

## New Mineral Names\*†

FERNANDO CÁMARA<sup>1</sup> AND DMITRIY BELAKOVSKIY<sup>2</sup>

<sup>1</sup>Dipartimento di Scienze della Terra, Università di degli Studi di Torino, Via Valperga Caluso, 35-10125 Torino, Italy

<sup>2</sup>Fersman Mineralogical Museum, Russian Academy of Sciences, Leninskiy Prospekt 18 korp. 2, Moscow 119071, Russia

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This New Mineral Names has entries for 6 new minerals, including kaliochalcite, magnesiorowlandite-(Y), mapiquiroite, mieite-(Y), nicksobolevite, and okruschite.

#### KALIOCHALCITE\*

I.V. Pekov, O.I. Siidra, N.V. Chukanov, V.O. Yapaskurt, D.I. Belakovskiy, M.N. Murashko and E.G. Sidorov (2014) Kaliochalcite,  $\text{KCu}_2(\text{SO}_4)_2[(\text{OH})(\text{H}_2\text{O})]$ , a new tsumcorite-group mineral from the Tolbachik volcano, Kamchatka, Russia. *European Journal of Mineralogy*, 26, 597–604.

Kaliochalcite (IMA 2013-037), ideally  $\text{KCu}_2(\text{SO}_4)_2[(\text{OH})(\text{H}_2\text{O})]$ , is a new mineral found as a product of the interactions involving the high-temperature, sublimate KCu-sulfates and atmospheric water vapor at temperatures <100–150 °C, in several fumaroles at the Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka, Russia. It occurs as the major component of polymineralic fine-grained green crusts 0.5 cm thick, where it pseudomorphoses euchlorine, fedotovite, or piypite. It is associated to hematite, tenorite, langbeinite, apthitalite, steklite, lammerite, chlorothionite, and gypsum. The mineral forms pseudo-rhombohedral crystals up to  $0.03 \times 0.10$  in cavities. Kaliochalcite is light green to bright grass-green, with pale green to white streak. It is transparent with vitreous luster in individuals and translucent and dull in aggregates. It is brittle with uneven fracture. Mohs hardness is 4 and cleavage or parting were not observed, the fracture is uneven. Density could not be measured because of paucity of pure and massive material as particles more than 0.05 mm in size, even monomineralic, are porous.  $D_{\text{calc}} = 3.49 \text{ g/cm}^3$ . Kaliochalcite is optically biaxial (+),  $\alpha = 1.630(3)$ ,  $\beta = 1.650(3)$ ,  $\gamma = 1.714(3)$  (589 nm),  $2V_{\text{meas}} = 55(10)^\circ$ ,  $2V_{\text{calc}} = 60^\circ$ . Dispersion of optical axes is strong,  $r < v$ . In transmitted light kaliochalcite is colorless to pale green, with a very weak pleochroism. The IR spectrum shows absorption bands ( $\text{cm}^{-1}$ ; s = strong band, w = weak band, sh = shoulder) related to OH<sup>-</sup> groups and H<sub>2</sub>O molecules as O–H-stretching vibrations at 3370sh, 3334, to trace amounts of HSO<sub>4</sub><sup>-</sup> groups as O–H-stretching vibrations at 2044w, H<sub>2</sub>O molecules as bending vibrations at 1623, SO<sub>4</sub><sup>2-</sup> groups as asymmetric stretching vibrations 1224s, 1061s, symmetric stretching vibrations at 998s, and bending vibrations at 655, 621, 599, Cu<sup>+</sup>·OH as bending vibrations at 914, and lattice modes involving Cu–O and bending mode of SO<sub>4</sub><sup>2-</sup> groups

at 492w, 439w, 374. Average electron probe WDS analyses is [wt% (range)]: Na<sub>2</sub>O 0.04 (0.00–0.14), K<sub>2</sub>O 11.01 (10.43–11.29), CaO 0.27 (0.00–0.67), FeO 0.15 (0.08–0.28), CuO 40.28 (39.35–40.61), ZnO 0.39 (0.00–1.49), SO<sub>3</sub> 40.97 (40.06–42.28), H<sub>2</sub>O 5.84 (by selective sorption from the gaseous products of heating), total 98.95. The empirical formula, calculated on the basis of 10 O apfu, is:  $(\text{K}_{0.94}\text{Ca}_{0.02}\text{Na}_{0.01})_{\Sigma 0.97}(\text{Cu}_{2.03}\text{Zn}_{0.02}\text{Fe}_{0.01})_{\Sigma 2.06}\text{S}_{2.05}\text{O}_{8.20}(\text{OH})_{1.01}(\text{H}_2\text{O})_{0.79}$ . The X-ray powder data was collected using Gandolfi method. The strongest lines of the X-ray powder diffraction pattern [ $d$  (Å) ( $I\%$ ;  $hkl$ )] are: 6.78 (100; 001), 4.93 (28; 110), 3.484 (70; 20 $\bar{2}$ ), 3.249 (63; 11 $\bar{2}$ ), 2.892 (77; 201), 2.852 (83; 02 $\bar{1}$ ), 2.554 (72; 31 $\bar{2}$ , 22 $\bar{1}$ ), 2.326 (44; 22 $\bar{2}$ ), and 1.693 (37; 42 $\bar{3}$ , 22 $\bar{4}$ ). The unit-cell parameters refined from powder data are:  $a = 8.933(3)$ ,  $b = 6.255(1)$ ,  $c = 7.607(3)$  Å,  $\beta = 117.29(3)^\circ$ ,  $V = 377.8$  Å<sup>3</sup>. X-ray single-crystal diffraction study [refined to  $R_1 = 0.101$  for 389 unique  $F > 4\sigma(F)$  reflections] on a crystal fragment  $5 \times 5 \times 90$  μm shows the mineral is monoclinic, space group  $C2/m$ ; with unit-cell parameters  $a = 8.935(2)$ ,  $b = 6.2520(18)$ ,  $c = 7.602(2)$  Å,  $\beta = 117.32^\circ$  (calculated, not reported by the authors),  $V = 377.29$  Å<sup>3</sup>;  $Z = 2$ . Kaliochalcite is named as the potassium (*kalium*, in Latin) analog of natrochalcite,  $\text{NaCu}_2(\text{SO}_4)_2[(\text{OH})(\text{H}_2\text{O})]$  and is a new member of the tsumcorite group. While kaliochalcite is almost Na-free, the intermediate K-Na compound has been synthesized and therefore it is expected to observed solid solution between natrochalcite and kaliochalcite. The holotype specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. **F.C.**

#### MAGNESIOROWLANDITE-(Y)\* AND MIEITE-(Y)\*

- S. Matsubara, R. Miyawaki, K. Yokoyama, M. Shigeoka, K. Momma and S. Yamamoto (2014) Magnesiorowlandite-(Y),  $\text{Y}_4(\text{Mg,Fe})(\text{Si}_2\text{O}_7)_2\text{F}_2$ , a new mineral in a pegmatite at Sour Valley, Komono, Mie Prefecture, Central Japan. *Journal of Mineralogical and Petrological Sciences*, 109, 109–117.
- R. Miyawaki, S. Matsubara, K. Yokoyama, M. Shigeoka, K. Momma and S. Yamamoto (2015), Mieite-(Y),  $\text{Y}_4(\text{Ti})(\text{SiO}_4)_2\text{O}[(\text{F,OH})]_6$ , a new mineral in a pegmatite at Sour Valley, Komono, Mie Prefecture, Central Japan. *Journal of Mineralogical and Petrological Sciences*, 110, 135–144.

Two new minerals, magnesiorowlandite-(Y) (IMA 2012-010), ideally  $\text{Y}_4(\text{Mg,Fe})(\text{Si}_2\text{O}_7)_2\text{F}_2$ , a Mg-analog of rowlandite-(Y) and

\* All minerals marked with an asterisk have been approved by the IMA CNMMC.  
† For a complete listing of all IMA-validated unnamed minerals and their codes, see <http://pubsites.uws.edu.au/ima-cnmmc/>.

mieite-(Y) (IMA 2014-020),  $Y_4Ti(SiO_4)_2O[F(OH)]_6$ , were found together in a loose pegmatite block from Souri Valley, Komono, Mie Prefecture, Central Japan. The upper zone of the valley is developed by the Cretaceous granite with numerous pegmatites composed of quartz, albite, K-feldspar, muscovite, allanite-(Ce), and gadolinite-(Y). In one of the pegmatite blocks a large crystal of thalenite-(Y) was found. The type specimens of magnesianrowlandite-(Y) and mieite-(Y) were deposited in the National Museum of Nature and Science, Japan.

Magnesianrowlandite-(Y) occurs as aggregates up to 1 cm scattered in the pegmatite and composed of gray massive and white powdery components. It is gray to white with a white streak, vitreous to oily luster and uneven fracture. No cleavage was observed. The Mohs hardness is 5–5½. The density was not measured due to small grain size;  $D_{\text{calc}} = 4.82 \text{ g/cm}^3$ . The mineral is biaxial (–),  $\alpha = 1.755(5)$ ,  $\gamma = 1.760(5)$ , with no pleochroism. The average of 16 electron probe WDS analysis [wt% (range)] is  $SiO_2$  28.61 (27.98–29.91),  $FeO$  2.94 (2.60–3.19),  $MnO$  0.35 (0.26–0.40),  $MgO$  2.77 (2.55–2.88),  $CaO$  0.03 (0–0.08),  $Y_2O_3$  36.02 (34.06–38.54),  $La_2O_3$  0.29 (0.07–0.55),  $Ce_2O_3$  2.64 (1.36–3.57),  $Pr_2O_3$  0.64 (0.25–0.96),  $Nd_2O_3$  4.72 (3.20–5.62),  $Sm_2O_3$  2.82 (2.28–3.20),  $Gd_2O_3$  4.45 (4.04–4.92),  $Tb_2O_3$  0.69 (0.51–0.93),  $Dy_2O_3$  4.87 (4.51–5.35),  $Ho_2O_3$  0.50 (0–0.89),  $Er_2O_3$  1.64 (1.40–1.92),  $Tm_2O_3$  0.34 (0.17–0.57),  $Yb_2O_3$  2.02 (1.48–2.37),  $Lu_2O_3$  0.69 (0.51–0.93),  $ThO_2$  0.24 (0.07–0.49),  $F$  4.56 (4.38–4.84),  $-O=F_2$  1.92, total 99.91. The empirical formula based on  $O+F = 16$  apfu is  $(Y_{2.71}Nd_{0.24}Dy_{0.22}Gd_{0.21}Ce_{0.14}Sm_{0.14}Yb_{0.09}Er_{0.07}Pr_{0.03}Tb_{0.03}Lu_{0.03}Ho_{0.02}Tm_{0.02}La_{0.01}Ca_{0.01}Th_{0.01})_{\Sigma 3.98}(Mg_{0.58}Fe_{0.35}Mn_{0.04})_{\Sigma 0.97}Si_{14.00}O_{13.97}F_{2.03}$ . The strongest lines of the X-ray powder diffraction pattern [ $d(\text{Å})$  ( $I\%$ ;  $hkl$ )] are 4.95 (33; 110), 3.64 (37; 021), 3.54 (38; 111), 3.08 (100; 201, 021), 2.92 (26; 211, 210), 2.68 (32; 112); 2.65 (26; 130, 012, 002), 2.63 (28; 220). The powder pattern was indexed by analogy with rowlandite-(Y) in triclinic unit cell, space group  $P\bar{1}$ ,  $a = 6.555(12)$ ,  $b = 8.65(2)$ ,  $c = 5.530(14) \text{ Å}$ ,  $\alpha = 99.3(3)$ ,  $\beta = 104.14(19)$ ,  $\gamma = 91.4(2)^\circ$ ,  $V = 299.4 \text{ Å}^3$ ,  $Z = 1$ . X-ray single-crystal diffraction study was carried out on the crystal fragment of  $0.07 \times 0.03 \times 0.01 \text{ mm}$  previously used for EMPA. The crystal structure was refined to  $R_1 = 0.0736$  for 1645 reflections with  $I > 2\sigma(I)$ . The single-crystal unit-cell dimensions are  $a = 6.527(6)$ ,  $b = 8.656(9)$ ,  $c = 5.519(5) \text{ Å}$ ,  $\alpha = 99.09(8)$ ,  $\beta = 104.17(7)$ ,  $\gamma = 91.48(8)^\circ$ ,  $V = 297.9 \text{ Å}^3$ . In the crystal structure  $Si_2O_7$  groups and  $(Mg,Fe)O_4F_2$  octahedra form chains running parallel to  $c$ . The chains are connected into sheets coplanar to (110) stacked alternately with sheets of the seven- and eightfold REE-centered polyhedra forming a layered structure. The relations to the structures of other REE fluosilicates are discussed. The Mg-analog of rowlandite-(Y) was previously described from Malmkärä, Sweden, as “unnamed mineral D” (Holstam and Anderson, 2007). The mineral is named for its chemical relation to rowlandite-(Y),  $Y_4FeSi_4O_{14}F_2$ .

Mieite-(Y) is found to be identical with “yftisite-(Y)” from Kola Peninsula, Russia (Pletneva et al. 1971; Balko and Bakakin 1975), a mineral not formally accepted by IMA CNMNC due to incomplete chemical analyses. Mieite-(Y) occurs as aggregates ~1 cm in size formed by an amber yellow masses with adamantine luster and white streak. Cleavage was not observed, the fracture is uneven, and Mohs hardness is 6. Density was not measured;  $D_{\text{calc}} = 4.61 \text{ g/cm}^3$ . The mineral is transparent and non-pleochroic. It is bi-

axial (optical sign not given) with  $\alpha = 1.694(2)$  and  $\gamma = 1.715(5)$  and with anomalous blue interference colors. The FTIR spectrum exhibits an absorption bands at ( $\text{cm}^{-1}$ ): 3400 (O–H stretching), broad bands 900–1100 (Si–O, Ti–O, and Al–O bonds); weak absorption band at  $1650 \text{ cm}^{-1}$  (H–O–H bending) may be due to absorbed water. The average of 7 electron probe WDS analysis [wt% (range)] is  $SiO_2$  14.70 (14.60–14.79),  $P_2O_5$  1.06 (0.95–1.10),  $TiO_2$  5.32 (5.14–5.57),  $Al_2O_3$  2.84 (2.66–2.94),  $Fe_2O_3$  0.06 (0.04–0.09),  $Y_2O_3$  45.14 (44.04–45.83),  $La_2O_3$  n.d.,  $Ce_2O_3$  0.39 (0.26–0.56),  $Pr_2O_3$  0.10 (0–0.49),  $Nd_2O_3$  1.62 (1.51–1.68),  $Sm_2O_3$  1.59 (1.15–1.79),  $Gd_2O_3$  3.99 (3.76–4.11),  $Tb_2O_3$  0.73 (0.50–0.85),  $Dy_2O_3$  4.70 (4.22–4.93),  $Ho_2O_3$  0.65 (0.52–0.77),  $Er_2O_3$  1.73 (1.55–1.94),  $Tm_2O_3$  0.39 (0.21–0.62),  $Yb_2O_3$  2.13 (2.01–2.25),  $Lu_2O_3$  0.77 (0.54–0.95),  $ThO_2$  1.59,  $UO_2$  0.63 (0.55–0.68),  $F$  9.28 (8.89–9.63),  $-O=F_2$  3.91,  $H_2O$  (by structure) 2.19, total 97.69. The empirical formula based on the sum of 7 cations and 9 O atoms pfu is  $(Y_{3.13}Dy_{0.26}Gd_{0.17}Yb_{0.08}Nd_{0.08}Sm_{0.07}Er_{0.07}Th_{0.05}Tb_{0.03}Ho_{0.03}Lu_{0.03}Ce_{0.02}Tm_{0.02}U_{0.02})_{\Sigma 4.00}(Ti_{0.52}Al_{0.44}Fe_{0.01})_{\Sigma 0.97}(Si_{1.92}P_{0.12})_{\Sigma 2.04}O_9[F_{3.83}(OH)_{1.91}]_{\Sigma 5.74}$ . The mineral is significantly metamictic. The strongest lines of the X-ray powder diffraction pattern obtained for material recrystallized by annealing at  $810^\circ \text{ C}$  (time not given) [ $d(\text{Å})$  ( $I\%$ ;  $hkl$ )] are: 2.68 (100; 331), 3.76 (85; 400), 3.54 (83; 002), 3.48 (82; 130), 2.16 (78; 023), 4.26 (68; 021), 5.46 (58; 111). The material annealed below  $800^\circ \text{ C}$  shows diffraction pattern as poor as the raw material. The sample annealed at  $900^\circ \text{ C}$  shows a different diffraction pattern which could not be assigned to any known phases. The parameters of orthorhombic unit cell refined from the powder XRD pattern of recrystallized material are:  $a = 14.979(6)$ ,  $b = 10.548(5)$ ,  $c = 6.964(3) \text{ Å}$ ,  $V = 1100.3 \text{ Å}^3$ , and  $Z = 4$ . The XRD pattern is basically identical to that of “yftisite” from Kola Peninsula, Russia (Pletneva et al. 1971). The crystal structure was refined in space group  $Cmcm$  to  $R_1 = 0.0825$  and  $0.0735$  for 491 and 581 reflections with  $I > 2\sigma(I)$  single-crystal XRD data of raw and recrystallized samples, respectively. The crystal structure of mieite-(Y) consists of infinite columns of corner-sharing  $TiO_6$  octahedra decorated by  $SiO_4$  tetrahedra. The columns are linked by two independent Y-centered polyhedra with different coordination,  $YO_2F_5$  and  $YO_3F_3$ . A coupled substitution of  $Ti^{4+} + F^- = Al^{3+} + \square$  is suggested. Mieite-(Y) is isostructural with “yftisite-(Y)” from Kola Peninsula (Balko and Bakakin 1975). The name is for the Mie Prefecture where the type locality is situated. **D.B.**

**Discussion:** The authors stated that no information has been given in any literature on the type specimen of “yftisite-(Y)” and no valid type specimen exists to be re-examined. This is incorrect. The type specimens of “yftisite” from El’ozero, Kola Peninsula, Russia, are deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences (RAS), Moscow, Russia and in the Bel’kov Museum of Geology and Mineralogy of Geological institute of Kola Science Center of RAS, Apatity, Russia (Pekov 1998). The first brief description of “yftisite-(Y)” was reported from alkaline apogranitic metasomatites of the Verkhnee Espe Massif, Tarbagatay Ridge, Eastern Kazakhstan (Shipovalov and Stepanov 1971; Pekov 1998).

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### MAPIQUIROITE\*

C. Biagioni, P. Orlandi, M. Pasero, F. Nestola and L. Bindi (2014) Mapiquiroite, (Sr,Pb)(U,Y)Fe<sub>2</sub>(Ti,Fe<sup>3+</sup>)<sub>18</sub>O<sub>38</sub>, a new member of the crichtonite group from the Apuan Alps, Tuscany, Italy. *European Journal of Mineralogy*, 26, 427–437.

Mapiquiroite (IMA 2013-010), with general formula (Sr,Pb)(U,Y)Fe<sub>2</sub>(Ti,Fe<sup>3+</sup>)<sub>18</sub>O<sub>38</sub>, is a new mineral from the barite + pyrite + iron oxide ores of Buca della Vena (BdV) and Monte Arsiccio (MA) mines, Apuan Alps, Tuscany, Italy. At BdV, it occurs as tabular pseudohexagonal black sub-metallic crystals up to 1 mm in size in vugs of quartz + “adularia” + barite veins embedded in tourmaline- and pyrite-rich schists, and it is associated with allanite-(Ce), anatase, destinezite, gypsum, monazite-(Ce), pyrite, rutile, and “tourmaline.” At MA, it occurs as tabular pseudohexagonal pitch black sub-metallic crystals, up to 5 mm in size, strictly associated with derbylite and sphalerite, embedded in quartz, in quartz + carbonate veins cutting magnetite-rich dolostones. In the same veins barite, Ba-rich feldspar (“hyalophane”), boulangerite, galena, and siderite are found. In reflected light mapiquiroite is blackish in color, weakly birefractant, and non-pleochroic. Anisotropism is distinct, without characteristic rotation tints and internal reflections. Reflectance data for the COM wavelengths [ $\lambda$  (nm),  $R_{\min}/R_{\max}$  (%); for the specimens from BdV and MA, respectively, in air] are: 471.1, 17.0/17.2 and 17.7/18.0; 548.3, 16.7/17.0 and 17.6/17.8; 586.6, 16.4/16.7 and 17.3/17.7; 652.3, 16.1/16.3 and 17.0/17.3. Vickers hardness is 750/782 kg/mm<sup>2</sup> (BdV/MA) corresponding to a Mohs hardness ~6.  $D_{\text{calc}} = 4.843$  (MA) and 4.670 g/cm<sup>3</sup> (BdV). Average electron probe WDS analyses is [wt% (range), for the BdV and MA, respectively]: Na<sub>2</sub>O 0.05 (0.02–0.07), 0.03 (0.00–0.09), CaO 0.08 (0.07–0.12), 0.04 (0.00–0.39), MnO 0.28 (0.23–0.35), 0.02 (0.00–0.07), ZnO nd, 1.29 (1.21–1.38), Al<sub>2</sub>O<sub>3</sub> 0.09 (0.06–0.18), 0.08 (0.01–0.14), TiO<sub>2</sub> 54.14 (53.21–55.03), 50.14 (49.56–50.43), V<sub>2</sub>O<sub>5</sub> 0.64 (0.51–0.72), 1.76 (1.55–2.67), Cr<sub>2</sub>O<sub>3</sub> 6.73 (6.08–8.63), 0.06 (0.01–0.23), Fe<sub>2</sub>O<sub>3</sub> 23.28 (21.65–24.25), 27.74 (27.02–28.64), SrO 3.01 (2.93–3.08), 1.68 (1.36–1.98), Y<sub>2</sub>O<sub>3</sub> 1.26 (1.20–1.46), 0.41 (0.24–0.53), Nb<sub>2</sub>O<sub>5</sub> 0.05 (0.00–0.11), 0.21 (0.03–0.48), SnO<sub>2</sub> 0.11 (0.03–0.14), 0.01 (0.00–0.04), La<sub>2</sub>O<sub>3</sub> 1.56 (1.28–1.83), 0.08 (0.00–0.30), Ce<sub>2</sub>O<sub>3</sub> 0.90 (0.68–1.00), 0.18 (0.00–0.33), PbO 1.28 (0.92–1.59), 2.88 (1.93–3.36), UO<sub>2</sub> 5.99 (4.40–6.97), 12.05 (11.75–12.52), total 99.45, 98.66. The empirical formulas, calculated on the basis of 38 O apfu, are: (Sr<sub>0.533</sub>La<sub>0.176</sub>Pb<sub>0.105</sub>Na<sub>0.030</sub>Ca<sub>0.026</sub>)<sub>Σ0.870</sub>(U<sub>0.407</sub>Ce<sub>0.101</sub>Y<sub>0.205</sub>Mn<sub>0.072</sub>)<sub>Σ0.785</sub>Fe<sub>2.000</sub><sup>3+</sup>(Ti<sub>12.423</sub>Fe<sub>3.345</sub>Cr<sub>1.624</sub>V<sub>0.129</sub>Al<sub>0.032</sub>Sn<sub>0.013</sub>Nb<sub>0.007</sub>)<sub>Σ17.573</sub>O<sub>38</sub> (BdV) and (Sr<sub>0.312</sub>Pb<sub>0.248</sub>Na<sub>0.019</sub>Ca<sub>0.014</sub>La<sub>0.009</sub>)<sub>Σ0.602</sub>(U<sub>0.858</sub>Y<sub>0.070</sub>Ce<sub>0.021</sub>Mn<sub>0.005</sub>)<sub>Σ0.954</sub>(Fe<sub>1.695</sub>Zn<sub>0.305</sub>)<sub>Σ2.000</sub>(Ti<sub>12.070</sub>Fe<sub>3.987</sub>V<sub>0.372</sub>Al<sub>0.030</sub>Nb<sub>0.030</sub>Cr<sub>0.015</sub>Sn<sub>0.001</sub>)<sub>Σ17.505</sub>O<sub>38</sub> (MA). The X-ray powder data was not obtained due to partial metamictic character of the material. The strongest lines of the calculated X-ray powder diffraction pattern [ $d$  (Å) ( $I$ %;  $hkl$ )] are:

6.81 (76; 10 $\bar{2}$ ), 5.18 (100; 110), 4.51 (44; 104), 3.404 (41; 20 $\bar{4}$ ), 2.994 (35; 300) for BdV and 6.82 (86; 10 $\bar{2}$ ), 5.19 (100; 110), 4.52 (49; 104), 3.408 (40; 204), 2.998 (33; 300) for MA. The unit-cell parameters of the unheated crystals of mapiquiroite are  $a = 10.4084(2)$ ,  $c = 20.9443(5)$  Å,  $V = 1965.01$  Å<sup>3</sup> (BdV) and  $a = 10.4721(3)$ ,  $c = 21.1412(8)$  Å,  $V = 2007.83$  Å<sup>3</sup> (MA). For the heated crystals (850 °C, 24 h)  $a = 10.3719(7)$ ,  $c = 20.875(1)$  Å,  $V = 1944.8$  Å<sup>3</sup> (BdV) and  $a = 10.3854(3)$ ,  $c = 20.8942(6)$  Å,  $V = 1951.7$  Å<sup>3</sup> (MA). X-ray single-crystal diffraction study refined to  $R_1 = 0.101$  for 389 unique  $F > 4\sigma(F)$  reflections] on crystal fragments of 0.20 × 0.06 × 0.05 (BdV) and 0.14 × 0.06 × 0.02 (MA) mm shows the mineral is trigonal, space group  $R\bar{3}$ ;  $Z = 3$ . For the natural crystals  $R_1$  converged to 0.037 for 1589 observed reflections (BdV) and 0.084 for 1173 observed reflections (MA) while  $R_1$  values for heated crystals were 0.028 (BdV) and 0.032 (MA). Mapiquiroite is isostructural with other members of the crichtonite group. The mineral name honors four Italian mineral collectors for their contribution to the mineralogy of the hydrothermal deposits from Apuan Alps and in particular of the barite + pyrite + iron oxide ores: Riccardo Mazzanti (b. 1953), Luigi Pierotti (b. 1953), Ugo Quilici (b. 1946), and Moreno Romani (b. 1949) who provided the specimen of mapiquiroite. Mapiquiroite is the acronym from their surnames: MAzzanti, PIEROTTI, QUILICI, and ROMANI. The holotype specimens of mapiquiroite are deposited in the mineralogical collection of the Museo di Storia Naturale, Università di Pisa, Italy. F.C.

### NICKSOBOLEVITE\*

L.P. Vergasova, T.F. Semenova, S.V. Krivovichev, S.K. Filatov, A.A. Zolotarev Jr. and V.V. Ananiev (2014) Nicksobolevite, Cu<sub>7</sub>(SeO<sub>3</sub>)<sub>2</sub>O<sub>2</sub>Cl<sub>6</sub>, a new complex copper oxoselenite chloride from Tolbachik fumaroles, Kamchatka peninsula, Russia. *European Journal of Mineralogy*, 26, 439–449.

Nicksobolevite (IMA 2012-097), ideally Cu<sub>7</sub>(SeO<sub>3</sub>)<sub>2</sub>O<sub>2</sub>Cl<sub>6</sub>, is a new mineral found as the result of post-eruptive fumarolic activity at the second cinder cone of the North Breach of the Great Fissure Tolbachik volcano eruption (1975–1976), Kamchatka Peninsula, Russia. It occurs as aggregates of red needle-like crystals up to 0.4 mm, elongated by [001]. The mineral is associated with chloromenite, prewittite, melanothallite, sophiite, ralstonite, ponomarevite, and native gold. Nicksobolevite is dark red, with vitreous luster and orange-red streak. The mineral is very brittle and transparent. Cleavage is perfect on {010} and { $\bar{1}01$ } and good on {120}. The hardness measured by microindentation VHN<sub>5</sub> = 33 (30–36 kg/mm<sup>2</sup>) corresponds to 2–2½ of Mohs scale.  $D_{\text{calc}} = 4.18$  g/cm<sup>3</sup>. The mineral does not fluoresce in either short- or long-wave UV radiation. Nicksobolevite is optically biaxial (+),  $\alpha = 2.00(1)$ ,  $\beta = 2.01(1)$ ,  $\gamma = 2.08(1)$  (unspecified light source),  $2V_{\text{calc}} = 43^\circ$ . The orientation is  $X = b$ ,  $Z^{\wedge}c = 36^\circ$  (in obtuse  $\beta$ ), and the pleochroism:  $X, Y = \text{red}$ ,  $Z = \text{brownish red}$ . Average electron probe WDS analyses is [wt% (range)]: CuO 56.17 (54.98–59.64), ZnO 2.34 (1.97–2.73), SeO<sub>2</sub> 23.29 (22.43–24.07), Cl 22.69 (21.44–23.53),  $-O \equiv Cl - 5.12$  (4.84–5.31), total 99.37 (98.26–101.18). The empirical formula, calculated on the basis of 14 anions pfu, is: (Cu<sub>6.71</sub>Zn<sub>0.27</sub>)<sub>Σ6.98</sub>Se<sub>1.99</sub>O<sub>7.92</sub>Cl<sub>6.08</sub>. The strongest lines of the X-ray powder diffraction pattern [ $d$  (Å) ( $I$ %;  $hkl$ )] are: 8.25 (77; 110), 5.877 (100; 120), 4.239 (26; 112), 3.619 (37;

040), 3.257 (95; 310,  $\bar{3}21$ ), 2.715 (50;  $\bar{4}02$ ), 2.668 (26; 033,  $\bar{4}11$ ), and 2.278 (40; 242,  $\bar{1}34$ ). The unit-cell parameters refined from powder data are:  $a = 10.958(9)$ ,  $b = 14.483(5)$ ,  $c = 10.494(14)$  Å,  $\beta = 113.61(7)^\circ$ ,  $V = 1526 \text{ \AA}^3$ . X-ray single-crystal diffraction study [refined to  $R_1 = 0.075$  for 3590 unique  $F > 4\sigma(F)$  reflections] on a crystal fragment  $4 \times 8 \times 80 \text{ }\mu\text{m}$  shows the mineral is monoclinic, space group  $P2_1/c$ ; with unit-cell parameters  $a = 10.906(4)$ ,  $b = 14.442(5)$ ,  $c = 10.395(4)$  Å,  $\beta = 113.559(8)^\circ$ ,  $V = 1500.7 \text{ \AA}^3$ ;  $Z = 4$ . The crystal structure of nicksobolevite can be described as consisting of structural units based upon oxocentered  $\text{OCu}$ , tetrahedra that, sharing a Cu corner, built up  $[\text{O}_4\text{Cu}_{13}]$  tetramers. The tetrahedra are surrounded by the  $\text{SeIO}_3$  and  $\text{Se}_2\text{O}_3$  selenite triangular pyramids to form linear  $\{[\text{O}_4\text{Cu}_{13}](\text{SeO}_3)_4\}$  complexes oriented parallel to  $[210]$  and  $[\bar{2}10]$  and linked to each other into layers with a ladder-like configuration. The layers are perpendicular to the  $a$  axis and are surrounded by Cl anions, which provide their linkage in the  $[100]$  direction. The mineral is named in honor of Nikolay (Nick) Vladimirovich Sobolev (b. 1935), in recognition of his important contributions to mineralogy and petrology. Type material is deposited at the Mineralogical Museum, St. Petersburg State University, St. Petersburg, Russia. **F.C.**

#### OKRUSCHITE\*

N.V. Chukanov, G. Möhn, I.V. Pekov, D.I. Belakovskiy, Y.V. Bychkova, V.V. Gurzhiy and J.A. Lorenz (2014) Okruschite,  $\text{Ca}_2\text{Mn}_5^+\text{Be}_4(\text{AsO}_4)_6(\text{OH})_4 \cdot 6\text{H}_2\text{O}$ , a new roscherite-group mineral from Sailauf, Bavaria, Germany. *European Journal of Mineralogy*, 26, 589–595.

Okruschite (IMA 2013-097), ideally  $\text{Ca}_2\text{Mn}_5^+\text{Be}_4(\text{AsO}_4)_6(\text{OH})_4 \cdot 6\text{H}_2\text{O}$ , is a new mineral found in a hydrothermal vein cross-cutting rhyolite exposed in the Fuchs quarry, near Sailauf, Spessart Mountains, Bavaria, Germany. It occurs as imperfect blocky thick-tabular crystals up to  $0.15 \times 0.3 \times 0.3 \text{ mm}$  in size, consisting of curved and differently oriented laths up to  $5 \times 150 \text{ }\mu\text{m}$ , with the major crystal forms being  $\{010\}$  and the subordinate forms  $\{100\}$ ,  $\{001\}$  and, probably,  $\{110\}$ . It is associated with braunite, Mn-bearing calcite, and arseniosiderite. Okruschite is white, semitransparent, with vitreous luster. The mineral is brittle, with Mohs hardness of  $3\frac{1}{2}$ . Cleavage is distinct on  $\{010\}$  and parting is observed on  $(100)$ .  $D_{\text{meas}}$  (by flotation in heavy liquids) =  $3.33(2) \text{ g/cm}^3$ ,  $D_{\text{calc}} = 3.34 \text{ g/cm}^3$ . Okruschite is optically biaxial (–),  $\alpha = 1.671(3)$ ,  $\beta = 1.682(2)$ ,  $\gamma = 1.687(3)$ ,  $2V_{\text{meas}} = 65(5)^\circ$  (589 nm),  $2V_{\text{calc}} = 68^\circ$ . The dispersion is weak,  $r > v$ . The orientation is  $X = b$ . The IR spectrum show bands at ( $\text{cm}^{-1}$ ; s = strong band, sh = shoulder): 3510, 3400sh, 3360, 3282s, 2960sh (O–H stretch-

ing vibrations), 1661 (bending vibrations of  $\text{H}_2\text{O}$  molecules), 982, 900sh, 855sh, 843s (stretching vibrations of  $\text{AsO}_4^{3-}$  anions), 798s, 769, 736, 680s, 635sh (Be–O stretching vibrations of  $\text{BeO}_4$  tetrahedra, possibly combined with  $M\cdots\text{O}–\text{H}$  bending vibrations where  $M = \text{Mn, Fe, Mg}$ ), 555, 450, 370 [stretching vibrations of  $(\text{Mn,Fe,Mg})\text{O}_6$  octahedra, possibly combined with librational vibrations of  $\text{H}_2\text{O}$  molecules]. Bands of B- or C-bearing groups are absent in the IR spectrum of okruschite. Lithium and beryllium were analyzed by ICP MS ( $\text{Li}_2\text{O}$  0.04,  $\text{BeO}$  7.70). Average electron probe EDS analyses is [wt% (range)]: MgO 1.68 (1.31–1.97), CaO 8.28 (8.05–8.66), MnO 16.27 (16.03–16.42), FeO 4.89 (4.68–5.16),  $\text{Al}_2\text{O}_3$  0.22 (0–0.43),  $\text{As}_2\text{O}_5$  51.11 (50.35–52.06),  $\text{H}_2\text{O}$  (by gas chromatography)  $11 \pm 1$ , total (including  $\text{Li}_2\text{O}$  and  $\text{BeO}$ ) 101.19. The empirical formula, calculated on the basis of 34 O apfu, is:  $\text{Ca}_{1.99}(\text{Mn}_{3.09}\text{Fe}_{0.92}\text{Mg}_{0.56}\text{Al}_{0.06}\text{Li}_{0.04})_{\Sigma 4.67}\text{Be}_{4.15}(\text{AsO}_4)_{5.99}(\text{OH})_{3.64} \cdot 6.40\text{H}_2\text{O}$ . The strongest lines of the X-ray powder diffraction pattern [ $d$  (Å) ( $I\%$ ;  $hkl$ )] are: 9.68 (39; 110), 4.95 (34; 310), 4.17 (34;  $\bar{3}11$ ), 3.25 (100;  $\bar{2}02, 330$ ), 3.11 (32;  $\bar{4}21$ ), 2.841 (27; 240), 2.711 (26; 600), 1.726 (26; 461,  $\bar{5}52, 004$ ). The unit-cell parameters refined from powder data are:  $a = 16.33(4)$ ,  $b = 12.03(3)$ ,  $c = 6.93(1)$  Å,  $\beta = 94.84(5)^\circ$ ,  $V = 1357 \text{ \AA}^3$ . X-ray single-crystal diffraction study was not performed due to the low quality of crystals (curved and built up of different oriented blocks) however unit-cell parameters were determined  $a = 16.32(3)$ ,  $b = 12.04(2)$ ,  $c = 6.92(1)$  Å,  $\beta = 94.8(1)^\circ$ ,  $V = 1355 \text{ \AA}^3$ , and showed that by analogy with monoclinic members of the roscherite group the mineral is monoclinic, space group  $C2/c$ ;  $Z = 2$ . Okruschite is the first arsenate representative of the roscherite group, whereas the other members of this group are phosphates; their crystal structure is based on a three-dimensional heteropolyhedral framework formed by  $\text{PO}_4$  and  $\text{BeO}_4$  tetrahedra, and octahedra centered with Mg, Mn, Fe, Al, and Zn. The framework contains cavities occupied by sevenfold-coordinated Ca atoms and  $\text{H}_2\text{O}$  molecules. The mineral is named in honor of Professor Martin Okrusch (b. 1934), a German specialist in mineralogy and petrology of magmatic and metamorphic rocks, as well as ore petrology and ore deposits. The type material is deposited in the collection of the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. **F.C.**

#### ERRATUM

##### New Mineral Names, v.100, p. 2352–2353

Bobmeyerite on page 2352 has the IMA number listed as IMA 2009-019, it should be IMA 2012-019.

Hylbrownite on page 2353 has the IMA number listed as IMA 2009-016, it should be IMA 2010-054.