

## NEW MINERAL NAMES\*

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### Abhurite\*

J.T. Matzko, H.T. Evans, Jr., M.E. Mrose, P. Aruscavage (1985) Abhurite, a new tin hydroxychloride mineral, and a comparative study with a synthetic basic tin chloride. *Can. Mineral.*, 23, 233–240.

Chemical analysis gave Sn 73.4, Cl 15.7, O 11.0, H 0.4, sum 100.5 wt%; the ideal formula  $\text{Sn}_3\text{O}(\text{OH})_2\text{Cl}$  requires Sn 74.6, Cl 14.9, O 10.1, H 0.4 wt%. The mineral occurs as cryptocrystalline crusts and as platy hexagonal crystals that average 1.5 mm in diameter. Colorless, transparent with opalescent luster, white streak, hackly fracture,  $H = 2$ , dissolves slowly in HCl and  $\text{HNO}_3$ ,  $D_{\text{meas}} = 4.29$  (pycnometer),  $D_{\text{calc}} = 4.35$  g/cm<sup>3</sup> with  $Z = 21$ . Crystals are platy to tabular on hexagonal (0001), twinned on (0001), and have rhombohedral forms {01 $\bar{1}$ 5} and {0001}. Optically uniaxial positive,  $\omega = 2.06$ ,  $\epsilon = \sim 2.11$ . Single-crystal X-ray study indicated rhombohedral symmetry, space group  $R\bar{3}m$ ,  $R3m$ , or  $R32$ ; the refined Guinier-Hägg powder pattern ( $\text{CuK}\alpha_1$ ) gave hexagonal parameters  $a = 10.0175(3)$ ,  $c = 44.014(2)$  Å, and strongest lines of 4.139(50)(116), 3.404(50)(208), 3.271(35)(211), 3.244(35)(122), 3.142(35)(214), 2.9074(35)(217), 2.8915(70)(300), 2.8175(50)(128), 2.5313(100)(11.15), and 1.8928(35)(410).

Abhurite occurs as blisterlike protuberances that formed as a corrosion product of tin ingots recovered from the cargo of a sunken ship, wrecked possibly 100 yr ago, lying in a Red Sea cove known as Sharm Abhur, about 30 km north of Jiddah, Saudi Arabia. Associated minerals are romarchite, kutnohorite, and aragonite. Specimens of abhurite are in the Smithsonian Institution, Washington, D.C., and in the Royal Ontario Museum, Toronto, Ontario. **J.L.J.**

### Bazhenovite\*

B.V. Chesnokov, V.O. Polyakov, A.F. Bushmakin (1987) Bazhenovite  $\text{CaS}_5 \cdot \text{CaS}_2\text{O}_3 \cdot 6\text{Ca}(\text{OH})_2 \cdot 20\text{H}_2\text{O}$ —A new mineral. *Zapiski Vses. Mineralog. Obshch.*, 116, 737–743 (in Russian).

Wet-chemical analysis combined with TG results (water) and corrected for impurities (Fe) gave Ca 27.58, sulfide

S (S<sup>s</sup>) 6.11, polysulfide S (S<sup>p</sup>) 7.25, thiosulfate S (S<sup>t</sup>) 6.20, H<sub>2</sub>O (hydroxyl) 9.46, H<sub>2</sub>O (molecular) 31.20, O 12.20, total 100.00 wt%, corresponding to  $\text{Ca}(\text{S}_{2.63}^{\text{s}}\text{S}_{2.22}^{\text{p}})_{24.85} \text{Ca}(\text{S}_{2.25}^{\text{s}}\text{O}_{3.00}) \cdot \text{Ca}_{6.00}(\text{OH})_{12.20} \cdot 20.14\text{H}_2\text{O}$ . The mineral forms aggregates up to 1 cm in diameter, orange to yellow, light yellow streak, vitreous luster; intergrowths of parallel plates have a pearly luster. Crystals are blades up to 5 mm long, flattened on {010}, elongate [001], with {110} edges and terminated by {011}, {101}, and {111}. Thin crystals are transparent, and coarser grains are transparent to translucent. Fracture uneven, very good {010} cleavage, brittle but elastic in thin leaves,  $H = 2$ ,  $D_{\text{meas}} = 1.83(1)$ ,  $D_{\text{calc}} = 1.845$  g/cm<sup>3</sup> with  $Z = 1$ . No luminescence in ultraviolet light (360 nm). Decomposes in water, giving S and a white porous residuum; decomposes in HCl to give S and H<sub>2</sub>S. Slowly hydrolyzes in air, gradually becoming colorless with a weak bluish tint, preserving the transparency. Hydrolyzed pseudomorphs typically have porous aggregates of S on their surfaces. The DTA curve shows a strong endothermic effect at 140 °C (loss of molecular water, 31.7 wt%), a distinct exothermic one at 365 °C (loss of sulfidic and polysulfidic sulfur, 13.4 wt%), and an endothermic one at 495 °C (loss of hydroxyl water, 16.2 wt%). Additional weight loss at higher temperatures is 4.8%. The infrared spectrum shows absorption bands at 810 (H<sub>2</sub>O), 1100 (SO and S<sub>2</sub>O<sub>3</sub>), 1630 (H<sub>2</sub>O), and 3300 (OH) cm<sup>-1</sup>. Optically biaxial positive,  $\alpha = 1.595(2)$ ,  $\beta = 1.619(2)$ ,  $\gamma = 1.697(3)$  (white light),  $a = Y$ ,  $b = X$ ,  $c \wedge Z = 30^\circ$ ,  $2V_{\text{calc}} = 60^\circ 20'$ . Strong pleochroism:  $X$  deep green-yellow,  $Y$  greenish-yellow,  $Z$  pale greenish-yellow,  $X > Z > Y$ . Single-crystal X-ray study shows the mineral to be monoclinic, space group  $P2_1/c$ ,  $a = 8.45(1)$ ,  $b = 17.47(1)$ ,  $c = 8.24(1)$ ,  $\beta = 119.5^\circ$ . Strongest lines of the powder pattern (57.3-mm camera) are 8.76(100)(020), 4.39 (100)(040), 2.91(60)(060), 2.81(50)(240), 2.62(50)(122), 2.28(50)(260), and 1.996(70)(162). The X-ray pattern of the mineral is similar to that of its synthetic orthorhombic analogue. The crystal structure of the mineral is layered, with  $\text{Ca}(\text{OH})_2$ , polysulfide, and water-bearing layers parallel to {010}.

Bazhenovite is associated with native iron, native sulfur, oldhamite, troilite, pyrrhotite, fluorite, and periclase in altered pyritized siderite fragments in the melted products of old, burning coal dumps of the Chelyabinsk coal basin, south Ural Mountains, USSR. The name is for A. G. Bazhenov (petrographer) and L. F. Bazhenova (analytical chemist). Type material is in the Fersman Mineralogical Museum, Moscow. **J.P.**

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

**Cesplumtantite\***

A.V. Voloshin, Ya. A. Pakhomovskii, A. Yu. Bakhchisaraitsev, N.N. Devnina (1986) Cesplumtantite—A new cesium-lead tantalate from granitic pegmatites. *Mineralog. Zhurnal* 8(5), 92–98 (in Russian).

Microprobe analysis (3 given) gave Ta<sub>2</sub>O<sub>5</sub> 63.85, Nb<sub>2</sub>O<sub>5</sub> 3.24, Cs<sub>2</sub>O 5.37, Na<sub>2</sub>O 0.71, CaO 0.83, PbO 20.24, Sb<sub>2</sub>O<sub>3</sub> 2.88, SnO<sub>2</sub> (calculated) 1.60, sum 100.21 wt%, corresponding to (Cs<sub>0.93</sub>Na<sub>0.56</sub>Ca<sub>0.36</sub>)<sub>Σ1.85</sub>(Pb<sub>2.22</sub>Sb<sub>0.48</sub>Sn<sub>0.17</sub>)<sub>Σ2.97</sub>(Ta<sub>7.07</sub>Nb<sub>0.60</sub>Sn<sub>0.26</sub>)<sub>Σ7.93</sub>O<sub>24</sub>, ideally (Cs,Na)<sub>2</sub>(Pb,Sb<sup>3+</sup>)<sub>3</sub>Ta<sub>8</sub>O<sub>24</sub> with Cs > Na, Pb > Sb. X-ray powder study shows the mineral to be tetragonal,  $a = 13.552(8)$ ,  $c = 6.445(5)$  Å,  $Z = 2$ . The strongest X-ray lines (35 given) are 6.11(50)(210), 3.19(50)(330), 3.054(100)(112), 2.037(50, diffuse)(621), 1.869(70)(323), 1.593(70)(821), and 1.181(50)(654). The mineral is colorless, transparent, white streak, adamantine luster. No cleavage observed. Microhardness 1240 kg/mm<sup>2</sup> (40 g load).  $D_{\text{calc}} = 6.87(5)$  g/cm<sup>3</sup>. Light gray in reflected light, weak birefractance, no pleochroism or internal reflection. Strongly anisotropic, with complex polysynthetic twinning. Reflectance values (nm, %) in air (Si standard) are 476, 18.2, 17.1; 553, 17.3, 16.5; 589, 17.1, 16.5; 656, 15.6, 15.3.

Cesplumtantite was found in a museum specimen of thoreaulite in granitic pegmatite from Manono, Zaire. The new mineral occurs as veinlets of elongate aggregates up to 0.3 mm long and is associated with lithiotantite, cassiterite, calciotantite, and microlite. The name alludes to the chemical composition. The type specimen is at the Museum of the Leningrad Mining Institute, Leningrad, USSR. **J.P.**

**Cobaltaustinite\***

E.H. Nickel, W.D. Birch (1988) Cobaltaustinite—A new arsenate mineral from Dome Rock, South Australia. *Austral. Mineral.*, 3, 53–57.

Electron-microprobe analysis gave CaO 22.4, CoO 25.8, CuO 2.5, As<sub>2</sub>O<sub>5</sub> 46.1, P<sub>2</sub>O<sub>5</sub> 0.3, SO<sub>3</sub> 0.3, H<sub>2</sub>O (CHN analysis) 3.6, sum 101.1 wt%, corresponding to Ca<sub>1.01</sub>Co<sub>0.87</sub>Cu<sub>0.08</sub>As<sub>1.01</sub>P<sub>0.01</sub>S<sub>0.01</sub>O<sub>4.06</sub>(OH)<sub>1.01</sub>, simplified as Ca(Co,Cu)(As,P,S)O<sub>4</sub>(OH) and ideally CaCoAsO<sub>4</sub>(OH). Additional microprobe analyses show substantial Co-Cu variations, suggesting complete solid solution with conchalcite, the Cu end-member. The mineral occurs as dull green coatings of crystallites up to 25 μm in diameter. Streak pale green, brittle, conchoidal fracture,  $H = 4\frac{1}{2}$ , soluble in HCl and HNO<sub>3</sub>,  $D_{\text{calc}} = 4.24$  g/cm<sup>3</sup> for the analytical formula and  $Z = 4$ . Optically biaxial positive,  $\alpha' = 1.777(3)$ ,  $\gamma' = 1.802(3)$ , large  $2V$ , greenish-yellow and not pleochroic. Cell dimensions calculated from the X-ray powder pattern (114.6-mm Debye-Scherrer camera, Cu radiation) indexed by comparison with nickelaustinite are  $a = 7.50$ ,  $b = 9.01$ ,  $c = 6.92$  Å; strongest lines are 4.13(70)(111), 3.159(100)(201), 2.633(80)(112), 2.600(80)(221), 2.532(40)(131), and 1.609(100)(332).

Cobaltaustinite occurs with erythrite and numerous other arsenates derived by oxidation of arsenide-rich ore at the small Dome Rock copper deposit, which is about 42 km

north of Mingary and on the Adelaide–Broken Hill railway about 470 km from Adelaide. The holotype specimen (M32479) is in the Museum of Victoria, Melbourne, Australia. **J.L.J.**

**Ecandrewsite\***

W.D. Birch, E.A.J. Burke, V.J. Wall, M.A. Etheridge (1988) Ecandrewsite, the zinc analogue of ilmenite, from Little Broken Hill, New South Wales, Australia, and the San Valentin Mine, Sierra de Cartegena, Spain. *Mineral. Mag.*, 52, 237–240.

Four electron-microprobe analyses of the mineral from the type locality, the Melbourne Rockwell mine at Little Broken Hill (13 km southeast of the main Broken Hill deposit, New South Wales), gave TiO<sub>2</sub> 50.12–52.45, FeO 8.8–13.65, MnO 4.4–7.64, ZnO 28.5–35.05, total 98.85–100.0 wt%, corresponding to (Zn<sub>0.55–0.69</sub>Fe<sub>0.19–0.30</sub>Mn<sub>0.10–0.17</sub>)Ti<sub>0.99–1.03</sub>O<sub>3</sub>, ideally ZnTiO<sub>3</sub>, the Zn analogue of ilmenite. At the type locality the mineral occurs as euhedral tabular grains, up to 50 by 150 μm. Physical and optical properties are similar to those of ilmenite: dark brown to black color and streak, submetallic luster,  $VH_{100} = 500–600$  kg/mm<sup>2</sup>, no cleavage or twinning,  $D_{\text{calc}} = 4.99$  g/cm<sup>3</sup> with  $Z = 6$ . In reflected light, grayish-white with a pinkish tinge, weak reflection pleochroism in air, strongly anisotropic from greenish-gray to dark brownish-gray. Reflectance values in air (SiC standard) for  $R_o$  and  $R_e$  are 470, 19.2–19.9, 17.2–17.7; 546, 19.0–19.7, 17.2–17.6; 589, 18.9–19.6, 17.0–17.6; 650, 18.7–19.2, 16.8–17.5. X-ray crystal-structure study indicated rhombohedral symmetry, space group  $R\bar{3}$ , hexagonal cell dimensions  $a = 5.090(1)$ ,  $c = 14.036(2)$  Å. Strongest lines of the powder pattern are 2.73(100)(10 $\bar{1}$ 4), 2.53(90)(11 $\bar{2}$ 0), 2.23(60)(11 $\bar{2}$ 3), 1.87(40)(02 $\bar{2}$ 4), and 1.71(70)(11 $\bar{2}$ 6), in close agreement with data for synthetic ZnTiO<sub>3</sub> (PDF 26–1500).

At the type locality the mineral is disseminated in quartz-rich metasedimentary rocks of amphibolite-granulite facies and coexists with almandine-spessartine, ferroan gahnite, and rutile. Associated amphibolites contain zincian ilmenite. The new mineral was discovered almost 20 yr ago in flotation residues of oxidized ore from the North mine at Broken Hill. At the San Valentin mine, La Union district, Sierra de Cartegena, Spain, ecandrewsite grains up to 50 μm across occur intergrown with zincian ilmenite in primary oxide-sulfate-carbonate ores. The new name is for E. C. Andrews, New South Wales government geologist (1870–1948), who mapped the Broken Hill region. A single grain from the Melbourne Rockwell mine type locality is at the Museum of Victoria (M35700). Specimens from the San Valentin occurrence are in the collections of the Free University, Amsterdam, the Netherlands. **J.L.J.**

**Fahleite\***

O. Medenbach, K. Schmetzer, K. Abraham (1988) Fahleite from Tsumeb/Namibia, a new mineral belonging

to the smolianinovite group. Neues Jahrb. Mineral. Mon., 167–171.

Electron-microprobe analyses of five different crystal aggregates gave CaO 3.8–4.3, MnO 0.4–0.6, ZnO 25.6–26.5, Fe<sub>2</sub>O<sub>3</sub> 10.1–10.4, As<sub>2</sub>O<sub>5</sub> 43.1–44.2, H<sub>2</sub>O (by difference) 14.4–16.6 wt%, Co, Ni, Mg, and Si not detected; the mean of the analyses corresponds to Ca<sub>1.11</sub>Mn<sub>0.11</sub>Zn<sub>5.02</sub>Fe<sub>1.99</sub>As<sub>5.91</sub>O<sub>24</sub>·13.42H<sub>2</sub>O, ideally Zn<sub>5</sub>CaFe<sub>3</sub><sup>3+</sup>(AsO<sub>4</sub>)<sub>6</sub>·14H<sub>2</sub>O, considered to be the Zn analogue of smolianinovite. The mineral occurs as minute fibrous aggregates or spherules and as gray to bright green to straw-yellow bundles of fibrous crystals more than 1 cm long. The crystals are only a few micrometers thick, are very soft, sectile, flexible, have a silky or pearly luster, are readily soluble in cold acid, and have a perfect cleavage normal to the fibers. The infrared spectrum (not given) is reported to confirm the presence of H<sub>2</sub>O. Optically biaxial positive, with parallel extinction, positive elongation,  $\alpha = 1.628(1)$ ,  $\beta = 1.631(1)$ ,  $\gamma = 1.656(1)$ ,  $2V_{\text{calc}} = 39^\circ$ , Z parallel to the fibers. The X-ray powder pattern contains only five diffuse lines, with  $d$  values and (intensities) as follows: 22(100), 11(100), 3.2(80), 2.9(50), and 1.65 Å (20); the data are in good agreement with the seven similarly diffuse lines reported for smolianinovite.

Fahleite is named for Rolf Fahle of Munich, a mineral dealer who donated the holotype specimen. Type material is deposited in the Mineralogical Institute, Ruhr University at Bochum, Federal Republic of Germany.

**Discussion.** If fahleite is the Zn analogue of smolianinovite, then the latter requires redefinition of its formula. Fahleite has the ideal formula Zn<sub>5</sub>CaFe<sub>3</sub><sup>3+</sup>(AsO<sub>4</sub>)<sub>6</sub>·14H<sub>2</sub>O, and smolianinovite would be Co<sub>6</sub>Fe<sub>3</sub><sup>3+</sup>(AsO<sub>4</sub>)<sub>6</sub>·14H<sub>2</sub>O or Co<sub>5</sub>CaFe<sub>3</sub><sup>3+</sup>(AsO<sub>4</sub>)<sub>6</sub>·14H<sub>2</sub>O. Cell dimensions of fahleite (calculated from the indices assigned to smolianinovite) are  $a = 6.60$ ,  $b = 11.6$ ,  $c = 22$  Å. J.L.J.

#### Ferristrunzite\*

D.R. Peacor, P.J. Dunn, W.B. Simmons, R.A. Ramik (1987) Ferristrunzite, a new member of the strunzite group, from Blaton, Belgium. Neues Jahrb. Mineral. Mon., 453–457.

Electron-microprobe analysis gave Fe<sub>2</sub>O<sub>3</sub> 46.3, P<sub>2</sub>O<sub>5</sub> 28.2, and TGA–EGA gave H<sub>2</sub>O 26.0, sum 100.5 wt%. Microchemical tests showed a strong reaction for Fe<sup>3+</sup> but no reaction for Fe<sup>2+</sup>. The results are in good agreement with those reported for the same mineral by van Tassel (*Bull. Soc. Belge Geol.*, 75, 38–48, 1966) and correspond to Fe<sub>0.92</sub>Fe<sub>2.00</sub><sup>3+</sup>(PO<sub>4</sub>)<sub>2</sub>(OH)<sub>2</sub>[(H<sub>2</sub>O)<sub>5.88</sub>(OH)<sub>0.76</sub>]. The ideal formula is Fe<sup>3+</sup>Fe<sub>2</sub><sup>3+</sup>(PO<sub>4</sub>)<sub>2</sub>(OH)<sub>2</sub>[(H<sub>2</sub>O)<sub>5</sub>(OH)<sub>2.6</sub>], and that of strunzite is MnFe<sub>2</sub><sup>3+</sup>(PO<sub>4</sub>)<sub>2</sub>(OH)<sub>2</sub>(H<sub>2</sub>O)<sub>6</sub>. The new name alludes to the composition and relation to strunzite.

Ferristrunzite occurs as light brownish-yellow matted aggregates: crystals are acicular [001], 2 to 30 μm long; composites are up to 0.5 mm long; and radiating sprays are up to 2.6 mm in diameter. Light yellow streak, brittle, good cleavage parallel to the X–Z optical plane,  $D_{\text{meas}} =$

2.38–2.50 (suspension),  $D_{\text{calc}} = 2.55$  g/cm<sup>3</sup> with Z = 2. Optically biaxial positive,  $\alpha = 1.664(4)$ ,  $\beta_{\text{calc}} = 1.698$ ,  $\gamma = 1.757(5)$ ,  $2V = 77(10)^\circ$ , strong dispersion; pleochroism X = greenish-yellow, Y not observed, Z = brownish-yellow, Z > X, Z  $\wedge$  c = ~17° and Z approximately parallel to the elongation. X-ray single-crystal study indicated triclinic symmetry, pseudomonoclinic, space group P1 or P1̄,  $a = 10.01(2)$ ,  $b = 9.73(2)$ ,  $c = 7.334(8)$  Å,  $\alpha = 90.52(12)$ ,  $\beta = 96.99(10)$ ,  $\gamma = 116.43(10)^\circ$ . Twinned {110}. Strongest lines of the powder pattern (114.6-mm Gandolfi camera, Fe radiation) are 8.87(80)(100), 5.34(100)(011, 11̄1), 4.48(20)(11̄, 200), 4.37(20)(020, 21̄1), 4.20(30)(220), 3.442(30)(012), 3.387(30)(210), 3.267(40)(012), 3.196(20)(102, 320), and 3.022(20)(202).

Ferristrunzite is associated with crandallite, diadochite, allophane-evansite, minyulite, strengite, phosphosiderite, cacoxenite, and beraunite that occur as secondary minerals in argillaceous and clastic sediments exposed in a canal near Blaton, Belgium. Type material is at the Smithsonian Institution, Washington, D.C. J.L.J.

#### Fluorellestadite\*

B.V. Chesnokov, L.F. Bazhenova, A.F. Bushmakin (1987) Fluorellestadite Ca<sub>10</sub>[(SO<sub>4</sub>)<sub>4</sub>(SiO<sub>4</sub>)<sub>6</sub>]F<sub>2</sub>—A new mineral. Zapiski Vses. Mineralog. Obshch., 116, 743–746 (in Russian).

Wet-chemical analysis of impure material gave SO<sub>3</sub> 20.75, SiO<sub>2</sub> 15.30, P<sub>2</sub>O<sub>5</sub> 1.31, CO<sub>2</sub> 0.66, CaO 55.00, MnO 0.18, MgO 1.38, Al<sub>2</sub>O<sub>3</sub> 1.84, Fe<sub>2</sub>O<sub>3</sub> 0.11, Na<sub>2</sub>O 0.33, K<sub>2</sub>O 0.1, H<sub>2</sub>O<sup>+</sup> 0.30, F 3.60, sum 100.76. When corrected for impurities (MgO, Al<sub>2</sub>O<sub>3</sub>, 4% CaO, Fe<sub>2</sub>O<sub>3</sub>, Na<sub>2</sub>O and H<sub>2</sub>O<sup>+</sup>), the analysis corresponds to (Ca<sub>9.97</sub>Mn<sub>0.03</sub>)<sub>210.00</sub>[(SO<sub>4</sub>)<sub>2.84</sub>(SiO<sub>4</sub>)<sub>2.79</sub>(PO<sub>4</sub>)<sub>0.20</sub>(CO<sub>3</sub>)<sub>0.17</sub>]<sub>26.00</sub>F<sub>2.08</sub>, ideally Ca<sub>10</sub>[(SO<sub>4</sub>)<sub>4</sub>(SiO<sub>4</sub>)<sub>6</sub>]F<sub>2</sub>. The mineral occurs as blue to pale bluish-green needles, as hexagonal prismatic, poorly terminated crystals up to 3 mm long, and as fine-grained aggregates. Thin needles are colorless, crystals are transparent, and aggregates are translucent. Vitreous to greasy luster, conchoidal fracture, no cleavage, white streak with a weak bluish tint, H = 4.5,  $D_{\text{meas}} = 3.03(1)$ ,  $D_{\text{calc}} = 3.090$  g/cm<sup>3</sup> with Z = 1. No luminescence in ultraviolet light (360 nm). Soluble and weakly effervescent in HCl, leaving a silica residuum that retains the original form. DTA and TGA curves are featureless, and only 1 wt% loss occurs on heating to 1000 °C. Optically uniaxial negative, colorless, negative elongation,  $\epsilon = 1.632(2)$ ,  $\omega = 1.638(2)$  for white light. The X-ray powder pattern, indexed by analogy with ellestadite (space group P6<sub>3</sub>/m) gave  $a = 9.485(2)$ ,  $c = 6.916(2)$  Å, and strongest lines of 2.84(100)(211), 2.80(60)(112), 2.74(90)(300), 2.28(60)(310), 1.954(70)(222), 1.852(80)(213), 1.766(60)(402), 1.729(70)(004), and 1.463(60)(324).

Fluorellestadite is associated with lime, periclase, magnesioferrite, hematite, srebrodolskite, anhydrite, and anhydrous lime silicates in burned fragments of petrified wood in coal dumps from the mines of Kopeysk, Chelyabinsk coal basin, south Ural Mountains, USSR. The

new name is for the chemical composition and analogy to ellestadite. The name had appeared in the literature previously (*Am. Mineral.* 67, 90–96, 1982), but a definitive description had not been given. The new mineral is the F analogue of hydroxyllellstadite,  $\text{Ca}_{10}(\text{SiO})_3(\text{SO}_4)_3(\text{OH})_2$ . Type material is in the Fersman Mineralogical Museum, Moscow. **J.P.**

#### Isocubanite\*

R. Caye, B. Cervelle, F. Cesbron, E. Oudin, P. Picot, F. Pillard (1988) Isocubanite, a new definition of the cubic polymorph of cubanite  $\text{CuFe}_2\text{S}_3$ , *Mineral. Mag.*, 52, 509–514.

The cubic phase of  $\text{CuFe}_2\text{S}_3$  has been variously named chalcopyrrhotite, cubanite II, cubic cubanite, and *iss* (intermediate solid solution of  $\text{CuFe}_2\text{S}_3$  composition); the name isocubanite has been approved to designate this cubic polymorph of cubanite. Five electron-microprobe analyses of isocubanite from modern “black-smoker” sulfide chimneys at 21°N, East Pacific Rise, gave Cu 20.79–21.52, Zn 0.77–1.09, Fe 41.64–42.49, S 35.49–35.82 wt%, corresponding to a range of  $\text{Cu}_{0.91}\text{Zn}_{0.05}\text{Fe}_{2.05}\text{S}_3$  to  $\text{Cu}_{0.90}\text{Zn}_{0.03}\text{Fe}_{2.02}\text{S}_3$ . The mineral is opaque, bronze color, metallic luster, grain size up to 400  $\mu\text{m}$ , typically euhedral with cubo-octahedra present and with rims and/or lamellae of Fe- and Zn-rich chalcopyrite. Pinkish-brown in reflected light, isotropic, slightly browner and softer than pyrrhotite. Reflectivity percentages (SiC standard) are given in 20-nm steps; representative values in air and oil, respectively, are 420, 22.73, 12.94; 460, 26.87, 16.40; 500, 31.34, 20.08; 540, 34.79, 22.73; 580, 37.35, 24.58; 620, 39.11, 25.83; 660, 40.32, 26.80; 700, 41.33, 27.48; 740, 41.91, 27.87; 780, 42.50, 27.42. Single-crystal study showed the mineral to be cubic, space group  $Fm\bar{3}m$ ,  $a = 5.303(3)$  Å [slightly larger than that of pure synthetic material ( $a = 5.283$ – $5.286$ ) because of the minor substitution of Zn]. The X-ray powder pattern (114-mm Gandolfi camera, Fe radiation) consists of five lines: 3.059(100)(111), 2.647(20)(200), 1.876(70)(220), 1.602(50)(311), and 1.327(20)(400). Type material is in the Mineralogical Collection of the Ecole Nationale Supérieure des Mines, Paris. **J.L.J.**

#### Kadyrelite\*

Vasilev V.I. (1987) Kadyrelite  $\text{Hg}_4(\text{Br},\text{Cl})_2\text{O}$ —A new oxyhalide of mercury from the Kadyrelsky ore occurrence (Tuvinskaya ASSR). *Zapiski Vses. Mineralog. Obshch.*, 116, 733–737 (in Russian).

Microprobe analysis (average of 5) gave Hg 84.36, Br 10.19, Cl 2.93, I 0.01, O (calc.) 1.70, total 99.19 wt%, corresponding to  $\text{Hg}_{3.99}(\text{Br}_{1.21}\text{Cl}_{0.79})_{2.00}\text{O}_{1.01}$ . In 40% KOH the mineral immediately turns black; in HCl, it slowly becomes dark gray, and it is readily soluble in 1:1  $\text{HNO}_3$ , leaving a cottonlike white residuum. X-ray powder study

showed the mineral to be cubic, isostructural with eglestonite. Space group (by analogy with eglestonite)  $Ia\bar{3}d$ ,  $a = 16.22$  Å. Strongest lines of the X-ray powder pattern (28 lines given) are 4.06(30)(400), 3.32(100)(422), 2.63(20)(611,532), 2.57(60–70)(620), 2.344(20)(444), 1.912(80–90)(822,660), and 1.731 (20)(664).  $D_{\text{calc}} = 8.79$  g/cm<sup>3</sup> with  $Z = 24$ . Bright to dull orange color, orange-yellow streak, brittle, vitreous to adamantine luster,  $H = 2.5$  to 3, microhardness 143–192 (average 175) kg/mm<sup>2</sup>, conchoidal to uneven fracture, no cleavage. Transparent in transmitted light, bright orange-yellow, isotropic, refractive index  $>2$ . In reflected light, grayish-white, with weak bluish tint visible at high magnifications. Isotropic, no birefractance, intense orange internal reflection. Reflectance (nm, %): 436, 27.7; 460, 25.3; 500, 21.2; 546, 19.4; 589, 18.1; 620, 17.8; 656, 16.6. Readily polishable, but after exposure in air the polished surface become bluish, then brownish.

Kadyrelite occurs in cavities in carbonate veins, or rarely forms individual grains up to 0.5 mm at the Kadyrelsky mercury ore occurrence, Tuvinskaya ASSR (USSR), where it is intergrown with eglestonite and bromian eglestonite and is associated with calomel, bromian calomel, kuzminite, corderoite, lavrentievite, etc. The new name is for the locality. Type material is at the Museum of the Institute of Geology and Geophysics (Novosibirsk, USSR), and at the Museum of the Leningrad Mining Institute, Leningrad, USSR. **J.P.**

#### Pottsite\*

S.A. Williams (1988) Pottsite, a new vanadate from Lander County, Nevada. *Mineral. Mag.*, 52, 389–390.

Electron-microprobe analysis gave PbO 32.4, Bi<sub>2</sub>O<sub>3</sub> 34.0, V<sub>2</sub>O<sub>5</sub> 26.6, H<sub>2</sub>O 6.71 (Penfield determination on 216  $\mu\text{g}$ ), sum 99.71 wt% [corresponding to  $\text{H}_{1.02}\text{Pb}_{0.99}\text{Bi}_{0.99}(\text{VO}_4)_{1.99} \cdot 2.0\text{H}_2\text{O}$ ], ideally  $\text{HPbBi}(\text{VO}_4)_2 \cdot 2\text{H}_2\text{O}$ . The special site for H is assigned merely to provide charge balance. The mineral is bright yellow, adamantine luster, pale yellow streak, brittle,  $H = 3\frac{1}{2}$ ,  $D_{\text{meas}} = \sim 7.0$ ,  $D_{\text{calc}} = 7.31$  g/cm<sup>3</sup> with  $Z = 10$ . Crystals are up to 1 mm long and are pyramids or stubby prisms terminated by pyramids; {101} is typically dominant, and also present are {110}, {103}, and {211}. In thin section, cloudy yellow, uniaxial negative,  $\omega = 2.40$ ,  $\epsilon = 2.30$ . X-ray single-crystal study indicated tetragonal symmetry, space group  $I_1422$ ,  $a = 11.084$ ,  $c = 12.634$  Å. Strongest lines of the powder pattern (114-mm camera, Cr radiation) are 4.618(90)(121), 4.168(30)(022), 3.210(40)(123), 3.062(100)(132), 2.476(40)(240), 2.252(30)(125), 2.184(30)(051,341), 1.952(30)(235,244), and 1.523(30).

Pottsite occurs near Potts, Lander County, Nevada, in the oxide zone of a tungsten mine. Associated minerals are scheelite, clinobisvanite, bismutite, and vanadinite. Type material is in the British Museum (N.H.), London, England. **J.L.J.**

**Zharchikhite\***

S.V. Bolokhontseva, S.V. Baturin, E.S. Ilmeyer, M.A. Papova, S.P. Purusova (1988) Zharchikhite  $\text{AlF}(\text{OH})_2$ —A new mineral. *Zapiski Vses. Mineralog. Obshch.*, 117, 79–83 (in Russian).

Wet-chemical analysis gave  $\text{Al}_2\text{O}_3$  59.03,  $\text{SiO}_2$  2.54,  $\text{MnO}$  0.07,  $\text{CaO}$  0.39,  $\text{MgO}$  0.13,  $\text{F}$  22.96,  $\text{H}_2\text{O}$  24.55,  $\text{O} = \text{F}$  9.67, sum 100.00, and microprobe analysis gave  $\text{Al}_2\text{O}_3$  61.8,  $\text{SiO}_2$  0.5, sum 62.3 wt%, suggesting that Mn, Ca, Mg and part of the Si are due to impurities; the ideal formula is  $\text{AlF}(\text{OH})_2$ . The infrared spectrum has strong absorption bands at 3200–3700  $\text{cm}^{-1}$ , proving the presence of OH groups in the mineral. The DTA curve exhibits a marked endothermic effect at 480 °C, a weaker one at 600 °C, and two weak and diffuse ones at 845 and 860 °C. Weight loss (%): 560 °C, 22.04; 560–650 °C, 3.64; 650–800 °C, 4.45; 800–900 °C, 3.23; sum 33.36. After heating to 650 °C the mineral becomes opaque and milky, and its refractive indices and birefringence are significantly lowered. Zharchikhite does not react with acids, but is mildly soluble in NaOH (heating enhances the dissolution rate). The mineral forms drusy aggregates consisting of fine-grained masses that grade into transparent, colorless, prismatic crystals up to 2.5 mm long. The crystals are orthorhombic, elongate [001], with prominent {110} and {010}, and terminated by {101} and {111}. Luster vitreous, microhardness 596  $\text{kg}/\text{mm}^2$  parallel to the elongation, 426  $\text{kg}/\text{mm}^2$  perpendicular to it, average 500  $\text{kg}/\text{mm}^2$  ( $H = 4.5$ , Mohs). Very brittle, perfect {010} cleavage.  $D_{\text{meas}} = 2.81(1)$ ,  $D_{\text{calc}} = 2.82 \text{ g}/\text{cm}^3$ . Biaxial negative,  $\alpha = 1.532(2)$ ,  $\beta = 1.552(2)$ ,  $\gamma = 1.567(2)$  (592 nm),  $2V_{\text{calc}} = 80^\circ$ ,  $Z \wedge c = 43\text{--}44^\circ$ ,  $Y = b$ , optic-axis plane (010), inclined dispersion,  $r > v$ . Single-crystal X-ray study showed the mineral to be monoclinic, space group  $P2_1/a$ ,  $a = 5.164(1)$ ,  $b = 7.843(1)$ ,  $c = 5.179 \text{ \AA}$ ,  $\beta = 116.244(8)^\circ$ . The strongest lines (43 given) of the powder pattern are 3.98 (100)(011), 2.92(80)(121), 2.31(70)(200), 1.833(90)(231), 1.737(70)(211), and 1.289(70)(402).

Zharchikhite occurs in cavities in hydrothermally mineralized fault breccia in a trachytic neck in the Zharchinskoye stockwork molybdenum deposit, Zabaykalye, USSR. The new mineral is associated with prosopite, ralstonite, gearksutite, barite, and siderite. The name is for the place of occurrence. Type material is at the Fersman Mineralogical Museum, Moscow. **J.P.**

**Unnamed  $\text{Au}_3\text{Hg}$** 

N.R. Baptista, A. Baptista (1987) Gold amalgam, a possible new mineral species, from Sumidouro de Mariana, Minas Gerais State. *An. Acad. brasil. Ciênc.*, 58, 457–463 (in Portuguese, English summary).

Microcrystalline aggregates and rosettes of pale yellow, metallic, hexagonal prismatic crystals from Sumidouro, Mariana County, Minas Gerais State, Brazil, are present in a vial of grains constituting sample 6210M in the min-

eralogical collection of the National Museum. Spectrochemical analysis of about 40 mg showed Au, Hg, and Fe to be the principal elements. Single-crystal X-ray study indicated hexagonal symmetry,  $a = 2.951$ ,  $c = 4.810 \text{ \AA}$ . Indexed Gandolfi powder patterns (three are listed) are in good agreement with data for synthetic  $\text{Au}_3\text{Hg}$  (PDF 4–808).

Although gold occurs at Sumidouro, mercury minerals are not known.  $\text{Au}_3\text{Hg}$  could have formed naturally or could be the result of mining activity known to have occurred in the region.

**Discussion.** The same mineral has been reported to occur in a gold-silver orebody in China and has been named weishanite (*Am. Mineral.*, 73, 196, 1988). **J.L.J.**

**Unnamed Mn phosphate**

D.R. Peacor, P.J. Dunn, R.A. Ramik, T.J. Campbell, W.L. Roberts (1985) A wicksite-like mineral from the Bull Moose mine, South Dakota. *Can. Mineral.*, 23, 247–249.

Chemical analysis gave  $\text{Fe}_2\text{O}_3$  17.2,  $\text{FeO}$  9.2,  $\text{MgO}$  0.2,  $\text{CaO}$  12.0,  $\text{Na}_2\text{O}$  0.8,  $\text{MnO}$  16.9,  $\text{P}_2\text{O}_5$  40.9,  $\text{H}_2\text{O}$  4.2, sum 101.4 wt%. The FeO was determined by titration,  $\text{H}_2\text{O}$  by estimation from the 6.7% loss obtained by TGA-EGA, and all others by electron-microprobe analysis. The tentative formula is  $\text{Fe}_{8.88}^{3+}\text{Fe}_{5.28}^{2+}\text{Mg}_{0.20}\text{Ca}_{8.82}\text{Na}_{1.06}\text{Mn}_{11.05}\text{P}_{23.77}\text{H}_{19.22}\text{O}_{108.23}$ , generalized as  $(\text{Mn}, \text{Fe}^{3+}, \text{Fe}^{2+}, \text{Na}, \text{Ca}, \text{Mg})_7\text{Ca}_2(\text{PO}_4)_6(\text{OH}, \text{H}_2\text{O})_4$ . The mineral is dark green and has a slightly pearly luster on cleavage surfaces but is dull on fracture surfaces,  $D_{\text{meas}} = 3.64(5)$  by suspension,  $D_{\text{calc}} = 3.766 \text{ g}/\text{cm}^3$  with  $Z = 4$ . Optically biaxial positive,  $\alpha = 1.781(3)$ ,  $\beta = 1.787(3)$ ,  $\gamma = 1.796(3)$ ,  $2V$  about  $75^\circ$ ; intensely pleochroic:  $X =$  dark brownish-green,  $Y =$  dark green,  $Z =$  medium brownish-green,  $X > Y > Z$ , strong dispersion  $r < v$ . Precession photographs are of poor quality but resemble those of wicksite. The X-ray powder pattern (114.5-mm Gandolfi camera, Fe radiation) also is similar to that of wicksite and yields an orthorhombic cell with  $a = 12.77(1)$ ,  $b = 12.59(1)$ ,  $c = 11.709(8) \text{ \AA}$ ; strongest lines are 6.31(40)(020), 5.84(50)(002), 2.997(90)(232,411), 2.927(100)(004), 2.769(100)(042,421), and 2.098(60).

The new mineral occurs as a drusy coating on barbosalite from the Bull Moose mine, South Dakota. The mineral is thought to be the Mn analogue of wicksite, but more work is needed to resolve the uncertainties in their formulas. The samples studied are in the Smithsonian Institution, Washington, D.C. (NMNH 159890 and 159892). **J.L.J.**

**New Data****Ehrleite**

F.C. Hawthorne, J.D. Grice (1987) The crystal structure of ehrleite, a tetrahedral sheet structure. *Can. Mineral.*, 25, 767–774.

X-ray crystal-structure study of holotype ehrleite showed that the formula is  $\text{Ca}_2\text{ZnBe}(\text{PO}_4)_2(\text{PO}_3\text{OH}) \cdot 4\text{H}_2\text{O}$  and the cell is triclinic, space group  $P\bar{1}$ ,  $a = 7.130(4)$ ,  $b = 7.430(4)$ ,  $c = 12.479(9)$  Å,  $\alpha = 94.31(5)$ ,  $\beta = 102.07(4)$ ,  $\gamma = 82.65(4)^\circ$ . The formula and unit cell are new. **J.L.J.**

#### Ramsbeckite

H. Effenberger (1988) Ramsbeckite,  $(\text{Cu,Zn})_{15}(\text{OH})_{22}(\text{SO}_4)_4 \cdot 6\text{H}_2\text{O}$ : Revision of the chemical formula based on a structure determination. *Neues Jahrb. Mineral. Mon.*, 38–48.

X-ray crystal-structure determination, utilizing type material provided by one of the co-authors of the 1985 original description of ramsbeckite, led to a revision of the formula to  $(\text{Cu,Zn})_{15}(\text{OH})_{22}(\text{SO}_4)_4 \cdot 6\text{H}_2\text{O}$  with  $Z = 2$ ; the original formula was  $(\text{Cu,Zn})_7(\text{OH})_{10}(\text{SO}_4)_2 \cdot 5\text{H}_2\text{O}$  with  $Z = 4$ . **J.L.J.**

#### Roggianite

E. Passaglia, G. Vezzalini (1988) Roggianite: revised chemical formula and zeolitic properties. *Mineral. Mag.*, 52, 202–206.

A new, complete chemical analysis of holotype roggianite revealed the presence of 3.19 wt% BeO. Re-interpretation of the composition, based on the chemical results and crystal-structure considerations, leads to the formula  $\text{Ca}_{14}(\text{Na,K})[\text{Be}_5\text{Al}_{15}\text{Si}_{28}\text{O}_{90}(\text{OH})_{14}](\text{OH})_2 \cdot 34\text{H}_2\text{O}$ . Roggianite is considered to be a zeolite-group mineral: it has an appreciable ion-exchange capacity and attains almost complete rehydration after heating to 750 °C. **J.L.J.**

#### Uranophane

D. Ginderow (1988) Structure of alpha uranophane,  $\text{Ca}(\text{UO}_2)_2(\text{SiO}_3\text{OH})_2 \cdot 5\text{H}_2\text{O}$ . *Acta Cryst.*, C44, 421–424 (in French).

Uranophane was considered previously to have the formula  $(\text{H}_3\text{O})_2\text{Ca}(\text{UO}_2)_2(\text{SiO}_4)_2 \cdot 3\text{H}_2\text{O}$ , but X-ray determination of the crystal structure showed that charge balance is attained by  $(\text{OH})^-$  in  $(\text{SiO}_3\text{OH})$  tetrahedra rather than by the presence of  $(\text{H}_3\text{O})$ . The new formula is  $\text{Ca}(\text{UO}_2)_2(\text{SiO}_3\text{OH})_2 \cdot 5\text{H}_2\text{O}$ .

**Discussion.** The new formula should apply also to uranophane-beta, which is dimorphous with uranophane. **J.L.J.**

## ERRATUM

#### Toward a practical plagioclase-muscovite thermometer by

Nathan L. Green and Steven I. Usdansky (v. 71, p. 1109–1117). Page 1111: The equation for  $T$  in the right-hand column contains a misplaced parenthesis. The following equation should therefore be substituted:

$$T = [19456A + 12230B + 27320C + 18810D + 8473E + 28226F - 65407G + 65305.4H - 2087.6587 + P(-0.0431 - 0.456A + 0.6653B + 0.364C + 0.364D + 2.1121G + 0.9699H)] / (7.5805 - 8.3147 \ln K_p - 1.6544A - 0.7104B + 10.3C + 10.3D - 114.104G + 12.5365H).$$