**NEW MINERAL NAMES**

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**Esperanzaite**


Electron microprobe analysis gave As 26.50, Al 10.16, Ca 14.83, Zn 0.70, Na 2.86, F 13.9, H$_2$O (titration) 8.65, O (calc.) 24.45, sum 102.15 wt%, corresponding to Na 0.68 Ca 2.03 Al 2.06 (AsO$_4$)$_2$(As$_{0.94}$Zn$_{0.07}$O$_3.87$)F$_4$OH-2.13H$_2$O. The mineral occurs as pale blue-green botryoidal patches, to 0.8 cm across, nonfluorescent, soluble in HCl, for Z = 1 and the ideal formula. Optically biaxial negative, $\alpha$ = 1.760(5), $\beta$ = 1.80(1), $\gamma$ = 1.83(1), 2$\nu$$_{max}$ = 77(4), 2$\nu$$_{calc}$ = 80(1)$^2$; weak pleochroism, $\alpha$ = $\beta$ = light green, $\gamma$ = green; weak r < v dispersion; on 100 $\alpha$ < $c$ < 33$^\circ$, $\beta$ < $a$ = 37.1$^\circ$; on 101 $\beta$ < $a$ = 34.3$^\circ$, $\gamma$ < $b$ = 30.1$^\circ$; on 101 $\gamma$ < $b$ = 44$^\circ$, $\beta'$ < $\gamma$ = 36.5$^\circ$. Single-crystal X-ray structure study ($R$ = 0.062) gave triclinic symmetry, space group P11, $a$ = 5.445(4), $b$ = 5.873(3), $c$ = 5.104(3) $\AA$, $\alpha$ = 114.95(3), $\beta$ = 93.05(5), $\gamma$ = 91.92(4)$^\circ$. Strongest lines of the powder pattern (114 mm Gandolfi, CuK$\alpha$ radiation) are 4.613(100,001), 4.580(50,011), 3.390(60,101), 2.714(40,200), 2.543(40,012,121), and 2.445(30,120).

The mineral, which is a polymorph of clinoclore, is associated with cuprite, posnjakite, lanite, clinotyrolite, connellite, and several other minerals. These occur in small geodes in narrow (<1 m) carbonate veins containing native copper and Cu arsenides at the Roua deposit, Guillaumes municipality, about 50 km from Nice, France. The new name is for Gilbert Mari (b. 1944), mineralogist at the University of Nice-Sophia Antipolis. Type material is in the Department of Mineralogy of the Natural History Museum of Geneva, Switzerland. **J.L.J.**

**Gilmarite**


The mineral occurs as blue-green rosettes, to 0.3 mm across, and as isolated crystals up to 0.1 × 0.04 × 0.02 mm. Electron microprobe analysis gave CuO 63.0, As$_2$O$_3$ 29.64, H$_2$O (by difference) 7.36, sum 100 wt%, corresponding to Cu$_{3.06}$As$_{0.98}$H$_{3.16}$O$_8$. Crystals are elongate [101] or [100], flattened [010], showing [100], [010], [001], and [110]. Vitreous luster, transparent, blue-green streak, brittle, irregular fracture, $H$ = 3, nonfluorescent, soluble in HCl, $D_{max}$ = 4.2(1), $D_{calc}$ = 4.28 g/cm$^3$ for $Z$ = 1 and the ideal formula. Optically biaxial negative, $\alpha$ = 1.760(5), $\beta$ = 1.80(1), $\gamma$ = 1.83(1), 2$\nu$$_{max}$ = 77(4), 2$\nu$$_{calc}$ = 80(1)$^2$; weak pleochroism, $\alpha$ = $\beta$ = light green, $\gamma$ = green; weak r < v dispersion; on 100 $\alpha$ < $c$ < 33$^\circ$, $\beta$ < $a$ = 37.1$^\circ$; on 101 $\beta$ < $a$ = 34.3$^\circ$, $\gamma$ < $b$ = 30.1$^\circ$; on 101 $\gamma$ < $b$ = 44$^\circ$, $\beta'$ < $\gamma$ = 36.5$^\circ$. Single-crystal X-ray structure study ($R$ = 0.062) gave triclinic symmetry, space group P11, $a$ = 5.445(4), $b$ = 5.873(3), $c$ = 5.104(3) $\AA$, $\alpha$ = 114.95(3), $\beta$ = 93.05(5), $\gamma$ = 91.92(4)$^\circ$. Strongest lines of the powder pattern (114 mm Gandolfi, CuK$\alpha$ radiation) are 4.613(100,001), 4.580(50,011), 3.390(60,101), 2.714(40,200), 2.543(40,012,121), and 2.445(30,120).

The mineral, which is a polymorph of clinoclore, is associated with cuprite, posnjakite, lanite, clinotyrolite, connellite, and several other minerals. These occur in small geodes in narrow (<1 m) carbonate veins containing native copper and Cu arsenides at the Roua deposit, Guillaumes municipality, about 50 km from Nice, France. The new name is for Gilbert Mari (b. 1944), mineralogist at the University of Nice-Sophia Antipolis. Type material is in the Department of Mineralogy of the Natural History Museum of Geneva, Switzerland. **J.L.J.**

**Haigerachite**


The mineral forms white spherules, to 0.2 mm across, consisting of scaly crystals to 0.05 mm; rarely as well-developed, thin tabular, six-sided, pseudoheaxagonal crystals flattened (011), showing [100] and [110]. Transparent to translucent, vitreous luster, white streak, uneven fracture, good [011] cleavage, $H$ = 2, $D_{max}$ = 2.44(1), $D_{calc}$ = 2.445 g/cm$^3$ for $Z$ = 4, soluble in dilute HCl or HNO$_3$. Optically biaxial negative, $\alpha$ = 1.557(2), $\beta$ = 1.598(2), $\gamma$ = 1.602(2), 2$\nu$$_{max}$ = 32(2), 2$\nu$$_{calc}$ = 34$^\circ$, X perpendicular to (011). Electron microprobe analysis gave K$_2$O 3.79, Na$_2$O 0.34, CaO 0.66, Fe$_2$O$_3$ 21.66, Al$_2$O$_3$ 0.66, MnO 0.42, MgO 0.18, P$_2$O$_5$ 53.39, H$_2$O (by difference) 18.89, sum 100 wt%, corresponding to K$_{0.25}$Na$_{0.12}$Ca$_{0.27}$Fe$_{0.93}$Al$_{0.78}$H$_{0.14}$P$_{0.95}$O$_{5.85}$, ideally KFe$_3$(H$_2$PO$_4$)$_2$(HPO$_4$)$_2$4H$_2$O. By analogy with the synthetic analog, monoclinic symmetry, space group C2/c; the X-ray powder pattern (57 mm Debye–Scherrer, FeK$\alpha$ radiation) has strongest lines of 8.83(100,002), 7.75(100,313,222), 3.23(50,115,314,024,115), and 3.02(90,224,303,512,224), from which $a = 16.95(3)$, $b = 9.59(2)$, $c = 17.57(3) \AA$, $\beta = 90.85(15)^\circ$. 

*Before publication, minerals marked with an asterisk were approved by the Commission on New Minerals and Mineral Names, International Mineralogical Association.*
Single-crystal X-ray structure study (R = 0.026) indicated tetragonal symmetry, space group I4/m, a = 12.134(2), c = 7.576(2) Å. Strongest lines of the powder pattern (114 mm Gandolfi, CuKα radiation) are 3.82(20,130), 3.45(100,112), 3.07(40,231), 3.04(15,040), and 2.69(15,132). The carbonate and sulfate groups are disordered.

The type locality is McBride Province, North Queensland, Australia, at which the mineral forms up to 20% of garnet-granulite xenoliths hosted by olivine nephelinite; numerous other occurrences, typically in granulite-facies metamorphic rocks and from mafic and ultramafic xenoliths, have been reported in the literature. The name silvialite, for Silvia Hillebrand, daughter of G. Tschermak, was first suggested in 1914 for the then-hypothetical SO₄ analog of meionite. Type material is in the Systematic Reference Series of the National Mineral Collection at the Geological Survey of Canada, Ottawa. J.L.J.

**Tongxinite**


The mineral is associated with chalcopyrite, cosalite, and galenobismutite in the silicified zone of a porphyry Cu deposit in the Yulong ore district of Tibet, with pyrite, chalcopyrite, enargite, tennantite, and bornite in rhyolite in the Malasondo district, Tibet, and in a brecciated silicified zone in association with sphalerite, marcasite, stibnite, and chalcocypite in a gold deposit in Kuerogai, Sichuan Province, China. Eleven listed electron microprobe analyses have an average and range of Cu 65.57 (61.80–69.80), Fe 0.58 (0.26–1.20), Zn 33.48 (20.80–37.60), sum 99.63 (99.10–100.40) wt%, corresponding to Cu₁₉₁₉[Zn₁₀₉₉Fe₀₅₂]₂₃, and ranging from Cu₂ₐₐZn₀₉₉Fe₀₅₂ to Cu₁₉₁₉[Zn₁₀₉₉Fe₀₅₂]. The mineral occurs as color-colored, irregular grains up to 0.2 mm across, metallic luster, tarnishes blue in air, VHN₁₀ = 161, VHN₂₀ = 200. D calc = 7.38 g/cm³ for Z = 12. Reflectance percentages in air in 20 mm steps from 480 to 660 mm are 41.12, 46.60, 49.02, 56.63, 58.00, 61.45, 65.10, 68.80, 73.53, and 77.50. The X-ray powder pattern (57 mm camera, Cu radiation) includes 10 lines listed) indicates a cubic cell with strongest lines of 2.153(80,320), 2.101(100,321), 1.849(70,410,322), and 1.815(70,330), from which a = 7.735 Å. The new name alludes to the composition (tong = copper, xin = zinc). The mineral is an end-member of the series Cu₂Zn (tongxinite) – CuZn₂ (danbaite); zhonghengite (CuZn) is an intermediate member.

**Discussion.** In the Chinese version the name tongxinite does not appear in the title of the paper, but it is stated in the Introduction that CuZn is tentatively named “tongxinite”. A repository is not given and no submission has been made to the CNMMN. J.L.J.

**Vergasovaite**


Electron microprobe analyses gave a mean and range of CuO 49.81 (47.88–52.35), ZnO 1.76 (0.15–4.19), SO$_2$ 21.44 (19.89–23.12), MoO$_3$ 25.29 (21.01–28.73), V$_2$O$_5$ 0.88 (10.01–18.1), PbO 0.63 (0.14–2.06), sum 99.81 (98.48–99.92) wt%, corresponding to (Cu$_{2.82}$Zn$_{0.09}$Pb$_{0.01}$)$_{0.02}$O$_1$ (Mo$_{0.77}$S$_{0.20}$V$_{0.02}$)$_{0.02}$O$_4$[SO$_4$]$_2$. The infrared spectrum confirms the absence of OH and H$_2$O. The mineral occurs as olive-green intergrowths of stout prismatic crystals, slightly elongate [001], up to 0.3 mm long, showing {100}, {110}, {120}, {130}, {111}, {263}, and {315}; also occurs as radiating aggregates, to 0.6 mm. Transparent, vitreous luster, brittle, uneven fracture, light yellow streak, $H = 4–5\frac{1}{2}$, no cleavage or twinning observed, nonfluorescent, $D_{calc} = 4.32$ g/cm$^3$ for $Z = 4$. Gray in reflected light, ubiquitous light green to colorless internal reflections, $n_{meas} = 1.87–1.98$; distinctly pleochroic in transmitted light, from olive green parallel to the morphological elongation, and yellowish to brownish green normal to it. Single-crystal X-ray study indicated orthorhombic symmetry, space group $Pnma$, $a = 7.420(3)$, $b = 6.741(2)$, $c = 13.548(5)$ Å as derived from refinement of a 114 mm Gandolfi pattern (FeKα radiation) with strongest lines of 3.391(60,020), 3.342(60,113), 2.931(60,012), 2.831(60,105), 2.542(60,105,123), 2.500(60,220), and 2.275(60,124).


Electron microprobe analysis of two grains gave Pd 74.68, 73.80, Fe 0.14, 0.41, Cu 0.81, 1.70, As 8.92, 8.90, Pb 16.35, 16.76, sum 100.90, 101.57 wt%, corresponding to (Pd$_{2.36}$Cu$_{1.00}$Fe$_{0.02}$)$_{2.35}$ (Sb$_{0.56}$As$_{0.44}$)$_{2.10}$ and (Pd$_{2.31}$Cu$_{1.11}$Fe$_{0.03}$)$_{2.35}$ (Sb$_{0.58}$As$_{0.42}$)$_{2.14}$ simplified as Pd$_6$(Sb,As). Attached to these grains are two low-reflec-

tance oxide minerals for which analyses gave, respectively Pd 0.86, Cu 0.11, Ni 0.04, Fe 0.03, Pt 0.78, Cu 4.84, Bi 1.41, 0.89, S 0.13, 0.06, O 23.29, 40.02, sum 101.26, 99.81, corresponding to (Pd$_{2.81}$Cu$_{0.11}$Fe$_{0.03}$)$_{2.83}$, Bi 1.41, 0.89, S 0.13, 0.06, O 23.29, 40.02, sum 101.26, 99.81, corresponding to Pd$_6$(Sb,As), Pd oxides

**Discussion.** A SEM photo indicates that sizes of the analyzed Pd(Sb,As) grains are ~8 × 25 and 20 × 30 µm respectively, and the oxide grains are >10 µm. The presence of four grains of “guanglinite” [Pd$_3$(As,Sb)] is also reported; the mineral is listed in the compilation of Daltry and Wilson (Mineralogy and Petrology, 60, 185–229, 1997) as an approved species, but that is not so. **J.L.J.**

**Platinum-group minerals**


Numerous analyses are given for platinum-group minerals that occur in different ore types of the Noril’sk intrusions, Russia. Some of the minerals are listed in granulometric classes, i.e., size ranges. Among the analyses are those for unnamed minerals Pt$_3$Fe$_2$(Pd,Pt)$_3$(Sn,As,As), the apparent As analog of stibiopalladinite, “guanglinite” (three analyses), Pd$_6$(As,Te,Sn)$_2$, and (Pd,Pt)$_3$(Sn,As,Sn)$_2$. **J.L.J.**

**Orthorhombic SiO$_2$**


The Martian meteorite Shergotty contains SiO$_2$ compounds in which islands of crystalline grains, 50 to 200 nm wide, are embedded in amorphous veins 50 to 100 nm wide. Electron diffraction patterns of the crystalline material showed it to consist of orthorhombic SiO$_2$ for which $a = 4.16(3)$, $b = 5.11(4)$, $c = 4.55(1)$ Å, $D_{calc} = 4.12$ g/cm$^3$ for $Z = 4$. **J.L.J.**

**Ti-rich member, eudialyte family**


The mineral occurs as yellow transparent grains up to 1 mm in hyperagpatic pegmatic rocks of the Lovozero massif, Kola Peninsula, Russia. Electron microprobe analyses gave Na$_2$O 16.45–18.53, K$_2$O 0.08–0.26, CaO 7.49–8.81, MnO 2.43–2.83, SrO 1.31–2.08, BaO 0.42–0.74, FeO 0.64–1.19, REE$_2$O$_3$ 3.26–3.94, SiO$_2$ 44.49–50.46, ZrO$_2$ 2.00–10.71, TiO$_2$ 1.40–5.24, Nb$_2$O$_5$ 1.67–3.74, Cl 0.52–0.97 wt%; the average approximates that of the grains used in the X-ray study, for which the formula was determined to be Na$_{4.84}$Sr$_{0.7}$Ca$_{0.4}$Na$_{0.1}$Fe$_{0.03}$O$_{3.83}$Zr$_{1.67}$Ti$_{1.33}$Si$_{0.68}$Al$_{0.42}$O$_{14}$Cu$_{0.09}$OH$_{3.7}$·1.5H$_2$O. An X-ray structure study ($R = 0.068$) indicated trigonal symmetry, space group $R3m$, $a = 14.153(9)$, $c = 60.72(5)$ Å, $D_{calc} = 2.88$ g/cm$^3$ for $Z = 3$. Unlike in alluavitie, Zr and Ti are ordered into (Zr,Ti) and (Ti,Zr) octahedra, thus resulting in the non-centrosymmetric space group. **J.L.J.**
New Data

Betpakdalite
M.A. Cooper, F.C. Hawthorne (1999) The crystal structure of betpakdalite, and a new chemical formula: \([\text{Mg}(\text{H}_2\text{O})_6]\text{Ca}_2(\text{H}_2\text{O})_{13}[\text{Mo}_{8}^{6+}\text{As}_{2}^{5+}\text{Fe}_{3}^{3+}\text{O}_{36}(\text{OH})](\text{H}_2\text{O})_4\). Can. Mineral., 37, 61–66.

Single-crystal X-ray structure study \((R = 0.025)\) of betpakdalite from Tsumeb, Namibia, gave monoclinic symmetry, space group \(C2/m\), \(a = 19.531(2)\), \(b = 11.061(1)\), \(c = 15.257(2)\) Å, \(\beta = 131.57(1)°\). Electron microprobe analysis gave \(\text{MgO } 1.8, \text{CaO } 5.3, \text{MoO}_3 52.9, \text{As}_2\text{O}_5 10.0, \text{Fe}_2\text{O}_3 11.2, \text{H}_2\text{O} (\text{calc.}) 19.4\), sum 100.6 wt%, with K and F not detected, thus leading to the new formula given above. J.L.J.

Destinezite

Single-crystal X-ray structure study \((R = 0.046)\) of destinezite from Alum Cave Bluff confirmed the triclinic cell and gave the space group \(P1\), \(a = 9.570(1)\), \(b = 9.716(1)\), \(c = 7.313(1)\) Å, \(\alpha = 98.74(1)\), \(\beta = 107.90(1)\), \(\gamma = 63.86(1)°\). An X-ray powder pattern of a fragment of holotype destinezite from Argenteau, Belgium, matches that of the Alum Cave Bluff mineral. Electron microprobe analysis and the structure determination of the latter lead to the new formula \((\text{Fe}_{1.77}\text{Al}_{0.23})(\text{PO}_4)(\text{SO}_4)(\text{OH})\cdot6\text{H}_2\text{O}, \text{D}_{\text{calc}} = 2.411 \text{g/cm}^3\) for \(Z = 2\). Although destinezite and diadochite are assumed to be identical, and diadochite has priority as a mineral name, it has not been proved that the two are identical because diadochite is almost X-ray amorphous and commonly shows a pronounced variation in chemical composition. It is proposed that destinezite be used for visibly crystalline, triclinic \(\text{Fe}_{2}(\text{PO}_4)(\text{SO}_4)(\text{OH})\cdot6\text{H}_2\text{O}\), and that diadochite be used for massive to earthy, poorly ordered, X-ray amorphous materials that approximate destinezite in composition.

Discussion. The proposal has not been submitted to the CNMMN for a vote. J.L.J.

Hainite, giannettite

A detailed description is given for hainite from Poços de Caldas, supporting a previous unofficial redefinition (Am. Mineral, 75, p. 936, 1990). Type giannettite was not available for restudy, but the authors are in agreement that recently published data for giannettite (Am. Mineral., 81, p. 770, 1996) apply to hainite, and that giannettite is not a valid species. J.L.J.

Jamesite
M.A. Cooper, F.C. Hawthorne (1999) Local Pb\(^{2+}\) – □ disorder in the crystal structure of jamesite, \(\text{Pb}_{2}\text{ZnFe}_{2}\text{Fe}_{3}^{3+}(\text{Fe}_{2}\text{Zn}_{12})\text{(AsO)}_3\text{(OH)}_6[\text{OH}]_2\text{O}_8\), and revision of the chemical formula. Can. Mineral., 37, 53–60.

Single-crystal X-ray structure study \((R = 0.049)\) of jamesite from the type locality, Tsumeb, Namibia, confirmed the previous unit cell but showed the space group to be \(P1\) rather than \(P1\). Electron microprobe analysis gave \(\text{PbO } 27.40, \text{As}_2\text{O}_5 27.94, \text{Fe}_2\text{O}_3 23.30, \text{ZnO } 10.39, \text{Ga}_2\text{O}_3 0.27, \text{Al}_2\text{O}_3 0.09, \text{CuO } 0.21, \text{H}_2\text{O} (\text{calc.}) 5.06, \text{sum } 94.66 \text{wt%}, \) corresponding to the formula as given above because the Zn and two Fe\(^{3+}\) sites are completely ordered. The previously assigned formula did not incorporate (OH). J.L.J.

Poyarkovite

Single-crystal X-ray structure study \((R = 0.06)\) of poyarkovite from the type locality confirmed the previously determined monoclinic symmetry and cell dimensions, and established the space group to be \(C2/c\). J.L.J.