooperite, irarsite, osarsite, unnamed Ir-Ni sulfide, unnamed Os-Ni disulfide, unnamed Rh-Ir disulfide.

Discussion. The mineral appears to be a new species. The ideal formula, based on data reported, may also be written as (Ct,Cu,Pt)<sub>2</sub>As or (Ct,Cu,Pt)<sub>2</sub>As. GYC-LJC.

Malanite, (Ct,Pt,Ir)<sub>2</sub>S<sub>2</sub>

Electron microprobe analysis gave: Cu 14.1, Ni 0.5, Fe 1.5, Pt 31.2, Ir 19.1, Pd 0.66, S 32.7, sum 99.7 percent, corresponding to \((\text{Ct}, \text{Cu}, \text{Pt})_2\text{S}_2\) or ideally (Ct,Pt,Ir)<sub>2</sub>S<sub>2</sub>.

The mineral is cubic with \(a = 6.030(9)\) Å. The strongest X-ray lines (17 given) are: 5.86 80 100, 3.00 70 200, 2.833 60 210, 2.501 100 221, 1.921 70 310, 1.761 100 222, 1.214 50 531, 0.7854 70 731.


The mineral occurs in the peridotite type of platinum ores related to Cu-Ni sulfides in a certain region in China, associated with olivine, orthopyroxenes, pyroxenes, serpentine, chlorites, pentlandite, pyrrhotite, bornite, magnetite, cooperite, sphenylite, cuproplatinum, and platinum.

Discussion. The mineral appears to be a new species. It may be related to synthetic CuS<sub>2</sub>, PtS<sub>3</sub> with \(a = 5.79\) Å (Munson, 1966, *Inorganic Chem.*, 5, 1296) and \(a = 5.897\) Å (Taylor and Kullerud, 1972, *Neues Jahrb. Min. M."), 458-463); and to fukuchilite, (Ct,FeS<sub>2</sub>)(*Am. Mineral.* 55, 1811). GYC-LJC.

Xinzhoukite, (Ir,Cu,Rh)<sub>2</sub>S<sub>2</sub>

Electron microprobe analysis gave: Ir 47.0, Os 3.0, Pt 4.0, Rh 7.6, Cu 10.0, Fe 2.5, Pb 8.0, S 17.1, sum 99.2 percent, corresponding to \((\text{Ir}, \text{Cu}, \text{Pt})_2 \text{S}_2\) or ideally (Ir,Cu,Rh)<sub>2</sub>S<sub>2</sub>.

The mineral is cubic or pseudocubic with \(a = 8.72(1)\) Å. The strongest X-ray lines (29 given) are: 5.99 60 110, 3.02 80 220, 1.769 70 422, 1.506 60 530, 1.340 60 541, 1.208 100 640, 1.034 80 822, 1.020 80 830.

The mineral is steel gray with metallic luster. It often occurs as a rim (0.1 mm wide) around iridosmine. Under reflected light the mineral is bluish gray. Reflectances are: 466 nm, 40.5; 544 nm, 38.9; 589 nm, 41.1; 656 nm, 41.0 percent. Isotopic. VHN<sub>100</sub> = 753 kg/sq mm.

The mineral occurs in the dunite type of platinum ores related to chromium mineralization in a certain region in China, associated with olivine, serpentine, talc, chrome, magnetite, and minor pyrite. Two analyses gave low sums (88.7 and 90.5 percent). Analysis of argentian varieties gave: Pd 42.0, 41.4; Te 52.6, 52.6; Bi 2.2, 2.2; Ag 3.7, 5.3; sums 100.5, 99.3 percent, corresponding to Pd<sub>90</sub>Ag<sub>10</sub>Te<sub>80</sub>Bi<sub>20</sub> and Pd<sub>90</sub>Ag<sub>10</sub>Te<sub>80</sub>Bi<sub>20</sub>. Analysis of an Hg-bearing variety gave: Pd 40.3, Te 52.7, Hg 7.7, sum 100.7 percent, corresponding to Pd<sub>90</sub>Hg<sub>10</sub>Te<sub>80</sub>Bi<sub>20</sub>

The mineral is hexagonal with \(a = 4.12\) and \(c = 5.62\) Å. The strongest X-ray lines (15 given) are: 3.037 100 101, 2.848 80 002, 2.222 70 102, 2.094 80 110, 2.014 60 201, 1.530 60 202.

The mineral was only found in polished sections, as droplets near the margin of bornite or in vein minerals such as hornblende. A few grains show hexagonal cross-sections. Grain size several tens of microns up to 0.1 mm.

Pale yellow under reflected light. Bireflectance not observed. Strongly anisotropic, pleochroic: pale bluish, grayish white to dark grayish yellow. Hardness less than that of bornite. Polishes well. Reflectances are: 466 nm, 53.7; 544 nm, 60.0; 589 nm, 62.5; 656 nm, 63.2 percent. VHN<sub>100</sub> = 15.8 kg/sq mm. Reflectances and VHN’s for Hg-, Ag-, and Bi-bearing varieties are somewhat different.

The mineral occurs in the garnet hornblende pyroxenite type of platinum ores in the Tao district, and in the olivine pyroxenite type of the Ma district, associated with minerals similar to those given for daomanite. In the Tao district the mineral is closely associated with bornite and is often found to replace bornite.

Discussion. Unnecessary name for kotulskite (*Am. Mineral.* 48, 1181). The d value (2.014) of reflection 201 is apparently in error. GYC-LJC.

Yuxunite, PtIn

Electron microprobe analysis gave: Pt 66.0, In 33.5, sum 99.5 percent, corresponding to \((\text{Pt}, \text{In})_2\text{S}_2\) or ideally PtIn. The mineral is not attacked by HCl, HNO<sub>3</sub>, or H<sub>2</sub>PO<sub>4</sub>.

The mineral is cubic, \(Fm3m\) with \(a = 3.948(5)\) Å. The powder pattern contains nine lines: 2.294 50 111, 1.991 70 200, 1.395 50 222, 1.222 50 311, 1.187 100 311, 1.140 30 222, 0.9873 20 400, 0.9048 40 331, 0.8820 50 420, 0.8057 60 422.

Color bright white with a blue tint, luster metallic, cleavage ab-
NEW MINERAL NAMES

sent, non-magnetic. Mineral grains are rounded (size not given). Under reflected light the mineral is bright white with a slight yellow tint, isotropic. Reflectances are: 466 nm, 67.0; 544 nm, 63.9; 589 nm, 78.5; 656 nm, 75.8 percent. VHNos = 159.4 kg/sq mm.

The mineral occurs in the garnet hornblende pyroxenite type of platinum ores related to Cu-sulfides in the Tao (GYC: apparently a code name) district in a certain region in China, associated with almandine, hornblende, diopside, augite, plagioclase, sphene, apatite, chalcopyrite, bornite, magnetite, covellite, carrollite, goethite, columbite, cooperite, sperrylite, moncheite, and other new minerals fengluanite, dayingite, yanzhongite, daomanite, and hongquite.

Discussion. The mineral appears to be a new species but the synthetic compound PtIn has not been reported for the Pt-In system. GYC, LJC.

Unnamed Sulfides of Ir, Os, Rh, Ni

(1) (Ni0.75Ir0.25)S
Electron microprobe analysis gave: Ir 41.0, 39.0; Os 2.0, 2.5; Ni 14.3, 11.5; Fe 11.0, 10.1; Cu 5.7, 4.5; Co 2.8, 0.7; S 24.5, 21.5; sum 101.4, 89.9 percent, the former corresponding to Ir0.25Ni0.75Fe0.78Cu0.17Co0.06S1.00, or ideally (Ni,Fe,Cu)0.33Ir0.67S.
The strongest X-ray lines (45 given, unindexed) are: 3.33 100, 2.982 80, 2.894 75, 2.798 60, 2.046 60, 1.917 80, 1.748 100, 1.022 50.

Reddish brown in reflected light. Strongly anisotropic, pleochroic: pale blue-fire red. Reflectances are: 466 nm, 46.9; 544 nm, 43.7; 589 nm, 43.4; 656 nm, 43.1 percent, VHNos = 642 kg/sq mm. Cleavage not observed. Polishes well.

The mineral occurs as rims around osmiridium, associated with polyxene, erlichmanite, irarsite and other minerals in chromium ores in dunite.

(2) (Ir,Rh,Ni)S
Electron microprobe analysis gave: Ir 59.0, Rh 14.2, Pt 3.5, Ni 4.9, S 17.5, sum 99.1 percent, corresponding to Ir0.36Rh0.25Pt0.25Ni0.13S0.89 or ideally (Ir,Rh,Ni)S.
Bluish gray under reflected light. Strongly anisotropic, pleochroic: dull red-bluish green. Reflectances are: 466 nm, 40.8; 544 nm, 39.5; 589 nm, 37.8; 656 nm, 41.5 percent. VHNos = 1650 kg/sq mm.

The mineral occurs in chromium ores of the dunite type, as exsolution product in osmiridium.

(3) (Os,Ni)S
Electron microprobe analysis gave: Os 48.5, Ni 15.0, Ru 5.0, S 31.7, sum 100.2 percent, corresponding to Os0.37Ni0.63Ru0.83S2.00.
Color bluish gray under reflected light. Isotropic with high relief. Reflectances are: 466 nm, 42.0; 544 nm, 44.5; 589 nm, 43.7; 656 nm, 38.9 percent. VHNos = 2575 kg/sq mm.

The mineral occurs as worm-like exsolution product (0.09 X 0.02 mm) in osmiridium in the chromium ores of the dunite type.

(4) (Ir,Rh)S
Electron microprobe analysis gave: Ir 58.0, Rh 14.5, S 29.5, sum 102.0 percent, corresponding to Ir0.65Rh0.35S2.00 or ideally (Ir,Rh)S. Bluish gray under reflected light. Isotropic with high relief. Reflectances are: 466 nm, 45.1; 544 nm, 48.1; 589 nm, 51.3; 656 nm, 47.1 percent. VHNos = 2300 kg/sq mm.

The mineral occurs as euhedral rhombohedral crystals (10 microns) in a matrix of polyxene in the chromium ores of the dunite type.

Discussion. (Ni0.75Ir0.25)S may be structurally unique if X-ray data reported were from pure material. (Ir,Rh,Ni)S and (Ir,Rh)S are compositionally unique. (Os,Ni)S may be a nickeloox erlichmanite. On the other hand, the near 1:1 ratio of Os:Ni may be structurally significant. We agree with the authors' statement that further studies are necessary for full characterization. GYC, LJC.

NEW DATA

(Khuniite = Iranite)


Iranite was described as PbCrO₄ · H₂O (Am. Mineral. 48, 1417), but new analyses of type material show CuO 4.59, ZnO 0.20 percent (Sebarz, Iran); CuO 2.29, ZnO 0.43 percent (Seh-Changi, Iran). The X-ray data for these match closely those for hemihedrite (Am. Mineral. 55, 1088-1102), and iranite is probably the Cu analog of hemihedrite, with a series probably existing. Khuniite (Am. Mineral. 55, 1813, 58, 562, 59, 633) is iranite, not hemihedrite. M.F.

Errata

Am. Mineral. 60, 488. In the discussion of natrofairchildite, “one percent cleavage” should read “one perfect cleavage.”