New Mineral Names*,†

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This New Mineral Names has entries for eight new minerals, including albertiniite, bosiite, coldwellite, ferrivauxite, hydroterskite, katiarsite, meerschautite, and tavagnascoite.

Albertiniite*

P. Vignola, G.D. Gatta, N. Rotiroti, P. Gentile, F. Hatert, M. Baijot, D. Bersani, A. Risplendente, and A. Pavese (2016) Albertiniite, $Fe^{2+}(SO_3)\cdot3H_2O$, a new sulfite mineral species from the Monte Falò Pb-Zn mine, Coiromonte, Armeno Municipality, Verbano Cusio Ossola Province, Piedmont, Italy. Mineralogical Magazine, 80, 985–994.

Albertiniite, (IMA 2015-004), ideally $Fe^{2+}(SO_3)\cdot3H_2O$, is a new mineral found on the mine dumps at the Monte Falò Pb-Zn mine near Coiromonte, Armeno Municipality, Verbano-Cusio-Ossola Province, Italy (45°50′52.37″N, 8° 29′1.13″E), where it occurs on the surfaces of brittle fractures in quartz veins and in the chlorite-schist hosting the mineralized quartz veins. The ore at the mine consists mainly of galena with minor sphalerite and arsenopyrite. Albertiniite occurs associated to stolzite, pyromorphite, hinsdalite, plumbogummite, gibbsite, scheelite, and jarosite. It is an intermediate product of oxidation between iron sulfides (pyrite and arsenopyrite) and sulfates. Albertiniite is present as monoclinic prisms up to 0.7 mm across, sometimes showing rounded corners and edges, and crystals are covered frequently by brownish amorphous hydrated Fe oxides. It forms colorless to yellowish transparent crystals with a vitreous luster. The cleavage is perfect on {010}. Hardness is not reported. Density was not measured due to the lack of suitable material. D_{calc} = 2.458 g/cm³. In transmitted light the mineral is colorless, non-pleochroic. It is optically biaxial (+), α = 1.612(2), β = 1.618(2), γ = 1.632(2), $2V_{meas}$ ≈ 40°, $2V_{calc}$ = 66°. (λ = 589 nm). The optical axis plane is parallel to (010). The single-crystal Raman spectrum of albertiniite (473.1 nm laser source) is typical of a hydrated sulfite and shows the bands (vs = very strong; s = strong; m = medium; w = weak; b = broad; sh = shoulder) at: 3350 and 3215vs (OH stretching of H_2O); 1660w (O-H-O bending); 970vs (ν_1 SO_3 symmetric stretching); 950s, 910m, 860w, 825w (ν_3 SO_3 asymmetric stretching); 660 and 600wb (ν_2 SO_3 symmetric bending); 495sh, 482m, 457m, 438sh (ν_4 SO_3 asymmetric bending); 324wb, 279w, 241w, 197w, 172, and 123m (lattice modes). The average of 16 electron probe WDS analyses [wt% (range)] is: SO_2 32.88 (31.54–33.95), FeO 29.38 (24.29–32.40), MnO 10.58 (8.60–14.46),

CaO 0.02 (0.01–0.04), MgO 0.01 (0–0.08), Na_2O 0.05 (0–0.09), H_2O (by difference) 27.07, total 100. The empirical formula based on 3 O (anhydrous) atoms, is $(Fe^{2+}_{0.77}Mn^{2+}_{0.28})_{\Sigma1.05}(S_{0.97}O_3)\cdot2.84H_2O$. The strongest lines in the X-ray powder diffraction pattern are [d Å (I%; hkl)]: 6,167 (14; 011); 5.533 (27; $\overline{1}$01); 5.257 (11; 110), 4.998 (14; 101), 4.721 (100; $\overline{1}$11), 4.353 (12; 111), 3.897 (12; 012), 3.539 (93; $\overline{1}$12); 2.830 (14; 211). The unit-cell parameters refined from the powder data are: a = 6.633(10), b = 8.831(9), c = 8.771(13) Å, β = 96.2(2)°, and V = 511 Å³. The single crystal unit-cell parameters are: a = 6.633(1), b = 8.831(1), c = 8.773(1) Å, β = 96.106(8)°, V = 511.0 Å³, monoclinic, space group $P2_1/n$, Z = 4. The crystal structure of albertiniite was refined to R_1 = 0.0227 for 1409 observed [$F_o > 4\sigma F_o$] reflections. It contains each Fe atom sixfold-coordinated to three different sulfite O atoms and three H_2O molecules, giving a slightly distorted octahedron. The sulfite group shows S–O bond distances similar to those reported previously for the synthetic equivalent α-$FeSO_3\cdot3H_2O$. Albertiniite is the monoclinic Fe equivalent of the orthorhombic gravegliaite, ideally $Mn^{2+}(SO_3)\cdot3H_2O$. The mineral is named in honor of Claudio Albertini, an Italian mineral collector and expert in the systematic mineralogy of the Alps and pegmatites. Cotype samples used for the complete characterization of the new species albertiniite are deposited in the Mineralogical Collection of the Museo Civico di Storia Naturale, Milano, Italy (number MM 38728; co-type used for chemical analysis, paragenesis, description, powder X-ray diffraction, Raman spectroscopy), and in the collection of the Laboratory of Mineralogy, University of Liège, Belgium (number 20393; co-type used for optical measurements and single-crystal X-ray structure determination). **F.C.**

Bosiite*

A. Ertl, I.A. Baksheev, G. Giester, C.L. Lengauer, V.Yu. Prokofiev and L.D. Zorina (2016) Bosiite, $NaFe^{3+}_3(Al_4Mg_2)(Si_6O_{18})(BO_3)_3(OH)_3O$, a new ferric member of the tourmaline supergroup from the Darasun gold deposit, Transbaikalia, Russia. European Journal of Mineralogy, 28(3), 581–591.

Bosiite (IMA 2014-094), ideally $NaFe^{3+}_3(Al_4Mg_2)(Si_6O_{18})(BO_3)_3(OH)_3O$, is a new tourmaline-supergroup mineral discovered at the Darasun gold deposit near Vershino-Darasunskiy, Transbaikal, Russia (52°20′24″N, 115°29′23″E). The mineral was originally described as ferric-iron-rich tourmaline (Baksheev et. al. 2011). Bosiite was found in hydrothermal sulfide- and gold-bearing quartz-vein spatially related to the subvolcanic

K-rich granodiorite-porphyry intrusion. The minerals in the vein are quartz, calcite, dolomite, tourmaline, gold, pyrite, arsenopyrite, chalcopyrite, pyrrhotite, tetrahedrite, sphalerite, and galena. Bosiite is intimately associated with quartz, pyrite, and other tourmalines. The first tourmaline generation is bosiite, which is followed by an oxy-dravite and then by dravite. Based on fluid inclusions study in associated quartz bosiite precipitated from boiling fluid at ~0.02 GPa and 380 °C. Bosiite along with oxy-dravite forms aggregates or sprays of prismatic crystals up to ~0.2 mm. Bosiite is dark brown to black with a dark brown streak. It is brittle with an uneven to subconchoidal fracture and a Mohs hardness of 7. No parting or cleavage was observed. $D_{meas} = 3.23(3)$ and $D_{calc} = 3.26$ g/cm³. The mineral is non-fluorescent. In plane-polarized light it is pleochroic, O = yellow-brown, E = red-brown. Bosiite is uniaxial (–), $\omega = 1.760(5)$, $\varepsilon = 1.687(5)$ (light wave not given). The transmittance IR spectra of powder and single crystal of bosiite (Baksheev et al. 2011) are provided for 4000–3200 cm⁻¹ interval. It is claimed IR data indicates that a part of Fe^{3+} occurs at the Z site. The interactions of three OH groups at the V sites with one Y-site cation and two Z-site cations are indicated by a band with a complex asymmetric profile in the range 3580–3480 cm⁻¹ (five component band with maxima at 3561 cm⁻¹ and weak broad band ~3380 cm⁻¹ in the powder spectrum). The interaction of the hydroxyl groups at the W site with three Y-site cations is represented by a single weak band at 3733 cm⁻¹ (3720 at powder spectrum). The average of 10 electron probe EDS analyses [wt% (standard deviation)] is: SiO_2 33.4(6), TiO_2 0.05(4), Al_2O_3 16.6(7), B_2O_3 9.82 (by stoichiometry), FeO_{total} 26.4(9) [FeO 3.97, and Fe_2O_3 24.98 by Mössbauer data], MgO 6.4(6), CaO 1.21(17), Na_2O 2.12(13), K_2O 0.01(1), H_2O 2.67 (calculated for a charge-balanced formula assuming that there are no vacancies at the Y, Z, and T site), total 101.27. Fluor, manganese, and zinc were below detection limit. Li (3.1 ppm) was determined on a bulk sample by ICP-MS. The empirical structural formula based on 31 O pfu is $^X(Na_{0.73}Ca_{0.23}\square_{0.04})_{\Sigma1.00}$ $^Y(Fe^{3+}_{1.47}Mg_{0.80}Fe^{2+}_{0.59}Al_{0.13}Ti^{4+}_{0.01})_{\Sigma3.00}$ $^Z(Al_{3.23}Fe^{3+}_{1.88}Mg_{0.89})$ $^T(Si_{5.92}Al_{0.08}O_{18})_{\Sigma6.00}$ $(BO_3)_3$ $^V(OH)_3$ $^W[O_{0.85}(OH)_{0.15}]_{\Sigma1.00}$. To accommodate the Mg-Al disorder over Y and Z, sites the procedure (Henry et al. 2013) was applied, which leads to the optimized empirical formula: $^X(Na_{0.73}Ca_{0.23}\square_{0.04})$ $^Y(Fe^{3+}_{2.40}Fe^{2+}_{0.59}Ti^{4+}_{0.01})$ $^Z(Al_{3.36}Mg_{1.69}Fe^{3+}_{0.95})$ $^T(Si_{5.92}Al_{0.08}O_{18})$ $(BO_3)_3$ $^V(OH)_3$ $^W[O_{0.85}(OH)_{0.15}]$. Bosiite, ideally $NaFe^{3+}_3(Al_4Mg_2)(Si_6O_{18})(BO_3)_3(OH)_3O$, is related to end-member povondraite, ideally $NaFe^{3+}_3(Fe^{3+}_4Mg_2)(Si_6O_{18})(BO_3)_3(OH)_3O$, by the substitution $ZAl_4 \rightarrow ZFe^{3+}_4$. Furthermore, bosiite is related to oxy-dravite, ideally $Na(Al_2Mg)(Al_5Mg)(Si_6O_{18})(BO_3)_3(OH)_3O$, by the substitutions $^{[6]}Fe^{3+}_3 \rightarrow ^{[6]}Al_3$. The crystal structure was refined to $R_1 = 3.77\%$ using 2286 unique reflections. The mineral is trigonal, space group $R3m$, $a = 16.101(3)$, $c = 7.327(2)$ Å, $V = 1645$ Å³. The X-ray powder data were not obtained due to ultimate intergrowths with the oxy-dravite. The strongest lines in the calculated X-ray diffraction powder pattern [d_{calc} Å (I_{calc}%; hkl) are: 8.051 (58; 100), 4.648 (28; 300), 4.279 (46; $3\bar{1}1$), 4.025 (57; $4\bar{2}0$), 3.543 (50; $10\bar{2}$), 3.008 (58; $31\bar{2}$), 2.606 (100; $50\bar{1}$), 2.068 (45; $61\bar{2}$). The name follows the tourmaline nomenclature recommendations approved by the IMA-CNMNC (Henry et al. 2011), which require a new root name for a mineral of the alkali-subgroup 3. The mineral is named after Ferdinando Bosi, researcher at the University of Rome La Sapienza, Italy, and an expert on the crystallography and mineralogy of the tourmaline-supergroup minerals and the spinels. The holotype specimen is deposited in the Naturhistorisches Museum Wien, Vienna, Austria. Part of the cotype has been deposited in the Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia. **D.B.**

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COLDWELLITE*

A.M. McDonald, L.J. Cabri, C.J. Stanley, D.J. Good, J. Redpath, G. Lane, J. Spratt, and D.E. Ames (2015) Coldwellite, Pd_3Ag_2S, a new mineral species from the Marathon Deposit, Coldwell Complex, Ontario, Canada. Canadian Mineralogist, 53, 845–857.

Coldwellite (IMA 2014-045), ideally Pd_3Ag_2S, was discovered in a heavy-mineral concentrate from the Marathon Cu-PGE-Au deposit, Coldwell Complex, Ontario, Canada, and named after the type locality. The deposit consists of disseminated sulfides hosted by the 200 m thick gabbroic sill intruded the gabbro of the Mesoproterozoic (1.1 Ga) Coldwell alkaline complex. A single grain of coldwellite ~150 × 80 μm in size was discovered in the concentrate from a one-tonne composite sample of a representative mineralised intervals of core from several drill holes. A number of much smaller coldwellite grains (0.5–10.9 μm) were discovered in a W horizon of the deposit in situ in gabbro and in other concentrates where one grain found intimately intergrown with Rh-bearing pentlandite. Coldwellite is 1 of 33 precious-metal minerals found in the concentrate, including Au-Ag alloy, hollingworthite, isoferroplatinum, keithconnite, kotulskite, mertieite-II, michenerite, palladoarsenide, sobolevskite, sperrylite, stillwaterite, and vysotskite, along with 21 unidentified PGM species. Other heavy minerals in concentrate are Ti- and Cr-rich magnetite, ilmenite, pyrrhotite, chalcopyrite, and pentlandite, with trace amounts of bornite, cobaltite, and galena. The major gangue minerals are plagioclase, augite, actinolite, olivine, and chlorite, with minor to trace serpentine, biotite, and talc. Previously the grains with composition similar to coldwellite were reported in Birch Lake deposit, Duluth complex, Minnesota, U.S.A. (Severson and Hauck 2003) in assemblages consisting of pyrope-pentlandite-hercynite-ulvöspinel, pentlandite-diopside, pentlandite-amesite-hercynite, and pentlandite-ulvöspinel-majorite(?)-amesite. Also a mineral of similar composition [$(Pd_{2.43}Ag_{1.69})_{\Sigma4.13}S$], based on 12 grains from 5 samples was reported from the Proterozoic Fedorova-Pana layered intrusion at the Kola Peninsula, Russia (Subbotin et al. 2012). The studied grain from Coldwell complex has a thin overgrowth of vysotskite (PdS). The grain is anhedral, slightly angular with scalloped grain edges with no obvious twinning. Coldwellite is opaque, metallic with no cleavage, parting, or fracture. The macroscopic color, hardness, and streak were not determined. In plane-polarized reflected light, coldwellite is white against pentlandite, chalcopyrite, and pyrrhotite, with a light pinkish-brown tint. It has no internal reflections, pleochroism, bireflectance, or anisotropy. The reflectance values in air (values for **COM** wavelengths are interpolated) [R (nm)] are: 40.0 (400), 40.4 (420), 40.9 (440), 41.5 (460), **41.9 (470)**, 42.1 (480), 42.7 (500), 43.4 (520), 43.9 (540), **44.9 (546)**, 44.1 (560), 44.1 (580), **44.0 (589)**, 44.1 (600), 44.2 (620), 44.6 (640), **45.0 (650)**, 45.2 (660), 45.9 (680), 46.6 (700). There were no visible absorption bands over the range 100–1000 cm⁻¹ in the Raman spectra. The average of 23 WDS electron probe analyses is [wt%, (range)]: Pd 56.10 (55.87–56.42), Fe 0.16 (0.11–0.24), Ag 38.20 (37.96–38.45), S 5.63 (5.58–5.69), total 100.09 wt%. The empirical formula based on 6 apfu is $(Pd_{2.99}Fe_{0.02})_{\Sigma3.01}Ag_{2.00}S_{0.99}$. The strongest lines of the powder X-ray diffraction pattern are [d Å (I%; hkl)]: 2.427 (100; 221), 2.302 (38; 310), 2.195 (38; 311), 1.944 (10; 321), 1.428 (44; 510,431), 1.352 (13; 432,520), 0.9433 (12; 731,553), 0.9294 (24; 650,643), 0.9208 (20; 732, 651). The crystal structure of coldwellite was solved by direct methods and refined to $R = 1.07\%$. The new mineral is cubic, $P4_332$, $a = 7.2470(8)$, $V = 380.61$ Å³, and $Z = 4$. Refinement of the crystal structure indicates that S is coordinated by Pd in a regular octahedron, Pd is eightfold-coordinated by S, Ag, and Pd, and Ag is sixfold-coordinated in an irregular octahedron by Ag and Pd. The crystal structure of coldwellite can be described in terms of anion-based coordination polyhedral, where a three-dimensional arrangement of SPd_6 octahedra are sharing both corners and edges in a (4+2) configuration, that gives rise to square channels accommodating

Ag ions. The type specimen is deposited in the Canadian Museum of Nature, Ottawa, Ontario, Canada. **Yu.U.**

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Ferrivauxite*

G. Raade, J.D. Grice, and R. Rowe (2016) Ferrivauxite, a new phosphate mineral from Llallagua, Bolivia. Mineralogical Magazine, 80, 311–324.

Ferrivauxite (IMA 2014-003), ideally $Fe^{3+}Al_2(PO_4)_2(OH)_3 \cdot 5H_2O$, is a new mineral discovered at the Llallagua tin deposit, Potosí, Bolivia. It was found in association with sigloite and crandallite and is believed to be of hydrothermal origin, as a product of fluorapatite alteration. Ferrivauxite occurs as porous fragile crusts, 2–4 mm thick, with no attached substrate, apparently having formed along narrow fractures. The new mineral typically occurs as radial aggregates, up to 0.7 mm in size, and in parallel growth. Thin-bladed, swallow-tail twins are observed. Crystal habit is tabular on {010}; twinning is observed along {010}. Crystals are golden brown, translucent to transparent, with pale yellow-brown streak and a vitreous luster. Ferrivauxite is brittle with irregular fracture and shows no cleavage or parting. Density was not measured due to the likeliness of crystal aggregates to trap air bubbles. Mohs hardness was not measured. Ferrivauxite dissolves slowly in room temperature diluted HCl and shows a strong red coloration with ammonium thiocyanate indicative of major Fe^{3+}. It is non-fluorescent. In plane-polarized light ferrivauxite is pale yellow with no pleochroism. It is biaxial (–) with α = 1.589(1), β = 1.593(1), γ = 1.596(1), $2V_{meas}$ = 60(4)° from extinction curves and 76(5)° by the Kamb method (λ = 589 nm); $2V_{calc}$ = 82°; $X \wedge$ **b** = 14°, $Y \wedge$ **c** = 4°, $Z \wedge$ **a** = 0°. The dispersion of the optical axis is distinct r < v, inclined. The main absorption bands of the IR spectrum (cm^{-1}) are: 1007, 1087, 1125 (asymmetric P–O stretching vibrations of PO_4 tetrahedra.), shoulder in the 900–1000 region (symmetric P–O stretching vibrations of PO_4 tetrahedra, 1638 (bending vibrations of H_2O molecules), weak bands in the 2000–2500 region (very strong hydrogen bonds, probably due to an acid HPO_4^{2-} group, broad absorption region with a maximum at 3348 (O–H stretching vibrations from rather strong hydrogen bonds in OH groups and H_2O molecules), narrow band at 3640 (OH group forming a very weak hydrogen bond). The average of 17 electron probe WDS analyses is [wt% (range)]: MnO 0.20 (0.12–0.38), Al_2O_3 22.43 (21.79–23.47), Fe_2O_3 16.62 (15.95–17.91), P_2O_5 32.32 (31.04–34.35), H_2O 26.07, total 97.64. This gives the empirical formula $Fe^{3+}_{0.94}Mn_{0.01}Al_{1.98}P_{2.05}O_8(OH)_3 \cdot 5H_2O$ based on 16 O pfu. Fe was calculated as trivalent, although a small amount could be divalent, and H_2O was calculated to bring the cation sum (Fe+Mn+Al+P) close to 5 for 13 H and 16 O pfu. The strongest lines in the X-ray powder-diffraction pattern [d Å (I%; hkl)] are: 10.834 (100; 010), 8.682 (24; 100), 8,242 (65; $\bar{1}$10), 6.018 (28; 001), 5.918 (23; 110), 5:491 (30; $\bar{1}$20), 4.338 (26; 200), 2.898 (32; 300). The unit-cell parameters refined from powder-diffraction data are a = 9.200(2), b = 11.621(2), c = 6.101(1) Å, α = 98.36(2), β = 91.86(2), γ = 108.65(2)°, V = 609.3 Å^3. Single-crystal X-ray diffraction data collected on a crystal of size 20 × 40 × 60 μm refined to R_1 = 0.0369 for 3244 unique reflections with $I \geq 4\sigma(I)$ shows ferrivauxite is triclinic, space group $P\bar{1}$, with a = 9.198(2), b = 11.607(3), c = 6.112(2) Å, α = 98.237(9), β = 91.900(13), γ = 108.658(9)°, V = 609.7 Å^3, Z = 2. Ferrivauxite is isotypic with vauxite with positional disorder of the Fe1 site and some of the oxygen sites. Ferrivauxite is named as an oxidized

equivalent of vauxite with which it forms oxidation pseudomorphs. The holotype specimen was deposited in the Natural History Museum, University of Oslo, Norway. **O.C.G.**

Hydroterskite*

J.D. Grice, R. Rowe, and G. Poirier (2015) Hydroterskite: a new mineral species from the Saint-Amable Sill, Quebec, and a comparison with terskite and elpidite. Canadian Mineralogist, 53, 821–832.

Hydroterskite (IMA 2015-042), ideally $Na_2ZrSi_6O_{12}(OH)_6$, is a new mineral species from the Saint-Amable sill at the Demix-Varennes quarry, near Varennes, Québec, Canada. The sill is comprised of multiple injections of fine grained phonolite predominantly consisting of nepheline phenocrysts in a trachytic matrix of K-feldspar, aegirine, and natrolite. Phonolite contains numerous mineralized cavities and seams with postmagmatic and hydrothermal minerals. Hydroterskite is associated with manganoneptunite, aegirine, analcime, an astrophyllite-group mineral, cataplei ite, a eudialyte-group mineral, fluorite, monazite, natrolite, and a rinkite-group species. It forms short prismatic crystals up to 3 mm in width bounded by the {100}, {010}, and {001}. The crystals are pale gray, translucent with a white streak and vitreous luster. Hydroterskite is brittle and splintery, with good cleavages on the prismatic planes (not specified). It is nonpleochroic, optically biaxial (–), α = 1.562(2), β = 1.567(2), γ = 1.571(2), $2V_{meas}$ = 86(3)° (light wave not given), $2V_{calc}$ = 83°; X = **c**, Y = **b**, and Z = **a**. Dispersion was not observed. The IR spectrum of hydroterskite has a moderate, broad band in the range 3600–3000 cm^{-1}, consisting of three discernible bands at 3569, 3393, 3138 cm^{-1} and a broad, low band in the 2500–2000 cm^{-1} all assigned to (OH stretching). Small, sharp band at 1644 cm^{-1} assigned to H_2O bending vibrations is very close to that on elpidite IR spectrum provided for comparison (1640 cm^{-1}). A series of strong sharp bands at 1200–900 cm^{-1} correspond to the SiO_4 stretching mode, the moderate sharp bands at 800–500 cm^{-1} assigned to the SiO_4 bending mode. The terskite IR spectrum is not provided. The average of 3 electron probe WDS analyses of a single grain (wt%) (ranges and standard deviations not given) is: Na_2O 7.82, K_2O 0.07, CaO 0.62, FeO 0.89, MnO 0.71, Al_2O_3 0.08, La_2O_3 0.12, Ce_2O_3 0.24, SiO_2 59.82, HfO_2 0.11, ThO_2 1.15, ZrO_2 15.00, TiO_2 1.15, Nb_2O_5 1.12, F 0.11, H_2O (by stoichiometry) 8.79, –O=F_2 0.05, total 96.84. The elements Mg, Y, Sr, and Cl were not detected. The low total is explained by partial loss of Na under the electron beam. Also the presence of small band at 1644 cm^{-1} on the IR spectrum shows that part of the Na sites might be occupied by molecular water. If true, the addition of ~ 0.38 H_2O groups would increase the total to 98.31%. The empirical formula on the basis of 18 anions with 6 OH$^-$ is $(Na_{1.54}K_{0.01}Ca_{0.07}La_{0.01}Ce_{0.01})_{\Sigma1.64}(Zr_{0.74}Ti_{0.09}Nb_{0.05}Th_{0.01}Fe_{0.08}Mn_{0.06}Al_{0.01})_{\Sigma1.04}Si_{6.09}O_{12}(OH_{5.96}F_{0.04})_{\Sigma6}$. The strongest lines in the X-ray powder diffraction pattern are [d Å (I%; hkl)]: 7.427 (56; 020), 6.638 (48; 011), 6.327 (47; 210), 5.093 (49; 220), 4.123 (55; 031), 3.716 (53; 002), 3.482 (51; 321), 3.322 (100; 022), 3.283 (80; 202). Orthorhombic unit-cell parameters refined from the powder data are: a = 13.958(3), b = 14.843(5), c = 7.424(3) Å, V = 1538.2 Å^3. The single-crystal unit-cell parameters are a = 13.956(6), b = 14.894(7), c = 7.441(4) Å, V = 1546.8 Å^3, Z = 4. The crystal structure refined in space group $Pnca$ to R = 0.0365 for 1080 observed $F_o > 4\sigma(F_o)$ reflections. Hydroterskite has a (010) layered structure with two types of layers. One layer is an open net of Na- and Zr-centered polyhedra, and another consists of single chains of SiO_4 tetrahedra. There are two crystallographically distinct Na sites: in hexagonal dipyramids of $[Na1O_6(OH)_2]$ and in a pentagonal dipyramids of $[Na2O_6(OH)_2]$. There are three distinct Si tetrahedral sites: $[Si1O_2(OH)_2]$, $[Si2O_3(OH)]$, and $[Si3O_4]$. The Si-centered tetrahedra form spiral open-branched vierer single chains parallel to the **c** axis. These chains are cross-linked by edge-sharing ZrO_6 octahedra and Na polyhedra. All three H atoms were located. Hydroterskite and terskite are isostructural. The (010) layers in the terskite structure differ from

those of hydroterskite by the two extra Na sites. These two additional Na sites share the layer of chains of Si(O,OH)$_4$ tetrahedra. In hydroterskite only half of the Na sites are occupied by Na$^+$, the rest being replaced by H$^+$. The general simplified formula for the series is H$_{4+x}$Na$_{4-x}$ZrSi$_6$O$_{18}$, with x ≤ 2. It is suggested that space group for terskite is *Pnca* while the previously assigned acentric space group *Pnc*2 is incorrect. The hydroterskite crystal structure is also compared to the structures of elpidite, and yusupovite. Although it is not mentioned in the paper the type material is deposited in the Canadian Museum of Nature, Ottawa, Ontario, catalogue number CMNMC 86896. **D.B.**

KATIARSITE*

I.V. Pekov, V.O. Yapaskurt, S.N. Britvin, N.V. Zubkova, M.F. Vigasina, and E.G. Sidorov (2016) New arsenate minerals from the Arsenatnaya fumarole, Tolbachik volcano, Kamchatka, Russia. V. Katiarsite, KTiO(AsO$_4$). Mineralogical Magazine, 80, 639–646.

Katiarsite (IMA 2014-025), ideally KTiO(AsO$_4$), is a new mineral discovered in sublimates of the Arsenatnaya fumarole at the Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka, Russia. It was found as a minor constituent of arsenate incrustations overgrowing orthoclase crusts and other arsenate minerals in association with hatertite, bradaczekite, johillerite, yurmarinite, tilasite, arsmirandite, hematite, tenorite, As-bearing orthoclase, fluorophlogopite and aphthitalite. The temperature of the area of the fumarole in which katiarsite occurs was 360–380°C. The mineral occurs as long prismatic to acicular, typically sword-like, crystals up to 3 ×10 ×50 μm in size, and rarely up to 0.15 mm long, with forms {011}, {201}, {100}, and {001}. Katiarsite is colorless, transparent with a vitreous luster. It is brittle, with an uneven fracture and no cleavage. Hardness and density were not measured due to crystal size; D_{calc} = 3.49 g/cm^3. Katiarsite is non-fluorescent under UV rays or electron beam. In transmitted light the mineral is colorless, non-pleochroic. It is optically biaxial (+), α = 1.784(3), β = 1.792(3), γ = 1.870(5) (λ = 589 nm); $2V_{obs}$ is small, $2V_{calc}$ = 37°; X = **b**, Y = **a**, Z = **c**. Extinction is straight and elongation is negative. The main absorption bands of Raman spectrum (cm^{-1}, s = strong) are 740 and 900 (As^{5+}–O antisymmetric stretching vibrations of AsO$_4$ groups), 701s (combination of symmetric stretching vibrations of AsO$_4$ groups and asymmetric stretching vibrations of Ti–O–Ti bridges in chains formed by corner-connected TiO$_6$ octahedra), 492s (stretching vibrations of non-bridging Ti–O bonds, and antisymmetric vibrations of Ti–O–Ti bridges), <400 (lattice modes involving As–O and Ti–O bending and K–O stretching vibrations). The average of 4 electron probe WDS analyses is [wt% (range)]: K$_2$O 18.98 (18.51–19.94), Fe$_2$O$_3$ 5.07 (4.93–5.36), TiO$_2$ 27.49 (26.97–28.01), As$_2$O$_5$ 47.48 (46.05–48.60), total 99.02. The empirical formula based on 5 O pfu is K$_{1.00}$(Ti$_{0.85}$Fe$^{3+}_{0.16}$)$_{\Sigma1.01}$As$_{1.02}$O$_5$. Fe was considered as Fe^{3+} due to the extremely oxidizing conditions in which the mineral occurs. The strongest lines in the X-ray powder-diffraction pattern [d Å (*I*%; *hkl*)] are: 5.91 (17; 110), 5.62 (74; 011), 4.18 (19; 202), 3.157 (66; 013), 2.826 (100; 221), 2.809 (96; 022), 2.704 (19; 004). The unit-cell parameters refined from powder-diffraction data are: a = 13.15(2), b = 6.556(4), c = 10.793(7) Å, V = 930 Å^3. Single-crystal X-ray diffraction data shows that katiarsite is orthorhombic, space group *Pna*2$_1$, with a = 13.174(4), b = 6.5635(10), c = 10.805(2) Å, V = 934.3(3) Å^3, Z = 8, by analogy to KTA, its synthetic analog. The crystal structure was not studied because of the imperfection of single crystals. The crystal structure of KTA is based on undulating chains of corner-connected Ti-centered octahedra cross-linked via isolated AsO$_4$ tetrahedra to form a three-dimensional framework. Katiarsite is named in reflection to its chemical composition, *ka*lium *ti*tanyl *ars*enate. The type specimen was deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. **O.C.G.**

MEERSCHAUTITE*

C. Biagioni, Y. Moëlo, P. Orlandi, and C.J. Stanley (2016) Lead-antimony sulfosalts from Tuscany (Italy). XVII. Meerschautite, (Ag,Cu)$_{5.5}$Pb$_{42.4}$ (Sb,As)$_{45.1}$S$_{112}$O$_{0.8}$, a new expanded derivative of owyheeite from the Pollone mine, Valdicastello Carducci: occurrence and crystal structure. Mineralogical Magazine, 80, 675–690.

Meerschautite (IMA 2013-061), with general formula (Ag,Cu)$_{5.5}$ Pb$_{42.4}$(Sb,As)$_{45.1}$S$_{112}$O$_{0.8}$, is a new mineral found in the baryte + pyrite ± (Pb-Zn-Ag) deposit of the Pollone mine, near Valdicastello Carducci, Apuan Alps, Tuscany, Italy. Meerschautite was found in a microcrystalline baryte + pyrite ore body at the Pizzone stop, near the contact with the footwall schist with crystals being scattered in the micro-crystalline barite, and (rarely) protruded in small vugs. Associated minerals are baryte, boulangerite, pyrite, quartz, and sphalerite. Meerschautite occurs as prismatic crystals striated parallel to the elongation (**a** axis), up to 2 mm long and 0.5 mm wide. Crystals are lead-gray to black with black streak and metallic luster, are opaque, brittle, with a perfect cleavage parallel to **a**, and with conchoidal fracture. Mohs hardness and density were not measured due to the small crystal size; D_{calc} = 5.924 and 5.908 g/cm^3 for two samples. In reflected light, meerschautite is white, weakly bireflectant, and non-pleochroic. In crossed polars, it is distinctly anisotropic with gray to dark gray rotation tints with brownish and greenish shades. Reflectance values were measured between 400 and 700 nm in 20 nm intervals. The values for COM wavelengths in air [R_{min}, R_{max} % (nm)] are: 39.7, 41.4 (470); 38.3, 39.9 (546); 37.4, 39.0 (589); 35.8, 37.2 (650). The average of 3/**3** electron probe WDS analyses on 2 crystals gives [wt% (range) sample 1/**sample 2**]: Cu 0.22/**0.22** (0.21–0.24)/**(0.20–0.24)**, Ag 3.15/**3.04** (3.05–3.25)/**(3.00–3.10)**, Tl 0.07/**0.13** (0.05–0.09)/**(0.12–0.13)**, Pb 48.54/**48.53** (48.42–48.74)/**(48.04–48.89)**, Sb 25.41/**25.4** (25.35–25.51)/**(25.20–25.58)**, As 2.82/**2.93** (2.80–2.85)/**(2.92–2.94)**, Bi n.d./**0.06**(0)/**(0.02–0.09)**, S 19.74/**19.82** (19.69–19.79)/**(19.79–19.86)**, Se 0.14/**0.13** (0.04–0.21)/**(0.11–0.16)**, Cl 0.03/**0.05** (0.03–0.04)/**(0.04–0.05)**, total 100.12/**100.31** (100.05–100.24)/**(99.57–100.76)**. The empirical formula based on 112 (S+Se+Cl) apfu is (Ag$_{5.29}$Cu$_{0.63}$)$_{\Sigma5.92}$(Pb$_{42.43}$Tl$_{0.06}$)$_{\Sigma42.49}$(Sb$_{37.80}$As$_{6.82}$)$_{\Sigma44.62}$(S$_{111.53}$Se$_{0.32}$Cl$_{0.15}$)$_{\Sigma112}$/**(Ag$_{5.08}$Cu$_{0.62}$)$_{\Sigma5.70}$(Pb$_{42.22}$Tl$_{0.12}$)$_{\Sigma42.34}$(Sb$_{37.61}$As$_{7.07}$Bi$_{0.05}$)$_{\Sigma44.73}$(S$_{111.45}$Se$_{0.30}$Cl$_{0.25}$)$_{\Sigma112}$**. The oxygen in the general formula is obtained based on structure refinement. The strongest lines in the X-ray powder-diffraction pattern [d Å (*I*, vs = very strong, s = strong, ms = medium-strong, m = medium; *hkl*)] are: 3.762 (m; 076), 3.663 (s; 057), 3.334 (vs; 0 13 1), 3.244 (s; 087), 3.016 (m; 274,2 10 0,$\overline{2}$ 10 1), 2.968 (m; 2 10 1,$\overline{2}$ 10 2,265,293,$\overline{2}$94,2 10 2), 2.902 (m; $\overline{2}$ 10 3, 0 15 1,246,275,$\overline{2}$76), 2.072 (ms; $\overline{4}$01). Single-crystal X-ray diffraction data collected on a crystal of size 90 × 90 × 6 μm refined to R_1 = 0.122 for 49 037 unique reflections with I ≥ 4σ(*I*) shows meerschautite is monoclinic, space group $P2_1$, with a = 8.2393(1), b = 43.6015(13), c = 28.3688(8)Å, β = 94.128(2)°, V =10164.93 Å^3, Z = 2. Meerschautite is homeotypic with sterryite and parasterryite. Its crystal structure is based on two building blocks, each formed by a complex column with a pseudo-trigonal Pb$_6$S$_{12}$ core and two "arms" of unequal lengths. Meerschautite is named in honor of Alain Meerschaut (b. 1945), chemist-crystallographer in the field of solid-state chemistry at the Institute des Matériaux Jean Rouxel, Nantes, France, for his outstanding contribution to the definition and crystal structure study of new lead-antimony sulfosalts from Apuan Alps hydrothermal ores. The holotype specimen was deposited in the Museo di Storia Naturale, Università di Pisa, Calci (PI), Italy. **O.C.G.**

TAVAGNASCOITE*

L. Bindi, C. Biagioni, B. Martini, A. Salvetti, G.D. Fontana, M. Taronna, and M.E. Ciriotti (2016) Tavagnascoite, Bi$_4$O$_4$(SO$_4$)(OH)$_2$, a new oxyhydroxy bismuth sulfate related to klebelsbergite. Mineralogical Magazine, 80(4), 647–657.

Tavagnascoite (IMA 2014-99), ideally $Bi_4O_4(SO_4)(OH)_2$, is a new mineral found at the Pb-Bi-Zn-As-Fe-Cu ore district of Tavagnasco, Turin, Piedmont, Italy. Tavagnascoite occurs within vugs of quartz veins, in association with other uncharacterized secondary Bi-minerals originating from the alteration of a bismuthinite ± Bi-sulfosalt assemblage. The origin of the Tavagnasco ore district could be related to the intrusion of the Oligocene Traversella pluton, causing remobilization of syngenetic proto-ores hosted in metasedimentary rock. The new mineral occurs as blocky, colorless crystals, up to 40 μm in size. Crystals are transparent to translucent, have a silky luster, show no cleavage or parting. Mohs hardness and density were not measured due to the small crystal size; D_{calc} = 6.505 g/cm^3. Optical properties were not determined. The average of 3 electron probe WDS analyses is [wt% (range)]: Bi_2O_3 85.32 (84.09–87.11), Sb_2O_3 0.58 (0.36–1.08), PbO 2.18 (1.71–2.86), SO_3 8.46 (7.44–9.05), H_2O (calculated for 2 OH groups pfu) 1.77, total 98.31. This gives the empirical formula $(Bi_{3.74}Pb_{0.10}Sb_{0.04})_{\Sigma3.88}O_{3.68}(SO_4)_{1.08}(OH)_2$ based on 10 O apfu. The strongest lines of the calculated X-ray powder-diffraction pattern [d_{calc} (Å) (I_{calc}%; hkl)] are: 6.39 (29; 012), 4.95 (19; 111), 4.019 (32; 121), 3.604 (28; 014), 3.213 (100; 123). Single-crystal X-ray diffraction data collected on a crystal of size $0.028 \times 0.020 \times 0.012$ mm refined to $R_1 = 0.037$ for 1269 unique reflections with $I \geq 4\sigma(I)$ shows tavagnascoite is orthorhombic, space group $Pca2_1$ with $a = 5.831(1)$, $b = 11.925(2)$, $c = 15.123(1)$ Å, $V = 1051.6$ Å^3, $Z = 4$. The structure of tavagnascoite consists of bismuth polyhedra connected through edge-sharing to form Bi–O sheets parallel to (001) that are linked together by SO_4 tetrahedra and H bonds. Tavagnascoite is the Bi-analog of klebelsbergite and is named after its type locality. The holotype material is deposited in the Museo di Storia Naturale, Università degli Studi di Firenze, Florence, Italy. **O.C.G.**

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