

## New Mineral Names\*

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

## ANORTHOMINASRAGRITE\*

M.A. Cooper, F.C. Hawthorne, J.D. Grice, P. Haynes (2003) Anorthominasragrite,  $V^{4+}O(SO_4)(H_2O)_5$ , a new mineral species from Temple Mountain, Emery County, Utah, U.S.A.: description, crystal structure and hydrogen bonding. *Can. Mineral.*, 41, 959–979.

The mineral forms blue-green crusts and spherical granular aggregates, up to ~1 mm across, wherein individual crystals are <0.1 mm. Electron microprobe analysis gave  $VO_2$  33.93,  $SO_3$  30.78,  $H_2O$  (calc.) 35.52, sum 100.23 wt%, corresponding to  $V_{1.04}^{4+}S_{0.98}O_5(H_2O)_5$ , ideally  $VO(SO_4)(H_2O)_5$ . Individual grains are pale blue, vitreous luster, no cleavage or parting, white streak,  $H = \sim 1$ , nonfluorescent,  $D_{calc} = 2.12 \text{ g/cm}^3$  for  $Z = 2$ . Optically biaxial positive,  $\alpha = 1.548(2)$ ,  $\beta = 1.555(2)$ ,  $\gamma = 1.574(2)$ ,  $2V_{meas} = 86(1)$ ,  $2V_{calc} = 63^\circ$ , nonpleochroic, orientation  $X \wedge c = \sim 18^\circ$  in  $\beta$  obtuse,  $Y = \sim a$ ,  $Z \wedge b = \sim 19^\circ$  in  $\gamma$  obtuse. Single-crystal X-ray structure study ( $R = 0.032$ ) indicated triclinic symmetry, space group  $P\bar{1}$ ;  $a = 7.548(3)$ ,  $b = 7.805(2)$ ,  $c = 7.821(3)$  Å,  $\alpha = 79.03(4)$ ,  $\beta = 71.94(3)$ ,  $\gamma = 65.31(3)^\circ$  as refined from a Debye–Scherrer powder pattern (114 mm,  $CuK\alpha$  radiation) with strongest lines of 7.053(80,010), 6.617(100,100), 4.116(80,110), 3.712(80,121), 3.206(70,221), and 2.934(50,112,102).

The mineral is the triclinic polymorph of orthominasragrite (orthorhombic) and minasragrite (monoclinic), and is associated with those and other minerals (*Am. Mineral.*, 87, p. 997, 2002) in a silicified tree in the Triassic Shinarump Conglomerate at the North Mesa mine group, Emery County, Utah. Type material is in the Canadian Museum of Nature, Ottawa. **J.L.J.**

## FERROSAPONITE\*

N.V. Chukanov, I.V. Pekov, A.E. Zadov, V.N. Chukanova, S. Mökkel (2003) Ferrosaponite  $Ca_{0.3}(Fe^{2+}, Mg, Fe^{3+})_3(Si, Al)_4O_{10}(OH)_2 \cdot 4H_2O$ , a new trioctahedral smectite (from Evenkiya). *Zap. Vseross. Mineral. Obshch.*, 132(2), 68–74 (in Russian, English abs.).

Electron microprobe analysis ( $H_2O$  by TGA;  $Fe^{2+}:Fe^{3+}$  by Mössbauer spectroscopy) gave  $Na_2O$  0.21,  $K_2O$  0.07,  $CaO$  3.31,  $MgO$  6.62,  $FeO$  21.23,  $Fe_2O_3$  8.78,  $Al_2O_3$  9.95,  $SiO_2$  33.15,  $H_2O$  17.92, sum 101.24 wt%, corresponding to

$Ca_{0.31}Na_{0.04}K_{0.01}(Fe_{1.56}^{2+}Mg_{0.87}Fe_{0.52}^{3+})_{\Sigma 2.95}[(Si_{2.91}Al_{1.03}Fe_{0.06}^{3+})_{\Sigma 4}O_{10}](OH)_2 \cdot 4.24H_2O$ , simplified as in the title. The mineral occurs as spherulites, up to 2 mm in diameter, and as radial columnar aggregates within calcite. Translucent, vitreous luster, dark green color gradually turning brownish by oxidation of  $Fe^{2+}$ , green streak,  $H = 2$ , perfect {001} cleavage,  $D_{meas} = 2.49(5)$ ,  $D_{calc} = 2.435 \text{ g/cm}^3$  for  $Z = 2$ . Optically biaxial negative,  $\alpha_{calc} = 1.448$ ,  $\beta = 1.641(2)$ ,  $\gamma = 1.642(2)$ ,  $2V_{meas} = 5(3)^\circ$ , brownish pleochroism,  $Z > Y$ . The IR spectrum is similar to that of saponite. Indexing of the X-ray powder pattern (86 mm camera, Fe radiation) gave a monoclinic cell with  $a = 5.365(2)$ ,  $b = 9.337(4)$ ,  $c = 14.65(2)$  Å,  $\beta = 94.9(1)^\circ$ ; strongest lines are 7.37(90,002), 4.72(90,020), 3.03(100,031), 2.585(90,201), 2.429(90,006), and 1.549(90,060); the first line at 14.61 (40,001) expands to 17.9 Å after glyceration.

The mineral, which is the  $Fe^{2+}$ -dominant analog of saponite and is named accordingly, had been reported to occur at other localities (e.g., *Am. Mineral.*, 73, p. 445, 1988), but had not been named. The type mineral is associated with calcite, pyrite, quartz, mordenite, heulandite-Ca, and stilbite-Ca that form a hydrothermal assemblage at the Levoberezhnye “Iceland spar” deposit near the Nizhnyaya Tunguska River, Evenkiya, Siberia, Russia. Type material is in the Geoscientific Collections of the Freiberg University of Mining and Technology, Germany. **J.L.J.**

## FLUORONYBÖITE\*

R. Oberti, M. Boiocchi, D.C. Smith (2003) Fluoronyböite from Jianchang (Su–Lu, China) and nyböite from Nybö (Nordfjord, Norway): a petrological and crystal-chemical comparison of these two high-pressure amphiboles. *Mineral. Mag.*, 67, 769–782.

Electron microprobe analysis gave  $Na_2O$  8.40,  $K_2O$  0.32,  $CaO$  3.03,  $MgO$  12.07,  $MnO$  0.09,  $FeO$  7.47,  $ZnO$  0.05,  $Al_2O_3$  12.35,  $Fe_2O_3$  2.94,  $Cr_2O_3$  0.02,  $SiO_2$  50.15,  $TiO_2$  0.13,  $H_2O$  (calc.) 0.88,  $F$  2.58,  $O \equiv F$  1.09, sum 99.39 wt%, corresponding to  $(Na_{0.78}K_{0.06})_{\Sigma 0.84}(Na_{1.53}Ca_{0.47})_{\Sigma 2.00}(Mg_{2.55}Fe_{0.89}^{2+}Mn_{0.01}Zn_{0.01}Fe_{0.32}^{3+}Al_{1.21}Ti_{0.01})_{\Sigma 5.00}(Si_{7.14}Al_{0.86})_{\Sigma 8.00}O_{22}[F_{1.16}(OH)_{0.84}]_{\Sigma 2.00}$ , ideally  $NaNa_2(Al_2Mg_3)(Si_7Al)O_{22}F_2$ . Bluish gray color, grain size and habit not given, translucent, vitreous luster, brittle,  $D_{calc} = 3.18 \text{ g/cm}^3$ ; reported as similar to nyböite, which has a poor {110} cleavage and  $H = 6$ . Optically biaxial negative,  $2V$  medium, measured R.I. not given, pleochroism presumably like that of nyböite,  $X =$  colorless,  $Y =$  pale brownish pink,  $Z =$  pale bluish green. Single-crystal X-ray structure study ( $R = 0.013$ ) indicated monoclinic symmetry, space group  $C2/m$ ,  $a = 9.666(4)$ ,  $b = 17.799(6)$ ,  $c = 5.311(2)$  Å,  $\beta = 104.10(3)^\circ$ . Strongest lines of the calculated X-ray powder pattern are 8.307(64,110),

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

† E-mail: J.L.Jambor@aol.com

3.382(42,131), 3.079(58,310), 2.691(100,151,331), and 2.532(47,202).

The new mineral, which is named in accordance with the CNMMN-approved nomenclature system for amphiboles, occurs as relicts in association with clinopyroxene, garnet, rutile, apatite, paragonite, plagioclase, and other amphiboles in a kyanite-bearing eclogite from the Jianchang eclogite pod in the Jiangsu and Shandong provinces of eastern China. Type material is in the Museo di Mineralogia, Dipartimeto di Scienze della Terra, Università di Pavia, Italy.

**Discussion.** A description is also given for nyböite, which although entrenched in the literature as an approved mineral and name, had not been fully described. **J.L.J.**

### GRAULICHITE-(Ce)\*

F. Hatert, P. Lefèvre, M. Pasero, A.-M. Fransolet (2003) Graulichite-(Ce), a new arsenate mineral from the Stavelot Massif, Belgium. *Eur. J. Mineral.*, 15, 733–739.

The mineral, which is the Fe-dominant analog of arsenoflorencite-(Ce), occurs as spherical aggregates, up to 150  $\mu\text{m}$  in diameter, consisting of rhombohedral crystals, some of which are isolated euhedra up to 50  $\mu\text{m}$  long, showing {102} modified by {101}. Electron microprobe analysis gave CaO 0.03, SrO 0.24, BaO 3.95, PbO 0.07, La<sub>2</sub>O<sub>3</sub> 2.26, Ce<sub>2</sub>O<sub>3</sub> 15.73, Nd<sub>2</sub>O<sub>3</sub> 2.08, Al<sub>2</sub>O<sub>3</sub> 3.09, Fe<sub>2</sub>O<sub>3</sub> 30.65, SO<sub>3</sub> 0.06, P<sub>2</sub>O<sub>5</sub> 0.03, As<sub>2</sub>O<sub>3</sub> 31.20, H<sub>2</sub>O (calc.) 8.37, sum 97.79 wt%, corresponding to  $(\text{Ce}_{0.67}\text{Ba}_{0.18}\text{La}_{0.10}\text{Nd}_{0.09}\text{Sr}_{0.02})_{\Sigma 1.06}(\text{Fe}_{2.68}\text{Al}_{0.42})_{\Sigma 3.10}[(\text{As}_{1.89}\text{S}_{0.01}\text{O}_{10})_{\Sigma 2.00}\text{O}_8][(\text{OH})_{5.57}(\text{H}_2\text{O})_{0.43}]_{\Sigma 6.00}$  on the basis of six cations [ $\Sigma = 6.06$ ], and 6(OH,H<sub>2</sub>O), ideally  $\text{CeFe}_3(\text{AsO}_4)_2(\text{OH})_6$ . Light green to brownish color, transparent, resinous luster, no cleavage, irregular fracture, nonfluorescent,  $D_{\text{meas}} = >3.9$ ,  $D_{\text{calc}} = 4.42 \text{ g/cm}^3$  for the empirical formula and  $Z = 3$ . Optically uniaxial negative,  $n = 1.97$ , light green to yellowish pleochroism. Single-crystal X-ray structure study ( $R = 0.0475$ ) indicated trigonal symmetry, space group  $R\bar{3}m$ ;  $a = 7.260(5)$ ,  $c = 16.77(2) \text{ \AA}$  as refined from a powder pattern (diffractometer, FeK $\alpha$  radiation) with strongest lines of 3.636(40,110), 3.052(100,113), 2.792(30,006), 2.239(35,107), and 1.817 (35,220).

The mineral is associated with scorodite, mimetite, goethite, pharmacosiderite, and barium-pharmacosiderite that formed by weathering of arsenopyrite-bearing quartzite at the Hourt quarry in the Stavelot massif, Belgian Ardennes. The new mineral name is for mining engineer Jean-Marie Graulich (1920–2001), honorary Director of the Geological survey of Belgium. Type material is in the University of Liège, Belgium, and in the Royal Belgian Institute of Natural Sciences, Brussels. **J.L.J.**

### HILLITE\*

O.V. Yakubovich, W. Massa, R.P. Liferovich, P.G. Gavrilenko, A.N. Bogdanova, P. Tuisku (2003) Hillite, a new member of the fairfieldite group: its description and crystal structure. *Can. Mineral.*, 41, 981–988.

The mineral occurs as doubly terminated euhedral crystals, <50  $\mu\text{m}$  long, and as concentric zones up to 200  $\mu\text{m}$  in thickness within zincian collinsite. Electron microprobe analysis

gave Na<sub>2</sub>O 0.11, CaO 30.36, MgO 4.34, ZnO 14.79, FeO 0.04, P<sub>2</sub>O<sub>5</sub> 40.85, H<sub>2</sub>O (calc.) 10.23, sum 100.72 wt%, corresponding to  $(\text{Ca}_{1.91}\text{Na}_{0.01})_{\Sigma 1.92}(\text{Zn}_{0.64}\text{Mg}_{0.38})_{\Sigma 1.02}\text{P}_{2.03}\text{O}_8 \cdot 2.00\text{H}_2\text{O}$ , simplified as  $\text{Ca}_2(\text{Zn,Mg})[\text{PO}_4]_2 \cdot 2\text{H}_2\text{O}$ . The microprobe compositions indicate a complete solid solution from 64 mol% Zn to collinsite and fairfieldite. Greenish or bluish to colorless, transparent to translucent, vitreous to silky luster,  $H = 3\frac{1}{2}$ , perfect {010} and {001} cleavages,  $D_{\text{meas}} = 3.16(2)$ ,  $D_{\text{calc}} = 3.18 \text{ g/cm}^3$  for  $Z = 1$ , very slowly soluble in HCl, weak greenish yellow fluorescence in short-wave ultraviolet light. Optically biaxial positive,  $\alpha = 1.635(5)$ ,  $\beta = 1.650(5)$ ,  $\gamma = 1.667(3)$ ,  $2V_{\text{calc}} = 83.4^\circ$ . Single-crystal X-ray structure study ( $R = 0.0378$ ) indicated triclinic symmetry, space group  $P\bar{1}$ ;  $a = 5.736(1)$ ,  $b = 6.767(2)$ ,  $c = 5.462(1) \text{ \AA}$ ,  $\alpha = 97.41(2)$ ,  $\beta = 108.59(2)$ ,  $\gamma = 107.19(2)^\circ$  as refined from a diffractometer powder pattern (CuK $\alpha$  radiation) with strongest lines of 6.24(34,010), 3.230(22,120), 3.130(37,020), 3.038(40,101), 2.690(100,201,21,102), and 1.668(22,213).

The mineral occurs on the prism faces of scholzite, as concentric zones within collinsite, and as clusters of crystals on crusts of collinsite in a small gossan on Precambrian argillaceous siltstone at Reaphook Hill, Flinders Ranges, South Australia. Other phosphates in the gossan are tarbuttite, parahopeite, switzerite, and phosphophyllite. The new mineral name is for Roderick Hill (b. 1949) of CSIRO at Melbourne, Australia, who described the mineral in 1973 and recognized it as a potentially new species. Type material is in the Museum of Victoria at Melbourne. **J.L.J.**

### MAGNESIOTANTALITE\*

I.V. Pekov, O.V. Yakubovich, D.K. Shcherbachev, N.N. Kononkova (2003) Magnesiotantalite (Mg,Fe)(Ta,Nb)<sub>2</sub>O<sub>6</sub> — a new mineral of the columbite–tantalite group, from desilicated granite pegmatites of Lipovka (Central Urals), and its genesis. *Zap. Vseross. Mineral. Obshch.*, 132(2), 49–59 (in Russian, English abs.).

The mineral occurs as black, opaque, irregular flattened grains up to 0.4 mm, and as segregations to 0.7 mm. One of four listed electron microprobe analyses has MgO 5.27, FeO 6.71, MnO 0.82, TiO<sub>2</sub> 0.38, Nb<sub>2</sub>O<sub>5</sub> 24.19, Ta<sub>2</sub>O<sub>5</sub> 61.86, sum 99.23 wt%, corresponding to  $(\text{Mg}_{0.56}\text{Fe}_{0.40}\text{Mn}_{0.05})_{\Sigma 1.01}(\text{Ta}_{1.20}\text{Nb}_{0.78}\text{Ti}_{0.02})_{\Sigma 2.00}\text{O}_6$ , simplified as  $(\text{Mg,Fe})(\text{Ta,Nb})_2\text{O}_6$ . The mineral forms a continuous solid-solution series with ferrotantalite and ferrocolumbite. Semi-metallic to metallic luster, brown-red streak, brittle, cleavage not observed, uneven fracture,  $H = 5\frac{1}{2}$ ,  $VHN_{50} = 489(5)$ ,  $D_{\text{meas}} = 6.7(3)$ ,  $D_{\text{calc}} = 6.79 \text{ g/cm}^3$  for  $Z = 4$ . Light gray in reflected light, weakly anisotropic, brown-red internal reflection. Reflectance values in air are tabulated in 10-nm steps from 400 to 700 nm; representative values for  $R_{\text{max}}$  and  $R_{\text{min}}$  are 15.20, 14.02 (400), 13.75, 12.95 (470), 13.47, 13.28 (550), 14.58, 14.25 (590), and 15.55, 15.15 (650). Laue and oscillation photographs indicated orthorhombic symmetry, space group  $Pbcn$  by analogy with other members of the group; indexing of the powder pattern (57 mm Debye–Scherrer, FeK $\alpha$  radiation) gave  $a = 14.335(2)$ ,  $b = 5.735(1)$ ,  $c = 5.058(1) \text{ \AA}$ . Strongest lines are 3.67(60,310,111), 2.96(100,311), 1.774(60,330), 1.728(70,621), and

1.462(90,911,332).

Magnesiotalite intergrown with ferrotantalite, ferrocolumbite, and microlite occurs as replacement rims on manganotantalite crystals within nests of calcite and sodic plagioclase that formed along the axial part of a desiccated granite pegmatite at the Lipovka pegmatite field, Rezh district, Central Urals, Russia. The new mineral name is for the composition and relationship to ferrotantalite and manganotantalite. Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

### NIIGATAITE\*

H. Miyajima, S. Matsubara, R. Miyawaki, K. Hirokawa (2003) Niigataite,  $\text{CaSrAl}_3(\text{Si}_2\text{O}_7)(\text{SiO}_4)\text{O}(\text{OH})$ : Sr-analogue of clinozoisite, a new member of the epidote group from the Itoigawa-Ohmi district, Niigata Prefecture, central Japan. *J. Mineral. Petrol. Sci.*, 98, 118–129.

Electron microprobe analysis gave CaO 14.09, MgO 0.07, MnO 0.22, SrO 14.75,  $\text{Al}_2\text{O}_3$  24.86,  $\text{Fe}_2\text{O}_3$  7.08,  $\text{TiO}_2$  0.75,  $\text{SiO}_2$  35.49,  $\text{H}_2\text{O}$  (calc.) 1.77, sum 99.08 wt%, corresponding to  $\text{Ca}_{1.00}(\text{Sr}_{0.72}\text{Ca}_{0.28})_{\Sigma 1.00}(\text{Al}_{2.48}\text{Fe}_{0.45}\text{Ti}_{0.05}\text{Mn}_{0.02}\text{Mg}_{0.01})_{\Sigma 3.01}(\text{SiO}_4)\text{O}(\text{OH})$ , simplified as in the title. The mineral occurs as transparent subhedral grains, to 0.5 mm across; vitreous luster, pale gray color with a yellowish green tint, brittle, white streak,  $H = 5-5\frac{1}{2}$ , one perfect cleavage, nonfluorescent,  $D_{\text{calc}} = 3.63 \text{ g/cm}^3$  for  $Z = 2$ . Colorless in thin section, optically biaxial,  $1.67 < n < 1.725$ , anomalous violet interference color. Single-crystal X-ray structure study ( $R_1 = 0.0453$ ) indicated monoclinic symmetry, space group  $P2_1/m$ ;  $a = 8.890(4)$ ,  $b = 5.5878(18)$ ,  $c = 10.211(4)$  Å,  $\beta = 115.12(3)^\circ$  as refined from a Gandolfi powder pattern (114 mm,  $\text{CuK}\alpha$  radiation) with strongest lines of 5.05(23,10 $\bar{2}$ ), 3.22(25,201), 2.90(100,11 $\bar{3}$ ), 2.79(48,020,211), 2.70(26,013,300), 2.60(24,31 $\bar{1}$ ), and 2.11(24,221,22 $\bar{3}$ ).

The new mineral, which is named for the type locality, was found in a boulder of prehnite rock wherein the prehnite occurs as fan-shaped aggregates to 3 cm in length. Niigataite is present interstitially with chlorite and diaspore, and is closely associated with strontian clinozoisite. The new mineral is isostructural with other members of the epidote group. The distinction in site occupancies is:

	A1	A2	M1	M2	M3
clinozoisite	Ca	Ca	Al	Al	Al
strontioepimontite	Ca	Sr	Al	Al	Mn <sup>3+</sup>
niigataite	Ca	Sr	Al	Al	Al

Type material is in the National Science Museum in Tokyo, and in the Fossa Magna Museum, Itoigawa, Niigata, Japan. **J.L.J.**

### PERCLEVEITE-(Ce)\*

D. Holstam, R. Norrestam, U.B. Andersson (2003) Percleveite-(Ce)—a new lanthanide disilicate mineral from Bastnäs, Skinnkatteberg, Sweden. *Eur. J. Mineral.*, 15, 725–731.

Electron microprobe analysis of the mineral, ideally  $(\text{Ce},\text{La},\text{Nd})_2\text{Si}_2\text{O}_7$ , gave  $\text{La}_2\text{O}_3$  14.66,  $\text{Ce}_2\text{O}_3$  31.36,  $\text{Pr}_2\text{O}_3$  3.41,

$\text{Nd}_2\text{O}_3$  12.97,  $\text{Sm}_2\text{O}_3$  2.69,  $\text{Gd}_2\text{O}_3$  2.26,  $\text{Dy}_2\text{O}_3$  0.53,  $\text{Ho}_2\text{O}_3$  0.07,  $\text{Er}_2\text{O}_3$  0.21,  $\text{Yb}_2\text{O}_3$  0.04,  $\text{Y}_2\text{O}_3$  2.93,  $\text{Fe}_2\text{O}_3$  0.01,  $\text{SiO}_2$  26.55, CaO 0.10, sum 97.79 wt%, corresponding to  $(\text{Ce}_{0.87}\text{La}_{0.41}\text{Nd}_{0.35}\text{Y}_{0.12}\text{Pr}_{0.09}\text{Sm}_{0.07}\text{Gd}_{0.06}\text{Dy}_{0.01}\text{Ca}_{0.01})_{\Sigma 2.00}\text{Si}_{2.01}\text{O}_7$ . The mineral occurs as yellowish gray to white anhedral grains, up to 0.5 mm across, with a greasy to resinous luster, white streak,  $H = 6$ , imperfect {001} cleavage, nonfluorescent,  $D_{\text{calc}} = 5.21(1) \text{ g/cm}^3$  for  $Z = 8$ . Optically uniaxial positive,  $\omega = 1.840(2)$ ,  $\epsilon = 1.846(2)$ , colorless. Single-crystal X-ray structure study ( $R = 0.047$ ) indicated tetragonal symmetry, space group  $P4_1$ ;  $a = 6.7805(8)$ ,  $c = 24.689(4)$  Å as refined from a diffractometer powder pattern ( $\text{CuK}\alpha$  radiation) with strongest lines of 3.271(31,202), 3.135(27,203), 3.121(24,116), 3.084(100,008), 2.846(22,213), and 2.034(19,219). The structure is isotopic with that of  $\beta\text{-Ca}_2\text{P}_2\text{O}_7$ .

The mineral was found in a museum specimen of cerite-rich ore, with subordinate magnetite, chalcopyrite, and clin amphibole, from the Bastnäs deposit, Skinnkatteberg district, Västmanland, Sweden. Close associates are cerite-(Ce), bastnäsite-(Ce), quartz, scheelite, and an unidentified REE–W–Mg silicate. The new mineral name is for Per Theodor Cleve (1840–1905), discoverer of holmium and thulium. Type material is in the Swedish Museum of Natural History, Stockholm. **J.L.J.**

### SURKHOBITE\*

E.M. Eskova, V.D. Dusmatov, R.K. Rastsvetaeva, N.V. Chukanov, A.A. Voronkov (2003) Surkhobite (Ca,Na)  $(\text{Ba},\text{K})(\text{Fe}^{2+},\text{Mn})_4\text{Ti}_2(\text{Si}_4\text{O}_{14})\text{O}_2(\text{F},\text{OH},\text{O})_3$  — a new mineral (Alai Ridge, Tajikistan). *Zap. Vseross. Mineral. Obshch.*, 132(2), 60–67 (in Russian, English abs.).

K.A. Rozenberg, R.K. Rastsvetaeva, I.A. Verin (2003) Crystal structure of surkhobite: New mineral from the family of titanosilicate micas. *Crystallogr. Reports*, 48, 384–389.

The mineral forms reddish brown crystals, to 1 mm, and platy grains to  $2 \times 1 \times 0.4$  cm. Wet-chemical analysis gave  $\text{Na}_2\text{O}$  1.57,  $\text{K}_2\text{O}$  1.30, CaO 4.74, SrO 0.06, BaO 14.45, MnO 12.75, FeO 13.00,  $\text{Fe}_2\text{O}_3$  3.47,  $\text{Al}_2\text{O}_3$  1.10,  $\text{SiO}_2$  26.68,  $\text{TiO}_2$  14.00,  $\text{Nb}_2\text{O}_5$  1.00,  $\text{ZrO}_2$  2.40,  $\text{H}_2\text{O}$  1.17, F 4.06, O  $\equiv$  F 1.70, sum 100.05 wt%, corresponding to  $(\text{Ca}_{0.76}\text{Na}_{0.46}\text{Sr}_{0.01})_{\Sigma 1.23}(\text{Ba}_{0.85}\text{K}_{0.25}\text{Cs}_{0.02})_{\Sigma 1.12}(\text{Fe}^{2+}_{1.63}\text{Mn}_{1.62}\text{Fe}^{3+}_{0.39}\text{Al}_{0.19})_{\Sigma 3.83}(\text{Ti}_{1.58}\text{Zr}_{0.18}\text{Nb}_{0.07})_{\Sigma 1.83}(\text{Si}_{4.01}\text{O}_{14})\text{O}_{2.26}\text{F}_{1.93}(\text{OH})_{1.17}$  on the basis of additional analyses that gave  $\text{Cs}_2\text{O}$  0.27,  $\text{Ta}_2\text{O}_5$  0.09 wt%; the simplified formula is as given in the title. Vitreous luster, translucent, brittle, white streak, perfect {001} cleavage, uneven fracture,  $H = 4\frac{1}{2}$ ,  $D_{\text{meas}} = 3.84$ ,  $D_{\text{calc}} = 3.98 \text{ g/cm}^3$  for the empirical formula and  $Z = 8$ , twinned on (001). Optically biaxial negative,  $\alpha_{\text{calc}} = 1.790$ ,  $\beta = 1.858(10)$ ,  $\gamma = 1.888(10)$ ,  $2V_{\text{meas}} = 65(5)^\circ$ , strong dispersion  $r < v$ , orientation  $X = b$ ,  $a \wedge Z = 34^\circ$ ; pleochroism,  $X = \text{yellow}$ ,  $Y = \text{orange}$ ,  $Z = \text{bright yellow}$ ,  $Y > Z \geq X$ . Single-crystal X-ray structure study ( $R = 0.047$ ) indicated monoclinic symmetry, space group  $C2$ ;  $a = 10.719(3)$ ,  $b = 13.838(8)$ ,  $c = 20.805(10)$  Å,  $\beta = 95.09(8)^\circ$ , isostructural with perraultite. Strongest lines of the powder pattern (diffractometer,  $\text{FeK}\alpha$  radiation) are 10.39(20,002), 3.454(100,006), 3.186(15,312), 2.862(15,225), 2.592(70,008), 2.074(40,048), and 1.728(15,602,3.3.10,371,370).

The mineral is associated with aegirine, microcline, albite, quartz, amphibole, annite, bafertsite, astrophyllite, and others in a rare-metal syenite pegmatite at the Dara-i-Pioz massif, central Tajikistan. The new mineral name is for the locality, which is in the basin of the Surkhob River. Type material is in the Fersman Mineralogical Museum, Moscow, Russia. **J.L.J.**

### **WO<sub>3</sub>·0.5H<sub>2</sub>O**

J. Rankin, L.J. Lawrence, J.L. Sharpe, P.A. Williams (2002) Rare secondary bismuth, tungsten and molybdenum minerals from Elsmore, New England district of New South Wales. *Austral. J. Mineral.*, 8(2), 55–60.

The mineral occurs as a white, microcrystalline powder associated with scheelite in a vug in quartz; both W minerals are thought to have formed by the oxidation of ferberite. Energy-dispersion analyses of the oxide indicated an absence of elements other than W. The X-ray powder pattern (data listed) contains admixed scheelite but is interpreted to be in good agreement with that of synthetic cubic WO<sub>3</sub>·0.5H<sub>2</sub>O. **J.L.J.**

### **(Cu,Zn)<sub>4</sub>(SO<sub>4</sub>)(OH)<sub>6</sub>·4H<sub>2</sub>O**

K. Walenta, T. Theye (2003) A new copper sulfate mineral from the Black Forest. *Erzgräber*, 17(1), 1–8 (in German, English abs.).

The mineral occurs as blue, less commonly bluish green, massive to earthy crusts and spherules consisting predominantly of anhedral grains; some grains are up to 20 μm across and 1 μm thick, and are flattened (001) with indistinct hexagonal outlines. Blue streak, vitreous luster, uneven fracture, no cleavage,  $H = 2$ ,  $D_{\text{meas}} = 2.9(1)$ ,  $D_{\text{calc}} = 2.89(2)$  g/cm<sup>3</sup> for  $Z = 18$ , rapidly soluble in cold 1:1 HCl. Refractive index 1.640, extremely low birefringence. Electron microprobe analysis gave CuO 56.30, ZnO 4.20, PbO 2.49, SiO<sub>2</sub> 0.65, SO<sub>3</sub> 13.35, H<sub>2</sub>O (by difference) 23.01, sum 100 wt%, corresponding to Cu<sub>3.86</sub>Zn<sub>0.28</sub>Pb<sub>0.06</sub>Si<sub>0.06</sub>S<sub>0.91</sub>H<sub>13.92</sub>O<sub>14</sub>, simplified as (Cu,Zn)<sub>4</sub>(SO<sub>4</sub>)(OH)<sub>6</sub>·4H<sub>2</sub>O, possibly related to namuwite. Indexing of the X-ray powder pattern (57 mm camera, FeK $\alpha$  radiation) gave trigonal symmetry,  $a = 24.703(3)$ ,  $c = 10.68(2)$  Å; strongest lines are 12.41(50,110), 10.74(100,200,001), 6.19(80,220), 5.19(70,311,102), and 3.04(50,700,313). The mineral is an oxidation product associated with cerussite, anglesite, galena, and quartz at the Friedrich Christian mine, and also occurs at the Wittichen and Schauinsland mines, Black Forest, Germany. **J.L.J.**

### **CANASITE, F-DOMINANT ANALOG**

R.K. Rastsvetaeva, K.A. Rozenberg, A.P. Khomyakov, I.V. Rozhdestvenskaya (2003) Crystal structure of F-canaseite. *Doklady Chem.*, 391, 177–180.

Frankeminite is compositionally and structurally similar to canasite, the latter of which is monoclinic, whereas frankeminite is triclinic and is F-dominant rather than OH-dominant (*Am. Mineral.*, 82, p. 431, 1997). Electron microprobe analysis (not given) of a mineral from the Khibiny alkaline massif, Kola Peninsula, Russia, gave a composition (Ca<sub>4.5</sub>Mn<sub>0.45</sub>Fe<sub>0.05</sub>)Na<sub>3</sub>K<sub>3</sub>Si<sub>12</sub>O<sub>30</sub>F<sub>2.8</sub>(OH)<sub>1.2</sub>nH<sub>2</sub>O, which corresponds to that of

frankeminite, but single-crystal X-ray structure study ( $R = 0.044$ ) gave a monoclinic cell with  $a = 18.846(4)$ ,  $b = 7.242(1)$ ,  $c = 12.650(2)$  Å,  $\beta = 111.84(2)^\circ$ , space group *Cm*,  $D_{\text{calc}} = 2.694$  g/cm<sup>3</sup> for  $Z = 1$ . Thus, the mineral is the monoclinic polymorph of frankeminite and is the F-dominant analog of canasite. **J.L.J.**

### **NEW DATA**

#### **ANCYLITE**

Yu.V. Belovitskaya, I.V. Pekov, E.R. Gobechiya, N.A. Yamnova, Yu.K. Kabalov, N.V. Chukanov, J. Schneider (2002) Crystal structures of two ancylite modifications. *Crystallogr. Reports*, 47, 223–228.

Rietveld refinements of X-ray powder data of ancylite specimens from a carbonatite and from hydrothermal deposits in alkaline massifs showed that ancylite from carbonatite has the space group *Pm $\bar{c}$ n* (*Am. Mineral.*, 60, 280–284, 1975), whereas that of hydrothermal ancylite is *Pmc*2<sub>1</sub>. The IR spectra differ, and weak X-ray diffraction peaks for 010 and 100, which negate space group *Pm $\bar{c}$ n*, are present in the pattern of hydrothermal ancylite. **J.L.J.**

#### **BUTTGENBACHITE**

D.E. Hibbs, P. Leverett, P.A. Williams (2003) Connellite–buttgenbachite from the Great Australia mine, Cloncurry: a crystal structural formula. *Austral. J. Mineral.*, 9, 39–42.

D.E. Hibbs, P. Leverett, P.A. Williams (2003) A single crystal X-ray study of a sulphate-bearing buttgenbachite, Cu<sub>36</sub>Cl<sub>7.8</sub>(NO<sub>3</sub>)<sub>1.3</sub>(SO<sub>4</sub>)<sub>0.35</sub>(OH)<sub>62.2</sub>·5.2H<sub>2</sub>O, and a re-examination of the chemistry of the buttgenbachite–connellite series. *Mineral. Mag.*, 67, 47–60.

Single-crystal X-ray structure refinements in space group *P6<sub>3</sub>/mmc* for various specimens of the connellite–buttgenbachite series have shown that there are two sites for substitution of nitrate by chloride and water, and only one site for substitution of sulfate. Various amounts of water molecules, chloride, or hydronium can be accommodated in small channels. Thus, end-member compositions can vary, such as from Cu<sub>36</sub>Cl<sub>6</sub>(NO<sub>3</sub>)<sub>2</sub>(OH)<sub>64</sub>·10H<sub>2</sub>O to Cu<sub>36</sub>Cl<sub>8</sub>(NO<sub>3</sub>)<sub>2</sub>(OH)<sub>62</sub>·10H<sub>2</sub>O, and to Cu<sub>36</sub>Cl<sub>6</sub>(NO<sub>3</sub>)<sub>4</sub>(OH)<sub>62</sub>·12H<sub>2</sub>O and Cu<sub>36</sub>Cl<sub>8</sub>(NO<sub>3</sub>)<sub>4</sub>(OH)<sub>60</sub>·12H<sub>2</sub>O. The previously suggested formulas for connellite Cu<sub>38</sub>Cl<sub>8</sub>(SO<sub>4</sub>)<sub>2</sub>(OH)<sub>64</sub>·6H<sub>2</sub>O and buttgenbachite Cu<sub>38</sub>Cl<sub>8</sub>(NO<sub>3</sub>)<sub>4</sub>(OH)<sub>64</sub>·4H<sub>2</sub>O are incorrect, and it is noted that sulfate–nitrate substitution can only be one-for-one for structural reasons. **J.L.J.**

#### **LAMPROPHYLLITE**

S.V. Krivovichev, T. Armbruster, V.N. Yakovenchuk, Y.A. Pakhomovsky, Yu.P. Men'shikov (2003) Crystal structures of lamprophyllite-2*M* and lamprophyllite-2*O* from the Lovozero alkaline massif, Kola Peninsula, Russia. *Eur. J. Mineral.*, 15, 711–718.

Single-crystal X-ray structure study of lamprophyllite-2*M* ( $R = 0.040$ ) gave  $a = 19.215(5)$ ,  $b = 7.061(2)$ ,  $c = 5.3719(15)$

$\hat{A}$ ,  $\beta = 96.797(4)^\circ$ , space group  $C2/m$ ; for lamprophyllite-2O,  $R = 0.084$ ,  $a = 19.128(4)$ ,  $b = 7.0799(14)$ ,  $c = 5.3824(11)$  Å, space group  $Pn\bar{m}n$ . The compositions of the two polytypes studied are similar, and the revised simplified formula is  $(\text{Sr,Ba})_2\text{Na}_3\text{Ti}_3\text{O}_2(\text{Si}_2\text{O}_7)_2(\text{OH})_2$ . **J.L.J.**

#### RATHITE

P. Berlepsch, T. Armbruster, D. Topa (2002) Structural and chemical variations in rathite,  $\text{Pb}_8\text{Pb}_{4-x}(\text{Ti}_2\text{As}_2)_x(\text{Ag}_2\text{As}_2)_{\text{As}_{16}\text{S}_{40}}$ : modulations of a parent structure. *Zeits. Kristallogr.*, 217, 581–590.

Single-crystal X-ray structure study ( $R = 0.0367$ ) of rathite from Lengenbach (Binntal, Valais, Switzerland) gave  $a = 8.496(1)$ ,  $b = 7.969(1)$ ,  $c = 25.122(3)$  Å,  $\beta = 100.704(2)^\circ$ , space group  $P2_1/c$ . The results of electron microprobe analyses (four listed) and the structure study lead to a simplified formula  $\text{Pb}_8\text{Pb}_{4-x}(\text{Ti}_2\text{As}_2)_x(\text{Ag}_2\text{As}_2)_{\text{As}_{16}\text{S}_{40}}$ , wherein substitution of Ti seems to be optional, but substitution by Ag seems to be essential. Rathite designated by various suffixes (such as rathite-I to rathite-V) corresponds to rathite, *sensu stricto*, and to dufrénoyite, liveingite, and sartorite. **J.L.J.**

#### SAHLINITE

E. Bonaccorsi, M. Pasero (2003) Crystal structure refinement of sahlinitite,  $\text{Pb}_{14}(\text{AsO}_4)_2\text{O}_9\text{Cl}_4$ . *Mineral. Mag.*, 67, 15–21.

Single-crystal X-ray structure study ( $R = 0.071$ ) of sahlinitite from Långban, Sweden, gave  $a = 12.704(4)$ ,  $b = 22.576(5)$ ,  $c = 11.287(4)$  Å,  $\beta = 118.37(3)^\circ$ , in good agreement with a previous

study (*Am. Mineral.*, 71, p. 231, 1986) and resolving the space group as  $C2/c$ . **J.L.J.**

#### SOUZALITE–GORMANITE

A. Le Bail, P.W. Stephens, F. Hubert (2003) A crystal structure for the souzalite/gormanite series from synchrotron powder diffraction data. *Eur. J. Mineral.*, 15, 719–723.

A specimen from Rapid Creek, Yukon, Canada, has the composition  $(\text{Mg}_{1.50}\text{Fe}_{1.50}^{2+})(\text{As}_{3.86}\text{Fe}_{0.14}^{3+})(\text{PO}_4)_4(\text{OH})_6 \cdot 2\text{H}_2\text{O}$ , which is at the boundary between souzalite (Mg dominant) and gormanite ( $\text{Fe}^{2+}$  dominant). Rietveld refinement of powder data ( $R_{\text{Bragg}} = 0.0515$ ) indicated triclinic symmetry, space group  $P\bar{1}$ , and the new unit cell  $a = 7.2223$ ,  $b = 11.7801$ ,  $c = 5.1169$  Å,  $\alpha = 90.158$ ,  $\beta = 109.938$ ,  $\gamma = 81.330^\circ$ ,  $Z = 1$ . **J.L.J.**

#### WICKENBURGITE

K.-F. Hesse, F. Liebau, H.-H. Eulert (2003) Wickenburgite, a double-layer silicate  $\text{Pb}_3\text{Al}^{[6]}[\text{Ca}^{[6]}\text{Al}^{[4]}\text{Si}^{[4]}]_{10}\text{O}_{27}(\text{H}_2\text{O})_3 \cdot \text{H}_2\text{O}$ : crystal chemistry and thermal behaviour. *Zeits. Kristallogr.*, 218, 542–552.

Single-crystal X-ray structure study ( $R_1 = 0.054$ ) of wickenburgite from near Wickenburg, Maricopa County, Arizona, gave  $a = 8.555(2)$ ,  $c = 20.190(5)$  Å, space group  $P31c$ ,  $D_{\text{calc}} = 3.87$  g/cm<sup>3</sup>,  $Z = 2$ , thus confirming a previous determination (*Am. Mineral.*, 80, p. 850, 1995) in which the assigned formula was  $\text{Pb}_3\text{Al}_2\text{CaSi}_{10}\text{O}_{27} \cdot 3\text{H}_2\text{O}$ . Electron microprobe analyses, DTA–TGA, and other new studies have indicated that the structure contains a fourth water molecule per formula unit. **J.L.J.**