New Mineral Names*†

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This New Mineral Names has entries for 10 new minerals, including calciomurmanite, czechralskiite, erazoite, honeaite, lobanovite, magnesiumvoltaite, odigitriaite, romanorlovite, tatarinovite, and a new data on boscainite and partizite (discredited).

CALCIOMURMANITE*


Calciomurmanite, (IMA 2014-103), with general formula (Na, Ca)2Ca(Ti,Mg,Nb)[Si2O7]2O2(OH,O)2(H2O)4, is a new murmanite-group mineral, the product of hydrothermal or supergene alteration of high-temperature, anhydrous phosphate-bearing titanolussicatemonosomovite and/or betalomonosovite. It was discovered in the specimen ST4994 (V.I. Spepanov collection at Fersman Mineralogical Museum, Moscow, Russia) originally catalogued as betalomonosovite from Mt. Flora, Lovozero alkaline complex, Kola peninsula, Russia. In this specimen (considered as the holotype) calciomurmanite forms irregular lamellae up to 0.1 × 0.4 × 0.6 cm sometimes combined in up to 3 cm aggregates are embedded in a rock mainly consisting of dark–green acicular aegirine and white microcline and containing lorenzenite, fluorapatite and minor calcite. In the cotype specimen (from hydrothermally altered peralkaline pegmatite at Mt. Eveslogehor, Khibiny alkaline complex, Kola peninsula, Russia) the mineral forms 2 × 3.5 cm fan-shaped aggregate of lamellae and is associated with microcline, aegirine, lamprophyllite, tsepinite-Ca, and tsepinite-K. The mineral has also been found in the outer zone of the Shcherbakovitovoe pegmatite at the Koashva open pit of the Vostochnyi apatite mine, Khibiny, with aegirine, microcline, lamprophyllite, perovskite, and relics of yellow betalomonosovite. Calciomurmanite is brownish, (holotype) or purple (cotype), with a nacreous luster on cleavage surfaces and relics of yellow betalomonosovite. It was discovered in the specimen ST4994 (V.I. Spepanov collection at Fersman Mineralogical Museum, Moscow, Russia) originally catalogued as betalomonosovite from Mt. Flora, Lovozero alkaline complex, Kola peninsula, Russia. In this specimen (considered as the holotype) calciomurmanite forms irregular lamellae up to 0.1 × 0.4 × 0.6 cm sometimes combined in up to 3 cm aggregates are embedded in a rock mainly consisting of dark–green acicular aegirine and white microcline and containing lorenzenite, fluorapatite and minor calcite. In the cotype specimen (from hydrothermally altered peralkaline pegmatite at Mt. Eveslogehor, Khibiny alkaline complex, Kola peninsula, Russia) the mineral forms 2 × 3.5 cm fan-shaped aggregate of lamellae and is associated with microcline, aegirine, lamprophyllite, tsepinite-Ca, and tsepinite-K. The mineral has also been found in the outer zone of the Shcherbakovitovoe pegmatite at the Koashva open pit of the Vostochnyi apatite mine, Khibiny, with aegirine, microcline, lamprophyllite, perovskite, and relics of yellow betalomonosovite. Calciomurmanite is brownish, (holotype) or purple (cotype), with a nacreous luster on cleavage surfaces and greasy on broken surfaces. The streak is white. Mica-like cleavage on {010} is perfect and two distinct nearly perpendicular cleavages, both almost perpendicular to {001} are observed under the microscope. Mohs hardness is 2½–3. Dcalc = 2.70(3) (by flotation in heavy liquids), Dmeas = 2.85 g/cm³. Calciomurmanite does not fluoresce under ultraviolet light or an electron beam. It is colorless, non-pleochroic in transmitted light, optically biaxial (−) with α = 1.680(4), β = 1.728(4), γ = 1.743(4), 2Vmeas = 58°(5), 2Vcalc = 57° (589 nm). Y and Z lie in the ab plane. Dispersion of optical axes was not observed. The FTIR spectra of calciomurmanite show absorption bands (cm⁻¹, s = strong, sh = shoulder) at 3395, 3250sh (bending vibrations of O–H, where M is a cation), 682 (O–Si–O bending vibrations), 523 (Ti–O stretching vibrations), 450, 410, 378 (lattice modes involving Si-O-Si bending vibrations). The average of 7 electron probe EDS analyses [wt% (range)] is: Na₂O 5.39 (4.79–5.54), K₂O 0.30 (0.22–0.43), CaO 7.61 (7.34–8.03), MgO 2.54 (1.79–3.05), MnO 2.05 (2.27–2.97), FeO 1.93 (1.58–2.09), Al₂O₃ 0.85 (0.49–1.04), SiO₂ 30.67 (28.82–32.13), TiO₂ 29.69 (27.60–31.32), Nb₂O₅ 6.14 (5.53–7.14), P₂O₅ 0.27 (0.17–0.63), H₂O (by the Alimarin method) 11.59, total 99.23. The empirical formula based on (Si+Al) = 4. pfu is Na₁.₃₄Ca₁.₀₄K₀.₀₅Mg₀.₄₉Mn₀.₂₉Fe₀.₂₁Nb₀.₃₆Ti₂.₈₅(Si₃.₈₇Al₀.₁₃)O₆(OH)₂O₄(PO₄)₀.₀₃(H₂O)₀₄. Measured H₂O is higher than the value observed by partial amorphization. The strongest lines in the X-ray powder diffraction pattern are [d Å (%; hkl)]: 11.69 (100; 001), 5.87 (68; 011,002), 4.25 (89; T1T1T1), 3.825 (44; T2T2T2,2T1), 2.940 (100; T2T1,2T1), 2.900 (79; 004,120). The unit-cell parameters refined from the powder data are: a = 5.349(9), b = 7.08(1), c = 12.15(2) Å, α = 91.85(3), β = 107.72(3), γ = 110.17(3)°, V = 438.1 Å³. The single-crystal unit-cell parameters are: a = 5.3470(6), b = 7.0774(7) Å, c = 12.1456(13) Å, α = 91.827(4), β = 107.527(4)°, γ = 105.154(4)°, V = 438.03 Å³. The crystal structure of calciomurmanite was refined to R₁ = 0.0656 for 1895 observed [I > 2σ(I)] reflections. Calciomurmanite is isostructural with murmanite. The structure is based on alternating HOH sheet of three polyhedral layers (two heteropolyhedral built up of tetrahedra disilicate groups and Ti-centered octahedra, and one central built up of NaO and TiO₂ octahedra) and intermediate layers (built up of Ca-centered polyhedra and two H₂O groups bonded to the apexes of Ti octahedra of the H layers and to the Ca-centered polyhedra). A continuous solid solution between calciomurmanite and murmanite is reported. Calciomurmanite is chemically related to another Ca-bearing member of the group is kolskiiyte (Ca₄Ti₄Na₂Ti₂(Si₂O₇)₂O₄(OH)₂)O₄(PO₄)₀.₀₃(H₂O)₀₄, although the latter has a different structure of the intermediate layer bearing more H₂O groups. The mineral is named as the Ca analog of murmanite. The holotype and cotype specimens are deposited in the Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia. E.C.

Comment: According the new classification of the seidozerite—supergroup [approved by IMA-CNNMC (memorandum 56-SM/16) and later published by Sokolova and Cámara (2017)] calciomurmanite belongs to the murmanite group of the seidozerite-supergroup.

Reference cited

ČZOCHRALSKIITE*

L. Karwowski, R. Kryza, A. Muszyński, J. Kusz, K. Helios, P. Droźdżewski and E. V. Galuskin (2017) Čzocharlskiite, Na$_3$Ca$_3$Mg$_2$(PO$_4$)$_3$, a second new mineral from the Morasko IAB-MG iron meteorite (Poland). European Journal of Mineralogy, 28(6), 969–977.

Čzocharlskiite (IMA 2015-11) ideally Na$_3$Ca$_3$Mg$_2$(PO$_4$)$_3$, is the second new phosphate discovered in the Morasko IAB-MG iron meteorite, found in 1914 at the northern edge of the city of Poznań (Poland, 52°29′25.2″N; 16°53′25.9″E). The matrix of the Morasko iron is composed of kamacite (6.0–6.5 wt% Ni) and taenite (17–38 wt% Ni), associated with subordinate tetraedrite (~30 wt% Ni), phosphides (schreibersite and nickelphosphide), carbide (cohenite), occasional sulfides (spalerite and troilite), and rare altaite. Morasko contains also nodules (up to few centimeters in size) dominated by graphite and troilite. Čzocharlskiite was found in three of these graphite-bearing nodules, 1–3 mm in size, enclosed in the metal matrix. The nodules also contain schreibersite, cohenite, and a mutually intergrowing phosphates: merrillite, brianite, and fluorapatite. Čzocharlskiite forms xenomorphic, usually oval and amoeboid aggregates, with individual grains ranging mostly represented by pyrite, chalcopyrite, enargite, and gold. Čzocharlskiite is enclosed in colorless euhedral baryte crystals up to 1.5 cm associated with alumine, jarosite, olivenite, and scorodite. El Guanaco is famous by secondary Cu-Al arsenates and sulfate mineralization. It is the type locality for cerelite, guanacoite, lemanskite, phosphoaluminate, and schloßmacherite. In the holotype specimen, erazoite forms roundish black opaque aggregates up to 0.4 mm of fibrous, frequently radiating crystalloids up to ~10 µm wide closely intergrown with chalcopyrite, Sb- and Se-rich bismuthinite, goldfieldite, and enargite. Other minerals in the baryte crystals are covellite, tennantite, and a dull yellow earthy unknown (Sn-Fe-Cu-As) mineral (under investigation). Čzocharlskiite has a black streak and submetallic to metallic luster. The hardness estimated by the Kalb line method corresponds to ~3 of Mohs scale. The density was not measured due to small size of crystals; $D_{calc} = 4.53$ g/cm$^3$. In reflected light erazoite is gray with no internal reflections observed. The reflectance data were measured in air from 400 to 700 nm with 20 nm intervals. The values for COM wavelengths ($R_\alpha, R_\beta, R_\gamma$) are: 21.9, 27.8, 470; 20.4, 26.8, 546; 19.7, 27.2, 589; 20.3, 30.3, 650. The mineral is strongly bireflectant and distinctly pleochroic from pinkish to gray (directions not specified). It is strongly anisotropic with characteristic orange-buff to deep red-brown to muddy green rotation tints. The average of 36 electron probe WDS analyses [wt% (range)] is: Cu 42.46 (41.87–43.47), Sn 20.99 (19.47–22.14), Fe 0.01 (0–0.29), In 0.26 (0.05–0.54), S 34.42 (33.96–34.90), total 98.14. The empirical formula based on 6 S pfu is Cu$_{3.01}$Sn$_{0.99}$In$_{0.01}$S$_6$. The strongest lines in the X-ray powder diffraction pattern [d Å (P; hkl)] are: 3.664 (8; 009), 3.265 (8; 101), 3.022 (100; 104), 1.999 (10; 1.013), 1.877 (47; 110), 1.667 (13; 119), 1.592 (12; 024). The cell parameters refined from powder diffraction data are $a = 4.375(8), c = 32.91(4)$ Å, $V = 402.1$ Å$^3$. Čzocharlskiite is hexagonal, space group $R\bar{3}m$, by analogy with synthetic Cu$_3$SnS$_3$ (ICSD 088972). No suitable crystals were found for single-crystal X-ray study. The crystal structure of the synthetic Cu$_3$SnS$_3$ is composed of slabs of edge-sharing SnS$_6$ octahedra sandwiched sharing corners between the sheets of Cu$_3$S$_4$-tetrahedra. Those slabs are stacked along [001] and connected via S-S bonds. Some Cu occupies sites close to the center of opposite triangular faces of the SnS$_6$ octahedra, which requires the center of that octahedron to be vacant. The resulting nearly planar Cu$_3$S$_4$ coordination with adjacent Cu$_3$S$_4$-tetrahedra is similar to the covellite (CuS) structure. The structure model suggests the substitution of one third of Sn atoms by pairs of Cu atoms. However, the EMPA results show that Cu/Sn substitution in erazoite is within of about 1 atom% and is equimolar. This might indicate that Sn/Cu substitution also affects the tetrahedrally coordinated Cu-sites. The only two other known natural ternaries in the system Cu–Sn–S, mohite Cu$_4$Sn$_3$S$_9$ and kuramite Cu$_2$Sn$_3$, both have Sn in tetrahedral coordination. Erazoite is named for Gabriel Erazo Fernández (b. 1943) a mining engineer and mineralogist. He was professor of geology, crystallography, and metallurgy at Copiapó University and was the first director of the Mineralogical Museum of
NEW MINERAL NAMES

LOBANOVITE*  

Lobanovite, ideally K₃Na[(Fe²⁺Mg₂Na)Ti₄(Si₂O₇)₂O₂(OH)₄], is a redefined mineral of the astrophyllite group. It was first noted as magnesium astrophyllite with 6.39 wt% MgO (Semenov 1959) with no other data. Later it was reported under the names monoclinic astrophyllite, magnesiumastrophyllite or magnesioastrophyllite (Peng and Ma 1963; Shi et al. 1998; Pilonen et al. 2003 and other papers), but has not been formally approved by the CNMNC, IMA. Based on this study the mineral has been revalidated, approved (CNMNC-IMA: Nomenclature voting proposal 15-B), and named after Konstantin V. Lobanov, a prominent Russian ore geologist who has worked in the Kola Peninsula for more than 40 years. Lobanovite was found in alkaline pegmatites at Mt. Yukspor, Khbin massif, Kola Peninsula, Russia, in association with scherbakovite, lamprophylite, delindeite, wadeite, kustylevite, and others. It forms straw yellow to orange, elongated bladed crystals up to 0.04 mm wide and 0.2 mm long with a vitreous luster and a yellowish-white streak. The new mineral does not fluoresce. Mohs hardness is 3. Lobanovite has a perfect cleavage on [001], moderate on [010], and no parting. The density was not measured; \( \rho = 3.161 \text{ g/cm}^3 \). The optical and DTA data were obtained on different specimen (X-ray Laboratory, Hubei Geological College 1974) shows lobanovite is optically biaxial (+), \( \alpha = 1.658, \beta = 1.687, \gamma = 1.710 (589 \text{ nm}) \). The DTA curve shows endothermic peaks at 835 °C (strong, escape of OH) and at 900 °C (weak). The average of 10 point WDS electron probe analyses is [wt%, (range)]: Nb₂O₅ 0.64 (0.29–1.22), TiO₂ 3.11 (12.47–13.48), SiO₂ 39.72 (39.43–39.92), Al₂O₃ 0.24 (0.08–0.42), BaO 0.13 (0.04–0.19), FeO 18.86 (17.98–21.05), MnO 4.21 (3.10–4.59), CaO 0.65 (0.59–0.82), MgO 6.72 (6.05–6.93), K₂O 7.66 (7.54–7.78), Na₂O 4.22 (4.10–4.29), F 0.29 (0.17–0.43), H₂O (by structure refinement) 3.00, \( \text{O}=\text{F}, 0.12, \text{total 99.33. The empirical formula based on 30 (O+OH) + 0.2 Fe is (K₀.₉Ba₀.₁)₁₅(Na₀.₆Ca₀.₁₄)₂₅(Fe³⁺₇Mg₀.₆₂Na₀.₁₆Mn₀.₀₂M₀.₀₁6Ti₀.₉₆Nb₀.₃₈Ba₀.₀₂M₀.₄₂Si₀.₅₂Al₀.₈₆O₂₀₂O₂(OH)₀₂(OH)₄. The strongest lines of the powder X-ray diffraction pattern are [d Å (%); hkl]; 3.38 (100; 003), 2.548 (90; 063), 10.11 (80; 001), 3.380 (60; 042/131), 3.079 (50; 132/062), 2.763 (90; 071). The crystal structure was refined to R = 3.2% based on 1861 unique F > 4σ(F) reflections. The mineral is monoclinic, C₂/m, a = 5.3327(2), b = 23.1535(9), c = 10.3775(4) Å, \( \beta = 99.615(1)° \), \( V = 1263.3 \text{ Å}^3 \), and Z = 2. The general topology of the structure is in accord with Shi et al. (1998). The main structural unit is the HOH block, consisting of one close-packed octahedral (O) and two heteropolyhedral (H) sheets. The M{1–4} octahedra form the O sheet and the Ti₂O₄ astrophyllite ribbons and [5]-coordinated Ti-dominant D polyhedra link through common vertices to form the H sheet. The HOH blocks repeat along [001], and K and Na atoms occur at the interstitial A and B sites. The topology of the HOH block in lobanovite differs from all other structures of the astrophyllite supergroup minerals due to the composition of the O sheet, Fe₃⁺Mg₂Na, where Na⁺ is dominant at the M(1) site. Hence the Na octahedron is too large to share edges with Si₂O₇ groups of astrophyllite ribbons resulting in a different linkage of H and O sheets. The crystal structure and the chemical data were obtained on the same crystal taken from the specimen of delindeite #6270 in the collection of Adriana and Renato Pugano, Milan, Italy. This crystal is considered as holotype and is deposited in the Fersman Mineralogical Museum Russian Academy of Sciences, Moscow, Russia. Yu.U. and D.B.

Comment: The mineral is widely distributed in Khbiny alkaline massif, mostly in rischorrite pegmatites related to the ijolite-urtite arc with apatite deposits. Sometimes it forms pseudomorphs after...
aegirine-diopside but most commonly occurs as scaly aggregates up to 15 cm with the very specific bronze-green color. Its physical, including optical properties, chemical composition, density, IR spectra, etc., were described in detail (under the name magnesioastrophyllite) for the different morphological varieties and associations (Kostyleva et al. 1978).

References cited


**MAGNESIOVOLTAITE***

N.V. Chukanov, S.M. Aksenov, R.K. Rastsvetaeva, G. Möhn, V.S. Rusakov, I.V. Pekov, R. Scholz, T.A. Eremina, D.I. Belakovsky and J.L. Zeravshan and Alay mountain ridges, Tajikistan. The name originates from the Greek Odigitria, meaning “she who shows the way,” it was named odigitriaite to emphasize the role of Cs as a major indicator of extreme fractionation. Odigitriaite was discovered in cobbles and boulders of anhedral quartz range in size from 5 to 80 cm, which contain inclusions of slightly deformed stacks of polyhitionite, crystals of pale-green to white microcline, patches of pale-pink reedmergnerite, randomly distributed black idiomorphic crystals of aegirine, rare red-brown translucent crystals of stillwellite-(Ce), grass-green translucent to transparent crystals of leucosphenite, yellow–greenish plates of sodgiate, dark-green crystals of turkestanie and brown patches (up to 30 cm) of pectolite. Odigitriaite occurs in these pectolite brown patches associated with Sr-rich fluorite, pekovite, mendeleevite-(Ce), olorovite, kirchoffite, neptunite, zavranshanite, senkevichite, nordite-(Ce), alamosite, hyalotekite, and khvorovite. It forms irregular elongated grains up to 100 μm. Odigitriaite is colorless, translucent, with a white streak and a vitreous luster. It does not fluoresce under the UV light.

Odigitriaite (IMA 2015-028), ideally CsNa2Ca[Si14B2O38]F2, was discovered in the moraine adjacent to the Darai-Pioz alkaline massif in the upper reaches of the Darai-Pioz river at the joint of Turkest, Zeravshan and Alay mountain ridges, Tajikistan. The name originates from the Greek Odýgērītpos, meaning “she who shows the way,” it was named odigitriaite to emphasize the role of Cs as a major indicator of extreme fractionation. Odigitriaite was discovered in cobbles and boulders of anhedral quartz range in size from 5 to 80 cm, which contain inclusions of slightly deformed stacks of polyhitionite, crystals of pale-green to white microcline, patches of pale-pink reedmergnerite, randomly distributed black idiomorphic crystals of aegirine, rare red-brown translucent crystals of stillwellite-(Ce), grass-green translucent to transparent crystals of leucosphenite, yellow–greenish plates of sodgiate, dark-green crystals of turkestanie and brown patches (up to 30 cm) of pectolite. Odigitriaite occurs in these pectolite brown patches associated with Sr-rich fluorite, pekovite, mendeleevite-(Ce), olorovite, kirchoffite, neptunite, zavranshanite, senkevichite, nordite-(Ce), alamosite, hyalotekite, and khvorovite. It forms irregular elongated grains up to 100 μm. Odigitriaite is colorless, translucent, with a white streak and a vitreous luster. It does not fluoresce under the UV light. Odigitriaite has a perfect cleavage on {001} with no parting. It is brittle with an uneven fracture. Indentation hardness VHN90 = 606 (560–65) kg/mm² corresponds to Mohs hardness of 5. D_min = 280(2) and D_max = 2830 g/cm². In transmitted light the mineral is colorless, non-pleochroic. It is optically biaxial (-), α = 1.502(2), β = 1.564(2), γ = 1.576(2) (589 nm); 2V_F = 46(2)* dispersion of optical axes is weak r > v. The average of 10 point EDS (WDS for B and F) electron probe analyses is [wt% (range)]: SiO2 55.30 (54.34–56.36), Y2O3 0.44 (0.1–2.1), Al2O3 0.09 (0.1–2.1), B2O3 4.75 (4.33–5.06), PBO 0.21 (0.04–0.1), Fe2O3 0.10 (0–0.22), MnO 0.94 (0.48–1.34), CaO 17.37 (16.80–17.92), CS2O 8.36 (7.85–9.00), K2O 0.01 (0–0.06), Na2O 10.49 (10.07–10.89), F 1.74 (1.64–1.79), H2O (by structure refinement) 0.37, –O=F 0.74, total 99.43. The empirical formula based on total of 40
Romanorlovite*  


Romanorlovite (IMA 2014-011), is a new tetragonal K-Cu hydroxychloride with simplified chemical formula K\(_2\)(Cu\(_{16}\)Cl\(_{25}\)(OH)\(_4\))·2H\(_2\)O. It was discovered in upper, moderately hot zones of two fumaroles, Glavnaya Tenoritovaya and Arsenatnaya, at the Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik volcano, Kamchatka, Russia. The association in the Arsenatnaya fumarole includes avdoninite along with earlier crystallized hematite, pseudobrookite, clinoenstatite, diopside, anhydrite, powellite and baryte. In Glavnaya Tenoritovaya the mineral is associated with avdoninite, bollite, sylvite, carrallite, mitchellite, sanguite, chlorothionite, eriochalcite, chrysothallite and mellizinkalite. Romanorlovite forms yellow-brown to dark brown prismatic, equant clusters up to 0.5 mm and crusts up to 2 × 2 mm in area. The mineral is transparent, vitreous with a yellow streak. Cleavage was not observed. Romanorlovite is brittle with Mohs hardness of ~3. Transmission was not observed. In transmitted plane-polarized light the mineral is yellow-brown, non-polarochroic. It is optically uniaxial (+), \(\alpha = 1.727(3), \beta = 1.694(2)\) (589 nm). The Raman spectrum shows maxima \(200\) cm\(^{-1}\) at 3512 (O–H stretching vibrations of OH groups), 3440 (O–H stretching of H\(_2\)O molecules), 931 and 879 (bending vibrations Cu\(^{2+}\)...O–H, 548 and 477 (most likely libration vibration of H\(_2\)O)), 290 (Cu\(^{2+}\)...O stretching). Strong bands below 280 cm\(^{-1}\) are assigned to stretching vibrations of Cu\(^{2+}\)...Cl, K–Cl and to lattice modes. The absorption of H–O–H bending vibrations bands between 1500 and 1700 cm\(^{-1}\) is explained by symmetrical position of H\(_2\)O. The average of 9 electron probe WDS analyses on the holotype specimen is \([\text{wt}\%\text{ (range)}]: K = 21.52 (20.24–23.17), Pb = 0.89 (0.1–0.69), Cu = 28.79 (26.82–30.64), Zn = 0.02 (0–0.12), Cl = 44.74 (42.72–46.97), O\(_{calc}\) = 4.85, H\(_{calc}\) = 0.41 (both by structure refinement), total 101.22. The empirical formula calculated based on 25 Cl and (OH)\(_2\)(H\(_2\)O), pfu is: K\(_{10}\)Fe\(_{10}\)Cu\(_{28}\)Cl\(_{25}\)(OH)\(_4\)·2H\(_2\)O. The strongest reflections of the powder XRD pattern \([\alpha (\%); \beta (\%)]\): 12.48 (56; 110), 11.74 (36; 101), 8.80 (100; 200), 7.39 (34; 002); 6.71 (40; 112), 3.165 (32; 512), 2.933 (80; 215,433), 2.607 (38; 514). Unit cell parameters refined from the powder XRD (holotype) are: \(a = 17.585(3)\), \(c = 15.912(3)\), \(V = 4920\) Å\(^3\), space group I4/mmm. Single-crystal unit-cell parameters are: \(a = 17.5804(7)\), \(c = 15.9075(6)\), \(Z = 4, V = 4916.5\) Å\(^3\). The crystal structure was refined to \(R = 5.49\%\) for 769 unique \(I > 2\sigma(I)\) reflections. The structure is based on two main blocks built by Cu\(^{2+}\)-centered polyhedra. The first one includes chains consisting of edge-sharing CuCl\(_4\)(OH) octahedra. In the chain a fragment built by four edge-sharing Cu(1)-centered octahedra could be distinguished whereas Cu(2)-centered octahedra are connected with this fragment from both upper and lower sides. The second structural block consists of isolated Cu\(_{16}\)Cl\(_{25}\) clusters built by Cu(3)-centered tetragonal pyramids and Cu(4)-centered distorted tetrahedra. In a core of the cluster Cu\(^{2+}\) and Pb\(^{2+}\) cations statistically replacing each other in the same site. These basic structural blocks are connected via distorted ACL octahedra \((A = Cu,K)\) forming pseudo-framework. K\(^{+}\) cations are located in the voids and channels of the pseudo-framework. Various defects in the structure are discussed. The crystal-chemical formula of romanorlovite is K\(_2\)(K,Pb)\(_{16}\)(K,Cu)\(_{16}\)(Cu,Pb)\(_2\)Cl\(_{25}\)(Cl,Cl,Pb)\(_4\)(Cl,Cl,O)\(_{16}\)·2H\(_2\)O \((Z = 1)\). The mineral is named in honour of the Russian mineralogist and physicist Roman Yu. Orlov (1929–2005) who worked in Department of Mineralogy of Moscow State University. The holotype specimen has been deposited in the Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia. D.B.

Tatarinovite*  

Tatarinovite (IMA 2015-055), is a new hexagonal member of the ettringite group with an ideal chemical formula Ca\(_3\)Al\(_2\)(SO\(_4\))\(_5\)(BO\(_3\))\(_3\)·12H\(_2\)O. It has been discovered at the Bazhenovskoe chrysotile asbestos deposit (near the town of Asbest, Middle Ural, Russia) in the cavities of rodinite body ~1.5 m thick and a few hundred meters long at the contact between the dike of partly rodinitized gabbroic rock and hosting serpentinite. Rodinite consist mostly of grossular, diopside, and clinohilchite with some vesuvianite, clinozoisite, prehnite, tremolite, serpentinite, and calcite. In peripheral part of rodinite body tatarinovite forms colorless, vitreous, dipyramidal \(\{104\}\) crystals up to 1 mm (0.5 mm in average) in cavities within massive diopside, in association with xonolithe, clinohilchite, pektolite, and calcite. Both in periphery and in central part of rodinite body tatarinovite also found as white granular sugary aggregates up to 5 mm on grossular with pektolite, diopside, calcite, and xenolithe. The mineral has a white streak, perfect cleavage on \(\{100\}\) and Mohs hardness ~3; \(D_{meas} = 1.79(1)\) and \(D_{calc} = 1.777(1)\) g/cm\(^3\). The fluorescence in UV light was not observed. In transmitted light tatarinovite is colorless, non-polarochroic. It is optically uniaxial (+), \(\alpha = 1.475(2), \beta = 1.496(2)\) (589 nm). The IR spectrum contains the bands \(\text{cm}^{-1}\): s = strong, w = weak, sh = shoulder): 3614s, 3495sh, 3460sh, 3425s, 3240sh (O–H stretching vibrations of H\(_2\)O and OH groups), 2420w, 2252w (O–H stretching of HSO\(_4\)), 1686 (H\(_2\)O bending), 1403s (asymmetric stretching of CO\(_3\)).
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1195sh (B–O bending of B(OH)2) and B(OH)3, 1141s (asymmetric bending of SO42–), 991, 953 (B–O stretching and B–O–H bending vibrations of B(OH)3), 879 (out of plane bending vibrations of CO32–), 720sh [Si–O stretching in Si(OH)x octahedra, 675s, 645sh, 595 (SO42– bending), 555 [Al–O stretching in Al(OH)x octahedra, 501 [O–Si–O bending of Si(OH)y], 417 [O–Al–O bending of Al(OH)z]). Quantitative electron probe analysis was not performed due to instability of the mineral under the beam. Semiquantitative analysis show the presence only B, Ca, Al, Si, S, and minor Fe in detectable amounts. The chemical composition (ICP-AES) of tatarinovite [% Fe36 (range)] is: CaO 27.40 (27.12–27.67), B2O3 4.06 (4.04–4.07), Al2O3 6.34 (6.23–6.44), Fe2O3 0.03 (0.03–0.03), SiO2 2.43 (2.34–2.52), SO3 8.48 (8.46–8.49), CO2 4.2 (3.9–4.5)*, H2O 46.12 (2)*, total 99.04 (% = determined by selective sorption of gaseous products of annealing). The empirical formula based on 3 Ca pfu is: H31.41Ca3.00(Al0.76Si0.25)Σ1.96O5.73Σ0.27·12H2O. The strongest reflections of the powder X-ray diffraction amount are: d Å (hkl; 2θ°) = 9.63 (100; 100), 5.556 (30; 110), 4.654 (14; 102), 3.841 (21; 112), 3.441 (12; 211), 2.746 (10; 302), 2.538 (12; 213). The unit-cell parameters refined from the powder XRD data are: a = 11.1161(6) Å, c = 10.626(5) Å, V = 1137.1 Å3. The single-crystal unit-cell parameters are: a = 11.1110(4) Å, c = 10.6294(6) Å, V = 1136.44 Å3, Z = 2, space group P63. The crystal structure solved by direct methods and refined to R1 = 0.0252 for 9846 I > 2σ(I) reflections. Tatarinovite is the structural analog of thaumasite with Al dominateing over Si in octahedral position. Its structure is based on infinite columns along a axis with composition of [Ca3(Al2Si2O10)(OH,SO4)4(OH)2]n consisting of octahedra [(Al2Si2O10)] and polyhedra Ca2(H2O)6(OH)2 in thaumasite those columns are connected between columns but strongly disordered. The sites occupied by S and C atoms in thaumasite in tatarinovite occupied by S, B, and C with statistical distribution leading to the crystal-chemical formula: Ca1.93(Al1.98Si1.05)Σ1.96[B(OH)3]0.06(OH)5.80Σ0.27(CO3)0.30Σ1.96(OH)0.05·12H2O. Tatarinovite was named in honor of the Russian geologist and petrologist Pavel Mikhailovich Tatarinov (1895–1976), a well-known specialist in deposits of chrysotile asbestos. Type specimens are deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. D.B.

ZINCOMENITE*


Zincomenite (IMA 2014-014), β-ZnSeO3, a new orthorhombic zinc selenite, was discovered in active fumaroles at the Northern fumarole field, First scoria cone, Northern Breakthrough of the Great Tolbachik Fissure Eruption, Tolbachik Volcano, Kamchatka, Russia. The mineral was found at 0.1–0.3 m depth from the surface where the temperature during collecting were 180–200 °C. It occurs in white to gray sublimate incrustations mainly consist of selellite, fluorite, halite, and anhydrite. Common minerals on that crust are cotunnite, soﬁite, and flintite. Subordinate minerals are anglesite, chalunovite, chalacolinite, olsherite, saltmoreite, hollandite, bixbyite, jacobsenite, sylvite, hematite, and baryte. In upper part of the fumarole cryobostrixite, leonardsenite, ralstonite, gypsum, vernadite, and opal are formed as products of the supergene alteration of sublimate minerals. Zincomenite forms tabular, equant or prismatic crystals up to 0.2 mm sometimes combined in dense crystal clusters up to 0.3 mm across, chain-like crystal groups up to 0.35 mm long, or interrupted incrustations up to 0.7 × 1 cm overgrowing basalt scoria. Partial to complete pseudomorphs of zincomenite after soﬁite are typical. The crystal forms are [101], [010], [100], and [013]. T-shaped twins with [012] as twin plane were found. Zincomenite is transparent, colorless (in separate crystals), white or pale beige (in aggregates) with white streak and adamantine luster. The fluorescence under UV radiation or electron beam was not observed. It is brittle with an uneven fracture. Cleavage and parting were not observed. Mohs hardness and density were not measured due to the size of the crystals; Dcalc = 4.760 g/cm3. In transmitted light zincomenite is colorless, non-pleochroic. It is optically biaxial (–), α = 1.744(5), β = 1.860(5), γ = 1.875(5) (589 nm), 2V was estimated as medium; 2Vcalc = 38°. Optical orientation is not given. Dispersion of the optical axes was not observed. Due to the insufficient amount of material, scattering, and atmospheric noise the IR spectrum of acceptable quality was obtained only in the region below 1800 cm–1. The spectrum of zincomenite is close to that of its synthetic analog. The absorption bands (cm–1, s = strong, w = weak): 845, 826, 818, 758, 724s, 697s (stretching vibrations of SeO42–), 532, 483w (bending vibrations of SeO33– possibly combined with stretching vibrations of ZnSeO4 polyhedra). Bands due to SeO33– are not observed and the absence of absorptions in the range 900–1800 cm–1 indicates the absence of O-H, C-O, and O-Se. The empirical formula was calculated on the basis of 3 O pfu: Zn3.02Se0.99O3. The strongest reflections of the powder X-ray diffraction pattern [d Å (hkl; 2θ°)]: 4.612 (26; 102), 3.601 (77; 200), 3.119 (48; 210), 3.048 (38; 113), 3.014 (100; 211), 2.968 (56; 004), 2.771 (19; 123,104,212), 2.459 (23; 213,023), 2.311 (20; 123,221,204), 2.162 (19; 214,024). The orthorhombic unit-cell parameters refined from the powder data are: a = 7.1991(1), b = 6.2383(1), c = 12.0062(2) Å, V = 539.2 Å3. The single-crystal unit-cell parameters are: a = 7.1971(2), b = 6.2320(2), c = 11.9914(3) Å, V = 537.84 Å3, Z = 8, space group Pbca. The crystal structure was solved by direct methods and refined to R = 0.0188 for 786 independent I > 2σ(I) reflections. Zincomenite is a representative of the CuSeO4 structure type. The crystal structure contains layers formed by ZnO2 dimers (consisting of edge-sharing ZnO4 trigonal bipyramids; each dimer shares four vertices with the neighboring ones) linked via (SeO4)2– groups with Se=O trigonal pyramidal coordination) to form an open framework. β-ZnSeO3 is the high-temperature modification and can be obtained from α-ZnSeO3 by heating that to 285 °C. The reverse transformation from beta- to alpha-form of ZnSeO3 does not occur, i.e., both synthetic α-ZnSeO3 and zincomenite are stable at room temperature. The stability field of β-ZnSeO3 extends until ~450 °C. Zincomenite could be deposited directly from the gas phase as a volcanic sublimate (well-shaped crystals). Alternatively the new mineral (or its hypothetic proto-phase α-ZnSeO3, if the process was occurring at a temperature lower than ca. 280 °C) could be formed as the result of the reaction between fumarole gases and soﬁite Zn5(SeO3)3Cl (pseudomorphs). The mineral is named in allusion to its chemical composition: zine selenite (the Greek μέν, means moon, indicating selenium). The type specimen have been deposited to the Fersman Mineralogical Museum Russian Academy of Sciences, Moscow, Russia. D.B.

NEW DATA

BOSCARDINITE


Boscardinite, ideally TlPb(3bAs3S3)Σn, triclinic homeotypic derivative of baumhauerite has been described recently from quartz
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PARTZITE, DISCREDITED

Partzite was originally described by Arents (1867) as a hydrous oxide of antimony and mixed metallic oxides from the Blind Spring Mountains, Mono County, California, U.S.A. It was considered to be identical with “cuproromeite” Cu,Sb₂(O,OH), with a questionable status since no cation site in pyrochlore structure is stereochemically favorable for Cu²⁺, and no synthetic Cu antimonates with the pyrochlore structure are known. The type specimen #80284, from the mineralogical collections of Harvard University, Cambridge, Massachusetts, U.S.A., has been re-investigated by powder X-ray diffraction and electron microprobe traverses. The type specimen consists of an olive green to dark green botryoidal-coolloform gel-like crust on tetrahedrite, with a transparent blue phase coating the crust. The material shows complex layering on the submicrometer scale, and consists of several distinct phases which could not be fully resolved by electron probe. The X-ray powder diffraction data shows that the partzite sample is very poorly crystalline. The background is high and irregular, featuring the presence of amorphous matter. The few visible peaks correspond to d = 6.03, 3.60, 2.99, 1.83 and 1.56 Å, consistent with the 111, 220, 222, 440, and 622 reflections from the cubic pyrochlore structure of the unit-cell parameter a ≈ 10.358 Å which is close to that observed for oxyplumboroméite (10.378). However (Pb+Ca)/Sb ratio is too low for that species. If Fe is trivalent and is in B site a charge-balanced formula could be (Pb₀.₇Ca₀.₃5Fe₀.₂)(Sb₅⁺₀.₇Fe³⁺₀.₃)(O₅.₇(OH)₀.₃)(H₂O). There is no evidence for significant Cu content in the pyrochlore phase. Copper is predominantly in a silicate phase resembling chrysocolla, but with an unusually high Cu/Si ratio of ~1.3. Thus, the correlations between elements along with XRD indicates that the two dominant phases are a plumboroméite-like oxide phase and a chrysocolla-like amorphous Cu silicate. The analysis also suggested the presence of several minor phases that were too scarce to be detectable by XRD, including acanthite, chlorargyrite, baryte, halite, and an Al-rich clay mineral. Subsequently partzite is discredited as a valid mineral species. This has been approved by the IMA CNMNC (proposal 16-B). D.B.

Reference cited