

## NEW MINERAL NAMES\*

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### Bearthite\*

C. Chopin, F. Brunet, W. Gebert, O. Medenbach, E. Tillmanns (1993) Bearthite,  $\text{Ca}_2\text{Al}[\text{PO}_4]_2(\text{OH})$ , a new mineral from high-pressure terranes of the western Alps. Schweiz. Mineral. Petrogr. Mitt., 73, 1–9.

Electron microprobe analyses of the holotype sample from the Monte Rosa massif, Zermatt Valley, Switzerland, gave CaO 33.04, SrO 3.53, MgO 0.12, FeO 0.03,  $\text{Al}_2\text{O}_3$  15.91,  $\text{Ce}_2\text{O}_3$  0.04,  $\text{La}_2\text{O}_3$  0.03,  $\text{SiO}_2$  0.30,  $\text{P}_2\text{O}_5$  44.32,  $\text{SO}_3$  0.01, F 0.48, Cl 0.02, sum (less O = F, Cl) 97.62 wt%, corresponding to  $(\text{Ca}_{3.74}\text{Sr}_{0.22})_{\Sigma 3.96}(\text{Al}_{1.98}\text{Mg}_{0.02})_{\Sigma 2.00}(\text{P}_{3.97}\text{Si}_{0.03})_{\Sigma 4.00}\text{F}_{0.16}$ , close to the ideal formula  $\text{Ca}_2\text{Al}[\text{PO}_4]_2(\text{OH})$ , with OH confirmed by structural refinement. Other analyses indicate appreciable Ca + Al = REE + Mg substitution. Occurs as yellowish aggregates, up to millimeter size, of partly euhedral, flat prismatic crystals and as smaller anhedral grains corroded by lazulite in concordant quartz segregations in gneiss and schist. Also present as a rock-forming accessory in pyrope-phenigite quartzite and in coesite-bearing metapelite in the Dora Maira massif, western Alps, Italy. Yellowish color, white streak, possibly one poor prismatic cleavage, uneven fracture,  $H = < 5$ , soluble in HCl,  $D_{\text{calc}} = 3.25 \text{ g/cm}^3$  with  $Z = 2$ . Colorless and transparent in thin section, biaxial positive,  $\alpha = 1.662(1)$ ,  $\beta = 1.671(1)$ ,  $\gamma = 1.696(1)$ ,  $2V_{\text{meas}} = 65.0(3)^\circ$ ,  $X \parallel b$ , distinct dispersion  $r < v$ . Single-crystal X-ray structure study ( $R = 0.058$ ) gave monoclinic symmetry, space group  $P2_1/m$ ,  $a = 7.231(3)$ ,  $b = 5.734(2)$ ,  $c = 8.263(4) \text{ \AA}$ ,  $\beta = 112.57(8)^\circ$ . Strongest lines of the X-ray powder pattern (114-mm Gandolfi camera,  $\text{CuK}\alpha$  radiation, calculated intensities) are 4.58(2,011), 3.05(100,  $\bar{2}11$ ), 2.867(61,020), 2.754(27,  $\bar{1}03$ ), 2.634(21,120), 2.568(39,112), and 2.444(19,211). Synthesized as flat prismatic crystals up to 150  $\mu\text{m}$ .

The new name is for P. Bearth (1902–1989) in recognition of his pioneering petrographic work on the high-pressure terranes of the western Alps. Textural relationships suggest that bearthite formed during the early high-pressure stages of Alpine metamorphism. Type material is in the Mineralogisch-Petrographisches Institut, University of Basel, Switzerland, and at the Musée de Minéralogie, Ecole des Mines de Paris, and the Museum d'Histoire naturelle, Paris. J.L.J.

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

### Cancrisilite\*

A.P. Khomyakov, E.I. Semenov, E.A. Pobedimskaya, T.N. Nadezhina, R.K. Rastsvetaeva (1991) Cancrisilite  $\text{Na}_7[\text{Al}_5\text{Si}_7\text{O}_{24}]\text{CO}_3 \cdot 3\text{H}_2\text{O}$ : A new mineral of the cancrinite group. Zapiski Vses. Mineral. Obshch., 120(6), 80–84 (in Russian).

The reported chemical composition is  $\text{Na}_2\text{O}$  21.30,  $\text{K}_2\text{O}$  0.10,  $\text{CaO}$  0.68,  $\text{MnO}$  0.11,  $\text{Fe}_2\text{O}_3$  0.33,  $\text{Al}_2\text{O}_3$  24.42,  $\text{SiO}_2$  43.11,  $\text{CO}_2$  4.82,  $\text{SO}_3$  0.36,  $\text{H}_2\text{O}$  5.01, sum 100.24 wt%, corresponding to  $(\text{Na}_{6.89}\text{K}_{0.02}\text{Ca}_{0.12}\text{Fe}_{0.04}\text{Mg}_{0.03})_{\Sigma 7.20}(\text{Al}_{4.80}\text{Si}_{7.20})_{\Sigma 12.00}\text{O}_{24.10}(\text{CO}_3)_{1.10}(\text{SO}_4)_{0.04} \cdot 2.79\text{H}_2\text{O}$ , ideally  $\text{Na}_7\text{Al}_5\text{Si}_7\text{O}_{24}\text{CO}_3 \cdot 3\text{H}_2\text{O}$ . Dissolves readily with effervescence at room temperature in 10% HCl,  $\text{HNO}_3$ , and  $\text{H}_2\text{SO}_4$ . Single-crystal X-ray study showed the mineral to be hexagonal, space group  $P6_3mc$ , unit cell  $a = 12.575(3)$ ,  $c = 5.105(2) \text{ \AA}$ . The powder pattern resembles that of cancrinite, though the symmetry is higher (cancrinite has space group  $P6_3$ ). The strongest lines (27 given) are 6.30(70,110), 4.61(50,101), 3.65(90,300), 3.22(100,211), and 2.722(50,400). Occurs as anhedral lilac-colored grains 1–3 mm across, varying from water-clear to turbid, vitreous luster, conchoidal fracture, colorless in thin section, white streak, brittle,  $H = 5$ ,  $D_{\text{meas}} = 2.40(2)$ ,  $D_{\text{calc}} = 2.39 \text{ g/cm}^3$  with  $Z = 1$ . Optically uniaxial negative,  $\omega = 1.509(2)$ ,  $\epsilon = 1.490(2)$ . Luminesces yellow in UV light, similar to feldspars containing  $\text{S}^{2-}$  or  $\text{SO}_4^{2-}$ . The IR spectrum has minima at 425, 455, 493, 573, 620, 686, 858, 980, 1120, 1453, 1560, 1620, and 3580  $\text{cm}^{-1}$ . The mineral occurs in hyperalkalic pegmatites of the Lovozero alkalic massif, which also contain potassium feldspar, nepheline, arfvedsonite, aegirine, and 27 other listed minor minerals. The name refers to the anomalously high Si/Al ratio for a cancrinite-group mineral. Type material is at the Fersman Mineralogical Museum, Moscow, and at the Vernadskii Geological Museum, Moscow. D.A.V.

### Guarinoite\*, thesesemagnanite\*

H. Sarp (1993) Guarinoite  $(\text{Zn},\text{Co},\text{Ni})_6(\text{SO}_4)(\text{OH},\text{Cl})_{10} \cdot 5\text{H}_2\text{O}$  and thesesemagnanite  $(\text{Co},\text{Zn},\text{Ni})_6(\text{SO}_4)(\text{OH},\text{Cl})_{10} \cdot 8\text{H}_2\text{O}$ , two new minerals from the Cap Garonne mine, Var, France. Archives des Sciences, 46(1), 37–44 (in French, English abs.).

### Guarinoite

Electron microprobe and CHN analyses gave ZnO 33.31, CoO 22.17, NiO 6.74, CuO 0.05,  $\text{SO}_3$  11.85, Cl

0.77, H<sub>2</sub>O 24.4, O = Cl 0.17, sum 99.12 wt%, corresponding to (Zn<sub>2.99</sub>Co<sub>2.16</sub>Ni<sub>0.66</sub>)<sub>25.81</sub>(SO<sub>4</sub>)<sub>1.08</sub>Cl<sub>0.16</sub>(OH)<sub>9.30</sub>·5.23H<sub>2</sub>O, ideally (Zn,Co,Ni)<sub>6</sub>(SO<sub>4</sub>)(OH,Cl)<sub>10</sub>·5H<sub>2</sub>O. Occurs as bright to deep pink aggregates or rounded aggregates to 0.3 mm of thin hexagonal crystals up to 0.04 × 0.2 mm, tabular {001}. Transparent, vitreous to pearly luster, light pink streak, irregular fracture, perfect {001} cleavage, soft, nonfluorescent, soluble in HCl,  $D_{\text{meas}} = 2.80$ ,  $D_{\text{calc}} = 2.77(1)$  g/cm<sup>3</sup> with  $Z = 3$ . Optically uniaxial negative,  $\omega = 1.584(2)$ ,  $\epsilon = 1.544(2)$ , strongly pleochroic with  $O = \text{pink}$ ,  $E = \text{light pink}$ . Single-crystal X-ray study indicated hexagonal symmetry, space group  $P6_3$ ,  $P6_3/m$ , or  $P6_32$ ,  $a = 8.344(4)$ ,  $c = 21.59(2)$  Å. Strongest lines of the powder pattern (114-mm Gandolfi, CuK $\alpha$  radiation) are 10.8(100,002), 3.300(90,114), 2.725(60,120,116), 2.563(50,123), 2.351(40,302,207), and 1.575(30,411).

The new name is for André Guarino, mineral collector. Type material is in the Mineralogy Department of the Natural History Museum, Geneva, Switzerland.

### Therese magnanite

Electron microprobe and CHN analyses gave CoO 32.95, ZnO 20.42, NiO 3.18, CuO 0.16, SO<sub>3</sub> 10.54, Cl 5.65, H<sub>2</sub>O 28.40, O = Cl 1.28, sum 100.02 wt%, corresponding to (Co<sub>3.47</sub>Zn<sub>1.98</sub>Ni<sub>0.34</sub>Cu<sub>0.02</sub>)<sub>25.81</sub>(SO<sub>4</sub>)<sub>1.04</sub>(OH)<sub>8.29</sub>Cl<sub>1.25</sub>·8.3H<sub>2</sub>O, ideally (Co, Zn, Ni)<sub>6</sub>(SO<sub>4</sub>)(OH, Cl)<sub>10</sub>·8H<sub>2</sub>O. Occurs as pink to light pink, thin platy crystals, tabular {001}, making up radiating spherules to 0.2 mm. Crystals are transparent, pearly luster, light pink streak, perfect {001} cleavage, irregular fracture, soft, nonfluorescent, soluble in HCl,  $D_{\text{meas}} = 2.52(2)$ ,  $D_{\text{calc}} = 2.48(1)$  g/cm<sup>3</sup> with  $Z = 3$ . Optically uniaxial negative,  $\omega = 1.568(2)$ ,  $\epsilon = 1.542(2)$ , strongly pleochroic with  $O = \text{pink}$ ,  $E = \text{light pink to colorless}$ . A Laue pattern indicated hexagonal symmetry,  $a = 8.363(8)$ ,  $c = 26.18(17)$  Å as derived from a Gandolfi pattern (114 mm, CuK $\alpha$  radiation) with strongest lines of 13.1(100,002), 3.523(30,114), 2.985(30,108), 2.681(40,122), and 2.527(90,124).

Therese magnanite is named for Thérèse Magnan, for her contributions to knowledge about the Cu-Pb Cap Garrone mine, Var, France. Type material is in the Mineralogy Department of the Natural History Museum, Geneva, Switzerland. Therese magnanite and guarinoite are secondary alteration minerals associated with a quartz gangue and anglesite, antlerite, ktenasite, cerussite, brochantite, covellite, tennantite, and gersdorffite. J.L.J.

### Hydroxycancrinite\*

A.P. Khomyakov, T.N. Nadezhina, R.K. Rastsvetaeva, E.A. Pobedimskaya (1992) Hydroxycancrinite Na<sub>8</sub>[Al<sub>6</sub>Si<sub>6</sub>O<sub>24</sub>](OH)<sub>2</sub>·2H<sub>2</sub>O: A new mineral. Zapiski Vses. Mineral. Obshch., 121(1), 100–105 (in Russian).

The reported chemical composition is Na<sub>2</sub>O 23.43, K<sub>2</sub>O 0.45, CaO 0.92, MgO 0.11, MnO 0.03, Fe<sub>2</sub>O<sub>3</sub> 0.18, Al<sub>2</sub>O<sub>3</sub> 31.15, SiO<sub>2</sub> 36.32, CO<sub>2</sub> 1.59, H<sub>2</sub>O 5.41, sum 99.59 wt%, corresponding to (Na<sub>7.46</sub>K<sub>0.10</sub>Ca<sub>0.16</sub>Mg<sub>0.03</sub>Fe<sub>0.02</sub>)<sub>27.77</sub>(Al<sub>6.03</sub>-

Si<sub>5.97</sub>)<sub>212</sub>O<sub>24</sub>(OH)<sub>1.23</sub>(CO<sub>3</sub>)<sub>0.36</sub>·2.35H<sub>2</sub>O, ideally Na<sub>8</sub>[Al<sub>6</sub>-Si<sub>6</sub>O<sub>24</sub>](OH)<sub>2</sub>·2H<sub>2</sub>O. The IR spectrum shows peaks at 1375 and 1460 cm<sup>-1</sup> due to carbonate. The mineral dissolves easily at room temperature in HCl, HNO<sub>3</sub>, and H<sub>2</sub>SO<sub>4</sub>, with slight effervescence. Single-crystal X-ray study gave trigonal symmetry, space group  $P3$ ,  $a = 12.740(3)$ ,  $c = 5.182(2)$  Å. Strongest lines (27 given) of the powder pattern are 6.43(25,110), 4.70(60,101), 3.68(70,300), 3.26(100,211), 2.756(50,400), and 2.433(30,401). Occurs in massive aggregates 10–15 mm across; blue color, vitreous luster, steplike fracture,  $H = 6$ , brittle, white streak, perfect {100} cleavage,  $D_{\text{meas}} = 2.32(2)$ ,  $D_{\text{calc}} = 2.26$  gm/cm<sup>3</sup> with  $Z = 1$ , nonfluorescent. Transparent and colorless in thin section, optically uniaxial positive,  $\omega = 1.494(2)$ ,  $\epsilon = 1.501(2)$ .

The mineral occurs in veins 1–5 cm wide in ultra-alkalic pegmatites of the Lovozero massif, Kola Peninsula, associated with natrolite, steenstrupine, vuonnemite, epistolite, mountainite, ilmajokite, and nastrophite. As with the synthetic analogue, the mineral is thought to form from alkalic fluids that are impoverished in Ca and CO<sub>3</sub>. The name is for the chemical composition. Type material is at the Fersman Mineralogical Museum, Moscow, and the Vernadskii Museum, Moscow. D.A.V.

### Manaksite\*

A.P. Khomyakov, T.A. Kurova, G.N. Nechelyustov (1992) Manaksite NaKMnSi<sub>4</sub>O<sub>10</sub>: A new mineral. Zapiski Vses. Mineral. Obshch., 121(1), 112–114 (in Russian).

Analysis by electron microprobe (average of three) gave Na<sub>2</sub>O 8.9, K<sub>2</sub>O 10.8, SrO 0.2, CaO 0.2, MgO 0.3, MnO 17.2, FeO 0.8, SiO<sub>2</sub> 62.0, sum 100.4 wt%, corresponding to (Na<sub>1.11</sub>K<sub>0.89</sub>Ca<sub>0.01</sub>)<sub>22.01</sub>Sr<sub>0.01</sub>(Mn<sub>0.94</sub>Fe<sub>0.03</sub>)<sub>20.97</sub>Mg<sub>0.03</sub>Si<sub>3.99</sub>O<sub>10</sub>, ideally NaKMnSi<sub>4</sub>O<sub>10</sub>. This represents the Mn analogue of fenaksite. Colorless to creamy or rosy, translucent and transparent in thin section, perfect {001} and {010} cleavages, steplike and hackly fracture, brittle,  $H = 5$ , nonfluorescent,  $D_{\text{meas}} = 2.73(2)$ ,  $D_{\text{calc}} = 2.71$  g/cm<sup>3</sup> with  $Z = 2$ . The infrared spectrum has a wide absorption peak from 1142–982, with a maximum at 1060, and a series of narrow peaks at 795, 770, 750 (weak), 692 (strong), 632 (weak), 605 (strong), 533 (moderate), 470, and 430 (strong) cm<sup>-1</sup>. Readily dissolves incongruently in cold 10% HCl, and on heat treatment at 600 °C produces several phases, including serandite. X-ray study indicated triclinic symmetry, space group  $P\bar{1}$ ,  $a = 6.993(5)$ ,  $b = 8.219(7)$ ,  $c = 10.007(9)$  Å,  $\alpha = 105.11(7)$ ,  $\beta = 100.76(6)$ ,  $\gamma = 114.79(6)^\circ$ . Strongest lines (20 given) of the powder pattern are 6.89(70,010), 3.45(100,022,020), 3.26(90,013), 3.05(80,212,113), 2.880(70,023), 2.715(70,113,122), and 2.463(70,031). Optically biaxial negative,  $\alpha = 1.540(2)$ ,  $\beta = 1.551(2)$ ,  $\gamma = 1.557(2)$ ,  $2V = 73^\circ$ , with clear dispersion  $r > v$ .

The mineral forms disseminated irregular grains from 1 to 3 mm across and in aggregates up to 5 mm, inter-

stitial to rock-forming minerals in alkalic pegmatites of the Lovozero massif, Kola Peninsula. Associated minerals include potassium feldspar, nepheline, sodalite, cancrisilite, arfvedsonite, aegirine, analcime, albite, ussingite, makatite, villiumite, and 16 accessory minerals. The new name is for the chemical composition. Type material is at the Fersman Mineralogical Museum, Moscow. **D.A.V.**

#### Namansilite\*

V.V. Kalinin, I.M. Marsii, Yu.P. Dikov, N.V. Troneva, N.V. Trubkin (1992) Namansilite  $\text{NaMn}^{3+}\text{Si}_2\text{O}_6$ : A new silicate. *Zapiski Vses. Mineral. Obshch.*, 121(1), 89–94 (in Russian).

Analysis by electron microprobe (average of five) gave  $\text{SiO}_2$  52.64,  $\text{Al}_2\text{O}_3$  0.20,  $\text{Ti}_2\text{O}_3$  [sic] 0.19,  $\text{Fe}_2\text{O}_3$  1.65,  $\text{Mn}_2\text{O}_3$  32.36,  $\text{MgO}$  0.32,  $\text{CaO}$  0.07,  $\text{Na}_2\text{O}$  13.81,  $\text{K}_2\text{O}$  0.05,  $\text{SrO}$  0.42,  $\text{BaO}$  0.05, sum 101.16 wt%, corresponding to  $[\text{Na}_{1.01}(\text{K}, \text{Sr}, \text{Ba})_{0.01}]_{\Sigma 1.02}[\text{Mn}_{0.93}^{3+}\text{Fe}_{0.05}^{3+}\text{Mg}_{0.02} - (\text{Ti}, \text{Al})_{0.01}]_{\Sigma 1.01}\text{Si}_2\text{O}_6$ , ideally  $\text{NaMn}^{3+}\text{Si}_2\text{O}_6$ . The indicated valence of Mn was determined through X-ray photoelectric spectroscopy. Electron microdiffraction demonstrated that the new mineral is isostructural with aegirine. Refinement of the powder X-ray diffraction pattern gave  $a = 9.513(4)$ ,  $b = 8.615(3)$ ,  $c = 5.356(7)$  Å,  $\beta = 105.12^\circ$ ; strongest lines (23 given) are 6.330(80,110), 4.306(80,020), 2.927(90,221), 2.886(80,310), 2.584(90,002), and 2.501(90,131). Occurs as equant to elongate grains (3:1 aspect ratio) and rarely as elongate prisms, measuring up to 0.6 mm. Dark red to orange-red color; luster vitreous, to pearly on cleavage surfaces; brittle,  $H_{100} = 794\text{--}1023$  kg/mm<sup>2</sup> (Mohs 6–7); square indentation and iridescent colors and microcracks parallel and subparallel to perfect {110} cleavage with  $(110) \wedge (110) \approx 87^\circ$ ;  $D_{\text{meas}} = 3.60$  g/cm<sup>3</sup>; insoluble in HCl. Twinning is polysynthetic, rarely simple, parallel to {100}. Optically biaxial negative, high birefringence,  $\alpha = 1.746(4)$ ,  $\beta = 1.769$ ,  $\gamma = 1.837$ ,  $2V = 15\text{--}20^\circ$ , positive elongation, inclined extinction,  $Y = b$ ,  $c \wedge X = 20^\circ$ ; pleochroic with  $Z = \text{blood red}$ ,  $Y = \text{raspberry red}$ ,  $X = \text{lemon yellow}$ .

The mineral occurs in mono- or polyminerale veins up to 3 mm wide in braunite ores of the Irnimiisk deposit, East Asia, associated with braunite, taikanite, an unnamed sodium barium manganese silicate, pectolite, and Mn-bearing amphibole, orthoclase, and phlogopite. The name is for the chemical composition. Type material is at the Fersman Mineralogical Museum, Moscow. **D.A.V.**

#### Quadruphite\*, polyphite\*

A.P. Khomyakov, G.N. Nechelyustov, E.A. Sokolova, G.I. Dorokhova (1992) Quadruphite  $\text{Na}_{14}\text{CaMgTi}_4\text{[Si}_2\text{O}_7\text{]}_2\text{[PO}_4\text{]}_4\text{O}_4\text{F}_2$  and polyphite  $\text{Na}_{17}\text{Ca}_3\text{Mg(Ti,Mn)}_4\text{[Si}_2\text{O}_7\text{]}_2\text{[PO}_4\text{]}_6\text{O}_2\text{F}_6$ : New minerals of the lomonosovite

group. *Zapiski Vses. Mineral. Obshch.*, 121(1), 105–112 (in Russian).

The two new minerals belong to the lomonosovite group and occur in alkalic pegmatites of the Lovozero alkalic massif, Kola Peninsula, associated with potassium feldspar, nepheline, sodalite, arfvedsonite, aegirine, cancrisilite, analcime, albite, ussingite, makatite, villiumite, lomonosovite, vuonnemite, sobolevite, kazakovite, lorenzenite, lintisite, lamprophyllite, zirsinalite, eudialyte, parakeldyshite, terskite, belovite, neptunite, serandite, and loparite. The minerals are barely distinguishable by optical and macroscopic properties. Both new minerals form flakes on {001}, 1–2 mm thick and 3 mm across, grown epitaxially on lomonosovite and sobolevite. The flakes are brittle,  $H = 5$ , light brown, nonfluorescent, translucent, and transparent in thin section. Luster is vitreous and resinous on fractures, pearly to mirrorlike or metallic on cleavages. Steplike fracture, perfect {001} and less perfect {110} and {100} cleavages. The minerals dissolve easily in HCl. Pleochroic from colorless ( $X$ ) to yellowish ( $Y$ ,  $Z$ ) with  $X < Y \leq Z$ ; dispersion strong,  $r < v$ .

#### Quadruphite

Analysis by electron microprobe (average of three) gave  $\text{Na}_2\text{O}$  28.1,  $\text{SrO}$  0.4,  $\text{BaO}$  1.1,  $\text{CaO}$  5.3,  $\text{MgO}$  1.1,  $\text{MnO}$  4.3,  $\text{FeO}$  0.3,  $\text{SiO}_2$  16.5,  $\text{ZrO}_2$  4.1,  $\text{TiO}_2$  13.7,  $\text{Nb}_2\text{O}_5$  3.8,  $\text{P}_2\text{O}_5$  19.2,  $\text{F}$  3.4,  $\text{O} \equiv \text{F}$  1.4, sum 99.9 wt%, corresponding to  $\text{Na}_{13.21}(\text{Ca}_{1.38}\text{Ba}_{0.10}\text{Sr}_{0.06})_{\Sigma 1.54}(\text{Mg}_{0.40}\text{Mn}_{0.28}\text{Fe}_{0.06})_{\Sigma 0.74}(\text{Ti}_{2.50}\text{Mn}_{0.60}\text{Zr}_{0.48}\text{Nb}_{0.42})_{\Sigma 4.00}\text{Si}_4\text{P}_{3.94}\text{O}_{33.04}\text{F}_{2.61}$ , ideally  $\text{Na}_{14}\text{CaMgTi}_4\text{[Si}_2\text{O}_7\text{]}_2\text{[PO}_4\text{]}_4\text{O}_4\text{F}_2$ . X-ray study showed the mineral to be triclinic,  $a = 5.415(2)$ ,  $b = 7.081(3)$ ,  $c = 20.34(1)$  Å,  $\alpha = 86.85(4)$ ,  $\beta = 94.40(4)$ ,  $\gamma = 89.94(3)$ ,  $Z = 1$ . The strongest lines (14 given) are 2.880(100,007), 2.702(80b,201,200), 2.636(70,107), 2.050(50,207,222), and 1.600(50,322,1.2.10). Optically biaxial negative,  $\alpha = 1.630$ ,  $\beta = 1.678$ ,  $\gamma = 1.697$ ,  $2V = 62^\circ$ ,  $D_{\text{meas}} = 3.12$ ,  $D_{\text{calc}} = 3.11$  g/cm<sup>3</sup>.

#### Polyphite

Analysis by electron microprobe (average of three) gave  $\text{Na}_2\text{O}$  28.0,  $\text{SrO}$  0.3,  $\text{BaO}$  0.9,  $\text{CaO}$  8.3,  $\text{MgO}$  1.3,  $\text{MnO}$  5.6,  $\text{FeO}$  0.2,  $\text{SiO}_2$  13.2,  $\text{ZrO}_2$  1.6,  $\text{TiO}_2$  12.0,  $\text{Nb}_2\text{O}_5$  2.7,  $\text{P}_2\text{O}_5$  23.3,  $\text{F}$  5.1,  $\text{O} \equiv \text{F}$  2.1, sum 100.4 wt%, corresponding to  $(\text{Na}_{16.45}\text{Mn}_{0.43})_{\Sigma 16.88}(\text{Ca}_{2.70}\text{Ba}_{0.11}\text{Sr}_{0.05})_{\Sigma 2.86}(\text{Mg}_{0.59}\text{Mn}_{0.36}\text{Fe}_{0.05})_{\Sigma 1.00}(\text{Ti}_{2.71}\text{Mn}_{0.65}\text{Zr}_{0.24}\text{Nb}_{0.37})_{\Sigma 3.97}\text{Si}_4\text{P}_{5.98}\text{O}_{40.58}\text{F}_{4.89}$ , ideally  $(\text{Na}_{17}\text{Ca}_3\text{MgTi}_4\text{[Si}_2\text{O}_7\text{]}_2\text{[PO}_4\text{]}_6\text{O}_2\text{F}_6$ . X-ray study showed the mineral to be triclinic,  $a = 5.412(2)$ ,  $b = 7.079(3)$ ,  $c = 26.56(1)$  Å,  $\alpha = 95.21(4)$ ,  $\beta = 93.51(2)$ ,  $\gamma = 90.10(3)^\circ$ . Strongest lines (28 given) of the powder pattern are 2.937(100,009), 2.702(90,201,125,200,123), 2.659(80,201,124,109), 2.048(80b,209,224,224), 1.771-(50b,041), and 1.730(50,1.2.12,0.2.14). Optically biaxial negative,  $\alpha = 1.600$ ,  $\beta = 1.658$ ,  $\gamma = 1.676$ ,  $2V = 56^\circ$ ,  $D_{\text{meas}} = 3.07$ ,  $D_{\text{calc}} = 3.00$  g/cm<sup>3</sup> with  $Z = 1$ .

The names are for the number of phosphate groups in

the formula unit. Type material is at the Fersman Mineralogical Museum, Moscow. D.A.V.

#### Sitinakite\*

Yu.P. Men'shikov, E.V. Sokolova, Yu.K. Egorov-Tismenko, A.P. Khomyakov, L.I. Polezhaeva (1992) *Sitinakite*  $\text{Na}_2\text{KTi}_4\text{Si}_2\text{O}_{13}(\text{OH})\cdot 4\text{H}_2\text{O}$ —A new mineral. *Zapiski Vses. Mineral. Obshch.*, 121(1), 94–99 (in Russian).

Analysis by electron microprobe (average of three,  $\text{H}_2\text{O}$  by TGA) gave  $\text{Na}_2\text{O}$  10.79,  $\text{K}_2\text{O}$  4.93,  $\text{CaO}$  0.05,  $\text{SrO}$  0.96,  $\text{BaO}$  0.58,  $\text{Ce}_2\text{O}_3$  0.12,  $\text{Fe}_2\text{O}_3$  0.16,  $\text{Nb}_2\text{O}_5$  5.05,  $\text{Ta}_2\text{O}_5$  0.05,  $\text{TiO}_2$  46.68,  $\text{ZrO}_2$  0.08,  $\text{SiO}_2$  17.80,  $\text{H}_2\text{O}$  11.7, sum 98.95 wt%, corresponding to  $(\text{Na}_{2.28}\text{K}_{0.68}\text{Sr}_{0.06}\text{Ba}_{0.02}\text{Ca}_{0.01})_{\Sigma 3.05}(\text{Ti}_{3.82}\text{Nb}_{0.25}\text{Fe}_{0.01})_{\Sigma 4.08}\text{Si}_{1.94}\text{O}_{13}(\text{OH}_{0.54}\text{O}_{0.46})_{\Sigma 1.00}\cdot 3.98\text{H}_2\text{O}$ , ideally  $\text{Na}_2\text{KTi}_4\text{Si}_2\text{O}_{13}(\text{OH})\cdot 4\text{H}_2\text{O}$ . X-ray study (single crystal and powder diffraction) showed the mineral to be tetragonal, space group  $P4_2/mcm$ ,  $a = 7.819(2)$ ,  $c = 12.099(4)$  Å. Strongest lines (34 given) are 7.84(100,100), 6.02(100,002), 3.25(80,113), 2.608-(60,300), and 2.003(70,006). Crystals with anomalous biaxial character may be indexed on the space group  $Pcc2$ . Symmetry reduction may be related to high concentrations of Nb, or to filling of zeolite-like channels by K and  $\text{H}_2\text{O}$ . IR spectroscopy revealed the presence of both  $\text{H}_2\text{O}$  and OH by absorption lines at 1660, 3000, 3350, and 3354  $\text{cm}^{-1}$ . DTA showed no endo- or exothermic events. X-ray studies of heated material showed no change at 400 °C, a change to  $\text{Na}_2\text{Ti}_5\text{O}_{11}$  between 600 and 1000 °C, and a change to rutile at 1100 °C. Occurs as equant and short prismatic crystals,  $1 \times 1 \times 2$  mm, and in 3–4 mm patches of intergrown crystals. Light brown with a pale rosy tint, rarely colorless, vitreous luster, white streak, no fluorescence,  $H_{30-50} = 301\text{--}412$  kg/mm<sup>2</sup> (average 356), or  $H = 4.5$ . Brittle, perfect {100} cleavage, parting on {001}, steplike fracture.  $D_{\text{meas}} = 2.86(6)$ ,  $D_{\text{calc}} = 2.87\text{--}2.89$  gm/cm<sup>3</sup> with  $Z = 2$ . No dissolution observed in  $\text{H}_2\text{O}$ , HCl, or  $\text{HNO}_3$  at room temperature. Optically uniaxial positive,  $\omega = 1.780(3)$ ,  $\epsilon = 1.988(3)$ ; may show anomalous  $2V = 10\text{--}11^\circ$ .

The mineral occurs in hydrothermal natrolite nodules in pegmatites of the Khibinsky alkali massif, closely associated with vinogradovite and related also to natrolite, aegirine, magnesium astrophyllite, shscherbakovite, lorenzenite, lamprophyllite, pectolite, ankilite, djerfisherite, orthoclase, nepheline, villiaumite, mosandrite, and nenadkevichite. The name is for the chemical composition. Type material is at the Mining Museum, Saint Petersburg, and at the Kola Science Center, Apatity. D.A.V.

#### Wadalite

T. Tsukimura, Y. Kanazawa, M. Aoki, M. Bunno (1993) Structure of wadalite  $\text{Ca}_6\text{Al}_5\text{Si}_2\text{O}_{16}\text{Cl}_3$ . *Acta Crystallogr.*, C49, 205–207.

The mineral occurs in a skarn xenolith in two-pyroxene andesite at a quarry in Tadano, Koriyama City, Fukushima, Japan, and in skarn at the La Negra mine, Querétaro, Mexico. Electron microprobe analysis (not given) and  $D_{\text{meas}} = 3.01$  g/cm<sup>3</sup> led to the formula  $(\text{Ca}_{3.88}\text{Mg}_{0.23})_{\Sigma 6.01}(\text{Al}_{4.26}\text{Fe}_{0.46})_{\Sigma 4.72}\text{Si}_{2.00}\text{O}_{15.68}\text{Cl}_{2.64}$ , ideally  $\text{Ca}_6\text{Al}_5\text{Si}_2\text{O}_{16}\text{Cl}_3$ ,  $D_{\text{calc}} = 3.056$  g/cm<sup>3</sup> with  $Z = 4$ . Single-crystal X-ray structure study ( $R = 0.062$ ) indicated cubic symmetry, space group  $I\bar{4}3d$ ,  $a = 12.001(2)$  Å. The powder pattern is stated to be indistinguishable from that of grossular.

**Discussion.** Use of the name prior to the appearance of a full description is inappropriate. It is not stated whether the mineral name has been approved by the CNMNMN. J.L.J.

#### $\text{Cu}_6\text{Bi}_2\text{S}_6$ , Cu-Pb-Fe sulfide

S.O. Akande, A. Mücke (1993) Coexisting copper sulphides and sulphosalts in the Abakaliki Pb-Zn deposit, lower Benue Trough (Nigeria) and their genetic significance. *Mineral. Petrology*, 47, 183–192.

Electron microprobe analysis gave Cu 38.42, Sb 0.11, Bi 42.81, S 19.08 wt%, corresponding to  $\text{Cu}_{6.08}(\text{Bi}_{2.07}\text{Sb}_{0.01})\text{S}_{6.00}$ . Light yellow in reflected light, reflectance identical to that of chalcocite, strongly anisotropic with polarization colors from bright yellow to cream. Size is not stated, but photomicrographs suggest about  $45 \times 50$   $\mu\text{m}$ . Because of the distinct optical properties, it is thought that the mineral might be a dimorph of wittichenite. Occurs as intergrowths with bornite, enargite, tennantite, and chalcopyrite. Also present in the same assemblage is a second unidentified mineral, possibly  $20 \times 50$   $\mu\text{m}$ , for which electron microprobe analysis gave Cu 63.50, Fe 2.34, Pb 12.29 (qualitative determination), S 20.87, sum 100 wt%, corresponding to  $\text{Cu}_{12.28}\text{Pb}_{0.79}\text{Fe}_{0.52}\text{S}_{8.00}$ . J.L.J.

#### Pd-Bi chloride, Pd-Bi sulfide(?)

Chusi Li, A.J. Naldrett (1993) Platinum-group minerals from the Deep Copper Zone of the Strathcona deposit, Sudbury, Ontario. *Can. Mineral.*, 31, 31–44.

Three electron microprobe analyses of each of three grains (size not stated, but photomicrographs suggest up to  $30 \times 35$   $\mu\text{m}$ ) gave a range of Pd 27.59–35.05, Pt 0.84–1.97, Bi 44.21–58.02, Te n.d.–0.53, Pb 0.47–1.47, Cl 3.66–5.96, sum 88.46–92.64 wt%, remainder O or OH. Pinkish brown to pale brown pleochroism in reflected light. The phase is associated with insizwaite, michenerite, hessite, and magnetite.

Three grains of a Cl-bearing Pd-Bi sulfide(?), up to  $15 \times 50$   $\mu\text{m}$ , were observed in association with bismoclite in fractures in magnetite. Electron microprobe analysis for one grain (three analyses reported) gave Pd 50.64, Pt 0.40, Bi 21.42, Pb 0.72, Fe 1.28, Ni 0.51, Zn 0.52, S

11.74, Cl 1.19, sum 88.42 wt%, plus O. In reflected light, gray, isotropic. J.L.J.

**BaS<sub>2</sub>O<sub>3</sub>·H<sub>2</sub>O, Ba<sub>2</sub>S<sub>2</sub>O<sub>3</sub>F<sub>2</sub>, BaSO<sub>3</sub>, Ba<sub>2</sub>Al<sub>2</sub>S<sub>3</sub>(OH)<sub>8</sub>·8H<sub>2</sub>O**

R.S.W. Braithwaite, A.R. Kampf, R.G. Pritchard, R.P.H. Lamb (1993) The occurrence of thiosulfates and other unstable sulfur species as natural weathering products of old smelting slags. *Mineral. Petrology*, 47, 255–261.

**BaS<sub>2</sub>O<sub>3</sub>·H<sub>2</sub>O**

Occurs as colorless, glassy linings of cracks and as rectangular crystals showing {100}, {010}, and {001}. Electron microprobe analysis gave Ba 51.7, S 23.5 wt%, very close to that of synthetic BaS<sub>2</sub>O<sub>3</sub>·H<sub>2</sub>O, which was used as a microprobe standard. The X-ray powder pattern and infrared spectrum also match those of the orthorhombic, synthetic phase. Identified in slags from three sites in Yorkshire and two in Derbyshire, U.K. Associated with the other three phases abstracted here.

**Ba<sub>2</sub>S<sub>2</sub>O<sub>3</sub>F<sub>2</sub>**

Typically forms colorless, transparent, near-rectangular plates up to 2 mm across that are polysynthetically twinned, triclinic crystals clustered as cavity linings. Less common as white coatings with a radiating texture. Electron microprobe analyses gave Ba 65.9, S 13.5, Al 0.4, Sr 0.3 (variable) wt%; BaS<sub>2</sub>O<sub>3</sub>·BaF<sub>2</sub> requires Ba 64.7, S 15.1%. The infrared spectrum shows sharp absorption maxima at 1132, 1019, 687, 554, and 527 cm<sup>-1</sup>, which are characteristic of thiosulfate and also indicate the absence of hydroxide and other oxyanions. Single-crystal X-ray study showed triclinic symmetry, space group *P* $\bar{1}$ , *a* = 22.63(2), *b* = 4.624(2), *c* = 4.581(4) Å,  $\alpha$  = 90.03(4),  $\beta$  = 95.82(8),  $\gamma$  = 89.97(5)°. Widespread in slags from two sites in Yorkshire and two in Derbyshire.

**BaSO<sub>3</sub>**

Occurs as pale yellow to dirty greenish yellow, granular, waxy-looking infillings of cavities to 2 mm across. Electron microprobe analyses gave Ba 62.0, Sr 0.3, S 11.8 [sic] wt%; (Ba<sub>0.99</sub>Sr<sub>0.01</sub>)SO<sub>3</sub> requires Ba 62.7, Sr 0.4, S 14.8%. The X-ray powder pattern and infrared spectrum match those of synthetic BaSO<sub>3</sub>. Relatively rare and identified from only one site, in Yorkshire.

**Ba<sub>2</sub>Al<sub>2</sub>S<sub>3</sub>(OH)<sub>8</sub>·8H<sub>2</sub>O**

Typically forms transparent, orange-yellow blades and pseudo-hexagonal plates to 1 mm. Some plates are thin, micaceous, and up to several millimeters across. Electron microprobe analysis gave Ba 33.6, Sr 5.3, Ca 0.6, Al 9.0, S 15.2 wt%; the formula (Ba<sub>0.52</sub>Sr<sub>0.38</sub>Ca<sub>0.10</sub>) $\Sigma_{1.00}$ S<sub>3</sub>·Ba(OH)<sub>2</sub>·2Al(OH)<sub>3</sub>·5H<sub>2</sub>O requires Ba 33.6, Sr 5.4, Ca 0.6, Al 8.7, S 15.5%. Single-crystal X-ray structure study indicated monoclinic symmetry, space group *P*2<sub>1</sub>/*c*, *a* = 8.786(8), *b* = 19.208(9), *c* = 11.105(6) Å,  $\beta$  = 105.98°. Three of the H<sub>2</sub>O molecules are only loosely held in the structure;

their ready loss during or prior to microprobe analysis accounts for the lower hydration relative to the structurally determined ideal formula containing 8H<sub>2</sub>O. Although uncommon, this phase has been identified in a slag from one site in Yorkshire, one in Derbyshire, and one at Sorn, Scotland.

Specimens have been deposited in the British Museum (Natural History), London, and in the Natural History Museum of Los Angeles County, Los Angeles, California.

**Discussion.** Although there are numerous accepted mineral species that were formed in similar environments, the current practice of the CNMMN is not to approve as new minerals those phases that originate from slags. The CNMMN practice also applies to phases formed in mine fires and burning coal dumps. J.L.J.

**Ba-dominant brewsterite**

R. Cabella, G. Lucchetti, A. Palenzona, S. Quartieri, G. Vezzalini (1993) First occurrence of a Ba-dominant brewsterite: Structural features. *Eur. Jour. Mineral.*, 5, 353–360.

Electron microprobe analysis (not given) led to the formula (Ba<sub>1.80</sub>Mg<sub>0.08</sub>Na<sub>0.07</sub>K<sub>0.04</sub>Ca<sub>0.03</sub>Sr<sub>0.02</sub>) $\Sigma_{2.04}$ (Si<sub>11.78</sub>Al<sub>4.29</sub>Fe<sub>0.02</sub>) $\Sigma_{12.09}$ O<sub>32</sub>·*n*H<sub>2</sub>O, where *n* = 9.82 by X-ray structure determination (*R* = 0.051). Occurs as colorless to pale pink prismatic crystals to 0.2 mm long and as radiating and parallel aggregates. Optically biaxial positive,  $\alpha$  = 1.514(2),  $\beta$  = 1.516(2),  $\gamma$  = 1.528(2),  $2V_{\text{meas}}$  = 45(1),  $2V_{\text{calc}}$  = 44°. Single-crystal X-ray study indicated monoclinic symmetry, space group *P*2<sub>1</sub>/*m*, *a* = 6.790(1), *b* = 17.581(4), *c* = 7.735(1) Å,  $\beta$  = 94.50(3)°. The mineral occurs in fractures in radiolaritic metacherts and in a schistose metapelite above radiolaritic strata at the Cerciara mine near Faggiona, La Spezia, Eastern Liguria, Italy. J.L.J.

**New Data**

**Native brass**

M.P. Davydov (1993) Native metals and intermetallic compounds in metal-bearing sediments of the East Pacific Rise. *Transactions USSR Acad. Sci., Earth Sci. Sect.*, 318(5), 174–179 [translated from *Doklady Akad. Nauk SSSR*, 318(5), 1211–1215, 1991].

The uppermost 0–2 cm of unconsolidated sediments on the flanks of the East Pacific Rise near 13°N, 21°S, contain sheaflike intergrown scales of native cadmium, plates of native nickel, layered fragments, scales, and fibers of native aluminium, honeycomb-textured native copper, and plates of native iron. The last contains round inclusions of native silicon and native titanium. Also present are flakes and lumps of Zn with up to 13.35 wt% Fe, Zn with up to 6.24 wt% Al, and thin, malleable, lath-like flakes of brass with a brass yellow to gray color. Electron microprobe analyses of the brass (two and five par-

ticles, respectively) gave Cu 60.50, 61.39, Zn 37.25, 37.90, Al 0.56, –, Si 0.03, –, sum 98.34, 99.29 wt%. X-ray powder data are given only for Al, Cu, Zn, and Fe. The origin of the metals is attributed to hydrothermal activity near active vents.

**Discussion.** See *Am. Mineral.*, 77, p. 446, 1992, for another reported occurrence of native brass. A phase with a similar composition has also been reported in association with native lead, tin, iron, copper, and aluminium exhalative products of the Great Tolbachik fissure eruption, Kamchatka [*Transactions USSR Acad. Sci., Earth Sci. Sect.*, 313(4), 211–214, 1990]. **J.L.J.**

### Huanghoite-(Ce)

Zhu-Ming Yang, F. Pertlik (1993) Huanghoite-(Ce),  $\text{BaCe}(\text{CO}_3)_2\text{F}$ , from Khibina, Kola Peninsula, Russia: Redetermination of the crystal structure with a discussion on space group symmetry. *Neues Jahrb. Mineral. Mon.*, 163–171.

Single-crystal X-ray structure determination of Huanghoite-(Ce) gave trigonal symmetry,  $a = 5.072(1)$ ,  $c = 38.46(1)$  Å,  $Z = 6$ , and the new space group  $R\bar{3}m$ . The results are in accord with data abstracted in *Am. Mineral.* 78, 1110 (1993) for the synthetic Sm analogue. **J.L.J.**