ARAPOVITE

A.A. Agakhanov, Pautov, L.A., Uvarova, Y.A., Sokolova, E.V., Hawthorne, F.C., Karpenko, Y.Yu., Dusmatov, Y.D., Semenov, E.I. (2004) Arapovite, (U,Th)(Ca,Na)2(K1-x\(\square\)(K0.85Th0.36Pb0.03Ce0.03Nd0.03La0.01Sm0.01Eu0.01Dy0.01)\(\square\)Si₈O₂₀·H₂O—New mineral. New Data Mineral. M., 39, 14–19.

Y.A.Uvarova, E. Sokolova, F.C. Hawthorne, A.A. Agakhanov, L.A Pautov (2004) The crystal structure of arapovite, U⁣⁺⁺(Ca,Na)₂(K₁-x\(\square\))(Si₈O₂₀)\(\square\)Si₈O₂₀·H₂O based on 8 Si atoms. The ideal topology of the structure is identical to that of both turkestanite and steacyite and consists of four-membered double rings of SiO₄ tetrahedra in the form [Si₈O₂₀]. Eight coordinated A and B polyhedra share edges to form (001) sheets that are connected through [SiO₃] groups to form a framework.

Arapovite was found in the moraine of the Dara-i-Pioz glacier, Alai mountain ridge, Tien Shan mountains, Garm region, northern Tajikistan. It is associated with microcline and subordinate aegirine, poly lithionite, stillwellite and turkestanite, and has been replaced by sogdianite and zektzerite. Accessory minerals in this rock include albite, hyalotekite, pyrochlore, quartz and tadhzikite-group minerals. The mineral is named for Yu. A. Arapov (1907–1988), a famous geologist and author of many works on the geochemistry, mineralogy and petrology of Middle Asia. Type material has been deposited at the Fersman Mineralogical Museum, Moscow, Russia.

CADMOINDITE


Cadmoindite, the cadmium analogue of indite, has been found in high-temperature fumarolic crusts of the Kudriavy stratovolcano on the northernmost part of Iturup Isle in the southern Kurile Islands. The crusts consist of an upper oxidized zone and a lower sulfide zone; cadmoindite is found in the lower zone. The mineral is inferred to have formed as a replacement of indium and cadmium chlorides with decreasing fumarolic gas temperature. It occurs as well-formed, sharp, octahedral crystals to 0.15 mm showing characteristic stepped growths, in druses of indium and cadmium chlorides with decreasing fumarolic gas temperature. It occurs as well-formed, sharp, octahedral crystals to 0.15 mm showing characteristic stepped growths, in druses
21.0), (640, 20.3), (700, 19.8). Conchoidal fracture; \(VHN_{206}\) 206 kg/mm²; \(D_{\text{ex}}\) 4.864 g/cm³. Electron microprobe analyses gave (mean [range]): Cd 19.98 [18.86–21.31], In 49.51 [48.33–50.45], S 27.53 [27.11–27.94], Fe 1.71 [1.01–2.42], Zn 0.77 [0.23–1.26], Ge 0.29 [0.00–1.19], Se 0.04 [0.00–0.08] wt%, giving the empirical formula \((\text{Cd}_{0.82}\text{Fe}_{0.14}\text{Zn}_{0.05})\text{In}_{1.99}\text{Ge}_{0.02}\text{S}_{3.08}\), or ideally \(\text{CdIn}_{2}\text{S}_4\). X-ray powder diffraction study with a 57.3 mm Debye camera gave \(\theta\) 844, 771, 695sh, 687, 587w, 577, 560, 533, 444w, and 419w cm⁻¹. The strongest reflections in the powder diffraction pattern (DRON MM-1, Co \(K\alpha\), \(\alpha\) = 1.586(2), \(\gamma\) = 1.573(2), \(\beta\) = 1.586(2), \(\gamma\) = 1.626(2), 2\(V_{\text{meas}}\) = 60(2)°, 2\(V_{\text{calc}}\) = 59°23', medium dispersion, \(r > v, X = c, Y = B, Z = a\) = 8°.

Wet chemical analyses of the mineral gave \(\text{Na}_2\text{O} 0.05, \text{K}_2\text{O} 0.07, \text{MgO} 0.56, \text{MnO} 0.02, \text{FeO} 0.20, \text{Al}_2\text{O}_3 0.03, \text{SiO}_2 0.20, \text{B}_2\text{O}_3 55.44, \text{Cl} 0.21, \text{H}_2\text{O} 13.36, \text{O} = \text{Cl} – 0.05, \text{sum} 100.10\) wt%, corresponding to \(\text{Ca}_{1.00}(\text{B}_{2.99}\text{Si}_{0.01})\text{O}_{4.125}(\text{OH})_{2.79}\text{Cl}_{0.01}\), based on three B+Si atoms pfu. The ideal formula for \(\text{jarandolite}\) is \(\text{Ca}(\text{B}_2\text{O}_5\text{OH})\). \(D_{\text{meas}}\) = 2.49 g/cm³, \(D_{\text{calc}}\) = 2.57 g/cm³, \(Z = 4\). The IR spectrum of \(\text{jarandolite}\) is characterized by the following bands (s = strong, w = weak, sh = shoulder): 3350s, 3115, 2980, 1447, 1402s 1369, 1300s, 898s, 867s, 810, 795s, 756, 695s, 687, 587w, 577, 560, 533, 444w, and 419w cm⁻¹. Absorption bands in the range 850–1050 cm⁻¹ and 1220–1450 cm⁻¹ correspond to stretching vibrations of the B-O bonds in the \(\text{BO}_3\) and \(\text{BO}_4\) groups, respectively. Absorption bands at 2980, 3115, and 3550 cm⁻¹ have been attributed to O–H vibrations in the two OH groups and OH substitution for Cl. Thermal and DTG/DTA analysis of \(\text{jarandolite}\) indicate that a 15% mass loss occurs at temperatures between 440 and 485 °C, close to the \(\text{H}_2\text{O}\) content determined by chemical analysis (13.36 wt%). The melting point of \(\text{jarandolite}\) is 820 °C.

The crystal structure of \(\text{jarandolite}\) was solved by direct methods and refined (Laue swing method and Syntax diffractometer) to \(R_e = 0.035\). It is monoclinic, \(P2_1/a\), \(a = 8.386(3), b = 8.142(4), c = 7.249(3)\) Å, \(\beta = 98.33(3)^\circ\), \(V = 489.7\) Å³. The strongest lines on the powder diffraction pattern (DRON MM-1, Co \(K\alpha\) radiation, 38 lines given) include 4.32(57,111), 3.39(100,201), 3.13(50,211), 2.93(23,202), 2.606(25,221), 2.560(17,311), 2.287(19,320), and 1.849(25,321,420). \(\text{Jarandolite}\) is structurally and chemically similar to Colemanite, \(\text{Ca}(\text{B}_2\text{O}_5\text{OH})_2\) \(\text{H}_2\text{O}\). Details concerning the structure can be found in Yamnova et al. [Kristallografiya (1938) 33, 71–76].

\(\text{Jarandolite}\) was found in the mixed volcanic-sedimentary deposits of Pobrđjski Potok and Piskanja in the Jarandol lacustrine
basin (Miocene), 280 km south from Belgrade, Serbia. Magnesite deposits containing both borate and coal layers alternate with tuffaceous rocks, clays, and marls. The borate deposits occur predominantly in the tuffaceous deposits and have thicknesses from 1 to 12 m (average 4 m). Associated minerals include colemanite, howlite, lúneburgite, montmorillonite, pentahydroborite, searlesite, studenitsite, ulexite, and veatchite. The mineral is named for the locality, the Jarandol basin. Type material has been deposited in the Fersman Mineralogical Museum, Moscow, Russia (catalog no. 1538/1).

Discussion: The first data on jarandolite was published at an earlier date [Stojanovic' 1992; Conf. Serbian Crystallogr. Soc. Abstracts L, 32–33; Stojanovic' et al. 1993; Conf. Yugoslav Mineral. Assoc.] under the tentative name "srbianite". Structural data was published by Yammova [Kristallografiia (1993) 38, 71–76] prior to approval by the IMA CNMNN. P.C.P.

PAARITE*, SALZBURGITE*


Paarite Cu1.7Pb1.7Bi6.3S12 and salzburgerite Cu1.6Pb1.6Bi6.4S12, are two new Cu–Pb–Bi sulfosalts, found in quartz veins of the Felbertal scheelite deposit, Hohe Tauern, about 10 km south of the town of Mittersill, Salzburg province, Austria. Abstracts for paarite and for salzburgerite (as an unnamed species) were given previously (Am. Mineral., 89, 1831; Am. Mineral., 86, 199; respectively), based on reports of their crystal structures (Makovicky et al. 2001, Can. Mineral., 39, 1377–1382; Topa et al. 2000, Can. Mineral., 38, 611–616). For comparative purposes, further data are given here.

Paarite is brittle, VHN0.1 = 204 (range 170–228) kg/mm2, VHN100 = 246 (range 195–286) kg/mm2, Hcalc 3.3–3.6, opaque, light grey, streak not given, metallic luster, with perfect {0k0} cleavage and an uneven fracture. It is white in reflected light with a creamy tint, bireflectance perceptible in air and moderate in oil, weakly pleochroic white to creamy white, no internal reflections, distinctly anisotropic. An average of electron microprobe analyses from 12 samples gave Cu 4.90, Fe 0.02, Pb 16.45, Bi 60.74, S 17.8, sum 99.95 wt%, (corresponding on the basis of Bi + [(Pb + Fe + Cu)/2] = 8) to Cu1.7Fe0.08Pb1.7Bi6.3S12 (ideally Cu1.7Pb1.7Bi6.3S12). Reflectance values of paarite (in air, WITC standard) are (Rr–Rg) 39.15–48.36 (470 nm), 38.26–47.65 (546 nm), 37.23–47.14 (589 nm), and 36.55–45.71 (650 nm). Dcalc = 6.942 for the empirical formula, 6.925 g/cm3 for the ideal formula and Z = 4. Single-crystal X-ray structure study (R = 0.0467) showed the mineral to be a 44.8 Å derivative of the bismuthinite-aikinite series: orthorhombic, space group Pmc21, cell dimension and angles a = 4.0074(9), b = 48.81(1), c = 11.513(3) Å, V = 2067(1) Å3. Powder diffraction data were calculated from the structure using Powder Cell 2.3 (λ = CuKα), strongest lines [d in Å (Ihkl)] are 4.015 (57.3,082), 3.631 (100,043), 3.586 (55.3,141), 3.552 (85.8,012.1), 3.156 (56.9,142), 3.136 (92.9,181), 2.836 (93.5,182), 2.658 (36.7,121.1), 2.560 (42.9,084), 2.004 (37.2,200). The most closely related species are paarite, lindströmite CuPbBi3S6, krupkaite CuPbBi3S6, and gladite CuPbBi3S6.

It is emphasized that the small differences in composition between paarite and salzburgerite are real, and correspond to differences in their structures. They are superstructures of the bismuthinite–aikinite series with a periodicity of order equal to a fivefold, and fourfold multiple, respectively, of the bismuthinite substructure motif. The structure determinations show that paarite and salzburgerite cannot be reduced to the integer formulae hitherto assumed for all members of the bismuthinite–aikinite series. In particular, salzburgerite appears to require a set of partly occupied Cu sites for its stability.

Paarite and salzburgerite occur as rare elongate crystals up to 0.2 and 0.3 mm in length, respectively, in columnar aggregates, and as exsolution lamellae formed by the decomposition of intermediate compositions of the bismuthinite-aikinite series. The intergrowths include krupkaite-paarite, gladite-paarite, krupkaite-salzburgerite, and gladite-salzburgerite. The minerals are hosted in quartz and associated with: other sulfosalts in the range gladite-krupkaite, the gustavite-lillianite solid solution, pavonite and makovickyite, traces of cosalite, cannizzarite, tetradymite, native Bi, chalcopyrite, and pyrite. Paarite is named after Werner Hermann Paar (b.1942), Professor of Mineralogy at the University of Salzburg, for his contributions to ore mineralogy. Salzburgerite is named after the province of Salzburg in the Republic of Austria, in which the Felbertal deposit is located. Holotype samples have been deposited at the Geological Museum of the University of Copenhagen (Denmark) and in the reference collection of the Mineralogical Institute, University of Salzburg.

Discussion. A possible additional occurrence of a paarite- or salzburgerite-type mineral is described by Förster et al. 2005 (Can. Mineral., 43, 899–908), and is abstracted here under Watkinsonite, Nevskite, Bohdanowiczite, CuBiSe4, CuPbBi3S6 A.J.L.
ROUXELITE*  


Rouxelite, Cu₂HgPb₂Sb₂S₆₄(O,S)₂, is a new species of sulfosalts discovered in the Buca della Vena Fe–Ba deposit, near the village of Ponte Stazzemese, Apuan Alps, Italy. The mineral occurs as very rare acicular crystals up to 2 mm long, elongated and striated parallel to [010]. The crystals are black with metallic luster, with the following properties not given due to the size and scarcity of the material: tenacity, microhardness, H, opacity, streak, and fracture; cleavage was not observed. Light grey in reflected light, weak bireflectance, distinctly anisotropic without polarization tints. The average of six electron microprobe analyses gave Cu 1.34, Hg 1.76, Pb 31.50, S 20.07, without polarization tints. The average of six electron microprobe analyses gave Cu 1.34, Hg 1.76, Pb 45.08, S 31.50, S 20.07, corresponding to Cu₂.20Hg0.92Pb₂2.78Sb₂7.10S₆₅.₅₃ for 53 cations, ideally Cu₂HgPb₂2Sb₂₈S₆₄(O,S)₂. Reflectance values of randomly oriented rouxelite (in air, NPL 50 SIC standard) are 38.2 (470 nm), 36.4 (546 nm), 35.4 (589 nm), and 32.8 (650 nm). D₂₉ = 5.92 for the empirical formula from the mean of the electron microprobe results, 5.86 g/cm³ for the ideal formula (with S 64.67 and O 1.33 atoms pfu) and calc = 5.92 for the empirical formula.

ROUXELITE occurs in small veinlets that cross-cut dolomitic lenses interstratified in Ba and Fe-oxide ore, and is closely associated with bouroninite, as well as tetrahedrite and sphalerite. A second occurrence has been noted from the antimony deposit associated with bournonite, as well as tetrahedrite and sphalerite. The structure refinement is of low precision. A.J.L.

TERLINGUACREEKITE*  


Terlinguacreekite is found as millimeter-sized, anhedral, dark orange to reddish crystalline crusts. Most crusts have no discernible crystal form, but rare crystal aggregates up to 0.5 mm are found. The crystals are up to 0.2 mm in length, subhedral, acicular to prismatic, elongation [001] with a maximum length-width ratio of 4:1. Terlinguacreekite is brittle with an uneven fracture, no observable cleavage, and non-fluorescent. The mineral is vitreous, transparent, and has a yellow streak. The hardness could not be properly determined owing to the small crystal size, but the mineral is relatively soft. Electron microprobe analyses of terlinguacreekite (average of 8 analyses) gave HgO 92.03, Cl 9.54, Br 1.22, sum 102.79, less O = Cl + Br 2.28, sum 100.51 wt%, corresponding to Hg₂⁺O₂(Cl₃Br₂)Cl₂ based on O + Cl + Br = 4. The ideal formula is Hg₃⁺O₂Cl₂. Terlinguacreekite is bluish grey in plane-polarized light, weakly birefringent, and non-pleochroic. In crossed-polars, it is anisotropic and shows yellowish orange internal reflections. Reflectance percentages for Rmin and Rmax are 15.4, 16.5 (470 nm), 14.5, 15.6 (546 nm), 14.3, 15.4 (589 nm), and 14.2, 15.6 (650 nm), respectively.

According to the work done by X-ray precession methods, terlinguacreekite is orthorhombic, Imam, Imcm, Ima₂, or I2cm, a = 6.73(3), b = 25.528(10), c = 5.533(2) Å, V = 951.6(6) Å³, Z = 8, Dcalc = 9.899 g/cm³. The strongest lines on the powder X-ray diffraction pattern (114.6 mm Debeye-Scherrer camera, CuKα radiation, 54 lines) include 12.764(20,020), 5.413(30,011), 5.277(20,130), 4.629(15,031), 4.063(80,121), 3.376(15,200), 3.201(50,080), 3.023(50,161), 2.983(60,240), 2.858(30,211), 2.765(50,002), 2.726(20,231), 2.518(100,091,251), 2.447 (15,132), 2.259(15,271), 2.191(20,111,0), 2.090(20,082), 2.026(30,242), 1.869(15,361), 1.798(25,212,0), 1.684(20,400), 1.639(15,163), 1.606(15,214,0), 1.542(25,093,253), 1.507 (20,212,2), 1.450(15,017,1), 1.438(15,402), 1.402(20,491). Terlinguacreekite has no direct relation with any of the other six Hg-O-Cl bearing phases found in nature or any other inorganic phase listed in the Powder Diffraction File (PDF). Two other polymorphs of Hg³⁺O₂Cl₂ are known, but their X-ray powder patterns differ from terlinguacreekite.

The mineral was found as a thin orange crust on massive calcite in an isolated area (approximately 1 x 0.5 m) within the lower level of the Perry pit, Mariposa mine, Terlingua mining district, Brewster county, Texas, U.S.A. It is also found at the McDermitt mine where it is associated with kleinite and calomel in silicified volcanic rocks and sediments. Terlinguacreekite is thought to form at the expense of primary cinnabar and native mercury. The mineral is named after the Terlingua Creek, which flows in the Terlingua mining district in Texas. The holotype material has been deposited in the Systematic Reference Series of the National Mineral Collection at the Geological Survey of Canada (catalog no. MNC68100). The polished sections used for probe and reflectance analyses have been deposited at the Natural Museum of History, London, U.K. (catalog no. BM2004, 54).

Discussion. The authors are unable to solve the structure for the mineral at this time, despite several attempts. R.R.
ZERAVSHANITE*

Zeravshanite occurs as colourless, transparent single crystals 0.02 to 0.1 mm in size, or in aggregates of tubular crystals up to 0.2 mm. It is vitreous, not fluorescent in short- or long-wave UV light, has cleavage in one direction (not given), and a Mohs hardness of 6. It is biaxial negative, $\alpha = 1.585(2), \beta = 1.598(2), \gamma = 1.603(2), 2V_{\text{calc}} = -63^\circ$, medium dispersion $r > v$, negative elongation.

Electron microprobe analyses of the mineral (WDS, average of 18 analyses) gave SiO$_2$ 52.20, TiO$_2$ 0.043, ZrO$_2$ 16.41, SnO$_2$ 0.46, Fe$_2$O$_3$ 0.21, Na$_2$O 3.06, K$_2$O 0.09, Cs$_2$O 26.58, H$_2$O$_{\text{calc}}$ 1.74, sum 101.18 wt%, corresponding to $(\text{Cs}_9\text{Na}_{18}\text{K}_{100}\text{Sn}_{100}\text{Zr}_2\text{Fe}_{2.73}\text{Ti}_{0.19}\text{Fe}_{3+})\Sigma_4\text{Na}_{100}$ (Zr$_{2+}$)$_2\text{Fe}_{2+}^+\text{Sn}_{0.04}\text{Si}_{18}\text{O}_{45}(\text{H}_2\text{O})_2$ based on 18 Si atoms. The ideal formula of zeravshanite is Cs$_n$Na$_r$Zr$_t$[(Si$_{18}$O$_{45}$)(H$_2$O)$_2$], $D_{\text{calc}} = 3.09(5)$ g/cm$^3$, $D_{\text{rel}} = 3.17$ g/cm$^3$, $Z = 4$. The IR spectrum of the mineral has strong absorption bands at 1089, 1045, 978, 709, 662, 585, and 538 cm$^{-1}$ (no designations given).

The structure of zeravshanite was solved and refined using direct methods on a 0.200 mm crystal to $R_i = 0.028$ for 4508 reflections with $F_o > 4\sigma(F_o)$. The mineral is monoclinic, $C2/c, a = 26.3511(8), b = 7.5464(3), c = 22.9769(8) \AA, \beta = 107.237(1)^\circ, V = 4363.9(4) \text{Å}^3, \mu = 4.49$ mm$^{-1}$. The strongest lines in the powder X-ray diffraction pattern (114 mm RKD camera, FeK$_\alpha$ radiation, 36 lines given) include 6.32(50,402), 3.65(50,006), 3.35(100,712), 3.25(40,206), 3.14(90,2–24), 2.82(50,716), 2.62(70,026), 1.946(40,22.10), 1.891(40,2.2.4), and 1.865(40,538). The structure contains SiO$_4$ tetrahedra linked together to form [Si$_{18}$O$_{45}$]$^{18–}$ sheets parallel to (101), with 5- and 6-membered silicate rings. These sheets are linked together with cations (Cs, Na, K) located in the framework cages. This is the first occurrence of a [Si$_{18}$O$_{45}$]$^{18–}$ sheet in a mineral. The topology of the sheet is identical to what is observed in the [Si$_6$O$_{18}$]$^{6–}$ sheets of nekoite and okenite which can be considered as geometrical isomers.

Zeravshanite was discovered in the moraine of the Dara-i-Pioz glacier at the junction of the Zeravshan, Turkestan and Kuh-i-Pioz glaciers, Tajikistan. It is often found as an intergrowth with pectolite and an unnamed Cs-Ca-Si mineral. No speculation on the origins of the mineral is given, although the authors suggest that the rock is the quartz core of a pegmatite or a fragment of a silicate vein body. The mineral is named after the type locality (Zeravshan Range). Type material has been deposited at the Fersman Mineralogical Museum, Moscow, Russia. P.C.P.

NEW DATA

ALAMOSITE* (SYNTHETIC)

Gray, semi-transparent crystals of synthetic alamosite, PbSiO$_4$, to 0.1 mm, were prepared hydrothermally in a 17 h run at 220 °C. A single-crystal X-ray structure refinement ($R$ = 0.047, $wR$ = 0.089; 1201 observed $I > 2\sigma(I)$ reflections, MoK$_\alpha$ radiation) gave monoclinic symmetry, $P2_1/n$, $a = 11.209(1), b = 7.0410(8), c = 12.220(1) \AA, \beta = 113.010(2)^\circ, D_{\text{calc}} = 6.36$ g/cm$^3$. Each of the three crystallographically independent, six-coordinated Pb$^{2+}$ cations shows an asymmetric bonding environment consistent with the presence of a stereoactive lone pair of 6 electrons. Silicon-oxygen tetrahedra link to form zigzag [Si$_6$O$_{18}$] chains along [101] with a modulation amplitude of 6.2. The high periodicity and degree of zigzagging of the chains are related to shortened Pb$^{2+}$-O bonding in the Pb1 and Pb2 polyhedra that cross-link every first and fourth tetrahedron in the chain sequence, which is in turn related to the stereoactivity of the Pb$^{2+}$ cations. T.S.E.

BERNALITE*

Re-investigation of the symmetry of bernalite, Fe(OH)$_3$, using material from the type specimen, by synchrotron powder diffraction, showed that it is orthorhombic, space group $Pmmm$, with cell dimensions at ambient pressure $a = 7.6191(2), b = 7.6191(2), c = 7.5534(4) \AA, V = 438.48(3) \text{Å}^3, Z = 8, D_{\text{calc}} = 2.34$ g/cm$^3$. Bernalite had been considered previously to have space group $Ihmm$. It is noted that the unit cell is metrically tetragonal. Electron microprobe analyses (methods and data not given; 12 analyses on 3 grains) gave the composition for the cation site Fe$_{0.68}$[Al$_{0.32}$Si$_{0.68}$]Pb$_{0.12}$[Zn$_{0.08}$] in agreement with the literature. A.J.L.

CALCIUM TSCHERMAK’S COMPONENT OF CLINOPYROXENE, CaAl$_2$SiO$_6$
M.-L. Pascal, I. Katona, M. Fonteilles, J. Verkaeren (2005) Relics of high-temperature clinopyroxene on the join Di-CaTs with up to 72 mol% Ca(Al$_{0.6}$Fe$_{0.4}$)$_2$SiO$_6$ in the skarns of Ciclova and Magureaua Vâţei, Carpathians, Romania. Can. Mineral., 43, 857–881.

Electron microprobe analysis of clinopyroxene (one crystal, two compositions discussed, one composition reported) from a wollastonite endskarn gave SiO$_2$ 34.37, TiO$_2$ 0.22, Al$_2$O$_3$ 24.04, Cr$_2$O$_3$ 0.05, FeO$_{\text{tot}}$ 9.67, MnO 0.16, MgO 5.11, CaO 24.83, Na$_2$O 0.46, Mg$_2$O 0.21, Na$_2$O 3.06, K$_2$O 0.09, Cs$_2$O 26.58, H$_2$O$_{\text{calc}}$ 1.74, sum 101.18 wt%, corresponding to (Cs$^+_9$Na$_{18}$K$_{100}$Sn$_{100}$Zr$_2$Fe$_{2.73}$Ti$_{0.19}$Fe$_{3+}$)$_\Sigma_4$Na$_{100}$ (Zr$_{2+}$)$_2$Fe$_{2+}^+Sn_{0.04}$Si$_{18}$O$_{45}(\text{H}_2\text{O})_2$ based on 18 Si atoms. The ideal formula of zeravshanite is Cs$_n$Na$_r$Zr$_t$[(Si$_{18}$O$_{45}$)(H$_2$O)$_2$], $D_{\text{calc}} = 3.09(5)$ g/cm$^3$, $D_{\text{rel}} = 3.17$ g/cm$^3$, $Z = 4$. The IR spectrum of the mineral has strong absorption bands at 1089, 1045, 978, 709, 662, 585, and 538 cm$^{-1}$ (no designations given).
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0.08, sum 98.53 wt%, which corresponds (on the basis of 4 cations and 6 anions) to \((\text{Ca}_{16.06}\text{Na}_{3.00}\text{Fe}_{0.01})(\text{Al}_{0.37}\text{Fe}_{0.63}\text{Mg}_{0.03}\text{Mn}_{0.29} \text{Ti}_{1.00}\text{Mn}_{0.20}\text{Ti}_{1.00})\text{Si}_{10.86}(\text{Si}_{3.01}\text{Al}_{0.67}\text{O}_{14})\). These data are interpreted to represent the first natural occurrence of clinopyroxene in which the calcium Tschermark’s component is dominant. The endmember proportions are 37.8% CaTs, calcium Tschermark’s component, \(\text{CaAlSiO}_6\); 30.7% Ess, esseneite, \(\text{CaFe}^{3+}\text{AlSiO}_4\); 28.9% Di, diopside, \(\text{CaMgSi}_2\text{O}_6\); 0.6% CaTi, calcium-titanium Tschermark’s component, \(\text{CaTiAl}_2\text{O}_5\); 2.0% remainder, sum 100.0%. The analysis technically corresponds to a new mineral species, but it is stated that the crystal is too small to be extracted for a formal description of its properties, and it is provisionally referred to as “ferrian CaTs”. This nomenclature is in accord with the usage in the report of the IMA Subcommittee on Pyroxenes (Morimoto et al. 1988, Amer. Mineral., 73, 1123–1133). Esseneite, \(\text{CaFe}^{3+}\text{AlSiO}_4\), is the only approved pyroxene species whose endmember formula requires a Tschermark’s-type substitution. A.J.L.

**EPISTOLITE*, **MURMANITE*, **SHKATULKALITE**


Syntactic intergrowths of the heterophyllosilicates epistolite and murmanite, and epistolite with minor shkatulkalite (members of the mero-plesiotype bafertisite series) were investigated by transmission electron microscopy, X-ray single-crystal and powder diffraction methods. In conjunction with electron microprobe analyses, these results are consistent with the ideal formulae (Na, Fe, Mm)_3[(Na,Ti),(Nb,(O,H2O),Si,O_4][(OH,F)_2]-2H_2O for epistolite, and (Na, Fe, Mm)_3[(Na,Ti),(Ti,(O,H2O),Si,O_4][(OH,F)_2]-2H_2O for murmanite. The formula [(Na,Mn,Fe,Mm)_2(Nb,(O,H2O),Si,O_4][(OH,F)_2]-2H_2O is given for shkatulkalite. Syntax amongst these minerals is favored by the presence in epistolite, murmanite and shkatulkalite of common supercells. The widespread presence of syntax leads to the systematic overlap of diffraction spots belonging to different intergrown minerals, and gives rise to problems in the refinement of their structures (e.g., unusually short bond-lengths, substantial residual electron-density peaks, convergence at high R-values). It is emphasized that epistolite and murmanite are not isomorphic, but have topologically distinct structures that are closely related. A.J.L.

**GOSLARITE**


The structure of goslarite, ZnSO_4·7H_2O, orthorhombic, space group \(P2_12_12_1\), was determined through the combined investigation of deuterated synthetic material by neutron powder diffraction (\(R = 0.1266\), \(a = 11.8176(6)\), \(b = 12.0755(7)\), \(c = 6.8270(4)\), \(\bar{A} = 974.24(7)\) Å, \(Z = 4\), \(D_{calc} = 2.01 \text{ g/cm}^3\), and of synthetic material by X-ray single-crystal structure refinement (\(R = 0.0872\), \(a = 11.728(4)\), \(b = 11.973(4)\), \(c = 6.772(2)\) Å, \(V = 950.8(8)\) Å³, \(Z = 4\), \(D_{calc} = 2.01 \text{ g/cm}^3\). The data reveal the hydrogen bonding in the structure. Variations in the Zn-O bond lengths are attributed to the influence of the H bonds. Goslarite is isostructural with epsomite, MgSO_4·7H_2O, and morenoseite, NiSO_4·7H_2O, but not melanterite, FeSO_4·7H_2O. A.J.L.

**HOLTITE**


Holtite occurs in two varieties in granitic pegmatites, a paragenetically early one sometimes referred to as “holtite I” (\(\{\text{Sh,As}\}-poor\)) and a later one, “holtite II” (\(\{\text{Sh,As}\}\)-rich). Single-crystal X-ray structure refinement (\(R = 0.047\)) gives the formula of “holtite I” from a granitic pegmatite in the Voron’i Tundra, Kola Peninsula, Russia as \((\text{Si}_{3.12}\text{Sh}_{0.88}\text{As}_{0.12})\text{(Al}_{0.85}\text{Ti}_{0.15})\text{O}_{12}\)(BO_3)(OH,OH,\text{H}_2O)\text{O}(\text{OH,OH,}\text{H}_2O), in good agreement with previously published refinements of the crystal structure of holtite. An X-ray Rietveld refinement was also done on “holtite I”, giving \(R_p = 0.027, R_t = 0.029, S = 1.23, a = 6.8800(1)\), \(b = 11.884, c = 20.35(3)\) Å, space group \(P_{nma}\). Single-crystal structure refinement of “holtite II” (Kola Peninsula), was not successful, nor were attempts at a Rietveld refinement, but cell parameters \(a = 4.6875(1), b = 11.881, c = 20.418(9)\) Å were obtained from the Rietveld refinement. As compared to “holtite I”, extra diffraction maxima appear in the powder pattern of “holtite II”, and may be due to admixture with another mineral phase; however, the “instability” of its structure refinement may point to as-yet undefined structural differences.

**Discussion.** (1) The names “holtite I” and “holtite II” (“holtite-I” and “holtite-II” in earlier publications of one of the authors) are paragenetic-compositional varietal terms for holtite with *inferred* but not proven structural differences. Given that the varietal distinction is based upon amounts of antimony and arsenic *subordinate* to the silicon they replace, given the lack of any established structural difference between the two varieties, and given that this terminology has not been approved by the IMA, its continued use seems ill-advised, especially with its similarity to accepted terminology currently in use for some polymorphic *species* (e.g., dimorphite-I, dimorphite-II). (2) The positional and thermal parameters resulting from the Rietveld refinement of “holtite I” are not given. (3) Standard deviations on the \(b\) cell parameters from the Rietveld refinements were omitted in the original paper, not by this abstractor. T.S.E.

**HYDROROMARCHITE**


Hydromarchite, ideally \(\text{Sn}_4\text{O}_4(\text{OH},\text{H}_2\text{O})\), was identified by electron microprobe analysis. Analyses from eight grains yielded the compositional ranges (and average) \(\text{Sn} 80.35–84.78 (83.41), \text{Fe} 0.50–1.36 (0.79), \text{Zn} 0–1.17 (0.57), \text{S} 0–0.17 (0.04), \text{O} (\text{calculated}) 11.33–11.87 (11.61), \text{H}_2\text{O} (\text{assumed from ideal formula}) 4.27, \text{sum} 97.86–102.59 (100.68) \text{wt%}. The average corresponds (on the basis of 3 cations and neglecting S) to \((\text{Sn}_{0.95}\text{Fe}_{0.05}\text{Zn}_{0.04})_2\).
Hydroxymarshite occurs with pyrite, sphalerite, or siderite as coatings, spots, or crystals 5–50 μm across. It is found as part of an assemblage of siderite, pyrite, smithsonite, barite, and an unidentified Fe–Ca sulfate associated with the interstitial quartz-calcite gangue of massive sphalerite-pyrite ore at “Cantiere Speranza”, Corchia (Emilia Romagna), Italy. Hydroxymarshite has most often been described as a corrosion product of pewter. This is the first non-anthropogenic occurrence of hydroxymarshite. A.J.L.

NICKELALUMITE


Nickelalumite was found in carboniferous-siliceous vanadium-bearing schists of Kara-Chagyr and Kara-Tangi, Batkensk region, south Kirgizia (Kyrgyzstan). This is the second occurrence of the mineral world-wide. At Kara-Chagyr, nickelalumite was found in the dumps of an old mine working associated with other Ni and V minerals in quartz breccia within the carboniferous-siliceous schists. It has a variable V content which is reflected in the range of colors observed with V-free crystals being light blue and V-bearing to V-rich samples pistachio-green to dark green in color. It forms fibrous, radiating aggregates with fibers from 0.05 to 0.5 mm in length, and as crusts of solid spherulites up to 1.5 mm. Spherulites are often coated in ankinovichite and intercalated with allophane. At Kara-Tangi, V-free nickelalumite was found in the dumps near a mine adit. It occurs as a light blue crust composed of fibrous, radiating, lamellar aggregates up to 1.5 mm. Some of these aggregates have been replaced by allophane. Nickelalumite is biaxial negative, \( n_\alpha = 1.533(2), n_\beta = 1.524(2), n_\gamma = 1.524(2) \), with inclined extinction 40° relative to the crystal elongation. Electron microprobe analyses (EDS) were performed on a variety of samples with differing V and Zn contents. V-free (Kara-Chagyr, 597/24): NiO 12.07, ZnO 0.66, CuO 0.00, FeO 0.02, Al2O3 38.05, SiO2 0.77, SO3 14.45, V2O5 0.00, H2O 31.10, sum 97.12 wt%, corresponding to (Ni0.85Zn0.04)4(Al3.93Si0.07)(SO4)0.97(OH)11.95·3.12H2O. V-rich (Kara-Chagyr, 5360): NiO 10.03, ZnO 1.15, CuO 1.10, FeO 0.00, Al2O3 26.35, SiO2 1.08, SO3 11.99, V2O5 5.40, H2O 31.10, sum 98.20 wt%, corresponding to (Zn0.62Ni0.31Cu0.06Fe0.03)4(Al3.96Si0.04)(SO4)0.95(OH)11.95·3.15H2O. V-rich (Kara-Chagyr, 5379/24): NiO 12.07, ZnO 0.66, CuO 0.00, FeO 0.02, Al2O3 38.05, SiO2 0.77, SO3 14.45, V2O5 0.00, H2O 31.10, sum 99.06 wt%, corresponding to (Ni,Zn,Cu)(Al,Si)(SO4)0.95(OH)11.95·3.12H2O. V-rich (Kara-Chagyr, 5360): NiO 4.34, ZnO 9.45, CuO 0.95, FeO 0.41, Al2O3 37.85, SiO2 0.42, SO3 14.54, V2O5 0.00, H2O 31.10, sum 97.12 wt%, corresponding to (Ni0.73Zn0.08Cu0.08)4(Al3.90Si0.10)(SO4)0.95(OH)11.95·3.12H2O. All formulae have been calculated based on 4(Al + Si) atoms pfu. The ideal formula is (Ni,Zn,Cu)(Al)(SO4)0.95(OH)11.95·3.12H2O. Nickelalumite is associated with allophane, ankinovichite, tangeite, and tyuyamunite.

**Discussion:** Neither nickelalumite nor chalcoalumite are recognized mineral species; nickelalumite was rejected by the IMA CNMMN in 1980. P.C.P.

NIFONTOVITE*


The occurrence of nifontovite, Ca6B6O16(OH)12(H2O)2, at Charcas, San Luis Potosi, Mexico, the third locality worldwide, is discussed. A crystal drawing is presented, and indexed relative to the conventional setting of the unit cell. The crystals from Charcas are considered the world’s finest for the species. A.J.L.

PEZZOTTAITTE*


Fourier-transform infrared and Raman spectroscopy were performed on oriented samples of pezzottaite to investigate the speciation of water in the structural channels. Results were compared with red beryl and morganite. The FTIR spectrum of pezzottaite is characterized by a Si-O vibration band at 1039 cm−1, which are thought to be related to the high Cs contents in the channel. The polarized Raman spectrum of pezzottaite is characterized by bands at 1120 (Si-O) and 1096 (Si-O-Be) cm−1. P.C.P.

POTASSIC-CARPHOLITE*


The actual type locality of the recently described mineral species potassic-carpholite (abstracted in Am. Mineral., 89, 1831) is in the Fall Creek drainage, in the vicinity of Glens Peak, Boise County, Idaho. The correct type locality had been deliberately kept secret for 22 years by a collector because of the legal status...
of the area. This collector misattributed material to the Sawtooth batholith, near Centerville, Idaho. The authors who described potassic-carpholite (Tait et al. 2004, *Can. Mineral.*, 42, 121–124) were not aware of this deception. A.J.L.

**Srebrodolskite* (Brownmillerite*?), CaFe4O7, BaFe2O19**


Electron microprobe analysis of srebrodolskite (2 grains, averages of 18 and 4 analyses, respectively) gave SiO2 7.09, 8.57; TiO2 4.52, 11.69; Al2O3 2.78, 1.89; Fe2O3tot 40.39, 32.54; MnO 0.84, 0.66; MgO 0.16, 0.18; CaO 41.34, 41.44; sum 97.12 (97.11 listed), 96.97 wt%, which corresponds (assuming Fe3+ and on the basis of 12, 7, and 4 points, respectively) gave: SiO2 1.30, 7.69, 8.84; Fe2O3tot 1.83, 7.69, 8.84; MnO 0.01, 0.01; MgO 1.09, 1.09, 1.09; CaO 0.90, 1.11; K2O 0.13, 0.06; BaO 12.73, 12.08; sum 99.56 (99.57 listed), 95.54 wt%, which corresponds (assuming Fe3+ and on the basis of 19 anions) to: (Ba0.89Ca0.17K0.03)21.01[Fe10.29Ti5.92Al1.30Mg2.09Mn18.01]21.01O19 and (Ba0.89Ca0.17K0.03)21.11[Fe10.29Al1.30Mg2.09Mn18.01]21.01O19, respectively. Minor Zr was also detected but not quantified. Powder diffraction data are not given. The phase is interpreted to be equivalent to synthetic barium ferrite, BaFe2O3, and is most closely related to the barium members of the magnetoplumbite group: batiferite Ba[Fe5Fe3+3Ti2]2O19, haggertyite (Ba,K)[Ti3Fe2+Fe3+]2Mg2Si2O19, and hawthorneite [Ba,Cr3Ti3Fe3+]2Mg2Si2O19. This phase occurs as platy euhedral opaque crystals up to 100 μm in size, associated with CaFe4O7 in a Ca-Fe-rich buchite.

The authors report electron microprobe analyses of ten poorly identified phases with generally low analytical totals; powder diffraction data are not given for these materials. Phases I and II are compositionally equivalent to larnite CaSiO4 (total 96.40 wt%) and bredigite Ca2Mg(SiO4)2 (total 97.84 wt%), respectively. Phase VI is interpreted to possibly represent thamasnite Ca5SiO8(SO4)(OH)2·12H2O (SO4, 33.71; CO2, major, total 83.56 wt%), and phase VII may be scawtite Ca7Si6O18(OH)2·2H2O (CO2, major, total 70.30 wt%). The analytical data provided for the remaining six phases do not correspond to any known minerals, have low totals (67.2–89.2 wt%) and appear to consist mostly of silicates of Ca and/or Mg, and a single iron-rich phase.

**Discussion.** The buchite (a vitrified hornfels produced by intense thermal metamorphism) was formed by the fossil burning of a coal seam, and contains several compounds not yet formally described as minerals. According to the IMA-CNMMN, products resulting from combustion are not generally to be considered minerals, because of the possibility of human intervention as the cause of the combustion. However, the Phiocene-Pleistocene age of the fossil combustion event may warrant special consideration for this particular deposit. A.J.L.


Re-investigation of the structure of strontioginorite SrCa2Ba2O10(OH)5·5H2O by single-crystal X-ray methods (*R* = 0.024), showed that it is monoclinic, space group *P2*/1 (alternative setting of *P2*1/c), with cell dimensions *a* = 12.8171(4), *b* = 14.4576(4), *c* = 12.8008(4) Å, *β* = 101.327(1)°, *V* = 2325.82(2) Å³. The data reveal the hydrogen bonding in the structure. All of the hydrogen positions were located, and refined with fixed isotropic displacement parameters, but without constraints on the O-H distances. The (010) sheets of borate polyhedra are weakly cross-linked by Sr and Ca polyhedra. The H2O and OH groups strengthen the cross-linkage with hydrogen bonding. The fundamental building block (FBB) within the structure is 8*A*(1)[*q*]<–Δ2Δ*–*Δ2∞*–<Δ2∞*–<Δ2∞*[<Δ2∞*–<Δ2∞*–*<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–]<*Δ2∞*–*<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2∞*–<Δ2 infinite. Electron-microprobe analysis (averages of 9 analyses), supported by the structure refinement, gave: SrO 12.23, CaO 7.47, B2O3 (from structure) 61.22, and H2O (from structure) 18.10, sum 99.02 wt%. The empirical formula, based on 31 anions, is Sr3Ca4Ba2B14O32(OH)5·5H2O. A.J.L.
**URANOSPATHITE**

A.J. Locock, W.S. Kinman, P.C. Burns (2005) The structure and composition of uranospathite, $\text{Al}_4[(\text{UO}_2)(\text{PO}_4)]_2(\text{H}_2\text{O})_{2-3x} F_{1-3x}$, $x = 0 - 0.33$, is non-centrosymmetric, fluoride-bearing mineral of the autunite group, and of a related synthetic lower hydrate, $\text{Al}_6[(\text{UO}_2)(\text{PO}_4)]_2(\text{H}_2\text{O})_{12.5}$. Can. Mineral., 43, 989–1003.

Single-crystal X-ray structure study of uranospathite ($R_1 = 0.040$), $\text{Al}_4[(\text{UO}_2)(\text{PO}_4)]_2(\text{H}_2\text{O})_{2-3x} F_{1-3x}$, indicated that it is orthorhombic, space group $Pnm2$, with cell dimensions $a = 30.020(4)$, $b = 7.0084(9)$, $c = 7.0492(9)$ Å, $V = 1483.1(3)$ Å$^3$, $Z = 2$, $D_{calc} = 2.54$ g/cm$^3$. The presence of $F$ in both uranospathite and arsenuranospathite was confirmed by qualitative WDS on an electron microprobe and appears to be necessary to maintain electroneutrality in the crystals studied.

Uranospathite appears to be one of only a few acentric compounds that contain the autunite-type sheet. The data resolve previous uncertainties about the symmetry, space group, and composition of uranospathite and arsenuranospathite. A.J.L.

**WATKINSONITE**, **NEVSKITE**, **BOHDANOWICZITE**, **CU$_2$Bi$_2$Se$_4$, CuPbBi$_4$S$_8$$^*$


Watkinsonite, ideally Cu$_2$PbBi$_4$Se$_8$, is reported from its second-known locality: an unconformity-related vein-type uranium deposit at Niederschlema-Alberoda in the western Erzgebirge of Germany. Electron microprobe analysis of watkinsonite (mean of 27 analyses) gave Cu 5.13, Ag 2.92, Hg 0.11, Pb 11.46, Cd 0.01, Fe 0.02, Bi 45.59, S 0.08, Se 34.53, sum 99.85 wt% (99.86 reported), which corresponds (on the basis of 15 atoms) to (Cu$_{1.03}$Pb$_{0.97}$Bi$_{1.99}$)Se$_8$ ($c = 32.00$, $S + Se = 12$). Watkinsonite from this locale matches the ideal stoichiometry more closely than the other analyses for material given for the material of the type locality, which have not reported Ag, and S 3.03–3.47 wt%. The identity of watkinsonite was confirmed by powder X-ray diffraction (Debye-Scherrer camera 57.3 mm in diameter). Watkinsonite occurs as anhedral grains (maximum size $120 \times 30$ μm) intergrown with clausthalite, and associated with bohdanowiczite and/or nevskite.

The Niederschlema-Alberoda U-Se-polymetallic deposit, Erzgebirge, Germany, is the fourth locality for nevskite, ideally BiSe. Electron microprobe analysis of nevskite (2 analyses) gave Cu 0.03, 0.03; Ag nd, 0.20; Pb 3.47, 4.44; Bi 69.71, 67.85; S 0.04, 0.03; Se 27.05, 26.99; sum 100.30, 99.54 wt% (100.30, 99.53 reported), which corresponds (on the basis of 2 atoms) to (Bi$_{0.62}$Pb$_{0.07}$)Se$_{1.00}$ and (Bi$_{0.55}$Pb$_{0.06}$)Ag$_{0.00}$S$_{1.00}$, respectively. Analyses richer in Ag were rejected by the authors as corresponding to analytical artifacts caused by surrounding grains. Nevskite from this locality is poorer in S relative to the analyses reported for the type locality: S 1.4–1.8 wt%. Nevskite either occurs as small rims between watkinsonite and clausthalite or as small grains (<20 μm) associated with watkinsonite and bohdanowiczite in the body of clausthalite.

The composition of bohdanowiczite, ideally Ag$_x$Bi$_{3-x}$Se$_4$, appears to depend on the local mineral assemblage. Bohdanowiczite associated with clausthalite or clausthalite and watkinsonite, has very low Cu, and has minor As, Pb, and S. A representative electron microprobe analysis gave: Cu 0.03, Ag 22.92, Hg 0.16, Pb 0.10, As 0.47, Bi 43.46, S 0.80, Se 32.16, sum 100.10 wt%, which corresponds (on the basis of 8 atoms) to (Ag$_{1.98}$Hg$_{0.03}$Pb$_{0.02}$Bi$_{2.02}$Se$_{8.00}$) ($c = 32.00$, $S + Se = 12$). Bohdanowiczite associated with copper selenides is devoid of S and As, but contains significant Cu (1.60–7.37 wt%). The range of Cu contents is interpreted to possibly represent solid solution, with Cu'+ in substitution for Ag'. An electron microprobe analysis of the material richest in Cu gave Cu 7.37, Ag 11.22, Au 0.08, Bi 46.43, S 34.60, sum 99.70 wt%, which corresponds (on the basis of 8 atoms) to (Cu$_{1.06}$Ag$_{0.94}$Pb$_{0.01}$Bi$_{2.00}$Se$_{8.00}$). This particular composition is consistent with a new mineral, ideally Cu$_2$Bi$_4$Se$_4$, the Cu-dominant analogue of bohdanowiczite and the Se-analogue of emplite, Cu$_2$Bi$_4$Se$_4$. The small grain-size (<25 μm) precluded identification by X-ray methods, and so the symmetry and structural affiliation of this material is unknown. It should be noted that bohdanowiczite has trigonal symmetry, with Ag and Bi in near-regular octahedral coordination, whereas emplite has orthorhombic symmetry, with Cu in tetrahedral coordination and Bi in distorted square pyramidal coordination. Simple solid solution between such differing structure types is unlikely. The authors noted that Cu-bearing bohdanowiczite has been observed by others to be inhomogeneous and have submicroscopic intergrowths on a scale less than 5 μm, and that recent attempts to synthesize the Se-analogue of emplite were unsuccessful and instead yielded Cu$_2$Bi$_4$Se$_4$.

An unidentified Cu-Pb-Bi sulfosalts, idealized as Cu$_4$Pb$_4$Bi$_5$S$_8$, is found locally intergrown with bismuthinite as small anhedral grains, 30–50 μm in size. Electron microprobe analysis (2 analyses) gave Cu 4.60, 4.67; Pb 15.55, 15.37; Sb nd, 0.05; Bi 60.46, 60.69; S 18.19, 18.01; Se 1.00, 1.53; sum 99.80, 100.31 wt%, which corresponds (on the basis of 14 atoms) to Cu$_{11.05}$Pb$_{11.05}$Bi$_{11.05}$S$_{11.05}$Se$_{11.05}$ and Cu$_{11.06}$Pb$_{11.06}$Bi$_{11.06}$S$_{11.06}$Se$_{11.06}$, respectively. These results are most similar to salzbergite Cu$_4$Pb$_4$Bi$_5$S$_8$ and paarite Cu$_4$Pb$_4$Bi$_5$S$_8$ (Topa et al. 2005, Can. Mineral., 43, 909–917), and for comparison to these minerals, the analytical results can be expressed on the basis of $S + Se = 12$: Cu$_{11.05}$Pb$_{11.05}$Bi$_{11.05}$S$_{11.05}$Se$_{11.05}$ and Cu$_{11.06}$Pb$_{11.06}$Bi$_{11.06}$S$_{11.06}$Se$_{11.06}$, respectively. The authors noted that because of the small grain-size and intimate intergrowth with bismuthinite and aikinite, the analytical results may reflect contamination with the neighboring minerals. The material is found in an assemblage of Bi sulfides, including bismuthinite-aikinite solid solutions, associated with Bi-bearing galena and Pb-bearing chalcopyrite. A.J.L.