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NEW MINERAL NAMES*

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Chvilevaite*

V.M. Kachalovskaya, B.S. Osipov, N.G. Nazarenko, V.A. Kukoev, A.O. Mazmanyan, I.N. Egorov, L.N. Kaplunnik (1988) Chvilevaite—A new alkali sulfide with the composition $Na(Cu,Fe,Zn)_2S_2$. Zapiski Vses. Mineralog. Obshch., 117(2), 204–207 (in Russian).

Analysis by electron microprobe gave an average of Na 10.93, Cu 38.63, Fe 11.64, Zn 6.72, S 30.83, As 0.55, Ca 0.26, Mn 0.06, sum 99.62 wt%, corresponding to $(Na_{1.01}Ca_{0.01})_{\Sigma 1.02}(Cu_{1.28}Fe_{0.44}Zn_{0.22}As_{0.01})_{\Sigma 1.95}S_{2.03}$, ideally $Na(Cu,Fe,Zn)_2S_2$. Single-crystal X-ray study showed the mineral to be hexagonal, space group $P3m$, $a = 3.873(1)$, $c = 6.848$ Å, Z = 1. The strongest lines (20 given) are 6.85(60)(001), 3.40(90)(002), 3.02(100)(101), 2.40(100)(102), 1.945(100)(110), and 1.870(90)(111). The mineral occurs in sphalerite samples from the Akatuya deposit, Transbaikal, where it forms individual grains up to 0.5 mm of tabular, prismatic, and equant habit; also as intergrowths with covellite and chalcocite. Other associated minerals are galena, pyrite, quartz, carbonates, boulangerite, and arsenopyrite. The mineral is bronze with metallic luster, tarnishing rapidly to a black sooty coating. Brittle, perfect {001} cleavage; hardness is 135 kg/mm² (average of 20, with 20-g load, range 110–153). Impressions are square with slightly concave sides and radial cracks. $D_{calc} = 3.94$ g/cm³. Orange in reflected light, changing to rosy purple with time. Distinct bireflectance from light orange to dark gray with a lilac tint. Strong anisotropy from black to white. Reflectance values are (nm, R_o,R_e): 420, 17.9,17.9; 440, 18.0,17.7; 460, 18.4,17.5; 480, 19.0,17.4; 500, 19.7,17.3; 520, 20.7,17.4; 540, 21.6,17.5; 560, 22.5,17.7; 580, 23.3,17.8; 600, 24.0,18.0; 620, 24.8,18.2; 640, 25.6,18.5; 660, 26.2,18.8; 680, 26.8,19.1; 700, 27.4,19.4.

The name honors mineralogist T. N. Chvileva. Type material is at the Fersman Mineralogical Museum, Moscow. **D.A.V.**

Fergusonite-(Ce)

Yu. L. Kapustin (1986) Rare-earth mineralization in late carbonatites of the Novopoltavsk Massif. Novye Dannye Mineral., 33, 43–52 (in Russian).

Analysis of the mineral gave Nb_2O_5 42.01, Ta_2O_5 1.00, TiO_2 0.05, ThO_2 0.88, UO_2 1.11 REE_2O_3 52.26 (where REE is all rare-earth cations), Al_2O_3 0.13, CaO 0.81, SrO 0.11, H_2O 1.79, sum [100.15] wt%, corresponding to $(REE_{0.96}Ca_{0.04}Th_{0.01}U_{0.01})_{\Sigma 1.02}(Nb_{0.98}Ta_{0.02})_{\Sigma 1.00}O_{4.00}\cdot 0.30H_2O$, similar to the ideal formula for fergusonite, $(REE)NbO_4$. Spectroscopic analysis of the mineral for rare-earth elements (REE_2O_3 = 100 wt%) gave La 12, Ce 34, Pr 4, Nd 21, Sm 3, Eu 0.5, Gd 5, Tb 0.2, Dy 1.7, Ho 0.3, Er 2, Tm 0.1, Yb 1.6, Y 11.6. The mineral forms irregular (to 1 cm) poikiloblasts and rare prismatic dipyramidal crystals (to 1 mm) associated with magnetite, phlogopite, graphite, chlorite, quartz, pyrite, columbite, and other accessory rare-earth minerals (allanite, bastnaesite, parisite, apatite, uranpyrochlore, aeschynite, fersmite, and monazite) in carbonatites of the Novopoltavsk Massif. The mineral is dark red to black with a reddish tint in transmitted light; anisotropic, optically uniaxial, $\omega = 2.30$, $\epsilon = 2.20$, $D = 5.48$ g/cm³. On heating, the mineral displays an exothermic peak at 650–680 °C, the amplitude of which varies directly with the degree to which the mineral is metamict (the less metamict, the smaller the peak). X-ray study shows the mineral to be tetragonal, unit cell $a = 5.17$, $c = 5.30$ Å. No lines are given. The name is for the Ce-dominant variety of fergusonite.

Discussion. Apparently the tetragonal polymorph of monoclinic fergusonite-beta-(Ce). A more complete description and formal submission for approval of the name are needed. **D.A.V.**

Fergusonite-(Nd)

Peishan Zhang, Kejie Tao (1987) Characteristics of the fergusonite- and aeschynite-group minerals in China. Zhongguo Xitu Xuebao, 5, 1–7 (in Chinese, English abstract).

Fergusonite-(Nd), formed at a late stage in the Bayan Obo rare-earth deposit, Inner Mongolia, China, occurs in aegerine veinlets as dark brown, granular or equant grains having an adamantine luster. The REE content of the mineral is 47.54 wt%, and the REE proportions, relative to 100 wt%, are La 2.54, Ce 19.54, Pr 4.96, Nd 45.75, Sm 5.44, Eu 3.09, Gd 6.79, Tb 0.77, Dy 4.37, Ho 0.46, Er 1.09, Tm 0.42, Yb 0.08, Lu 0.04, Y 4.6. The empirical formula is stated to be $(Nd_{0.33}Ce_{0.14}Gd_{0.05}Pr_{0.04}Dy_{0.03}Y_{0.03}La_{0.02}Eu_{0.01}Tb_{0.01}Er_{0.01}Fe^{2+}_{0.10}Th_{0.01}U_{0.01}Mn_{0.01})_{\Sigma 0.85}(Nb_{0.83}Ti_{0.17})_{\Sigma 1.00}O_{3.64}$.

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

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Discussion. Cations in the REE position sum to 0.80 rather than 0.85; chemical data additional to those listed above are not given. A more complete description, including optical and X-ray data and confirmation of the symmetry, is necessary to authenticate the identification; as well, formal submission for approval of the name is needed. **J.L.J.**

Maricopaite*

D.R. Peacor, P.J. Dunn, W.B. Simmons, F.J. Wicks, M. Raudsepp (1988) Maricopaite, a new hydrated Ca-Pb, zeolite-like silicate from Arizona. Can. Mineral., 26, 309–313.

Electron-microprobe and TG-EG analyses gave SiO_2 42.0, Al_2O_3 11.4, CaO 2.4, PbO 30.8, H_2O 11.0, hydrocarbon 0.5, sum 98.1 wt%, corresponding to $Pb_{7.00}Ca_{2.17}(Si_{35.46}Al_{11.34})_{\Sigma 46.80}O_{97.10}\cdot 30.96H_2O$ plus minor hydrocarbon, ideally $(Pb_7Ca_2)(Si,Al)_{48}O_{100}\cdot 32H_2O$. On heating, the water loss occurred continuously from 50 to 500 °C, a feature typical for zeolites. The mineral characteristically occurs as sprays of translucent, white, acicular crystals associated with orange mimetite on a quartz matrix. Sprays up to 1 mm in diameter are common; silky to vitreous luster, extremely soft and friable, imperfect {010} cleavage, $D_{meas} = 2.94$, $D_{calc} = 2.96$ g/cm³ with Z = 1. Optically, the crystals are intimately intergrown and have patchy and undulose extinction, biaxial negative, $\alpha = 1.563(3)$, $\beta = 1.582(3)$, $\gamma_{calc} = 1.592$, $2V = 70(10)°$, $X = \mathbf{a}$, $Y = \mathbf{c}$, $Z = \mathbf{b}$, $r > v$ (strong). The infrared spectrum has strong absorptions, characteristic of H_2O, at 1637, 3220, and 3435 cm^{-1}, and strong absorptions from 900 to 1300 cm^{-1} and at 443 cm^{-1}, characteristic of vibrations of the $(Si,Al)O_4$ tetrahedra. Single-crystal study indicated orthorhombic symmetry, space group *Cmmm* or a corresponding subgroup, $a = 19.65(2)$, $b = 19.40(3)$, $c = 7.513(7)$ Å based on refinement from a 114-mm Gandolfi powder pattern using Fe radiation. Strongest lines of the powder pattern are 13.7(100)(110), 9.86(40)(200), 4.35(30)(240), 3.357(40)(530), 3.216(50)(312), 2.978(40)(402), and 2.845(40)(422).

The new name is derived from the county containing the type locality, the Moon Anchor mine near Tonopah, Maricopa County, Arizona. Type material is in the Smithsonian Institution, Washington, D.C. **J.L.J.**

Roxbyite*

W.G. Mumme, G.J. Sparrow, G.S. Walker (1988) Roxbyite, a new copper sulphide mineral from the Olympic Dam deposit, Roxby Downs, South Australia. Mineral. Mag., 52, 323–330.

Fifteen electron-microprobe analyses gave a range of Cu 76.15–78.56, Fe 0.35–1.54, S 21.58–22.76 wt%, corresponding to $(Cu,Fe)_{1.72\text{-}1.86}S$, with a mean of $Cu_{1.75}Fe_{0.02}S$. The mineral is blue-black, poor {100} cleavage, $VHN_{50} = 83$; single crystals have dimensions up to 0.01 mm. In reflected light, white to off-white with a blue tinge, nonpleochroic, very weak anisotropism, $R = 24.5\text{–}29.8\%$ at 546 nm. On heating, converts to a digenite phase at 65–70 °C. Single-crystal X-ray studies indicated monoclinic symmetry, space group *C*2, *Cm*, or *C*2/*m*, $a = 53.79$, $b = 30.90$, $c = 13.36$ Å, $\beta = 90.0°$. A Gandolfi pattern of the same crystal gave strongest lines of 2.86(70) (12.8.1,18.2.1), 2.630(50)(10.10.1,20.0.1), 2.375(90)(885), 1.933(100)(086,0.16.0), and 1.857(80)(886).

Roxbyite occurs in chalcocite-bornite lenses and crosscutting veins in the Olympic Dam deposit, Roxby Downs Pastoral Station, South Australia, and probably also in the El Teniente porphyry copper deposit, Chile. Type material is in the Museum of Victoria, Melbourne, Australia.

Discussion. Roxbyite also has been reported to occur in "black-smoker" sulfide chimneys on the Galapagos Ridge, eastern Pacific Ocean (*Can. Mineral.* 26, p. 523, 1988). **J.L.J.**

Skippenite*

Z. Johan, P. Picot, F. Ruhlmann (1987) The ore mineralogy of the Otish Mountains uranium deposit, Quebec: Skippenite, Bi_2Se_2Te, and watkinsonite, $Cu_2PbBi_4(Se,S)_8$, two new mineral species. Can. Mineral., 25, 625–638.

One of six similar electron-microprobe analyses gave Cu 0.08, Pb 0.20, Bi 61.62, Se 22.27, S 0.56, Te 15.66, sum 100.89 wt%, corresponding to $(Bi_{2.06}Cu_{0.08}Pb_{0.06})_{\Sigma 2.20}Se_{2.02}(Te_{0.86}S_{0.12})_{\Sigma 0.98}$, ideally Bi_2Se_2Te. The mineral occurs as massive aggregates of lamellar crystals (0.2 to 1 mm long) flattened along [0001], with perfect {0001} cleavage; megascopically steel-gray, high metallic luster, black streak. In reflected light, white with a yellow tint; bireflectance not perceptible in air, yellowish-white to gray in oil; moderate anisotropism, from gray to bluish-gray. Reflectances in air (SiC standard) are given in 20-nm steps for two grains; representative values for R_{max}, R_{min} for one grain are 420, 43.0,41.0; 460, 47.8,46.5; 500, 49.5,48.3; 540, 50.3,49.0; 580, 50.4,49.1; 620, 50.6,49.3; 660, 50.8,49.4; 700, 50.8,49.4. $VHN_{25} = 63.0(7.7)$. Single-crystal X-ray study gave rhombohedral symmetry, space group *R*3*m*, *R*$\bar{3}$*m*, or *R*32; cell dimensions refined from the powder pattern are $a = 4.183(4)$, $c = 29.12(8)$ Å, Z = 3. $D_{calc} = 7.80$ g/cm³ for $Bi_2Se_2(Te_{0.87}S_{0.13})$. Strongest lines of the Debye-Scherrer pattern (Cu radiation, 76.4-mm camera) are 4.85(60)(006), 3.584(60)(101), 3.074(100)(015), 2.267(70)(10.10), and 2.090(80)(110).

The new name is for Professor George Skippen, Carleton University, Ottawa, Canada. The mineral is associated with vein-type uranium deposits in the Otish Mountains basin, Quebec, Canada (lat 52°12′30″N, long 71°03′00″W), where a complex assemblage of tellurides, sulfides, and selenides (including watkinsonite, which see) occurs in a dolomite gangue. Type material is in the École des Mines, Paris. **J.L.J.**

Watkinsonite*

Z. Johan, P. Picot, F. Ruhlmann (1987) The ore mineralogy of the Otish Mountains uranium deposit, Quebec: Skippenite, Bi_2Se_2Te, and watkinsonite, $Cu_2PbBi_4(Se,S)_8$, two new mineral species. Can. Mineral., 25, 625–638.

One of the eleven listed electron-microprobe analyses gave Cu 9.04, Pb 15.83, Bi 43.90, Se 27.98, S 3.24, Te 0.46, sum 100.45 wt%; the average of the eleven analyses corresponds to $Cu_{2.36}Pb_{1.26}Bi_{3.70}(Se_{6.21}S_{1.74}Te_{0.05})$, ideally $Cu_2PbBi_4(Se,S)_8$ assuming $Cu^+ + Pb^{2+}$ substitution for Bi^{3+} + vacancy. The mineral occurs predominantly as irregular grains, 0.01 to 3 mm, enclosed in skippenite (which see); megascopically black, metallic luster, conchoidal fracture, no cleavage, VHN_{25} = 166(155–186). In reflected light, white with a bluish tint; bireflectance not evident in air, weak in oil, from grayish-white to bluish-white; moderately anisotropic, with blue-gray to dark grayish-brown polarization colors. Reflectance values for the grains are given in 20-nm steps; highest R_{max} and lowest R_{min} obtained are 420, 46.6,43.2; 460, 47.6,44.3; 500, 48.3,45.0; 540, 48.6,45.4; 580, 48.8,45.5; 620, 48.9,45.6; 660, 49.0,45.7; 700, 49.0,45.8. Single-crystal X-ray study indicated monoclinic symmetry, space group *P*2, *Pm*, or *P*2/*m*, a = 12.92(3), b = 3.997(1), c = 14.989(3) Å, β = 109.2(2)° as refined from the Debye-Scherrer pattern (76.4-mm camera, Cu radiation). Strongest lines of the powder pattern are 3.573(90B)(111), 2.976(100)($20\bar{5}$), 2.929(100)($31\bar{1}$), 2.407(70)($30\bar{6}$), 2.140(70B)($20\bar{7},41\bar{5}$), 2.065(70B)($31\bar{6},51\bar{4}$), and 1.484(70)($81\bar{2}$,703). D_{calc} = 7.82 g/cm³ for $Cu_2PbBi_4(Se_{6.21}S_{1.74}Te_{0.05})$ and Z = 2.

The new name is for Professor David H. Watkinson of Carleton University, Ottawa, Canada. The mineral occurs in a dolomite gangue containing a complex assemblage of selenides, tellurides, and sulfides associated with vein-type uranium deposits in the Otish Mountains basin of Quebec (lat 52°12′30″N, long 71°03′00″W). Type material is at the École des Mines, Paris. **J.L.J.**

WC

Jianhong Zhang, Guojie Yang, Zhaohui Li (1986) Discovery of natural tungsten carbide (WC) in China. Kuangwu Xuebao, 6, 344–349 (in Chinese, English abstract).

Tungsten carbide occurs at Mengyin, Shandong (province), and at Dauba, Sichuan (province), China. In the Sichuan occurrence the mineral is in a platinum-bearing copper-nickel sulfide ore in altered ultrabasic rocks. In the Shandong occurrence the mineral was hand-picked directly from crushed and washed kimberlite in which associated minerals are serpentinized olivine, phlogopite, pyroxene, apatite, zircon, moissanite, rutile, perovskite, mongshanite [*Am. Mineral.,* 73, p. 441, 1988], and yimengite. In both occurrences the mineral is present as equant grains and granular aggregates, with individual grains 0.5 to 4 μm, but mostly 1 to 2 μm; SEM study shows that crystals are euhedral to subhedral, short prismatic, and some are terminated by pyramidal faces; rectangular to cubic to triangular in cross-section; aggregates commonly have interstitial voids. Color black or steel-gray, conchoidal fracture, white to yellowish-white in reflected light, isotropic to weakly anisotropic, no internal reflection or bireflectance. Reflectance percentages (WTiC standard, in air), are 400, 66.46; 420, 64.42; 440, 55.13; 480, 53.14; 500, 50.73; 520, 48.56; 540, 46.66; 546, 46.09; 560, 45.39; 580, 45.02; 589, 44.94; 600, 44.51; 620, 43.88; 640, 43.32; 660, 41.64; 680, 40.75; 700, 40.60. D_{meas} = 14.3 g/cm³ (low, possibly because of voids in the aggregates). Hardness estimated to be >8 on the basis of difficulty in polishing with Al_2O_3. Electron-microprobe analysis of ten homogeneous spots (WC standard) gave W 88.05–89.58 wt% for the mineral from the Shandong occurrence, and W 91.13 wt% (three spots) for the Sichuan mineral. The Auger spectrum indicated W:C = 1:1 and no other elements >1%. Strongest lines of the X-ray powder pattern (57-mm camera, Fe radiation) are 2.501(90)(100), 1.874(100)(101), 1.290(80)(111), 1.233 (80)(102), 1.148(70)(201), and 1.015(90)(112); hexagonal cell dimensions calculated from the pattern are a = 2.903(4), c = 2.835(4) Å, Z = 1. The data are in good agreement with PDF 25-1407.

Discussion. The occurrence of W and Ti carbides, together with several native elements (including Al), in ultramafic rocks of the Koryak Upland, northeastern USSR, also is reported in *Mineral. Zhurnal,* 9, 71–82, 1987. **J.L.J.**

Unnamed Bi selenides

Z. Johan, P. Picot, F. Ruhlmann (1987) The ore mineralogy of the Otish Mountains uranium deposit, Quebec: Skippenite, Bi_2Se_2Te, and watkinsonite, $Cu_2PbBi_4(Se,S)_8$, two new mineral species. Can. Mineral., 25, 625–638.

In the Otish Mountains dolomite-hosted complex assemblage of sulfides, tellurides, and selenides, which includes the second occurrences of poubaite and součekite and the new minerals skippenite and watkinsonite (which see), are unidentified bismuth selenides. Cores of some skippenite crystals contain a selenide for which electron-microprobe analyses (two are listed) gave a composition close to $Bi_2(Se_{1.5}Te_{0.5})$. In a paragenetically later assemblage of veinlets that cut watkinsonite, a possibly different Te-free mineral has compositions [analyses not given] corresponding to $Bi_2(Se,S)_2$, probably nevskite.

$(Bi,Pb)_2(Se,Te,S)_3$. The mineral is associated with skippenite, watkinsonite, and, rarely, poubaite; electron-microprobe analyses are the only properties given, and these are characterized as (1) Pb-bearing lamellae and (2) Pb-poor domains. Two analyses of the mineral in the first category gave Cu 0.06, 0.00, Pb 9.43, 9.64, Bi 53.03, 52.74, Se 27.57, 27.46, S 0.72, 0.70, Te 9.59, 9.41, sums 100.40, 99.95 wt%, corrresponding to $(Bi_{1.70}Pb_{0.31}Cu_{0.01})_{\Sigma 2.02}(Se_{2.35}S_{0.15}Te_{0.50})_{\Sigma 2.90}$ and $(Bi_{1.71}Pb_{0.32})_{\Sigma 2.03}$-

$(Se_{2.35}S_{0.15}Te_{0.50})_{\Sigma 2.90}$. The average of three analyses of the Pb-poor domains is Cu 0.00, Pb 0.80, Bi 60.37, Se 26.06, S 0.67, Te 11.72, sum 99.62 wt%, corresponding to $(Bi_{1.96}Pb_{0.03})_{\Sigma 1.99}(Se_{2.24}Te_{0.63}S_{0.14})_{\Sigma 3.01}$, ideally $Bi_2(Se,Te,S)_3$.

Discussion. Data for incompletely defined bismuth selenides with the general formula $Bi_2(Se,Te)_3$, from the Northwest Territories, Canada, were abstracted in *Am. Mineral.,* 71, 847, 1986. **J.L.J.**

Unnamed $AgBi_2Te_4$, Pb_2Te_3, $PbTe_2$ and Pb_2TeS

L.E. Filimonova, V.L. Levin, S.D. Abulgazina, E. Ya. Eremeeva, V.F. Mitina (1986) Tellurium minerals in ores of the Aidarly porphyry copper deposit. Zapiski Vses. Mineralog. Obshch., 115(4), 459–466 (in Russian).

Electron-microprobe analysis of anhedral inclusions up to 8 μm across in altaite gave Ag 9.42, Bi 41.95, Te 49.18, sum 100.55 wt%, corresponding to $Ag_{0.897}Bi_{2.062}Te_{4.040}$, ideally $AgBi_2Te_4$. Properties in reflected light are similar to those of volynskite: violet-rose color, no bireflectance, very weak anisotropy, microhardness variable from 55.5 to 83 kg/mm² (with 5-g load).

Analysis of Pb_2Te_3 gave Pb 51.12, Te 46.44, sum 97.56 wt%, corresponding to $Pb_{2.039}Te_3$. The mineral occurs as inclusions up to 4 μm across in altaite and is finely intergrown with the $PbTe_2$ phase. Gray-white in reflected light, with notable bireflectance, gray-white to gray pleochroism, and yellow-gray to gray anisotropism.

Analysis of $PbTe_2$ gave Pb 46.36, Te 52.59, sum 98.95 wt%, corresponding to $Pb_{1.085}Te_2$.

Analysis of Pb_2TeS gave Pb 66.54, Te 22.15, S 4.75, sum 93.44 wt%, corresponding to $Pb_{2.15}Te_{1.17}S$. The mineral forms anhedral and elongate grains, 2 to 3 μm across, intergrown with volynskite and included in altaite. In reflected light the mineral is gray, with a violet tint in immersion oil. The mineral has no bireflectance and is weakly anisotropic.

Reflectance spectra (from 440 to 750 nm) are presented graphically for all of the phases described. The minerals occur with hessite, volynskite, rucklidgeite, altaite, and tetradymite as accessory minerals in a porphyry copper-molybdenum deposit in Kazakhstan. Associated ore minerals are magnetite, pyrite, chalcopyrite, molybdenite, sphalerite, and galena; gangue minerals include chlorite, epidote, prehnite, potassium feldspar, quartz, and muscovite. **D.A.V.**

Unnamed Au-Bi sulfide

I. Ya. Nekrasov, Ya. V. Yakovlev, L.I. Solov'ev, and N.V. Leskova (1988) Discovery of gold-bismuth sulfide. Doklady Akad. Nauk SSR, 299(2), 438–441 (in Russian).

Four analyses by electron microprobe gave Au 13.13–17.40, Bi 71.38–79.15, S 8.92–14.00, sum 99.62–100.60 wt%, corresponding closely to Bi_5AuS_4 (three analyses) and Bi_3AuS_5 (one analysis). The ideal formula is therefore yet to be determined precisely. The mineral occurs as tiny (up to 50 μm) anhedral grains interstitial to native Bi and joseite-B. These, in turn, are accessory phases in mineralized quartz veins that cut granitoid intrusions in northeastern Yakut. Associated ore minerals include chalcopyrite, sphalerite, pyrrhotite, and galena, and traces of tetradymite, hedleyite, and maldonite are also present. In reflected light the mineral is gray and isotropic. **D.A.V.**

Arsenic analogue of tvalchrelidzeite

L. Ya. Krapiva, V.I. Stepanov, G.N. Nechelystov, V. Yu. Bolgin (1986) New data on tvalchrelidzeite $Hg_{12}(As,Sb)_8S_{12}$. Doklady Akad. Nauk SSR, 290, 1208–1212 (in Russian).

Tvalchreldzeite, first described as occurring in the Gomi ore deposit, North Georgia, was reported subsequently from the Tyute antimony-mercury deposit, Gornyi Alti, and also occurs in the Chauvai deposit, southwestern Kirghizia. Two electron-microprobe analyses of tvalchreldzeite from the Chauvai deposit, and another from the original Gomi locality gave, respectively, Hg 66.4, 66.3, 67.7, As 8.4, 8.7, 8.5, Sb 14.0, 13.8, 13.7, S 10.9, 10.9, 11.0, total 99.7, 99.7, 100.9 wt%, corresponding to $Hg_{2.915}(Sb_{1.013}As_{0.987})S_{2.993}$, $Hg_{2.88}(As_{1.012}Sb_{0.988})S_{2.963}$, and $Hg_{2.987}(Sb_{1.004}As_{0.996})S_{3.036}$. Physical and optical properties are similar to those described for tvalchrelidzeite [*Am. Mineral.*, 62, 174, 1977]; reflectance percentages for samples from Gomi and Chauvai are given in 20-nm steps. Based on previous data by Pobedimskaya and Kaplunnik for tvalchrelidzeite (*Sulfosalts, Platinum Minerals and Ore Microscopy*; Nauka, Moscow, 49–58, 1980), the unit cell is triclinic, $P1$, $a = 4.391$, $b = 11.573$, $c = 15.667$ Å, $\alpha = 88.17$, $\beta = 90.01$, $\gamma = 89.98°$, Z = 4.

Discussion. Tvalchrelidzeite originally was described as monoclinic and of composition $Hg_{12}(Sb,As)_8S_{15}$ with Sb > As. The crystal-structure study by Pobedimskaya and Kaplunnik led to the revised symmetry and a formula $Hg_{10}(Sb,As)_8S_{16}$ (no other data are given in the reference cited, but an abstract by the same authors and N.V. Belov appeared in the *4th European Crystallographic Meeting,* Oxford, England, p. 103, 1977). The new analyses, which indicate a formula $Hg_{12}(Sb,As)_8S_{12}$, show both Sb > As and As > Sb, but the ratio for the latter is so close to 1:1 that the authors consider a new name for the As analogue to be premature. **J.L.J.**

$(Cu,Ag)_{3-x}(Bi,Pb)_{7+x}(S,Se)_{12}$ and $Bi_3(Se,S)_2$

V.A. Kovalenker (1986) Typomorphic minerals of ores of shallow gold-silver deposits of Upper Paleozoic volcanic areas of Middle Asia. *In* Metasomatism, mineralogy, and problems of genesis of gold and silver deposits in volcanic strata, 111–145, Nauka, Moscow (in Russian).

Associated with hodrushite and cupropavonite are 20–30 μm aggregates whose optical properties differ somewhat from those of cupropavonite. Electron-microprobe analysis gave Cu 4.92, Ag 4.45, Pb 1.93, Bi 66.78, Sb 0.37, As 0.62, Se 4.49, S 15.69, sum 99.25 wt%, corresponding to $(Cu_{1.69}Ag_{0.90})_{\Sigma 2.58}(Bi_{6.98}Pb_{0.20}Sb_{0.07}As_{0.18})_{\Sigma 7.43}(S_{10.70}Se_{1.24})_{\Sigma 11.94}$ for 22 atoms. The simplified formula is $(Cu,Ag)_{3-x}(Bi,Pb)_{7+x}(S,Se)_{12}$, possibly the Cu analogue of benjaminite.

In ore deposits of the gold-silver-polysulfide-barite-quartz-carbonate type, the upper parts are enriched in Se relative to Te because of the presence of laitakarite and a sulfoselenide of bismuth. Three analyses of the latter gave Bi 77.50, 83.88, 75.49, Cu 0.71,—, 3.20, Pb 0.60, —, 1.67, Se 18.10, 13.10, 17.72, S 1.33, 3.90, 1.51, As 0.66, 1.55, —, sums 98.90, 101.43, 99.59 wt%, corresponding to $(Bi_{2.80}Cu_{0.09}Pb_{0.02})_{\Sigma 2.91}(Se_{1.72}S_{0.31}As_{0.06})_{\Sigma 2.09}$, $Bi_{2.81}(Se_{1.18}S_{0.86}As_{0.15})_{\Sigma 2.19}$, and $(Bi_{2.61}Cu_{0.36}Pb_{0.06})_{\Sigma 2.03}(Se_{1.63}S_{0.34})_{\Sigma 1.97}$, respectively. The simplified formula is $Bi_3(Se,S)_2$.

Discussion. Much more data are needed to substantiate the validity of these as distinct minerals. Synthesis of the Cu analogue of benjaminite is reported in *Econ. Geol.*, 83, 405–418 (1988); also reported are substitutions of Ag and Pb in synthetic $Cu_3Bi_5S_9$ that give compositions close to those of the supposed benjaminite-type mineral. **J.L.J.**

$Ag_2Pb_{13.5}Bi_9S_{28}$

K. Tsunoda, M. Shimizu (1986) Mode of occurrence and chemical composition of ore minerals from the Otome mine, Yamanaski Prefecture, Japan. Mem. Fac. Lib. Arts Educ., Part 2 (Yamanaski Univ.), 37, 74–81 (in Japanese, English abstract).

Quartz veins at the Otome mine contain various sulfides, including cosalite and an unidentified sulfosalt for which one of seven similar electron-microprobe analyses gave Pb 49.70, Ag 3.87, Fe 0.04, Bi 30.11, Sb 0.51, S 15.79, sum 100.02 wt%, corresponding to $(Ag_{2.04}Fe_{0.04})_{\Sigma 2.08}Pb_{13.60}(Bi_{8.17}Sb_{0.4})_{\Sigma 8.41}S_{27.92}$. The general formula is $\sim Ag_2Pb_{13.5}Bi_9S_{28}$.

Discussion. The general formula reduces to $Ag_{0.44}Pb_3Bi_2S_{5.78}$, similar to that of xilingalite, $Pb_{3+x}Bi_{2-(2/3)x}S_6$ (*Am. Mineral.*, 69, 409, 1984); without supporting X-ray diffraction data, however, detailed comparisons are not possible. **J.L.J.**

"Mineral MK"

A.N. Nekrasova, M.M. Botova, S.M. Sandomirskaya, D.I. Troitskii (1986) Chemical composition of lead and silver sulfoantimonides from tin-silver deposits of the eastern U.S.S.R. Novye Dannye Mineral., 33, 140–143 (in Russian).

Analysis of the mineral by electron microprobe gave Ag 4.66, Cu 0.95, Pb 41.95, Sb 32.00, S 20.40, sum 99.96 wt%, corresponding to $Cu_{0.89}Ag_{2.74}Pb_{12.90}Sb_{16.70}S_{40.64}$, or ideally $CuAg_3Pb_{13}Sb_{17}S_{40}$. The mineral forms irregular and platy grains (up to 0.02 mm) associated with freibergite, miargyrite, andorite, and fizelyite, within tin-silver ore deposits. The ores are part of quartz-cemented breccias hosted by dacite and porphyritic granodiorite intrusions.

Discussion. The simplified formula is $(Pb_{1.63}Ag_{0.33}Cu_{0.11})_{\Sigma 2.07}Sb_{2.09}S_{5.08}$, close to the Sb analogue of "cuprocosalite" (*Am. Mineral.*, 70, 880, 1985); without supporting X-ray data, however, no distinctions are possible. **D.A.V.**

Se analogue of miargyrite

I. Ya. Nekrasov, S. Ye. Lunin (1987) Formation conditions of silver sulfides, selenides, and sulfoselenides in the system Ag-Sb-S-Se, determined experimentally. Mineral. Zhurnal, 9(1), 25–39 (in Russian).

Five electron-microprobe analyses of natural miargyrite from silver sulfoantimonide deposits of the eastern and northeastern USSR gave Se compositions of 1.48, 3.0, 6.3, 9.9, and 30.0 wt%. The most Se-rich analysis gave Ag 30.6, Sb 33.1, S 6.3, Se 30.0, sum 100.1 wt%, corresponding to $Ag_{1.00}Sb_{0.96}(S_{0.69}Se_{1.34})_{\Sigma 2.03}$ on the basis of four atoms. No further details were given for the natural material.

Synthetic miargyrite was prepared hydrothermally at temperatures between 300 and 400 °C. The maximum amount of Se observed in the low-temperature α-miargyrite (monoclinic) is 6.91 wt%. X-ray diffraction lines for this phase are very close to those of Se-free miargyrite. The high-temperature polymorph β-miargyrite (cubic) forms an apparent complete solid solution with its Se analogue, cubic $AgSbSe_2$. The effect of Se on the α–β phase transition is to lower the temperature; thus, the Se-free compound undergoes phase transformation at 380 °C, but the α-miargyrite bearing 6.9 wt% Se transforms to β-miargyrite on heating at 300 °C. **D.A.V.**

Unnamed Ti-Al-Zr oxide

V.I. Tatarintsev, S.M. Sandomirskaya, S.N. Tsymbal (1987) Discovery of titanium nitride (osbornite) in terrestrial rocks. Doklady Akad. Nauk SSR, 296(6), 1458–1461 (in Russian).

Analysis by electron microprobe (one of three) gave Al_2O_3 19.50, ZrO_2 19.17, TiO_2 52.94, CaO 0.99, Y_2O_3 2.18, La_2O_3 0.23, Ce_2O_3 0.43, P_2O_5 4.01, SiO_2 0.85, sum 100.30 wt%, corresponding to $(Al_{0.88}Ti^{3+}_{0.50}Zr_{0.35}P_{0.14}Si_{0.03}Ca_{0.04}Y_{0.04}(La + Ce)_{0.01})_{\Sigma 1.99}Ti_{1.01}O_5$. This formula is based on five oxygen atoms and a TiO_2–Ti_2O_3 distribution for pseudobrookite-type stoichiometry ($M^{3+}_2M^{+4}O_5$). The mineral occurs as tiny (to 40 μm) grains in polymineralic inclusions in corundum, associated with native iron, iron silicide, perovskite, and osbornite. The provenance of the corundum grain, from a Quaternary loam, is unknown but may be a nearby ultramafic breccia pipe that contains corundum, native iron, armalcolite, ulvöspinel, manganese silicide, iron carbide, etc. The mineral is gray, opaque, and without internal reflection and has reflectance values (nm,R'_1) of 440, 13.6; 590, 12.9; 700, 13.2. **D.A.V.**

Cr-bearing alumohydrocalcite

G.R. Kapustkin, A.V. Sivtsov (1987) Mineralized plant roots in a paleosol on ultramafic rocks. Izvest. Akad. Nauk, Geol. Ser., 5, 127–132 (in Russian, English translation available).

Molds of plant roots in a lateritic paleosol at the contact between ultramafic rocks and amphibolites near the Rozhdestvenskoye ore deposit, Kempirsay District, Kazakhstan, USSR, contain concentric zones of manganese oxides, clay minerals, quartz, chalcedony, and an alumohydrocalcite-type mineral, the last in the inner parts of the roots as porous, reddish masses consisting of fibrous aggregates and isolated crystallites up to 30 μm in size. The mineral is strongly pleochroic from deep to pale pink. Chemical analysis (method unstated) gave Cr_2O_3 >20 wt%, Al_2O_3 <1 wt%, and Sc_2O_3 0.28 wt% (by neutron-activation analysis).

Discussion. Possibly the Cr analogue of alumohydrocalcite, but more data are essential. The method of identification of the mineral as "chromian alumohydrocalcite" is not given, but electron-diffraction patterns are shown for some of the associated manganese oxides. **J.L.J.**

New Data

Drugmanite

G.S.D. King, L. Sengier-Roberts (1988) Drugmanite, $Pb(Fe_{0.78}Al_{0.22})H(PO_4)_2(OH)_2$: Its crystal structure and place in the datolite group. Bull. Minéral., 111, 431–437.

Crystal-structure study of drugmanite showed it to have the above formula and to be in the datolite-gadolinite group. **J.L.J.**

Germanite

E.M. Spiridonov (1987) On the composition of germanite. Doklady Akad. Nauk SSR, 295(2), 477–481 (in Russian).

Thirty new electron-microprobe analyses of germanite from Tsumeb, Namibia, gave (average) Cu 45.06, Fe 8.14, Zn 1.51, Ge 9.61, Ga 0.25, As 2.97, Mo 0.26, W 0.33, V 0.12, S 31.96, sum 100.21 wt%. Recalculation based on 66 atoms, consistent with the approved formulae of germanite and closely related colusite, gave $(Cu_{22.74}Fe_{4.68}Zn_{0.74})_{\Sigma 28.16}(Ge_{4.25}Ga_{0.12}As_{1.27}Mo_{0.09}W_{0.06}V_{0.08})_{\Sigma 5.87}S_{31.97}$. The author proposes that if Fe^{3+} in germanite occupies a site analogous to V^{3+} in colusite, then the ideal formula for germanite should be written $Cu^{+}_{20}(Cu^{2+},Fe^{2+},Zn)_6Fe^{3+}_2Ge^{4+}_6S^{2-}_{32}$. **D.A.V.**

Rostite

V. Žáček, P. Povondra (1988) New mineralogical data for rostite from Libušín, Central Bohemia, Czechoslovakia. Neues Jahrb. Mineral. Mon., 476–480.

Rostite from the type locality at Libušín near Kladno, Central Bohemia, Czechoslovakia, occurs as white, chalky nodules, 1 to 8 cm in diameter, consisting of well-formed crystals 0.01 to 0.05 mm long and 0.002 to 0.006 mm thick. X-ray powder data, cell dimensions, and optical properties are in good agreement with data for rostite from other localities. Wet-chemical analysis, after deduction of 12.36% impurities consisting of gypsum [$CaSO_4 \cdot 2H_2O$] and tschermigite [$(NH_4)Al(SO_4)_2 \cdot 12H_2O$], gave Al_2O_3 20.83, Fe_2O_3 0.53, CaO 0.36, MgO 0.02, NH_3 0.48, SO_3 33.49, H_2O 41.51, F_2 4.25, insol. 0.3, O ≡ F 1.79, sum 100.09 wt%, corresponding to the ideal formula $Al(SO_4)(OH,F) \cdot 5H_2O$ with OH slightly exceeding F. An analysis of rostite from Cetine di Cotorniano, Tuscany, Italy (C. Sabelli, *Periodico Mineral.*, 53, 53–65, 1984) also shows OH > F.

Discussion. In a recent review (*Am. Mineral.*, 73, 1499, 1988) the IMA concluded that type rostite, for which F had not been determined, is the same mineral as khademite (*Am. Mineral.*, 66, 1102, 1981); khademite was assigned the ideal formula $Al(SO_4)F \cdot 5H_2O$, and rostite, supposedly $Al(SO_4)(OH) \cdot 5H_2O$, was discredited. Although the analysis of the mineral from Czechoslovakia is not incontrovertible because of the high impurity content, the data reported by Sabelli (1984) also suggest that the mineral with OH > F exists.

Also reported as associated minerals at the Czechoslovakian locality, but without data, are hexagonal $NH_4Al(SO_4)_2$, cubic $(NH_4)_2Mg_2(SO_4)_3$, and trigonal $NH_4Al_3(SO_4)_2(OH)_6$. **J.L.J.**