

## NEW MINERAL NAMES\*

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### BRINROBERTSITE\*

H. Dong, D.R. Peacor, R.J. Merriman, S.J. Kemp (2002) Brinrobertsite: a new R1 interstratified pyrophyllite/smectite-like clay mineral: characterization and geological origin. *Mineral. Mag.*, 66, 605–617.

Energy-dispersion analyses (not given) and TGA results correspond to  $(\text{Na}_{0.22}\text{K}_{0.07}\text{Ca}_{0.06})_{\Sigma 0.35}(\text{Al}_{3.81}\text{Mg}_{0.08}\text{Fe}_{0.08})_{\Sigma 3.97}(\text{Si}_{7.84}\text{Al}_{0.16})_{\Sigma 8.00}\text{O}_{20}(\text{OH})_4 \cdot 3.54\text{H}_2\text{O}$  for  $\text{O} = 22$ , simplified as  $(\text{Na,K,Ca})_x(\text{Al,Mg,Fe})_4(\text{Si,Al})_8\text{O}_{20}(\text{OH})_4 \cdot 3.54\text{H}_2\text{O}$ , where  $x = 0.35$ . Clay-like appearance, gray to yellowish gray color, translucent, gray streak,  $H = 1$ , perfect {001} cleavage, grain size  $< 1 \mu\text{m}$ , anhedral, typically in aggregates that show microscopically radial extinction under crossed polarizers. TGA gave losses of 4 wt% at  $< 100^\circ\text{C}$  (interlayer water), and 8 wt% at  $600\text{--}700^\circ\text{C}$  (loss of OH). X-ray diffractometer patterns (CoK $\alpha$  radiation) of basal-oriented, air-dried mounts gave nine diffraction lines (all basal), the strongest of which are at 22.29(48,001), 10.99(100,002), 5.48(7,004), 3.17(33,007), and 2.01(4,0,0.11); after glycolation, 001 to 0.0.14 are present, with the strongest at 26.80(100,001), 13.21(33,002), 9.02(9,003), 5.30(7,005), and 3.33(20,008). Lattice-fringe images and electron-diffraction patterns indicate a 1:1 interlayered smectite-pyrophyllite mineral, probably with a C-centered monoclinic cell, and with  $a \approx d_{100} = 5.2$ ,  $b = 9.1$ ,  $c \approx d_{001} = 24.4 \text{ \AA}$ . From the bulk formula given above, and assuming  $\text{Al}_4\text{Si}_8\text{O}_{20}(\text{OH})_4$  for pyrophyllite, the model composition for the smectite is  $(\text{Na}_{0.44}\text{K}_{0.14}\text{Ca}_{0.12})(\text{Al}_{3.62}\text{Mg}_{0.16}\text{Fe}_{0.16})(\text{Si}_{7.68}\text{Al}_{0.32})\text{O}_{20}(\text{OH})_4$ .

The mineral occurs interstitially or as a matrix amidst quartz and chlorite, and makes up about 30% of an Ordovician soapy mudstone bed (metabentonite) near Bangor, northern Wales. The metabentonite, which is about 20 cm thick, has a vitroclastic texture, and the hydrothermal alteration sequence is interpreted to be glass  $\rightarrow$  pyrophyllite  $\rightarrow$  brinrobertsite. The new mineral name is for geologist Brin Roberts of the University of London. Type material is in the Museum of Natural History, Washington, D.C., and the British Geological Survey, Nottingham, U.K. **J.L.J.**

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

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### COBALTKIESERITE\*

D. Holtstam (2002) Cobaltkieserite,  $\text{CoSO}_4 \cdot \text{H}_2\text{O}$ , a new mineral species from Bastnäs, Skinnskatteberg, Sweden. *GFF (Geol. Fören. Stockh. Förh.)*, 124, 117–119.

The mineral occurs as powdery aggregates within which the individual grains, no more than  $3 \mu\text{m}$  in size, are mainly euhedral and thick tabular to dipyrnidal. Pink color, powdery luster,  $H = 2\text{--}3$ ,  $D_{\text{calc}} = 3.28(1) \text{ g/cm}^3$  for  $Z = 4$ , slowly soluble in water. Electron microprobe analysis gave CoO 42.7, FeO 0.2,  $\text{SiO}_2$  0.3,  $\text{SO}_3$  42.4–45.7 (44.2),  $\text{As}_2\text{O}_5$  4.3,  $\text{H}_2\text{O}$  (calc.) 10.5, sum 102.2 wt%, corresponding to  $(\text{Co}_{0.98}\text{Fe}_{0.01})\text{S}_{0.95}\text{As}_{0.06}\text{Si}_{0.01}\text{O}_4 \cdot \text{H}_2\text{O}$ . Least-squares refinement of the diffractometer pattern (CuK $\alpha$  radiation) gave  $a = 6.980(1)$ ,  $b = 7.588(2)$ ,  $c = 7.639(2) \text{ \AA}$ ,  $\beta = 118.65(3)^\circ$ , in good agreement with data for the synthetic analog, which is monoclinic, space group  $C2/c$  (PDF 15–701). Strongest lines of the powder pattern are 4.829(33,  $\bar{1}11$ ) 3.405(100,  $\bar{1}12$ ), 3.339(34, 111), 3.062(56, 200), and 2.513(49, 022).

The mineral is associated with scorodite and erythrite as oxidation products on a quartz-rich museum specimen containing cobaltite, pyrite, and chalcopyrite, which was collected in 1922 or earlier from the Bastnäs deposit, near Riddarhyttan, Sweden. The new mineral is a member of the kieserite group and is named to reflect the Co predominance. Type material is in the Swedish Museum of Natural History, Stockholm. **J.L.J.**

### GUTKOVAITE-Mn\*

I.V. Pekov, N.V. Chukanov, R.K. Rastsvetaeva, A.E. Zadov, N.N. Kononkova (2002) Gutkovaite-Mn,  $\text{CaK}_2\text{Mn}(\text{Ti,Nb})_4(\text{Si}_4\text{O}_{12})_2(\text{O,OH})_4 \cdot 5\text{H}_2\text{O}$ , a new mineral of the labuntsovitte group from the Khibiny massif, Kola Peninsula. *Zap. Vseross. Mineral. Obshch.*, 131(2), 51–57 (in Russian, English abs.).

The mineral forms pale yellowish-pink prismatic crystals up to 0.8 mm in length; transparent to translucent, vitreous luster, white streak, brittle, no cleavage, uneven fracture,  $H = 5$ ,  $D_{\text{meas}} = 2.83$ ,  $D_{\text{calc}} = 2.79 \text{ g/cm}^3$  for  $Z = 2$ . Optically biaxial positive,  $\alpha = 1.688$ ,  $\beta = 1.700$ ,  $\gamma = 1.805$ ,  $2V_{\text{meas}} = 35(10)$ ,  $2V_{\text{calc}} = 39^\circ$ , nonpleochroic, no dispersion observed. Electron microprobe analysis gave  $\text{Na}_2\text{O}$  0.18,  $\text{K}_2\text{O}$  6.54, CaO 4.81, SrO 0.54, BaO 1.03, MgO 0.17, MnO 4.96, FeO 0.61, ZnO 0.13,  $\text{Al}_2\text{O}_3$  0.17,  $\text{SiO}_2$  41.03,  $\text{ZrO}_2$  0.08,  $\text{TiO}_2$  24.47,  $\text{Nb}_2\text{O}_5$  5.14,  $\text{H}_2\text{O}$

(calc.) 8.67, sum 98.53 wt%, corresponding to  $(\text{Ca}_{2.00}\text{Na}_{0.14})_{\Sigma 2.14}(\text{K}_{3.24}\text{Ba}_{0.16}\text{Sr}_{0.12})_{\Sigma 3.52}(\text{Mn}_{1.63}\text{Fe}_{0.20}\text{Mg}_{0.10}\text{Zn}_{0.04})_{\Sigma 1.97}(\text{Ti}_{7.14}\text{Nb}_{0.90}\text{Zr}_{0.02})_{\Sigma 8.06}[(\text{Si}_{15.92}\text{Al}_{0.08})_{\Sigma 16}\text{O}_{48}][\text{O}_{4.94}(\text{OH})_{3.06}]_{\Sigma 8} \cdot 9.7\text{H}_2\text{O}$ , simplified as in the title. Single-crystal X-ray structure study ( $R = 0.058$ ) indicated monoclinic symmetry, space group  $Cm$ , microtwinning on (001) and (401),  $a = 14.30(2)$ ,  $b = 13.889(7)$ ,  $c = 7.760(10)$  Å,  $\beta = 117.51^\circ$  as refined from powder data (57 mm Debye-Scherrer,  $\text{FeK}\alpha$  radiation) whose strongest lines are 7.0(70B,020,001), 6.33(50,20 $\bar{1}$ ,200), 3.22(90,42 $\bar{1}$ ,40 $\bar{2}$ ,400), 3.05(100,24 $\bar{1}$ ,240), 2.57(50,24 $\bar{2}$ ,241), and 2.48(60,44 $\bar{1}$ ,403,401).

The mineral occurs in pegmatite within nepheline syenite at Mount Maly Mannepakhk, Khibiny alkaline massif, Kola Peninsula, Russia. Associated minerals are microcline, aegirine, arfvedsonite, nepheline, eudialyte, albite, lorenzenite, analcime, and others. The new mineral name is for Russian mineralogist N.N. Gutkova (1896–1960?), and for the predominance of Mn on the D site of the  $Cm$  labuntsovite-group minerals (*Am. Mineral.*, 87, p. 1733, 2002). Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

#### KARUPMØLLERITE-Ca\*

I.V. Pekov, N.V. Chukanov, O.V. Petersen, A.E. Zadov, N.A. Yamnova, Y.K. Kabalov, J. Schneider (2002) Karupmøllerite-Ca,  $(\text{Na,Ca,K})_2\text{Ca}(\text{Nb,Ti})_4(\text{Si}_4\text{O}_{12})_2(\text{O,OH})_4 \cdot 7\text{H}_2\text{O}$ , a new mineral of the labuntsovite group from the Ilímaussaq alkaline complex, South Greenland. *Neues Jahrb. Mineral. Mon.*, 433–444.

The mineral occurs as pseudomorphs, up to  $0.1 \times 1.5 \times 2$  cm, after lamellae of epistolite. Translucent, white with grayish and pinkish tints, irregular platy habit, vitreous to dull luster, brittle, white streak,  $H = 5$ , no cleavage,  $D_{\text{meas}} = 2.71(1)$ ,  $D_{\text{calc}} = 2.74 \text{ g/cm}^3$  for  $Z = 2$ . Optically biaxial positive,  $\alpha = 1.656(2)$ ,  $\beta = 1.662(2)$ ,  $\gamma = 1.755(3)$ ,  $2V_{\text{meas}} = 30$ ,  $2V_{\text{calc}} = 29.7^\circ$ . Electron microprobe analysis gave  $\text{Na}_2\text{O}$  2.17,  $\text{K}_2\text{O}$  1.74,  $\text{CaO}$  6.00,  $\text{SrO}$  0.08,  $\text{BaO}$  0.28,  $\text{MnO}$  0.31,  $\text{ZnO}$  0.06,  $\text{Fe}_2\text{O}_3$  0.47,  $\text{Al}_2\text{O}_3$  0.25,  $\text{SiO}_2$  39.85,  $\text{TiO}_2$  8.51,  $\text{Nb}_2\text{O}_5$  29.92,  $\text{H}_2\text{O}$  (TGA) 11.31, sum 100.95 wt%, corresponding to  $(\text{Na}_{0.84}\text{Ca}_{0.64}\text{K}_{0.44}\text{Ba}_{0.02}\text{Sr}_{0.01})_{\Sigma 1.95}(\text{Ca}_{0.64}\text{Mn}_{0.05}\text{Zn}_{0.01})_{\Sigma 0.70}(\text{Nb}_{2.70}\text{Ti}_{1.28}\text{Fe}_{0.07}^{3+})_{\Sigma 4.05}(\text{Si}_{7.94}\text{Al}_{0.06})_{\Sigma 8.00}\text{O}_{24}[\text{O}_{2.75}(\text{OH})_{1.25}]_{\Sigma 4} \cdot 6.94\text{H}_2\text{O}$ , ideally  $(\text{Na,Ca,K})_2\text{Ca}(\text{Nb,Ti})_4(\text{Si}_4\text{O}_{12})_2(\text{O,OH})_4 \cdot 7\text{H}_2\text{O}$ . Rietveld refinement of the X-ray powder diffractometry data (*Am. Mineral.*, 86, p. 1114, 2001) indicated monoclinic symmetry, space group  $C2/m$ ,  $a = 14.641(1)$ ,  $b = 14.214(1)$ ,  $c = 7.9148(2)$  Å,  $\beta = 117.36(1)^\circ$ . Strongest lines of the powder pattern ( $\text{MoK}\alpha$  radiation) are 7.104(73,020), 7.026(100,001), 6.482(45,20 $\bar{1}$ ), 4.996(74,021), and 3.171(56,041).

The new mineral, which is in the kuzmenkoite subgroup of the labuntsovite group (*Am. Mineral.*, 87, p. 1733, 2002), is associated with epistolite that replaced vuonnemite in a pegmatite in the Kangerluarsuk area of the Ilímaussaq alkaline complex, South Greenland. The new name is for Danish mineralogist Svend Karup-Møller (b. 1936). Type material is in the Fersman Mineralogical Museum, Moscow, Russia, and in the Geological Museum, Copenhagen, Denmark. **J.L.J.**

#### KUZMENKOITE-Zn\*

N.V. Chukanov, I.V. Pekov, A.E. Zadov, Yu.V. Azarova, E.I. Semenov (2002) Kuzmenkoite-Zn,  $\text{K}_2\text{Zn}(\text{Ti,Nb})_4(\text{Si}_4\text{O}_{12})_2(\text{OH,O})_4 \cdot 6\text{--}8\text{H}_2\text{O}$ , a new mineral of the labuntsovite group from the Lovozero massif, Kola Peninsula. *Zap. Vseross. Mineral. Obshch.*, 131(2), 45–50 (in Russian, English abs.).

The mineral occurs as a hydrothermal product in three pegmatites in the Lovozero massif. At Mount Karnasurt, rough crystals are up to  $3 \times 0.5 \times 0.3$  mm, elongate [010], showing {100}, {001}, {201}, poorly developed {010} and possibly {021} and {110}. At Mount Kedykverpakhk, the mineral forms pseudomorphs after murmanite, and at Mount Lepkhe-Nelm, coarse prismatic crystals are up to  $0.5 \times 7$  mm. Electron microprobe analysis (Kedykverpakhk; also listed for the other two localities) gave  $\text{Na}_2\text{O}$  0.49,  $\text{K}_2\text{O}$  5.69,  $\text{CaO}$  2.19,  $\text{SrO}$  0.19,  $\text{BaO}$  2.00,  $\text{MgO}$  0.03,  $\text{MnO}$  2.07,  $\text{FeO}$  0.54,  $\text{ZnO}$  3.73,  $\text{Al}_2\text{O}_3$  0.10,  $\text{SiO}_2$  38.56,  $\text{TiO}_2$  17.68,  $\text{Nb}_2\text{O}_5$  12.54,  $\text{H}_2\text{O}$  (TGA) 13.8, sum 99.61 wt%, corresponding to  $(\text{K}_{3.00}\text{Ca}_{0.97}\text{Na}_{0.39}\text{Ba}_{0.32}\text{Sr}_{0.05})_{\Sigma 4.73}(\text{Zn}_{1.14}\text{Mn}_{0.73}\text{Fe}_{0.19}\text{Mg}_{0.02})_{\Sigma 2.08}(\text{Ti}_{5.50}\text{Nb}_{2.35})_{\Sigma 7.85}[(\text{Si}_{15.79}\text{Al}_{0.21})_{\Sigma 16}\text{O}_{48}][(\text{OH})_{4.07}\text{O}_{3.93}]_{\Sigma 8} \cdot 17\text{H}_2\text{O}$  for  $(\text{Si,Al})_{16}\text{O}_{48}(\text{OH,O})_8$ , simplified as given in the title. Pink, pinkish brown, gray, or white color, translucent, brittle, white streak, no cleavage, rough fracture,  $H = 5$ ,  $D_{\text{meas}} = 2.78\text{--}2.87$ ,  $D_{\text{calc}} = 2.98 \text{ g/cm}^3$  for  $Z = 2$ . Optically biaxial positive,  $\alpha = 1.680\text{--}1.683$ ,  $\beta = 1.686\text{--}1.688$ ,  $\gamma = 1.783\text{--}1.787$ ,  $2V_{\text{meas}} = 25(10)^\circ$ ,  $Y = b$ , nonpleochroic, dispersion not observed. Single-crystal X-ray structure study gave monoclinic symmetry, space group  $Cm$ ,  $a = 14.40(1)$ ,  $b = 13.851(4)$ ,  $c = 7.781(9)$  Å,  $\beta = 117.33(8)^\circ$ . Strongest lines of a diffractometer powder pattern ( $\text{CuK}\alpha$  radiation; Kedykverpakhk) are 6.92(75,020,001), 6.40(20 $\bar{1}$ , 200), 3.19(100,400,42 $\bar{1}$ ,40 $\bar{2}$ ), 3.09(91,041,022), 2.58(35,241), and 2.49(35,44 $\bar{1}$ ,40 $\bar{3}$ ).

Among the associated minerals at Mount Kedykverpakhk are natrolite, microcline, albite, aegirine, nepheline, arfvedsonite, sodalite, eudialyte, and lorenzenite; at Mount Lepkhe-Nelm, with microcline, aegirine, nepheline, magnesioarfvedsonite, eudialyte, lorenzenite, lamprophyllite, catapleite, and others; at Mount Karnasurt, with natrolite, microcline, albite, aegirine, nepheline, arfvedsonite, sodalite, eudialyte, beryllite, elpidite, and others. The new mineral, which is the Zn-dominant analog of kuzmenkoite-Mn in the labuntsovite group, is named for Russian geochemist and mineralogist Maria V. Kuz'menko (1918–1995). Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

#### ORGANOVAITE-Zn\*

I.V. Pekov, N.V. Chukanov, A.E. Zadov, S.V. Krivovichev, Yu.V. Azarova, P.C. Burns, J. Schneider (2002). Organovaitite-Zn,  $\text{K}_2\text{Zn}(\text{Nb,Ti})_4(\text{Si}_4\text{O}_{12})_2(\text{O,OH})_4 \cdot 6\text{H}_2\text{O}$ , a new mineral of the labuntsovite group. *Zap. Vseross. Mineral. Obshch.*, 131(1), 29–34 (in Russian, English abs.).

The mineral occurs as pink, pinkish brown, and white prismatic crystals, up to  $0.5 \times 0.5 \times 4$  mm, and as massive pseudomorphs after vuonnemite, to  $3 \times 2 \times 0.2$  cm. One of four listed electron microprobe analyses has  $\text{Na}_2\text{O}$  0.67,  $\text{K}_2\text{O}$  3.77,  $\text{CaO}$  1.14,  $\text{SrO}$  0.19,  $\text{BaO}$  2.24,  $\text{MgO}$  0.10,  $\text{MnO}$  0.70,  $\text{FeO}$  0.24,  $\text{ZnO}$  5.39,  $\text{Al}_2\text{O}_3$  0.45,  $\text{SiO}_2$  39.27,  $\text{TiO}_2$  10.49,  $\text{Nb}_2\text{O}_5$  26.35,

H<sub>2</sub>O (TGA) 10.20, sum 101.20 wt%, corresponding to (K<sub>1.93</sub>Na<sub>0.52</sub>Ca<sub>0.49</sub>Ba<sub>0.35</sub>Sr<sub>0.04</sub>)<sub>Σ3.33</sub>(Zn<sub>1.60</sub>Mn<sub>0.24</sub>Fe<sub>0.08</sub>Mg<sub>0.06</sub>)<sub>Σ1.98</sub>(Nb<sub>0.79</sub>Ti<sub>1.17</sub>)<sub>Σ2.96</sub>[(Si<sub>15.79</sub>Al<sub>0.21</sub>)O<sub>48</sub>][O<sub>4.59</sub>(OH)<sub>3.14</sub>]<sub>Σ8.00</sub>·11.97H<sub>2</sub>O, ideally K<sub>2</sub>Zn(Nb,Ti)<sub>4</sub>(Si<sub>4</sub>O<sub>12</sub>)<sub>2</sub>(O,OH)<sub>4</sub>·6H<sub>2</sub>O. Translucent, vitreous luster, brittle, white streak, rough fracture, no cleavage,  $H = \sim 5$ ,  $D_{\text{meas}} = 2.88$ ,  $D_{\text{calc}} = 2.89$  g/cm<sup>3</sup> for  $Z = 4$ . Optically biaxial positive,  $\alpha = 1.683(2)$ ,  $\beta = 1.688(1)$ ,  $\gamma = 1.785(3)$ ,  $2V_{\text{meas}} = 45(15)$ ,  $2V_{\text{calc}} = 27^\circ$ ,  $Y = b$ , pleochroism  $Y =$  light brown,  $X, Z =$  very pale brown. Single-crystal X-ray structure study ( $R = 0.063$ ) indicated monoclinic symmetry, space group  $C2/m$ ,  $a = 14.535$ ,  $b = 13.927$ ,  $c = 15.665$  Å,  $\beta = 117.6^\circ$ . Strongest lines of the powder pattern (diffractometer, MoK $\alpha$ , radiation) are 6.96(100,020,002), 6.43(24,200,20 $\bar{2}$ ), 4.924(30,022), 3.222(84,42 $\bar{2}$ , 400,40 $\bar{4}$ ), 3.114(66,042,024), 2.514 (30,44 $\bar{2}$ ,402), and 1.430(22, several).

The mineral is associated with natrolite, microcline, albite, aegirine, organovaitite, berylite, elpidite, and many others in an alkaline pegmatite at Karnasurt Mountain, Lovozero massif, Kola Peninsula, Russia. The new mineral name is for Russian crystallographer Natalia I. Organova (b. 1929); the mineral is a member of the organovaitite subgroup of the labuntsovite group. Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

#### POTASSIC CHLOROPARGASITE\*

N.V. Chukanov, A.N. Konilov, A.E. Zadov, D.I. Belakovskiy, I.V. Pekov (2002) The new amphibole potassic chloropargasite (K,Na)Ca<sub>2</sub>(Mg,Fe<sup>2+</sup>)<sub>4</sub>Al(Si<sub>6</sub>Al<sub>2</sub>O<sub>22</sub>)(Cl,OH)<sub>2</sub> and conditions of its formation in the granulite complex of the Sal'nye Tundry massif (Kola Peninsula). Zap. Vseross. Mineral. Obshch., 131(2), 58–62 (in Russian, English abs.).

The mineral occurs as anhedral black grains, to 0.5 mm;  $H = 5\frac{1}{2}$ , perfect {110} cleavage,  $D_{\text{meas}} = 3.29(5)$ ,  $D_{\text{calc}} = 3.35(3)$  g/cm<sup>3</sup> for  $Z = 2$ . Optically biaxial negative,  $\alpha = 1.675(1)$ ,  $\beta = 1.687(1)$ ,  $\gamma = 1.690(3)$ ,  $2V_{\text{meas}} = 65(15)$ ,  $2V_{\text{calc}} = 53^\circ$ , pleochroism  $\alpha =$  light gray,  $\beta =$  gray,  $\gamma =$  dark green,  $Z > Y > X$ . Electron microprobe analysis gave Na<sub>2</sub>O 1.22, K<sub>2</sub>O 3.03, CaO 11.41, MgO 9.08, FeO 16.63, Al<sub>2</sub>O<sub>3</sub> 15.05, TiO<sub>2</sub> 0.26, SiO<sub>2</sub> 38.71, Cl 4.33, H<sub>2</sub>O (calc.) 0.84, O  $\equiv$  Cl 0.98, sum 99.58 wt%, corresponding to K<sub>0.60</sub>Na<sub>0.37</sub>Ca<sub>1.89</sub>(Mg<sub>2.09</sub>Fe<sub>1.68</sub>Fe<sub>1.47</sub>Al<sub>0.73</sub>Ti<sub>0.03</sub>)(Si<sub>5.99</sub>Al<sub>2.01</sub>)Cl<sub>1.14</sub>(OH)<sub>0.86</sub>, simplified as (K,Na)Ca<sub>2</sub>(Mg,Fe<sup>2+</sup>)<sub>4</sub>Al[Si<sub>6</sub>Al<sub>2</sub>O<sub>22</sub>](Cl,OH)<sub>2</sub>. Indexing of the X-ray powder pattern (57 mm Debye–Scherrer) indicated monoclinic symmetry, probable space group  $C2/m$  by analogy with other amphiboles,  $a = 9.843(3)$ ,  $b = 18.130(5)$ ,  $c = 5.362(3)$  Å,  $\beta = 105.5(5)^\circ$ . Strongest lines given in the abstract are 8.40(80,110), 3.116(30,310), 2.951(30,151,221), 2.714(100,151), 2.562(70,241), and 1.444(30,533).

The mineral is associated with chlorapatite, almandine, diopside, enstatite, biotite, potassic pargasite, marialite, and plagioclase at Elgoras Mountain in the Sal'nye Tundry granulite complex, Kola Peninsula, Russia. The new mineral name is in accord with the IMA-approved nomenclature for the amphiboles. Type material is in the Fersman Mineralogical Museum, Moscow, Russia.

**Discussion.** J.A. Mandarino (written comm.) pointed out that the strongest lines given in the abstract differ from those

of the full X-ray pattern listed in the text. Closer examination of the latter suggests that the data most likely are for mineral IMA 2001-044 rather than for potassic chloropargasite. **J.L.J.**

#### MANGANESE, Mn CARBIDE

A.A. Kim, N.V. Zayakina (2001) Native manganese from alkali picrites of central Aldan. Otechestvennaya Geologia, (5), 32–34 (in Russian).

The mineral occurs as smoothly angular grains up to 0.8 mm in Pt-bearing gold placers, and as sharply angular grains up to 0.4 mm within orthoclase-olivine picrites from an alkali mafic-ultramafic massif in the central Aldan shield of eastern Siberia, Russia. Steel-gray color with a creamy tint, opaque, bright metallic luster, brittle, dark gray streak, VHN = 908–1095,  $D_{\text{meas}} = 7.01$ ,  $D_{\text{calc}} = 7.04$  g/cm<sup>3</sup> for  $Z = 20$ . Light gray in reflected light, isotropic, no internal reflection. Reflectance percentages (Si standard, air) are given in 20 nm steps from 420 to 760 nm; representative values are 56.8 (480), 59.5 (560), 59.9 (580), and 61.7 (660). Electron microprobe analyses gave Mn 88.2, Fe 6.67, Si 4.86, P 0.28, sum 100.03 wt%, corresponding to Mn<sub>0.83</sub>Si<sub>0.09</sub>Fe<sub>0.07</sub>P<sub>0.01</sub>. Indexing of the X-ray powder pattern, by analogy with that of synthetic  $\beta$ -Mn, indicated cubic symmetry, space group  $P4_32$ ,  $a = 6.287$  Å. Strongest lines of the powder pattern (57 mm camera, FeK $\alpha$  radiation) are 2.096(100,221), 1.989(80,310), 1.893(30,311), 1.234(60,510), 1.168(40,520), and 1.047(30,442).

The matrix of the manganese grains contains tephroite, spessartine, Cr-bearing hausmannite, and Mn<sub>3</sub>C. The carbide, which occurs as lamellae, has a composition corresponding to (Mn<sub>2.92</sub>Fe<sub>0.13</sub>)<sub>Σ3.03</sub>(C<sub>0.8</sub>Si<sub>0.17</sub>)<sub>Σ0.97</sub>. **V.A.K.**

#### Cu<sub>3</sub>AuHg<sub>0.4</sub>Sn<sub>0.7</sub>–Cu<sub>3</sub>Au<sub>1.8</sub>HgSn

S.M. Zhmodik, A.G. Mironov, L.V. Agafonov (2000) Au–Sn intermetallic compound in ophiolites of the Eastern Sayans. Zap. Vseross. Mineral. Obshch., 129(2), 54–57 (in Russian, English abs.).

The mineral occurs as an equant grain, 30–40  $\mu$ m across, with a highly irregular periphery. Opaque, light yellow with a creamy tint in reflected light, weakly anisotropic. Reflectance percentages (conditions not stated) for the central part of the grain are given for wavelengths from 380 to 660 nm; representative values are 22.1 (460), 41.4 (540), 45.3 (580), and 52.8 (660). The grain is non-uniform in composition, with the central and peripheral portions enriched in heavy metals. Electron microprobe analyses of the core, intermediate zone (one of two similar analyses that are listed), and rim gave, respectively, Au 40.0, 35.40, 34.47, Ag 0.0, 0.14, 0.05, Cu 20.07, 33.85, 23.91, Hg 22.09, 13.24, 25.42, Sn 13.23, 15.35, 13.74, As 0.03, 0.02, 0.00, Sb 3.64, 1.52, 2.00, Rh 0.00, 0.03, 0.01, Fe 0.26, 0.40, 0.28, Pb 0.14, 0.09, 0.6, Bi 0.09, 0.07, 0.04, sum 99.56, 100.13, 99.80 wt% (data for As, Rh, Pb, and Bi are uncorrected). The compositions are interpreted to represent a continuous solid solution between Cu<sub>3</sub>AuHg<sub>0.4</sub>Sn<sub>0.7</sub> and Cu<sub>3</sub>Au<sub>1.8</sub>HgSn. The mineral is associated with Hg- and Cu-bearing gold, sperrylite, and Sn–Pb intermetallic minerals in magnetite- and pyrite-bearing amphibolitic alteration zones in an ophiolitic belt at the southeastern part of the Eastern Sayan, Russia. **V.A.K.**

**Cu<sub>3</sub>AsS<sub>4</sub>, (Cu,Zn)<sub>3</sub>(Sb,As)S<sub>3</sub>**

L.E. Gertsen, V.L. Levin, B.M. Tasov, S.D. Abulgazina (2001) First identification of zinc-arsenic varieties of skinnerite in Kazakhstan. *Geol. Kazakhstana*, (5–6), 75–80 (in Russian).

The mineral occurs as opaque grains, up to 2 × 6 μm, creamy gray in reflected light, weakly birefractant, anisotropic with brownish gray tints. Electron microprobe analysis gave Cu 52.36, Zn 2.39, Fe 1.78, As 16.64, Sb 0.74, S 27.01; sum 100.92 wt%, corresponding to (Cu<sub>2.97</sub>Zn<sub>0.13</sub>Fe<sub>0.11</sub>)Σ<sub>3.21</sub>(As<sub>0.79</sub>Sb<sub>0.02</sub>)Σ<sub>0.81</sub>S<sub>2.98</sub>, simplified as Cu<sub>3</sub>AsS<sub>3</sub>. An associated mineral identified as skinnerite-like occurs as irregular to oval grains, up to 15 μm. Opaque, light pinkish brown in reflected light, weakly birefractant, distinctly anisotropic with rotation tints from yellowish gray to violet-brown; red internal reflection in oil. Reflectance percentages are illustrated, but not tabulated, for the Cu<sub>3</sub>AsS<sub>3</sub> and for three grains of the skinnerite-like mineral, for which electron microprobe analysis gave Cu 41.00, 40.00, 40.91, Zn 7.89, 7.29, 8.02, Fe 0.30, 0.22, 0.60, As 5.67, 5.95, 8.46, Sb 20.85, 21.87, 16.11, S 25.35, 24.33, 25.28, sum 100.46, 100.32, 99.38 wt%, corresponding to (Cu<sub>2.54</sub>Zn<sub>0.43</sub>Fe<sub>0.02</sub>)Σ<sub>2.99</sub>(Sb<sub>0.66</sub>As<sub>0.29</sub>)Σ<sub>0.95</sub>S<sub>3.06</sub>, (Cu<sub>2.53</sub>Zn<sub>0.44</sub>Fe<sub>0.01</sub>)E<sub>2.98</sub>(Sb<sub>0.71</sub>As<sub>0.31</sub>)Σ<sub>1.02</sub>S<sub>3.00</sub>, and (Cu<sub>2.52</sub>Zn<sub>0.47</sub>Fe<sub>0.04</sub>)Σ<sub>3.03</sub>(Sb<sub>0.51</sub>As<sub>0.43</sub>)Σ<sub>0.94</sub>S<sub>3.03</sub>. Indexing of the X-ray powder pattern (Debye–Scherrer, CoKα radiation) by analogy with data for synthetic Cu<sub>3</sub>SbS<sub>3</sub> gave orthorhombic symmetry, space group *Pnma*, *a* = 7.679(2), *b* = 10.02(7), *c* = 6.876 Å. Strongest lines of the power pattern (10 lines listed) are 3.226(40,212), 3.026(20,220), 2.842(100,132), 1.859(50,036), and 1.729(40,252,334). The minerals are associated with chlorite, sericite, quartz, pyrite, and chalcopyrite in stockwork ores at the Bayskoe porphyry copper deposit, Kazakhstan.

**Discussion.** The small size of the grains introduces uncertainty about the correctness of the reflectance and X-ray data. **V.A.K.**

**Cu-Fe SULFIDE, OXSULFIDE**

D.V. Lisitsin, M.G. Dobrovol'skaya, A.I. Tsepin, D.K. Shcherbachev, N.V. Trubkin, N.N. Kononkova (2002) Sulfide mineralization in high-alkaline pegmatites of the Koashva deposit (Khibiny massif, Kola Peninsula). *Geol. Ore Deposits*, 44, 385–395.

**Cu<sub>4</sub>FeS<sub>4</sub>(?)**

The results of one of seven listed electron microprobe analyses, and the range for all seven, are K 1.03 (0.44–1.54), Fe 12.90 (11.73–14.55), Cu 56.37 (53.30–57.55), S 28.03 (28.03–30.56), sum 98.33 (98.12–100.14) wt% possibly corresponding to KCu<sub>1</sub><sup>1/3</sup>Cu<sub>1</sub><sup>2/3</sup>Fe<sub>1</sub><sup>1/3</sup>S<sub>3</sub>, simplified as Cu<sub>2</sub>Cu<sub>2</sub><sup>+</sup>Fe<sup>2+</sup>S<sub>4</sub> or Cu<sub>4</sub>FeS<sub>4</sub>. Millimetric size, brittle, platy with a prominent cleavage along the layers, unstable in air. In reflected light, yellow to yellow with a lilac shade, *VHN*<sub>5</sub> = 161.8, weakly anisotropic, rotation tints from grayish yellow to grayish blue, weakly birefractant, reflectance percentages 12.1–13.5 (470 nm), 15.3–16.7 (546), 17.2–18.6 (589), and 20.4–21.5 (650). Electron diffraction patterns indicated a supercell in which the subcell is *F*-centered cubic, *a* = ~5.4 Å. The principal association is with chalcopyrite.

**Cu-Fe oxysulfide(?)**

The mineral occurs as millimetric, platy aggregates that cut chalcopyrite and are concentrated among its interstices. The color in reflected light varies from bronze-yellow to gray, intense birefractance and anisotropy, rotation tints variable from yellow-orange to blue and dark blue, reflectance percentages 18.0–19.9 (470 nm), 26.2–31.4 (546), 28.7–34.3 (589), and 31.2–36.1 (650), *VHN*<sub>5</sub> = 133.2, *VHN*<sub>15</sub> = 74.4. The results of one electron microprobe analysis and the range for the 10 listed analyses are K 0.07 (0.07–0.39), Fe 21.02 (13.99–23.86), Cu 40.53 (33.78–41.34) S 27.11 (25.50–33.74), sum 88.73 (78.10–92.55) wt%, with O assumed to make up the difference.

Twelve additional microprobe analyses of Na- and K-bearing sulfides are listed, but formulas are uncertain, possibly with one mineral representing a Na-dominant analog of djerfisherite. The various sulfide minerals, among which are galena, sphalerite, pyrite, chalcopyrite, molybdenite, cobaltite, djerfisherite, and rasvumite, occur in alkali-rich pegmatites at the Koashva apatite deposit, Khibiny massif, Kola Peninsula, Russia. **J.L.J.**

**(Ca,Fe)<sub>3</sub>TiSi<sub>2</sub>O<sub>9</sub>**

A.L. Hammond, R.H. Mitchell (2002) Accessory mineralogy of orangeite from Swartruggens, South Africa. *Mineral. Petrology*, 76, 1–19.

The mineral occurs as euhedral grains, up to 60 μm across, that have a hexagonal habit and are dark reddish to purplish brown, almost opaque in thin section. The average of four listed electron microprobe analyses is Na<sub>2</sub>O 0.65, CaO 30.26, MgO 1.57, MnO 0.38, Fe<sub>2</sub>O<sub>3</sub> 15.59, TiO<sub>2</sub> 21.38, SiO<sub>2</sub> 26.19, sum 96.02 wt%, corresponding to (Ca<sub>2.11</sub>Fe<sub>0.53</sub>Mg<sub>0.15</sub>Na<sub>0.08</sub>Mn<sub>0.02</sub>)Σ<sub>2.89</sub>(Ti<sub>0.76</sub>Fe<sub>0.24</sub>)Σ<sub>1.00</sub>(Si<sub>1.71</sub>Ti<sub>0.29</sub>)Σ<sub>2.00</sub>O<sub>9</sub>, perhaps ideally Ca<sub>3</sub>TiSi<sub>2</sub>O<sub>9</sub>, which is the Ti-dominant analog of baghdadite. The mineral is associated with apatite, phlogopite, diopside, perovskite, and other minerals, locally making up to 10% of the groundmass in orangeite dikes at Swartruggens, Gauteng, South Africa. **J.L.J.**

**NEW DATA****CALCIOBURBANKITE**

Yu.V. Belovitskaya, I.V. Pekov, E.R. Gobechiya, Yu.K. Kabalov, V.V. Subotin (2001) Crystal structure of calcioburbankite and the characteristic features of the burbankite structure type. *Crystallogr. Reports*, 46, 1009–1013.

The burbankite family consists of hexagonal and pseudo-hexagonal monoclinic members. Reitveld refinement (*R*<sub>wp</sub> = 0.0249) of calcioburbankite (*Am. Mineral.*, 81, p. 1013, 1996) from the Vuoriyarvi carbonatites, northern Karelia, Russia, was obtained with a hexagonal cell similar to that of burbankite, and with the same space group, *P6<sub>3</sub>mc*. **J.L.J.**

**LOVOZERITE**

N.A. Yamnova, Yu.K. Egorov-Tismenko, I.V. Pekov (2001) Refined crystal structure of lovozerite Na<sub>2</sub>CaZr[Si<sub>6</sub>O<sub>12</sub>(OH, O)<sub>6</sub>]·H<sub>2</sub>O. *Crystallogr. Reports*, 46, 1019–1023.

Single-crystal X-ray structure study ( $R = 0.077$ ) of Iovozerite from the Khibiny alkaline massif, Kola Peninsula, Russia, indicated that the previously uncertain symmetry is trigonal, space group  $R\bar{3}$ ,  $a = 10.18(1)$ ,  $c = 13.13(2)$  Å,  $Z = 3$ . The structure determination showed that molecular  $H_2O$  is a component of the formula. **J.L.J.**

#### Na-DOMINANT KOMAROVITE

T. Balić Zunić, O.V. Petersen, H.-J. Bernhardt, H.I. Micheelsen (2002) The crystal structure and mineralogical description of a Na-dominant komarovite from the Ilímaussaq alkaline complex, South Greenland. *Neues Jahrb. Mineral. Mon.*, 497–514.

Electron microprobe analysis gave  $Na_2O$  12.26,  $K_2O$  0.15,  $CaO$  3.36,  $FeO$  0.16,  $Ce_2O_3$  1.11,  $La_2O_3$  0.57,  $SiO_2$  17.50,  $TiO_2$  3.34,  $Nb_2O_5$  53.98,  $F$  3.03,  $H_2O$  (calc.) 5.25,  $O \equiv F$  1.28, sum 98.43 wt%, corresponding to  $(Na_{5.43}K_{0.04})_{\Sigma 5.47}Ca_{0.82}(Ce_{0.09}La_{0.05}Fe_{0.03})_{\Sigma 0.17}Ti_{0.57}Nb_{5.58}[Si_4O_{12}]O_{13.89}F_{2.19} \cdot 4H_2O$ , ideally  $Na_6CaNb_6[Si_4O_{12}]O_{14}F_2 \cdot 4H_2O$  for the end-member formula. The mineral occurs as light yellowish, transparent, lamellar aggregates in which crystals are platy on {010} and are needle- or lath-like, elongate [100], perfect {010} and fair {001} cleavages,  $D_{calc} = 3.41$  g/cm<sup>3</sup> for  $Z = 2$ . Optically biaxial negative,  $\alpha = 1.809$ ,  $\beta =$

1.876,  $\gamma = 1.912$ ,  $2V_{meas} = 72(1)^\circ$ , dispersion  $r \gg v$ ,  $Y = a$ ,  $X = b$ ,  $Z = c$ . Single-crystal X-ray structure study ( $R = 0.0466$ ) indicated orthorhombic symmetry, space group  $Cmmm$ ,  $a = 7.310(1)$ ,  $b = 24.588(3)$ ,  $c = 7.402(1)$  Å.

**Discussion.** The formula and unit cell are new. The authors point out that the mineral corresponds to “Na-komarovite,” a name that is widely accepted but has not been approved by the CNMNC; moreover, whereas komarovite is supposedly Ca-dominant (*Am. Mineral.*, 57, 1315–1316, 1972), the composition of pure material needs to be determined. **J.L.J.**

#### PRICEITE

K.S. Wallwork, A. Pring, M.R. Taylor, B.A. Hunter (2002) The structure of priceite, a basic hydrated calcium borate, by *ab initio* powder-diffraction methods. *Can. Mineral.*, 40, 1199–1206.

The mineral is known only as microcrystalline masses. Reitveld refinement ( $R_{wp} = 0.042$ ,  $R_p = 0.030$ ) of synchrotron X-ray powder data of a specimen from Sultancayir, near Panderma, Turkey, indicated monoclinic symmetry, space group  $P2_1/c$ ,  $a = 11.623(1)$ ,  $b = 6.976(1)$ ,  $c = 12.350(1)$  Å,  $\beta = 110.70(1)^\circ$ ,  $D_{calc} = 2.427$  g/cm<sup>3</sup> for  $Z = 4$  and the formula  $Ca_2B_5O_7(OH)_5 \cdot H_2O$ . The unit cell and formula are new. **J.L.J.**