

## NEW MINERAL NAMES\*

JOHN L. JAMBOR<sup>1</sup> AND ANDREW C. ROBERTS<sup>2</sup><sup>1</sup>Department of Earth and Ocean Sciences, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada<sup>2</sup>Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8, Canada**Esperanzaite\***

E.E. Foord, J.M. Hughes, F. Cureton, C.H. Maxwell, A.U. Falster, A.J. Sommer, P.F. Hlava (1999) Esperanzaite,  $\text{NaCa}_2\text{Al}_2(\text{As}^{5+}\text{O}_4)_2\text{F}_4(\text{OH})\cdot 2\text{H}_2\text{O}$ , a new mineral species from the La Esperanza mine Mexico: descriptive mineralogy and atomic arrangement. *Can. Mineral.*, 37, 67–72.

Electron microprobe analysis gave As 26.50, Al 10.16, Ca 14.83, Zn 0.70, Na 2.86, F 13.9,  $\text{H}_2\text{O}$  (titration) 8.65, O (calc.) 24.45, sum 102.15 wt%, corresponding to  $\text{Na}_{0.68}\text{Ca}_{2.03}\text{Al}_{2.06}(\text{AsO}_4)[(\text{As}_{0.94}\text{Zn}_{0.07})\text{O}_{3.87}]\text{F}_{4.00}(\text{OH})\cdot 2.13\text{H}_2\text{O}$ . The mineral occurs as pale blue-green botryoidal patches, to 0.8 cm across, and as radiating crystals in spheres up to 1.5 mm in diameter. Vitreous luster, white streak, transparent to translucent,  $H = \sim 4^{1/2}$ , brittle, no parting, perfect cleavage parallel to  $c$ , nonfluorescent,  $D_{\text{meas}} = 3.24$ ,  $D_{\text{calc}} = 3.36(3)$  g/cm<sup>3</sup> for the ideal formula and  $Z = 2$ . Optically biaxial negative,  $\alpha = 1.580(1)$ ,  $\beta = 1.588(1)$ ,  $\gamma = 1.593(1)$ ,  $2V_{\text{meas}} = 74(1)^\circ$ ,  $2V_{\text{calc}} = 76.3^\circ$ ,  $a \wedge Z = +50.5^\circ$ ,  $b = Y$ ,  $c \wedge X = +35^\circ$ , medium dispersion  $r < v$ , nonpleochroic. Single-crystal X-ray structure study ( $R = 0.032$ ) indicated monoclinic symmetry, space group  $P2_1/m$ ,  $a = 9.687(5)$ ,  $b = 10.7379(6)$ ,  $c = 5.5523(7)$  Å,  $\beta = 105.32(1)^\circ$ . Strongest lines of the X-ray powder pattern (114 mm Gandolfi,  $\text{CuK}\alpha$  radiation) are 5.364(80,001,020), 4.796(80,011), 3.801(80,021), 3.527(90,220), 2.966(100,131,311, 031), and 2.700(90,221,002,040).

The mineral is associated with cassiterite, hematite, tridymite, cristobalite, opal, mimetite, zeolites, and other minerals on an altered rhyolite from the La Esperanza cassiterite mine, 60 km northeast of Durango, Mexico. Type material is in the United States National Museum, Smithsonian Institution, Washington. **J.L.J.**

**Gilmarite\***

H. Sarp, P. Černý (1999) Gilmarite,  $\text{Cu}_3(\text{AsO}_4)(\text{OH})_3$ , a new mineral: its description and crystal structure. *Eur. J. Mineral.*, 11, 549–555.

The mineral occurs as blue-green rosettes, to 0.3 mm across, and as isolated crystals up to  $0.1 \times 0.04 \times 0.02$  mm. Electron microprobe analysis gave  $\text{CuO}$  63.0,  $\text{As}_2\text{O}_5$  29.64,  $\text{H}_2\text{O}$  (by difference) 7.36, sum 100 wt%, corresponding to  $\text{Cu}_{3.00}\text{As}_{0.98}$

$\text{H}_{3.10}\text{O}_7$ . Crystals are elongate [101] or [100], flattened {010}, showing {100}, {010}, {001}, and {101}. Vitreous luster, transparent, blue-green streak, brittle, irregular fracture,  $H = 3$ , nonfluorescent, soluble in HCl,  $D_{\text{meas}} = 4.2(1)$ ,  $D_{\text{calc}} = 4.28$  g/cm<sup>3</sup> for  $Z = 1$  and the ideal formula. Optically biaxial negative,  $\alpha = 1.760(5)$ ,  $\beta = 1.80(1)$ ,  $\gamma = 1.83(1)$ ,  $2V_{\text{meas}} = 77(4)$ ,  $2V_{\text{calc}} = 80(1)^\circ$ ; weak pleochroism,  $\alpha = \beta =$  light green,  $\gamma =$  green; weak  $r > v$  dispersion; on {010}  $\alpha \wedge c = 33^\circ$ ,  $\beta \wedge a = 37.1^\circ$ ; on {100}  $\beta \wedge a = 34.3^\circ$ ,  $\gamma \wedge b = 30.1^\circ$ ; on {101}  $\gamma \wedge b = 44^\circ$ ,  $\beta' \wedge [101] = 36.5^\circ$ . Single-crystal X-ray structure study ( $R = 0.062$ ) gave triclinic symmetry, space group  $P1$ ,  $a = 5.445(4)$ ,  $b = 5.873(3)$ ,  $c = 5.104(3)$  Å,  $\alpha = 114.95(3)$ ,  $\beta = 93.05(5)$ ,  $\gamma = 91.92(4)^\circ$ . Strongest lines of the powder pattern (114 mm Gandolfi,  $\text{CuK}\alpha$  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 clinoclase, is associated with cuprite, posnjakite, langite, 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\***

K. Walenta, T. Theye (1999) Haigerachite, a new phosphate mineral from the Silberbrünnle mine near Gegenbach in the central Black Forest. *Aufschluss*, 50, 1–7 (in German, English abs.).

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, pseudo-hexagonal crystals flattened (001), showing {100} and {110}. Transparent to translucent, vitreous luster, white streak, uneven fracture, good {001} cleavage,  $H = 2$ ,  $D_{\text{meas}} = 2.44(1)$ ,  $D_{\text{calc}} = 2.445$  g/cm<sup>3</sup> for  $Z = 4$ , soluble in dilute HCl or  $\text{HNO}_3$ . Optically biaxial negative,  $\alpha = 1.557(2)$ ,  $\beta = 1.598(2)$ ,  $\gamma = 1.602(2)$ ,  $2V_{\text{meas}} = 32(2)$ ,  $2V_{\text{calc}} = 34^\circ$ ,  $X$  perpendicular to (001). Electron microprobe analysis gave  $\text{K}_2\text{O}$  3.79,  $\text{Na}_2\text{O}$  0.34,  $\text{CaO}$  0.66,  $\text{Fe}_2\text{O}_3$  21.66,  $\text{Al}_2\text{O}_3$  0.66,  $\text{MnO}$  0.42,  $\text{MgO}$  0.19,  $\text{P}_2\text{O}_5$  53.39,  $\text{H}_2\text{O}$  (by difference) 18.89, sum 100 wt%, corresponding to  $\text{K}_{0.85}\text{Na}_{0.12}\text{Ca}_{0.12}\text{Fe}_{2.85}\text{Al}_{0.14}\text{Mn}_{0.06}\text{Mg}_{0.05}\text{P}_{7.91}\text{H}_{22.05}\text{O}_{36}$ , ideally  $\text{KFe}_3(\text{H}_2\text{PO}_4)_6(\text{HPO}_4)_2\cdot 4\text{H}_2\text{O}$ . By analogy with the synthetic analog, monoclinic symmetry, space group  $C2/c$ ; the X-ray powder pattern (57 mm Debye–Scherrer,  $\text{FeK}\alpha$  radiation) has strongest lines of 8.83(100,002), 3.75(100,313,222), 3.23(50,115,314,024,115), and 3.02(90,224,303,512,224), from which  $a = 16.95(3)$ ,  $b = 9.59(2)$ ,  $c = 17.57(3)$  Å,  $\beta = 90.85(15)^\circ$ .

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

The mineral is a secondary phosphate formed on dump material in association with quartz, pyrite, gypsum, jarosite, diadochite, and another new phosphate mineral. The new name is derived from that of a village and valley near the mine. Type material is in the Institute of Mineralogy and Crystal Chemistry of the University of Stuttgart, and in the Staatlichen Museum für Naturkunde, Stuttgart, Germany. **J.L.J.**

### Quadratite\*

S. Graeser, W. Lustenhouwer, P. Berlepsch (1998) Quadratite  $\text{Ag}(\text{Cd,Pb})(\text{As,Sb})\text{S}_3$ —a new sulfide mineral from Lengenbach, Binntal (Switzerland). *Schweiz. Mineral. Petrogr. Mitt.*, 78, 489–494.

Electron microprobe analysis gave Ag 26.30, Cu 0.05, Tl 0.49, Cd 21.42, Pb 10.17, As 18.06, Sb 0.27, S 23.61, sum 100.37 wt%, corresponding to  $(\text{Ag}_{7.95}\text{Cu}_{0.03})_{\Sigma 7.98}(\text{Cd}_{6.27}\text{Pb}_{1.61}\text{Tl}_{0.08})_{\Sigma 7.96}(\text{As}_{7.92}\text{Sb}_{0.07})_{\Sigma 7.99}\text{S}_{24}$ , simplified as  $\text{AgCdAsS}_3$ . The mineral occurs as characteristic quadratic crystals, some of which are octagonal in shape, rarely to 1 mm. The crystals are tabular, showing a large {001}, with {103}, {104}, {111}, and {116}, rarely twinned along (016). Reddish translucent in thin laminae, gray metallic where thicker; reddish brown streak, perfect {001} and distinct {110} cleavages, ductile to flexible in thin laminae,  $H = 3$ ,  $VHN_{10} = 63$  (52–72),  $D_{\text{calc}} = 5.31 \text{ g/cm}^3$  for  $Z = 8$ . In reflected light, grayish white with a bluish tint, but data are available only for grains mounted parallel to (001); reflectance percentages in air (WTiC standard) are 30.5–32.3 (470 nm), 29.6–30.8 (543), 28.7–29.7 (587), and 26.3–28.0 (657). In oil immersion, dark red internal reflection along cleavage cracks. Single-crystal X-ray study indicated tetragonal symmetry, space group  $I4/amd$ ,  $a = 5.499(5)$ ,  $c = 33.91(4)$  Å as refined from a Gandolfi pattern (114 mm,  $\text{FeK}\alpha$  radiation) with strongest lines of 3.19(50,116), 2.77(100,200), 1.960(80,2.0.12), 1.679(70,2.0.16), 1.598(70,2.2.12,3.0.11), and 1.274(60,4.0.10).

The mineral is associated with galena, jordanite, pyrite, sphalerite, lengenbachite, and hatchite in small vugs in dolomite. The new name alludes to the characteristic crystal habit. Type material is in the Natural History Museum in Basel, and in the Mineralogical Institute, University of Basel, Switzerland. **J.L.J.**

### Silvialite\*

D.K. Teertstra, M. Schindler, B.L. Sherriff, F.C. Hawthorne (1999) Silvialite, a new sulfate-dominant member of the scapolite group with an Al-Si composition near the  $I4/m - P4_2/n$  phase transition. *Mineral Mag.*, 63, 321–329.

Electron microprobe analysis gave  $\text{Na}_2\text{O}$  3.49,  $\text{K}_2\text{O}$  0.06, CaO 16.95, SrO 0.08,  $\text{Al}_2\text{O}_3$  26.25,  $\text{Fe}_2\text{O}_3$  0.22,  $\text{SiO}_2$  45.26, Cl 0.02,  $\text{SO}_3$  4.82,  $\text{CO}_2$  (calc.) 1.92, sum 99.08 wt%, corresponding to  $(\text{Ca}_{2.86}\text{Na}_{1.06}\text{K}_{0.01})_{\Sigma 3.93}(\text{Si}_{7.13}\text{Al}_{4.87}\text{Fe}_{0.02})_{\Sigma 12.02}\text{O}_{24}[(\text{SO}_4)_{0.57}(\text{CO}_3)_{0.41}]_{\Sigma 0.98}$ , ideally  $\text{Ca}_4\text{Al}_6\text{Si}_6\text{O}_{24}\text{SO}_4$ . Occurs as grains up to 3 mm long, with subhedral grains elongate [001]; slightly yellowish color, transparent, subvitreous luster, white streak, brittle,  $H = 5\frac{1}{2}$ , good {100} cleavage, conchoidal fracture, nonfluorescent, faint deep-red cathodoluminescence,  $D_{\text{meas}} = 2.75$ ,  $D_{\text{calc}} = 2.77 \text{ g/cm}^3$  for  $Z = 2$ . Optically uniaxial negative,  $\omega = 1.585$ ,  $\epsilon = 1.558$ .

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,  $\text{CuK}\alpha$  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  $\text{SO}_4$  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.**

### Tongxinitite

Dequan Shuai, Rubo Zhang, Mei Luo, Jingwu Zhang (1998) The study of the natural Cu-Zn series mineral—tongxinitite. *Acta Mineralogica Sinica*, 18, 509–513 (in Chinese, English abs.).

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 chalcopyrite in a gold deposit in Ruerogai, 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  $\text{Cu}_{1.99}(\text{Zn}_{0.99}\text{Fe}_{0.02})_{\Sigma 1.01}$ , and ranging from  $\text{Cu}_{2.06}\text{Zn}_{0.90}\text{Fe}_{0.04}$  to  $\text{Cu}_{1.87}\text{Zn}_{1.10}\text{Fe}_{0.02}$ . The mineral occurs as gold-colored, irregular grains up to 0.2 mm across, metallic luster, tarnishes blue in air,  $VHN_{10} = 161$ ,  $VHN_{20} = 200$ ,  $D_{\text{calc}} = 7.38 \text{ g/cm}^3$  for  $Z = 12$ . Reflectance percentages in air in 20 mm steps from 480 to 660 nm 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, 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  $\text{Cu}_2\text{Zn}$  (tongxinitite) –  $\text{CuZn}_2$  (danbaite); zhanghengite ( $\text{CuZn}$ ) is an intermediate member.

**Discussion.** In the Chinese version the name tongxinitite does not appear in the title of the paper, but it is stated in the Introduction that  $\text{Cu}_2\text{Zn}$  is tentatively named “tongxinitite”. A repository is not given and no submission has been made to the CNMMN. **J.L.J.**

### Vergasovaite\*

E.Y. Bykova, P. Berlepsch, P.M. Kartashov, J. Brugger, T. Armbruster, A.J. Criddle (1998) Vergasovaite  $\text{CuO}[(\text{Mo,S})\text{O}_4][\text{SO}_4]$ , a new copper-oxy-molybdate-sulfate from Kamchatka. *Schweiz. Mineral. Petrogr. Mitt.*, 78, 479–488.

P. Berlepsch, T. Armbruster, E.Y. Bykova, J. Brugger, P.M. Kartashov (1999) The crystal structure of vergasovaite  $\text{Cu}_3\text{O}[(\text{Mo},\text{S})\text{O}_4\text{SO}_4]$  and its relation to synthetic  $\text{Cu}_3\text{O}[\text{MoO}_4]_2$ . *Eur. J. Mineral.*, 11, 101–110.

Electron microprobe analyses gave a mean and range of  $\text{CuO}$  49.81 (47.88–52.35),  $\text{ZnO}$  1.76 (0.15–4.19),  $\text{SO}_3$  21.44 (19.89–23.12),  $\text{MoO}_3$  25.29 (21.01–28.73),  $\text{V}_2\text{O}_5$  0.88 (0.10–1.81),  $\text{PbO}$  0.63 (0.14–2.06), sum 99.81 (98.48–99.92) wt%, corresponding to  $(\text{Cu}_{2.82}\text{Zn}_{0.10}\text{Pb}_{0.01})_{\Sigma 2.93}\text{O}[(\text{Mo}_{0.79}\text{S}_{0.20}\text{V}_{0.04})_{\Sigma 1.03}\text{O}_4][\text{SO}_4]$ . The infrared spectrum confirms the absence of OH and  $\text{H}_2\text{O}$ . 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,  $H = 4\text{--}5\frac{1}{2}$ , no cleavage or twinning observed, nonfluorescent,  $D_{\text{calc}} = 4.32 \text{ g/cm}^3$  for  $Z = 4$ . Gray in reflected light, ubiquitous light green to colorless internal reflections,  $n_{\text{calc}} = 1.87\text{--}1.98$ ; 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 (FeK $\alpha$  radiation) with strongest lines of 3.391(60,020), 3.342(60,113), 3.077(100,104), 2.542(60,105,123), 2.500(60,220), and 2.275(60,124).

The mineral occurs on encrustations of sulfates in fumaroles at the Large Tolbachik Fissure Eruption, Kamchatka Peninsula, Russia. Associated minerals are chalcocyanite, dolerophanite, euchlorine, fedotovite, tenorite, Cu-bearing anglesite, and native gold. The new name is for mineralogist L.P. Vergasova (b. 1941). Type material is in the Fersman Mineralogical Museum, Moscow, Russia, and in the Natural History Museum, Basel, Switzerland. **J.L.J.**

### $\text{Pd}_3(\text{Sb},\text{As})$ , Pd oxides

I. McDonald, D. Ohnenstetter, M. Ohnenstetter, D.J. Vaughan (1999) Palladium oxides in ultramafic complexes near Lavatrafo, western Andriamena, Madagascar. *Mineral. Mag.*, 63, 345–352.

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, Sb 16.35, 16.76, sum 100.90, 101.57 wt%, corresponding to  $(\text{Pd}_{2.88}\text{Cu}_{0.05}\text{Fe}_{0.02})_{\Sigma 2.95}(\text{Sb}_{0.56}\text{As}_{0.49})_{\Sigma 1.05}$  and  $(\text{Pd}_{2.81}\text{Cu}_{0.11}\text{Fe}_{0.03})_{\Sigma 2.95}(\text{Sb}_{0.56}\text{As}_{0.48})_{\Sigma 1.04}$ , simplified as  $\text{Pd}_3(\text{Sb},\text{As})$ . Attached to these grains are two low-reflectance oxide minerals for which analyses gave, respectively Pd 67.85, 50.42, Pt 0.78, 0.00, Fe 1.36, 2.23, Ni 1.60, 1.51, Cu 4.84, 2.83, Bi 1.41, 0.89, S 0.13, 0.06, O 23.29, 40.02, sum 101.26, 97.96 wt%, corresponding to  $(\text{Pd}_{0.86}\text{Cu}_{0.11}\text{Ni}_{0.04}\text{Fe}_{0.03})_{\Sigma 1.04}\text{O}_{1.96}$  and  $(\text{Pd}_{0.78}\text{Cu}_{0.07}\text{Fe}_{0.07}\text{Ni}_{0.04})_{\Sigma 0.96}\text{O}_{4.04}$ . It is suggested that the oxides may exist as  $\text{Pd}(\text{OH})_2$  and  $\text{PdO}\cdot 3\text{H}_2\text{O}$ . The minerals are associated with sperrylite, ‘guanglinite’, michenerite, and other PGM in drill core. The oxides are interpreted to have formed by in-situ replacement of precursor Pd-rich PGM.

**Discussion.** A SEM photo indicates that sizes of the analyzed  $\text{Pd}_3(\text{Sb},\text{As})$  grains are  $\sim 8 \times 25$  and  $20 \times 30 \mu\text{m}$  respectively, and the oxide grains are  $> 10 \mu\text{m}$ . The presence of four grains of ‘guanglinite’  $[\text{Pd}_3(\text{As},\text{Sb})]$  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

V.V. Distler, S.F. Sluzhenikin, L.J. Cabri, N.A. Krivolutsкая, D.M. Turovtsev, T.A. Galovanova, A.V. Mokhov, V.V. Knauf, O.I. Oleshkevich (1999) Platinum ores of the Noril’sk layered intrusions: Magmatic and fluid concentration of noble metals. *Geology of Ore Deposits*, 41, 214–237 (English transl. of *Geol. Rudnykh Mestorozh.*, 41, 241–265, 1999).

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  $\text{Pt}_2\text{Fe}$ ,  $(\text{Pd},\text{Pt})_3(\text{Sb},\text{Sn},\text{As})$ , the apparent As analog of stibiopalladinite, ‘guanglinite’ (three analyses),  $\text{Pd}_3(\text{As},\text{Te},\text{Sn})_2$ , and  $(\text{Pd},\text{Pt})_3(\text{Sn},\text{As},\text{Sb})_2$ . **J.L.J.**

### Orthorhombic $\text{SiO}_2$

T.G. Sharp, A. El Goresy, B. Wopenka, M. Chen (1999) A post-shivovite  $\text{SiO}_2$  polymorph in the meteorite Shergotty: Implications for impact events. *Science*, 284, 1511–1513.

The Martian meteorite Shergotty contains  $\text{SiO}_2$  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  $\text{SiO}_2$  for which  $a = 4.16(3)$ ,  $b = 5.11(4)$ ,  $c = 4.55(1)$  Å,  $D_{\text{calc}} = 4.12 \text{ g/cm}^3$  for  $Z = 4$ . **J.L.J.**

### Ti-rich member, eudialyte family

R.K. Rastsvetaeva, A.P. Khomyakov, G. Chapuis (1999) Crystal structure and crystal-chemical features of a new Ti-rich member of the eudialyte family. *Zeits. Kristallogr.*, 214, 271–278.

The mineral occurs as yellow transparent grains up to 1 mm in hyperagpaitic pegmatitic rocks of the Lovozero massif, Kola Peninsula, Russia. Electron microprobe analyses gave  $\text{Na}_2\text{O}$  16.45–18.53,  $\text{K}_2\text{O}$  0.08–0.26,  $\text{CaO}$  7.49–8.81,  $\text{MnO}$  2.43–2.83,  $\text{SrO}$  1.31–2.08,  $\text{BaO}$  0.42–0.74,  $\text{FeO}$  0.64–1.19,  $\text{REE}_2\text{O}_3$  3.26–3.94,  $\text{SiO}_2$  44.49–50.46,  $\text{ZrO}_2$  2.00–10.71,  $\text{TiO}_2$  1.40–5.24,  $\text{Nb}_2\text{O}_5$  1.67–3.74,  $\text{Cl}$  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  $\text{Na}_{34.43}\text{Sr}_{0.77}\text{Ce}_{1.13}\text{Ca}_{8.5}\text{Mn}_{2.13}\text{Fe}_{0.94}\text{Zr}_{3.63}\text{Ti}_{3.37}\text{Si}_{50.68}\text{Al}_{0.42}\text{O}_{144}\text{Cl}_{0.9}(\text{OH})_{5.7}\cdot 1.5\text{H}_2\text{O}$ . An X-ray structure study ( $R = 0.068$ ) indicated trigonal symmetry, space group  $R3m$ ,  $a = 14.153(9)$ ,  $c = 60.72(5)$  Å,  $D_{\text{calc}} = 2.88 \text{ g/cm}^3$  for  $Z = 3$ . Unlike in alluaivite, 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:  $\{\text{Mg}(\text{H}_2\text{O})_6\}\text{Ca}_2(\text{H}_2\text{O})_{13}[\text{Mo}_8^{6+}\text{As}_5^{5+}\text{Fe}_3^{3+}\text{O}_{36}(\text{OH})](\text{H}_2\text{O})_4$ . *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,  $\beta = 131.57(1)^\circ$ . Electron microprobe analysis gave MgO 1.8, CaO 5.3, MoO<sub>3</sub> 52.9, As<sub>2</sub>O<sub>5</sub> 10.0, Fe<sub>2</sub>O<sub>3</sub> 11.2, H<sub>2</sub>O (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

D.R. Peacor, R.C. Rouse, T.D. Coskren, E.J. Essene (1999) Destinezite ("diadochite"),  $\text{Fe}_2(\text{PO}_4)(\text{SO}_4)(\text{OH})\cdot 6\text{H}_2\text{O}$ : its crystal structure and role as a soil mineral at Alum Cave Bluff, Tennessee. *Clays Clay Minerals*, 47, 1–11.

Single-crystal X-ray structure study ( $R = 0.046$ ) of destinezite from Alum Cave Bluff confirmed the triclinic cell and gave the space group  $P\bar{1}$ ,  $a = 9.570(1)$ ,  $b = 9.716(1)$ ,  $c = 7.313(1)$  Å,  $\alpha = 98.74(1)$ ,  $\beta = 107.90(1)$ ,  $\gamma = 63.86(1)^\circ$ . 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  $(\text{Fe}_{1.77}\text{Al}_{0.23})(\text{PO}_4)(\text{SO}_4)(\text{OH})\cdot 6\text{H}_2\text{O}$ ,  $D_{\text{calc}} = 2.411 \text{ g/cm}^3$  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  $\text{Fe}_2(\text{PO}_4)(\text{SO}_4)(\text{OH})\cdot 6\text{H}_2\text{O}$ , 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 CNMNM for a vote. **J.L.J.**

### Hainite, giannettite

D. Atencio, J.M.V. Coutinho, M.N.C. Ulbrich, S.R.F. Vlach, R.K. Rastsvetaeva, D. Yu. Pushcharovsky (1999) Hainite from Poços de Caldas, Minas Gerais, Brazil. *Can. Mineral.*, 37, 91–98.

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  $\text{Pb}^{2+}$  – □ disorder in the crystal structure of jamesite,  $\text{Pb}_2\text{ZnFe}_3^{3+}(\text{Fe}_{2.8}^{3+}\text{Zn}_{1.2})(\text{AsO}_4)(\text{OH})_8[(\text{OH})_{1.2}\text{O}_{0.8}]$ , 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  $P\bar{1}$  rather than  $P1$ . Electron microprobe analysis gave PbO 27.40, As<sub>2</sub>O<sub>5</sub> 27.94, Fe<sub>2</sub>O<sub>3</sub> 23.30, ZnO 10.39, Ga<sub>2</sub>O<sub>3</sub> 0.27, Al<sub>2</sub>O<sub>3</sub> 0.09, CuO 0.21, H<sub>2</sub>O (calc.) 5.06, sum 94.66 wt%, corresponding to the formula as given above because the Zn and two Fe<sup>3+</sup> sites are completely ordered. The previously assigned formula did not incorporate (OH). **J.L.J.**

### Poyarkovite

V.I. Vasil'ev, N.V. Pervukhina, G.V. Romanenko, S.A. Magarill, S.V. Borisov (1999) New data on the mercury oxide–chloride mineral poyarkovite: the second find, and crystal-structure determination. *Can. Mineral.*, 37, 119–126.

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.**