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# New Mineral Names*,†

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This New Mineral Names has entries for 14 new minerals, including ferricoronadite, garronite-Na, gauthierite, gurimite, hansesmarkite, hexacelsian, hydroxylgugiaite, hydropascoite, meierite, parascandolaite, petersite-(Ce), rietveldite, rossovskyite, and telluromandarinoite.

## FERRICORONADITE*

N.V. Chukanov, S.M. Aksenov, S. Jančev, I.V. Pekov, J. Göttlicher, Y.S. Polekhovsky, V.S. Rusakov, Y.V. Nelyubina, and K.V. Van (2016) A new mineral species ferricoronadite, $Pb[Mn^{4+}_6(Fe^{3+},Mn^{3+})_2]O_{16}$: mineralogical characterization, crystal chemistry and physical properties. Physics and Chemistry of Minerals, 43, 503–514.

Ferricoronadite (IMA 2015-93) with simplified formula $Pb(Mn^{4+}_6Fe^{3+}_2)O_{16}$, is a new hollandite-supergroup mineral collected in the in the Babuna River valley, in talus at the bottom of the Kalugeri Hill, at the orogenetic zone related to the “Mixed Series” metamorphic complex situated in the Pelagonian massif near the Nežilovo village, about 40 km SW of the town of Veles, Republic of Macedonia (41°34′N, 21°34′E). The mineral is the major component of hydrothermal veins up to 8 mm thick crossing a rock mainly consisting of zinc spinel, having as minor components franklinite (relics of an earlier paragenesis), gahnite, quartz, roméite, almeidaite, and zincohögbomite analog with $Fe^{3+} > Al$. Ferricoronadite forms aggregates of anhedral grains up to 0.6 mm across. The mineral is black, opaque with a brownish black streak and strong submetallic to metallic luster. It is brittle with an uneven fracture. Distinct cleavage is observed on {100}. The micro-indentation hardness $VHN_{150} = 819$ (754–858) kg/mm$^2$ corresponding to a Mohs hardness of ~6. $D_{calc} = 5.538$ g/cm$^3$. In plane-polarized reflected light ferricoronadite is light gray, without internal reflections, anisotropic. Reflectance values were measured in air between 400 and 700 nm in 20 nm intervals. The values for COM wavelengths [$R_{max}$, $R_{min}$ % (λ in nm)] are: 28.7, 27.8 (470); 27.6, 26.6 (546); 27.2, 26.1 (589); 26.5, 25.4 (650). The absorption IR spectrum is similar to IR spectra of other coronadite-group minerals and shows bands in the range 360–700 cm$^{-1}$ (vibrations of the octahedral pseudo-framework). A weak band at 1078 cm$^{-1}$ is assigned to a combination mode. Bands of O-H-stretching vibrations (in the range 2000–4000 cm$^{-1}$) are absent. Mn *K*-edge XANES spectroscopy shows that Mn is predominantly $Mn^{4+}$, with minor $Mn^{3+}$ (a residual presence of $Mn^{2+}$ could not be excluded). $^{57}$Fe Mössbauer spectroscopy shows values of hyperfine parameters for ferricoronadite, which correspond to $Fe^{3+}$ in octahedral oxygen coordination. The average of 5 spots electron probe WDS analysis [wt% (range)] is: BaO 5.16 (4.56–5.87), PbO 24.50 (23.42–25.68), ZnO 0.33 (0–0.61), $Al_2O_3$ 0.50 (0.42–0.70), $Fe_2O_3$ 11.45 (11.01–11.93), $TiO_2$ 4.19 (3.64–4.46), $MnO_2$ 44.81 (54.85–56.62), $Mn_2O_3$ 9.90, total 100.84. The empirical formula based on 8 cations pfu (and $Mn^{3+}/Mn^{4+}$ from charge balance) is $Pb_{1.03}Ba_{0.32}(Mn^{4+}_{4.85}Fe^{3+}_{1.35}Mn^{3+}_{1.18}Ti_{0.49}Al_{0.09}Zn_{0.04})_{\Sigma8.00}O_{16}$. The strongest lines in the X-ray powder diffraction pattern are [*d* Å (*I*%; *hkl*)]: 3.497 (33; 220), 3.128 (100; 130,130), 2.424 (27; 121,121), 2.214 (23; 240,240), 2.178 (17; 031), 1.850 (15; 141,141), 1.651 (16; 060), 1.554 (18; 251,251). The unit-cell parameters refined from the powder data are: $a = 9.9073(9)$, $c = 2.9023(4)$ Å, $V = 284.87$ Å$^3$. X-ray diffraction intensity data was collected in one single crystal of 0.11 × 0.12 × 0.15 mm. The single crystal unit-cell parameters are: $a = 9.9043(7)$, $c = 2.8986(9)$ Å, $V = 284.34$ Å$^3$. Ferricoronadite is tetragonal, space group $I4/m$, $Z = 1$. The crystal structure of ferricoronadite was refined to $R_1 = 0.026$ for 242 independent $I > 2\sigma(I)$ reflections. It is isostructural with other members of the coronadite group belonging to the hollandite-supergroup, and is based on double chains of edge-shared M-octahedra running along **c**. These chains share corners with neighboring double chains to form a pseudo-framework structure containing large 2 × 2 tunnels where the guests are $Pb^{2+}$ and $Ba^{2+}$ ions. Ferricoronadite is named in accordance with the accepted hollandite-supergroup nomenclature (Biagioni et al. 2013), as an analog of coronadite $Pb(Mn^{4+}_6Mn^{3+}_2)O_{16}$, with the major charge-compensating octahedral cation being $Fe^{3+}$ instead of $Mn^{3+}$. Fragments of the holotype specimen of ferricoronadite are deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia, and in the National Institution Macedonian Museum of Natural History, Skopje, Republic of Macedonia. **F.C.**

### Reference cited

Biagioni, C., Capalbo, C., and Pasero, M. (2013) Nomenclature tunings in the hollandite supergroup. European Journal of Mineralogy, 25, 85–90.

## GARRONITE-(NA)*

J.D. Grice, R. Rowe, and G. Poirier (2017) Garronite-(Na), a new zeolite species from Mont Saint-Hilaire, Québec. Canadian Mineralogist, 54(6), 1549–1562.

Garronite-(Na) (2015-015), $Na_6(Al_6Si_{10}O_{32})\cdot7–10H_2O$, is a new zeolite-group mineral with gismondine framework topology. It was discovered in the Poudrette quarry, Mont Saint-Hilaire, La Vallée-du-Richelieu RCM, Montérégie, Quebéc, Canada, and was named as a Na analog of garronite. Garronite-(Na) was first found in 1984 in tiny vugs in tawite (sodalite-rich) segregations in nepheline syenite but the material was not suitable for crystal structure analysis. A better specimen was found in 1991 in a hydrothermally altered zone of the Poudrette pegmatite, where it forms opaque white spheres, aggregates on natrolite or individual, opaque, white, frosted, crude to sharp pseudo-octahedral

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* 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-cnmnc/.

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crystals up to 2 mm. The mineral occurs in a vug in association with natrolite, gmelinite, aegirine, and gonnardite. Garronite-(Na) is transparent to translucent, pale yellow, with a white streak and vitreous luster. It is brittle, with Mohs hardness of ~4 and no apparent cleavage or parting. $D_{meas}$ = 2.19(2) g/cm$^3$, $D_{calc}$ = 2.071 g/cm$^3$. The new mineral is nonpleochroic, optically biaxial (+), $\alpha$ = 1.489(1), $\beta$ = 1.492(1), $\gamma$ = 1.496(1) (590 nm), $2V_{meas}$ = 75(3)°, $2V_{calc}$ = 82(7)°. No dispersion was observed. The optical orientations coincide with the cell vectors. Twinning is not definitively observed however the extinction is not sharp most likely due to the twinning. The bands of IR spectrum (cm$^{-1}$; s = strong, w = weak, sh = shoulder) are: 3417s ($OH^-$ stretching), 2964w (stretching of $H_2O$), 1642s ($H_2O$ bending), 1261s ($OH^-$ bending); 992s with 1100sh (stretching mode of the condensed $SiO_4$ polyhedra), 802, 741, and 668 (bending modes for condensed $SiO_4$ and $AlO_4$ polyhedra. The averaged 7 point electron probe WDS analyses on two grains [wt%, (range)] is: $Na_2O$ 14.28 (10.38–18.55), $K_2O$ 1.10 (0.51–3.07), CaO 0.04 (0.01–0.11), BaO 0.09 (0–0.44), FeO 0.02 (0–0.07), MnO 0.02 (0–0.09), MgO 0.00 (0–0.01), $Al_2O_3$ 26.89 (25.71–28.96), $SiO_2$ 46.71 (42.65–49.32), $TiO_2$ 0.00 (0–0.02), $Nb_2O_5$ 0.04 (0–0.10), $H_2O$ (by crystal structure) 10.73 (10.22–11.22), total 99.92. The empirical formula of is $(Na_{5.650}K_{0.286}Ca_{0.009}Ba_{0.007}Mn_{0.003}Fe_{0.003}Nb_{0.004})_{\Sigma 5.960}H_{0.50}[(Al_{6.468}Si_{9.532})_{\Sigma 16}O_{32}]$ based on 16 ($Al^{3+}$+$Si^{4+}$) cations with 32 O atoms in the framework and 7.3 $H_2O$ groups pfu. The strongest lines of the powder X-ray diffraction pattern are [*d* Å (*I*%; *hkl*)]: 7.098 (79; 011,110), 5.026 (32; 002,200), 4.101 (77; $112,\bar{2}11,\bar{1}21,121$), 3.172 (100; 013,031,130,310), 2.904 (14; $\bar{2}22,222$), 2.685 (64; $123,\bar{3}21$), 1.9669 (14; $015,\bar{1}43,341,510$), 1.7213 (11; $\bar{3}34,053,350,433$). The crystal structure of garronite-(Na) was refined to *R* = 6.8%. The new mineral is monoclinic, *I*2, *a* = 9.990(2), *b* = 10.032(2), *c* = 10.036(2) Å, $\beta$ = 90.11(3)°, *V* = 1005.8 Å$^3$, *Z* = 1. The crystal structure of garronite-(Na) is a gismondine-type framework of Si and Al tetrahedra, with four partially ordered tetrahedral sites where the *Si*2 site has the highest Si content and the *Si*4 site has the highest Al content. Sodium atoms and $H_2O$ groups are in the cages of the framework. The framework is topologically nearly tetragonal while the cage contents are strikingly monoclinic. The holotype specimen of garronite-(Na) is deposited in the collections of the Canadian Museum of Nature, Ottawa, Ontario, Canada. **Yu.U.**

## GAUTHIERITE*

T.A. Olds, J. Plášil, A.R. Kampf, R. Škoda, P.C. Burns, J. Čejka, V. Bourgoin, and J.-C. Boulliard (2017) Gauthierite, $KPb[(UO_2)_7O_5(OH)_7]\cdot 8H_2O$, a new uranyl-oxide hydroxy-hydrate mineral from Shinkolobwe with a novel uranyl-anion sheet-topology. European Journal of Mineralogy, 29, 129–141.

Gauthierite (IMA 2016-004), ideally $KPb[(UO_2)_7O_5(OH)_7]\cdot 8H_2O$, is a new uranyl-oxide hydroxy-hydrate mineral discovered at the Shinkolobwe Mine, Democratic Republic of Congo, Africa. This mine is famous for the variety of rare secondary uranium minerals found there (it is the type locality for more than 25 minerals) and for its strategic supply of U-ore during the Manhattan Project of WWII. Gauthierite is found only in several specimens on a matrix of uraninite-bearing quartz gangue associated with soddyite and a minor metazeunerite–metatorbernite series mineral. It is a product of oxidation-hydration weathering of uraninite and is presumably formed by the combination of radiogenic lead and uranium from altered uraninite, with K leached from other gangue minerals. Gauthierite forms yellowish orange prismatic crystals up to 1 mm in length with pronounced lengthwise striations. Crystals are elongated on [001] and have pyramidal terminations. Crystal forms are {100}, {101}, {$20\bar{1}$}, {310}, {210}, {120}, and {010}. Twinning was not observed. The mineral has a light orange streak and vitreous luster. It is brittle with an uneven fracture and perfect cleavage on {010}. The Mohs hardness is ~3 to 4. The density was not measured because of the paucity of pure material; $D_{calc}$ = 5.437 g/cm$^3$. In the transmitted plain polarized light gauthierite is pleochroic with *X* very pale yellow, << *Y* and *Z* orange-yellow. It is optically biaxial (–), $\alpha$ = 1.780(5), $\beta$ = 1.815(5), $\gamma$ = 1.825(5) (white light), $2V_{meas}$ = 58(1)°, $2V_{calc}$ = 55.4°; $X = \mathbf{b}$, $Y \approx \mathbf{a}^*$, $Z \approx \mathbf{c}$ (or $X = \mathbf{b}$, $Y \wedge \mathbf{a}$ = 14° in obtuse $\beta$). Dispersion of an optical axes is extreme $r >> v$. The bands of the Raman spectra are (cm$^{-1}$): 833 and 821 [$\nu_1$ $(UO_2)^{2+}$ symmetric stretching]; 696, 558, and 539 ($\delta$ U-OH bending vibrations and/or libration modes of $H_2O$); 464, 454, 403, 355, and 328 ($\nu$ U-$O_{ligand}$ vibrations); 260, 204 [split doubly degenerate $\nu_2(\delta)$ $(UO_2)^{2+}$. bending]; 160 and 128 (lattice vibrations). The bands of the FTIR spectra are (cm$^{-1}$): 3350 ($\nu$O-H of the hydrogen-bonded hydroxyls); 3154 ($\nu$O-H of the hydrogen-bonded $H_2O$); 2919 and 2852 (probably related to organic impurities); 1980 broad (overtones or combination modes); 1607 [$\nu_2$ ($\delta$) $H_2O$ bending]; 915 strong [$\nu_3$ $(UO_2)^{2+}$ antisymmetric stretching]; 764 (libration of $H_2O$ or $\delta$ U-OH bending). The average of 9 electron probe WDS analyses [wt% (range)]: $K_2O$ 1.29 (1.16–1.38), PbO 7.17 (6.57–7.71), $UO_3$ 82.10 (81.60–82.44), $H_2O$ 8.78 (structure), total 99.34. The empirical formula (based on 34 O apfu) is: $K_{0.67}Pb_{0.78}U_7O_{34}H_{23.77}$. The strongest powder X-ray diffraction lines are [*d* Å (*I*%; *hkl*)]: 7.28 (49; 020,400), 3.566 (67; $040,\bar{8}02,\bar{2}04$), 3.192 (100; $622,\bar{2}24$), 2.541 (18; $\bar{8}42,\bar{2}44$), 2.043 (14; 406), 2.001 (23; $662,\bar{2}64$,14 2 0), 1.962 (14; $426,\bar{1}46$), 1.783 (17; 12 0 4,$\overline{10}$ 4 6). Unit-cell parameters refined from the powder data *a* = 29.842(5) Å, *b* = 14.563(5) Å, *c* = 14.088(5) Å, $\beta$ = 103.906(6)°, *V* = 5943 Å$^3$. The single crystal X-ray data shows gauthierite is monoclinic, $P2_1/c$, with *a* = 29.844(2) Å, *b* = 14.5368(8) Å, *c* = 14.0406(7) Å, $\beta$ = 103.708(6)°, *V* = 5917.8Å$^3$, *Z* = 8. The crystal structure refined to *R* = 0.0567 for 6997 $I > 3\sigma(I)$ reflections. It contains sheets of $UO_7$ pentagonal bipyramids of $[(UO_2)_7O_5(OH)_7]^{3-}$ composition with a novel topology similar to that of vandendriesscheite, but with a unique chain sequence. The sheets alternate with interlayer $K^+$ and $Pb^{2+}$ atoms and molecular $H_2O$. The mineral is named in honor of Gilbert Joseph Gauthier (1924–2006), a famous Belgian geologist and mineralogist and an enthusiast of Katanga minerals. He found the mineral and provided it for the study. The description of the gauthierite is based on one holotype specimen deposited in the Natural History Museum of Los Angeles County, Los Angeles, California, U.S.A. **D.B.**

## GURIMITE* AND HEXACELSIAN*

I.O. Galuskina, E.V. Galuskin, Ye. Vanek, K. Prusik, M. Stasiak, P. Dzierżanowski, and M. Murashko (2017) Gurimite, $Ba_3(VO_4)_2$ and hexacelsian, $BaAl_2Si_2O_8$—two new minerals from schorlomite-rich paralava of the Hatrurim Complex, Negev Desert, Israel. Mineralogical Magazine, 81(4), 1009–1019.

Gurimite (IMA 2013-032), ideally $Ba_3(VO_4)_2$, and hexacelsian (IMA 2015-045), ideally $BaAl_2Si_2O_8$, are new minerals found at the Gurim Anticline in the Negev Desert, Israel. The new minerals were observed in thin veins of paralava cutting gehlenite-flamite hornfels where gurimite is a common accessory mineral and hexacelsian is more rare. The new minerals occur in isolated oval polymineralic inclusions 1–2 cm in size in rankinite, and in angular aggregates interstitial to crystals of rankinite, gehlenite, pseudowollastonite, schorlomite, and fluorapatite–fluorellestadite. Other associated minerals include flamite, larnite, schorlomite, andradite, kalsilite, cuspidine, aradite, zadovite, and khesinite. Gurimite was also found associated with minerals of the zadovite–aradite series and walstromite in paralava of Zuk Tamrur (Negev Desert) as well as in an outcrop near the highway linking Jerusalem with the Dead Sea and Nabi Musa The new minerals are proposed to have formed at temperatures >1100 °C from the relatively fast crystallization of the paralava residual melt enriched with Ba, V, S, P, Ti, U, and other elements not incorporated in the early crystallized Ca-silicates and kalsilite filling interstices between those. Gurimite and hexacelsian form elongate crystals, typically <10 μm thick and <50 μm long. Both minerals form colorless transparent crystals with white streak and vitreous luster, have irregular fracture and good cleavage on {001} (very good for hexacelsian). Density and optical properties were not measured due to small crystal size; $D_{calc}$ = 5.044 g/cm$^3$ for gurimite and 3.305 g/cm$^3$ for hexacelsian. Gurimite and hexacelsian are non-pleochroic, optically uniaxial with calculated mean refractive indices of 1.945 and 1.561, respectively. The Raman spectrum of gurimite shows bands at (cm$^{-1}$): 980 $\nu_1(SO_4)^{2-}$, 920 $\nu_1(PO_4)^{3-}$, 839 $\nu_1$ and $\nu_3(VO_4)^{3-}$, 781 $\nu_3(VO_4)^{3-}$, 418 $\nu_4(VO_4)^{3-}$, 380 $\nu_4(VO_4)^{3-}$, 330 $\nu_2(VO_4)^{3-}$, 174 $T$(Ba) + $T(VO_4)^{3-}$, 136 $T$(Ba) + $R(VO)^{3-}$, 106 $T$(Ba). The spectrum is identical to the one for synthetic $Ba_3(VO_4)_2$. The Raman spectrum of hexacelsian shows bands at (cm$^{-1}$): 107, 296, 406, 461, 480, 594, 678, 809, 890, 924, 961, 1087, and 1119. Two strong bands at ~406 and 107 cm$^{-1}$ are related to $\nu_2(SiO_4)$ and ($T'M$), respectively, and the spectrum is similar to that of the synthetic disordered β-$BaAl_2Si_2O_8$. Small crystal size (thickness <10 μm) prevented single-crystal X-ray diffraction experiments for gurimite and hexacelsian. Electron backscattered diffraction (EBSD) was used to study their structure by fitting the patterns of the minerals studied to those of their known synthetic analogs. The average of 18 electron probe analyses of gurimite [wt% (range)] is: $SO_3$ 1.17 (0.87–0.96), $V_2O_5$ 26.80 (25.67–27.88), $P_2O_5$ 0.59 (0.18–1.01), $SiO_2$ 0.04 (0–0.25), $Fe_2O_3$ 0.04 (0–0.13), $Al_2O_3$ 0.33 (0.29–0.36), CaO 0.76 (0.44–1.59), SrO 0.33 (0.23–0.45), BaO 69.10 (67.79–70.10), $K_2O$ 0.70 (0.53–1.01), $Na_2O$ 0.16 (0.13–0.19), total 100.03. This gives the empirical formula $(Ba_{2.794}K_{0.092}Ca_{0.084}Na_{0.033}Sr_{0.017})_{\Sigma 3.020}(V^{5+}_{1.827}S^{6+}_{0.091}P^{5+}_{0.05}Al_{0.040}Si_{0.005}Fe^{3+}_{0.05})_{\Sigma 2.017}O_8$ based on 8 O apfu.The average of 14 electron probe analyses on a crystal of hexacelsian [wt% (range)] is: $SiO_2$ 33.06 (32.62–33.48), $Fe_2O_3$ 1.55 (1.29–2.02), $Al_2O_3$ 26.07 (25.66–26.39), CaO 0.64 (0.30–1.20), BaO 37.76 (36.67–39.21), $K_2O$ 0.75 (0.70–0.81), $Na_2O$ 0.08 (0.07–0.11), total 99.91. This gives the empirical formula $(Ba_{0.911}K_{0.059}Ca_{0.042}Na_{0.010})_{\Sigma 1.022}Al_{1.891}Fe^{3+}_{0.072}Si_{2.034}O_8$ based on 8 O apfu. The strongest lines in the X-ray powder-diffraction pattern [$d$ Å ($I$%; $hkl$)] of gurimite, calculated from the single-crystal structure refinements of the synthetic analog, are: 3.2434 (100; 015), 2.8906 (79; 110), 2.1580 (48; 205), 1.7292 (26; 125), 1.9591 (25; 1 0 10) and 2.2652 (19; 024). For hexacelsian, these are: 3.949 (100; 102), 2.965 (75; 104), 2.646 (44; 110), 2.198 (30; 202), 7.779 (28; 002), and 1.582 (22; 214). The electron backscattered diffraction (EBSD) pattern of gurimite was fitted to the structure of its synthetic analog with cell parameters $R\overline{3}m$, $a$ = 5.784(1), $c$ = 21.132(1) Å, $V$ = 612.2 Å$^3$, $Z$ = 3, giving a mean angular deviation = 0.43° (good fit). Fitting for hexacelsian to synthetic β-hexacelsian with $P6_3/mcm$, $a$ = 5.2920(4) Å, $c$ = 15.557(2) Å, α = β = 90°, γ = 120° gave a mean angular deviation of 0.51–0.59°. Gurimite is the analog to well-known synthetic phase $Ba_3(VO_4)_2$ with palmierite [$K_2Pb(SO_4)_2$] structure type. Hexacelsian is the natural analog of the disordered polytype β-hexacelsian. It has the $CaAl_2Si_2O_8$ structure type, a layered sorosilicate structure where Ba cations are located between ditetrahedral layers of disordered Si and Al. Gurimite is named after the geographical region of Gurim, its type locality. The type specimen is deposited in the mineralogical collection of the Museum of Natural History in Bern, Switzerland. Hexacelsian is the historical name of the synthetic phase with structure and composition analogous to the mineral described in this paper and named after Anders Celsius (1701–1744), Swedish astronomer, physicist, and naturalist. Type material is deposited in the mineralogical collection of Mineralogical Museum, University of Wroclaw, Poland. **O.C.G.**

## HANSESMARKITE*

H. Friis, M.T. Weller, and A.R. Kampf (2017) Hansesmarkite, $Ca_2Mn_2Nb_6O_{19}\cdot 20H_2O$, a new hexaniobate from a syenite pegmatite in the Larvik Plutonic Complex, southern Norway. Mineralogical Magazine, 81(3), 543–554.

Hansesmarkite (IMA 2015-067), ideally $Ca_2Mn_2Nb_6O_{19}\cdot 20H_2O$, is a new mineral from Tvedalen, Larvik, Vestfold, Norway. It was discovered in a miaskitic pegmatite dike ~20 cm thick on level 4 of the AS Granit larvikite quarry where it occurs on fracture surfaces in the center of the dike, always on top of gonnardite. This part of the pegmatite dike experienced hydrothermal alteration. Associated minerals include analcime, arsenopyrite, behoite, bertrandite, calcite, chiavennite, chlorite, epididymite, fluorapophyllite-(K), fluorite, galena, gonnardite, hambergite, linarite-(OH), molybdenite, natrolite, neotocite, and peterandresenite. Hansesmarkite typically forms fine-grained aggregates in patches up to 6 mm across. Distinct crystals, as tablets elongated on [100] up to 0.3 mm in size, occur rarely within the patches. Observed crystal forms are {100}, {010}, {011}, {01$\overline{1}$}, {10$\overline{1}$}, {1$\overline{1}$1}, {1$\overline{1}$0}, {1$\overline{2}$2}, {12$\overline{3}$} and {210}. Crystals of hansesmarkite are transparent, yellow (faint) with very pale-yellow streak, and a vitreous to resinous luster. The mineral is brittle with curved fracture and good cleavage on {011} and {01$\overline{1}$}. Density was not measured due to paucity of material; $D_{calc}$ = 2.74 g/cm$^3$. The estimated Mohs hardness is ~2–2½. Hansesmarkite exhibits no luminescence under long- or short-wave UV light nor under electron beam. In transmitted plane-polarized light, the mineral is pleochroic with $X$ (almost colorless) < $Y$ (pale yellow) << $Z$ (orange-yellow). It is biaxial (+), α = 1.683(2), β = 1.698(2), γ = 1.745(3) (white light); $2V_{meas}$ = 60.7(6)°, $2V_{calc}$ = 60.3°; $X \wedge \mathbf{c}$ = 20°, $Y \wedge \mathbf{b}$ = 16°, $Z \wedge \mathbf{a}$ = 5°. The dispersion of an optical axes is moderate $r > v$. The main absorption bands of Raman spectrum (cm$^{-1}$, s = strong, m = medium, w = weak, n = narrow, b = broad, s = shoulder) are: 913 s,n (stretching of Nb-O$t$), 865 m,n (stretching of Nb-O$t$), 841w,s (stretching of Nb-O$t$), 734 w,b (stretching of Nb-O$b$), 520 w,b (stretching of Nb-O$b$/breathing mode O$b$), 473 w,s (stretching of Nb-O$b$/breathing mode O$b$), 302 m,n (Nb-O-Nb cage deformation), and 217 m,n (Nb-O-Nb bending mode). All bands are associated with the Lindqvist ion and are typical for such compounds. The average of 5 electron probe WDS analyses is [wt% (St. dev.)]: $Nb_2O_5$ 64(1), MnO 10.2(3), CaO 8.6(3), FeO 0.6(3), $Na_2O$ 0.04(3), $K_2O$ 0.02(2), $H_2O$ 28.94 (from structure solution). This gives the empirical formula $(Ca_{1.93}Na_{0.02}K_{0.01})_{\Sigma 1.96}(Mn_{1.79}Fe_{0.11})_{\Sigma 1.90}Nb_6O_{18.84}\cdot 20H_2O$ based on 6 Nb apfu. The strongest lines in the simulated X-ray powder-diffraction pattern [$d$ Å ($I$%; $hkl$)] are: 8.610 (100; 100,01$\overline{1}$), 9.282 (36; 001), 3.257 (30; 03$\overline{1}$,1$\overline{3}$1) and 3.058 (18; 1$\overline{3}$0, 2$\overline{1}$2). Single-crystal X-ray diffraction data refined to $R_1$ = 2.50 for $I \geq 4\sigma(I)$ reflections shows the mineral is triclinic, $P\overline{1}$, $a$ = 9.081(4), $b$ = 9.982(8), $c$ = 10.60(1) Å, α = 111.07(8), β = 101.15(6), γ = 99.39(5)°, $V$ = 850.8 Å$^3$, and $Z$ = 1. The structure was solved at 120 K because of thermal instability. The structure of hansesmarkite has six edge-sharing Nb-octahedra forming the Lindqvist ion. The Mn octahedron connects two Lindqvist ions to form rods along [100] that are inter-connected by Ca, forming a three-dimensional structure via hydrogen bonds. Comparison with the structures of other natural hexaniobates peterandresenite $Mn_4Nb_6O_{19}\cdot 14H_2O$ and melcherite $(Ba,K)_2(Na,Ca)_2MgNb_6O_{19}\cdot 6H_2O$ is discussed. The mineral is named in honor of Hans Morten Thrane Esmark (1801–1882), a Norwegian priest from the town of Brevik, an enthusiastic mineral collector in the pegmatites who had discovered several new mineral species including aegirine, leucophanite, and thorite. Type material is deposited at the Natural History Museum, University of Oslo, Norway, and a vial containing loose crystals of hansesmarkite is in the Mineral Sciences Department, Natural History Museum of Los Angeles County, California, U.S.A. **O.C.G.**

## HYDROXYLGUGIAITE*

J.D. Grice, R. Kristiansen, H. Friis, R. Rowe, M.A. Cooper, G.G. Poirier, P. Yang, and M.T. Weller (2017) Hydroxylgugiaite: A new beryllium silicate mineral from the Larvik plutonic complex, southern Norway and the Ilímaussaq alkaline complex, south Greenland; the first member of the melilite group to incorporate a hydrogen atom. Canadian Mineralogist, 55(2), 219–232.

Hydroxylgugiaite (IMA 2016-009) with simplified formula $(Ca,\square)_4(Si,Be)_2(Be,Si)_4O_{11}(OH)_3$, is a new melilite group mineral collected in from two localities in the Larvik plutonic complex in Porsgrunn, Telemark, Norway (Langangen, 59°50′34″ N, 9°41′38″ E, the type locality for ferrochiavenite; and Saga I quarry, 59°2′40″ N, 9°50′00″), and one locality (on top of Mt. Nakkaalaaq, 60°58′56″ N, 45°54′58″ W) in Ilímaussaq, southern Greenland. In the first locality hydroxylgugiaite occurs in a syenite pegmatite associated to microcline, albite, biotite, zircon, pyrochlore, fayalite, magnetite, ferrochiavennite, and gadolinite-(Ce) (magmatic phase); aegirine, analcime, pyrophanite, nepheline, calcite, natrolite, pyrite, molybdenite, galena, sphalerite, thomsonite-Ca, hambergite, and chlorite (hydrothermal phase). In the second locality, at the Saga I quarry, occurs as small grayish pillow-like crystals in vugs in analcime in a syenite pegmatite with aegirine, eudidymite, bertrandite, helvine, gibbsite, calcite, chlorite, annite, fluorite, and montmorillonite. In both localities, the mineral occurs as stacked, elongate (100 × 20 μm) tetragonal prisms at Blåfjell and individual or aggregates of flattened (30 × 50 μm) tetragonal dipyramids, {111}. In the Ilímaussaq complex hydroxylgugiaite occurs as one of the last Be-minerals in cavities in a large pegmatite, associated to other Be-minerals such as bavenite, barylite, behoite, bertrandite, epididymite, genthelvite, helvine, leucophanite, odintsovite, and a meliphanite-like mineral, which grew as replacement of previous epididymite. In this latter locality hydroxylgugiaite forms small, euhedral crystals in vugs and is associated with aegirine, an apatite-group mineral, bavenite, calcite, epididymite (primary and secondary), fersmite, helvine, microcline, and a pyrochlore-group mineral. Hydroxylgugiaite is colorless or white to gray with a white streak and vitreous luster. It is translucent to transparent, non-fluorescent, and has a Mohs hardness of ~5. Cleavage and parting are not observed while tenacity is brittle. $D_{calc}$ = 2.79 g/cm³. It is optically uniaxial (+), with ω = 1.622(2), ε = 1.632(2) (λ = 590 nm), non-pleochroic. The electron probe WDS analysis average (9 spots Blåfjell/*8 spots Saga*/**9 spots Nakkaalaaq**) [wt% (range)] is: $SiO_2$ 42.03 (41.19–42.61)/*44.06 (42.95–44.75)*/**44.71 (43.55–45.39)**, $Al_2O_3$ 1.39 0.59–2.77/*0.74 (0.59–0.79)*/**0.34 0.23–0.48)**, FeO 1.12 (0.70–2.05)/*0.22 (0.18–0.33)*/**0.10 (0.04–0.16)**, MnO 1.10 (0.88–1.25)/*0.74 (0.60–1.15)*/**0.41 (0.21–0.96)**, MgO 0.02 (0–0.02)/*0 (0–0.01)*/**0 (0–0.01)**, CaO 32.35 (32.20–33.10)/*32.90 (32.42–33.59)*/**34.56 (33.73–34.97)**, $Na_2O$ 0.47 (0.35–0.73)/*2.04 (1.82–2.36)*/**0.81 (0.68–0.98)**, BeO 12.51 (on the basis of Si+Be+Al=6)/*13.47(±0.22, LA-ICP-MS)*/**13.30 (on the basis of Si+Be+Al=6)**, $H_2O$ [calculated on the basis of (OH)+F = 3 pfu], 5.32/*4.93*/**5.20**, F 0.43 (0.30–0.76)/*1.74 (1.44–2.09)*/**1.22 (0.92–1.54)**, –O=F 0.18/*0.73*/**0.51**, total 96.57/*100.10*/**100.14**. The empirical formulae calculated on the basis of 14 anions are: Blåfjell $(Ca_{2.82}Na_{0.07}Mn_{0.08}Fe_{0.08}Mg_{0.00})_{\Sigma 3.05}(Si_{3.42}Be_{2.45}Al_{0.13})_{\Sigma 6}O_{11}[(OH)_{2.89}F_{0.11}]_{\Sigma 3}$; Saga $(Ca_{2.76}Na_{0.31}Mn_{0.05}Fe_{0.01})_{\Sigma 3.13}(Si_{3.45}Be_{2.53}Al_{0.07})_{\Sigma 6.05}O_{11}[(OH)_{2.57}F_{0.43}]_{\Sigma 3}$; Nakkaalaaq $(Ca_{2.88}Na_{0.12}Mn_{0.02})_{\Sigma 3.02}(Si_{3.48}Be_{2.49}Al_{0.03})_{\Sigma 6}O_{11}[(OH)_{2.70}F_{0.30}]_{\Sigma 3}$. The strongest lines in the X-ray powder diffraction pattern are [*d* Å (*I*; *hkl*)]: 3.604 (27; 111), 2.971 (34; 201), 2.755 (100; 211), 2.318 (26, 221), 2.212 (301), 1.9866 (19; 212), 1.7056 (22, 312). The unit-cell parameters refined from the powder data are: $a$ = 7.415(1), $c$ = 4.964(2) Å, $V$ = 272.9 Å³. X-ray diffraction intensity data was collected in one single crystal of 0.07 × 0.04 × 0.04 mm from Saga with unit-cell parameters are: $a$ = 7.4151(2), $c$ = 4.9652(1) Å, $V$ = 272.9 Å³, and one single crystal from Nakkaalaaq of unreported size collected at 150(2) K with unit-cell parameters are: $a$ = 7.4007(2), $c$ = 4.9609(2) Å, $V$ = 271.70(1) Å³, both tetragonal, $P42_1m$, $Z$ = 1. The crystal structure of hydroxylgugiaite was refined to $R_1$ = 0.028 for 342 independent $F_o > 4\sigma(F_o)$ reflections (Saga) and to $R_1$ = 0.016 for 297 independent $F_o > 4\sigma(F_o)$ reflections (Nakkaalaaq). Hydroxylgugiaite is essentially isostructural with gugiaite. The structure of hydroxylgugiaite has two distinct layers: in one layer, one Ca site with eightfold coordination is a square antiprism polyhedron, which is in a layer with the H atoms; the second layer consists of corner-sharing Si/Be atoms in tetrahedral coordination with O. One H atom is bonded to an apical O atom that is not shared by two tetrahedra, and is present only when there is a Ca-site vacancy. Hydroxylgugiaite is named as the OH analog of gugiaite. The holotype is preserved at the Natural History Museum, University of Oslo, Norway, as well as material from Nakkaalaaq. A cotype is deposited at the Canadian Museum of Nature, Ottawa, Canada. **F.C.**

## HYDROPASCOITE*

A.R. Kampf, B.P. Nash, J. Marty, J.M. Hughes, and T.P. Rose (2017) Hydropascoite, $Ca_3(V_{10}O_{28})\cdot 24H_2O$, a new decavanadate mineral from the Packrat mine, Mesa County, Colorado. Canadian Mineralogist, 55(2), 207–217.

Hydropascoite (IMA 2016-032) ideally $Ca_3(V_{10}O_{28})\cdot 24H_2O$, is a new mineral species discovered in Packrat mine, Mesa County, Colorado, U.S.A. (38°38′51.28″N, 109°02′49.77″W). The mine is located near the northern end of the Uravan mineral belt, which consists of bedded or roll-front deposits in sandstone, where uranium and vanadium were transported as oxyanions of $U^{6+}$ and $V^{4+}$ in weakly alkaline, moderately reducing, $CO_2$-rich ground water. Later exposure of these deposits to more oxidizing near-surface aqueous solutions resulted in a variety of secondary phases. Hydropascoite in one of the few rare known species containing the $[V_{10}O_{28}]^{6-}$ decavanadate cluster. Hydropascoite has so far been found on only one specimen. It occurs on asphaltum associated with montroseite- and corvusite-bearing sandstone, along with other secondary minerals as pascoite, rossite/metarossite, and sherwoodite, found in close association. Hydropascoite crystals form as blades, flattened on {001} and elongated on [100], up to 2 mm in length, exhibiting the forms {001}, {010}, {011}, {101}, {101}, and {110}. Macroscopic color is dark yellow-green, and the streak is pistachio green. Crystals are transparent with a vitreous luster and exhibit brittle tenacity, perfect cleavage on {001}, and irregular fracture. Mohs hardness is about 1½. $D_{meas}$ = 2.38(2) g/cm³ (by flotation in a methylene iodide–toluene mixture), $D_{calc}$ = 2.324 g/cm³. At room temperature, hydropascoite is very slowly soluble in $H_2O$ and immediately soluble in HCl. In transmitted plane-polarized light, the mineral is pleochroic: $X$ = bluish green > $Y$ = orange > $Z$ = yellowish green. It is optically biaxial (–), α = 1.730(5), β = 1.780(5), γ = 1.790(5) (white light), $2V_{meas}$ = 54.1(6)°, $2V_{calc}$ = 47.1°; $X \wedge \mathbf{a} \approx 10°$, $Z \wedge \mathbf{c}^* \approx 20°$. It has anomalous extinction colors. Dispersion of an optical axes is extreme but sense was not determined. The average of 26 electron probe WDS analyses on eleven crystals [wt% (range)] is (analyzed values/*normalized values to provide a total of 100% when combined with the calculated $H_2O$*): $Na_2O$ 0.78/*0.62* (0.17–2.20), CaO 12.62/*10.02* (9.10–13.90), $V_2O_5$ 76.10/*60.44* (66.25–82.63), $H_2O$ (by difference/*by crystal structure*)10.50/*28.92*, total 100. The empirical formula on the basis of 52 apfu is $(Ca_{2.69}Na_{0.30})_{\Sigma 2.99}(H_{0.31}V^{5+}_{10}O_{28})\cdot 24H_2O$. The strongest lines in the X-ray powder diffraction pattern are [*d* Å (*I*; *hkl*)]: 8.92 (100; 110), 10.70 (31; 002), 9.77 (28; 010), and 7.41 (22; 102). X-ray diffraction intensity data was collected in one single crystal of 30 × 90 × 130 μm. The single crystal unit-cell parameters are: $a$ = 10.0870(19), $b$ = 11.0708(2), $c$ = 21.8112(15) Å, $V$ = 2150.2 Å³, triclinic, $P1$, $Z$ = 2. The crystal structure of hydropascoite was solved by direct methods and refined to $R_1$ = 0.0488 for 8187 observed $F_o > 4\sigma(F_o)$ reflections. As other decavanadates, the structure of hydropascoite consist of two parts: a rigid structural unit and an interstitial complex. Hydropascoite is one decavanadate where the rigid unit is $[V_{10}O_{28}]^{6-}$ and the interstitial complex is $[Ca_3(H_2O)_{24}]^{6+}$. While the formula of hydropascoite is consistent with all V as $V^{5+}$, the green color of hydropascoite suggests intervalence charge transfer (IVCT) between $V^{4+}$ and $V^{5+}$ in the decavanadate structural unit. The name hydropascoite is based upon the compositional and structural similarity of the mineral to pascoite, $Ca_3(V_{10}O_{28})\cdot 17H_2O$, and the fact that it has 41% more $H_2O$ groups. The holotype specimen of hydropascoite is deposited in the Natural History Museum of Los Angeles County, Los Angeles, California, U.S.A. **F.C.**

## MEIERITE*

R.C. Peterson, G. Farber, R.J. Evans, L. Groat, L. MacNeil, B. Joy, B. Lafuente, and T. Witzke (2016) Meierite, a new barium mineral with KFI-type zeolite framework from the Gun Claim, Yukon, Canada. Canadian Mineralogist, 54(5), 1249–1259.

Meierite (IMA 2014-039), with a simplified chemical formula $Ba_{44}Si_{66}Al_{30}O_{192}Cl_{25}(OH)_{33}$, was discovered at the Gun Claim, 5 km southeast of the Itsi Lakes, Yukon, Canada (130°0′51″W, 62°50′50″N) in the Pb-Zn skarn deposit associated with a quartz monzonite stock and formed in the adjacent sedimentary package of argillite, limestone, shale, slate, and quartzite. Mineralized zones occur in pyroxene-quartz skarn lenses and consist of sphalerite and chalcopyrite with pyrrhotite, barite, witherite, and several rare barium silicates such as gillespite, cerchiaraite-(Fe), and pellyite. Meierite forms equant grains up to 200 μm across enclosed within large pink gillespite crystals with pellyite and small white equant grains of edingtonite. Where meierite is not fully enclosed by gillespite, it alters to a mixture of cerchiaraite-(Fe) and hedenbergite. Meierite is white and clear, transparent, with a white streak and vitreous luster. It is brittle with a conchoidal fracture and no cleavage. The estimated Mohs hardness is 5½. The density was not measured; $D_{calc}$ = 3.50 g/cm$^3$. Meierite is isotropic, with $n$ = 1.589 (λ = 589 nm). The Raman spectrum of meierite shows weak bands between 3680 and 3100 cm$^{-1}$ (O-H stretching), bands between 1130–880 cm$^{-1}$ ($\nu_3$ mode) and 830–670 cm$^{-1}$ ($\nu_1$ mode) corresponding to the T-O anti-symmetric and symmetric vibrations within the [$TO_4$] groups, bands between 560 and 260 cm$^{-1}$ (T-O-T bending vibrations), and bands below 200 cm$^{-1}$ related to the rotational and translational modes of the [$TO_4$] tetrahedra. The average of 11-point WDS electron probe analyses is (wt%): $Na_2O$ 0.15, $K_2O$ 0.21, CaO 0.21, BaO 47.61, FeO 0.27, $Al_2O_3$ 11.75, $TiO_2$ 0.05, $SiO_2$ 28.30, $P_2O_5$ 1.61, Cl 6.64, –O=C1 1.50, total 95.29; $OH^-$ (added based on crystal structure refinement) 4.29. total 99.58 (no ranges or deviations provided). The empirical formula is: $Ba_{41.1}Na_{0.7}K_{0.6}Fe_{0.5}Ca_{0.5}\,Ti_{0.1}[Si_{62.5}Al_{30.5}P_{3.0}]_{96}O_{192}Cl_{24.82}(OH)_{33.4}$, calculated based on the full occupancy of the tetrahedral framework by Al, Si, and P atoms, and the charge balance assumptions. The strongest lines in the powder X-ray diffraction pattern are [$d$ Å ($I$%; $hkl$)]: 4.39 (70; 411), 4.16 (26; 420), 3.798 (25; 422), 3.288 (34; 440), 3.189 (100; 433), 3.016 (72; 611), 2.803 (42; 622), 2.629 (31; 710), 2.323 (46; 800), and 2.287 (59; 741). The crystal structure of meierite was refined to $R$ = 4.47% using the starting atomic coordinates of the synthetic zeolite $Na_{30}Al_{30}Si_{66}O_{192}\cdot 98H_2O$. The new mineral is cubic, $Im\bar{3}m$, $a$ = 18.5502(4) Å, $V$ =6383.3 Å$^3$, Z = 1. The crystal structure of meierite is based on the framework built of eight-membered and double six-membered rings of Si, Al, and P tetrahedra. Barium and Cl atoms and (OH) groups are located in various cavities of the framework. The mineral was named after Walter M. Meier, a pioneer in zeolite research (1926–2009). The type specimen is deposited in the Royal Ontario Museum, Toronto, Canada. **Yu.U.**

## PARASCANDOLAITE*

F. Demartin, I. Campostrini, C. Castellano, and M. Russo (2014) Parascandolaite, $KMgF_3$, a new perovskitetype fluoride from Vesuvius. Physics and Chemistry of Minerals, 41, 503–514.

Parascandolaite (IMA 2013-092), ideally $KMgF_3$, is a new mineral isotypic to cubic perovskites, found as a volcanic sublimate at Vesuvius volcano (Naples, Italy) on 1944 eruption lava scoria (fumarole B5, temperature ca. 80 °C). It is associated with opal, cerussite, mimetite, phoenicochroite, and fluornatrocoulsellite. It forms transparent colorless to white cubic crystals up to 0.5 mm in length, with a vitreous luster. No twinning was observed. Cleavage is perfect on {100}. No fluorescence was observed under either short- or long-wave ultraviolet radiation. $D_{meas}$ = 3.11(1) g/cm$^3$ (by flotation in a diiodomethane–toluene mixture), $D_{calc}$ = 3.123 g/cm$^3$. The mineral is isotropic with $n$ = 1.395(5) (580 nm). Mohs hardness is not reported. The average of 8 electron probe EDS analysis on one single crystal [wt% (range)] is: K 32.65 (32.54–32.76), Mg 20.24 (20.10–20.40,) F 46.71 (46.46–47.25), total 99.60. The empirical formula based on 5 apfu is $K_{1.01}Mg_{1.01}F_{2.98}$. The strongest lines in the X-ray powder diffraction pattern are [$d$ Å ($I$%; $hkl$)]: 2.001 (100; 200), 2.831 (83; 110), 2.311 (78; 111), 1.415 (56; 220), 1.633 (35; 211), 1.206 (22; 311). The unit-cell parameter refined from the powder data is: $a$ = 3.9950(2) Å. The single crystal data obtained from one single crystal of 0.02 × 0.02 × 0.02 mm shows the mineral is cubic, $Pm3m$, $a$ = 4.003(1) Å, $V$ = 64.14 Å$^3$, $Z$ = 1. The crystal structure was refined to $R_1$ = 0.0149 for 35 observed $I > 2\sigma(I)$ reflections. Parascandolaite is related to orthorhombic neighborite $NaMgF_3$. Intermediate compositions are tetragonal. The large $K^+$ cations fill the dodecahedral cavity in the cubic perovskite phase, while octahedral sites are filled by Mg coordinated by F. Previously, a mineral with the probable composition of $KMgF_3$ had been reported in sublimates from Nyiragongo volcano (Democratic Republic of Congo) by Herman et al. (1960), although this was not recognized as a novel mineral species (corresponding to unnamed mineral UM1960-02-F:KMg). The name parascandolaite honors Antonio Parascandola (1902–1977), who taught mineralogy, geology, and later volcanology and physical geography at the Pozzuoli Aeronautical Academy, at the Istituto di Mineralogia della Facoltà di Scienze of Napoli and at the Istituto di Mineralogia e Geologia della Facoltà di Agraria of Portici (Napoli). He undertook remarkably accurate studies between 1947 and 1961, providing countless observations about the conditions of formation of the minerals in the fumaroles. The holotype specimen is deposited in the Reference Collection of the Dipartimento di Chimica, Università degli Studi di Milano, Italy. **F.C.**

**Comment:** Following the perovskite nomenclature approved by the Commission on New Minerals, Nomenclature and Classification (CNMNC) of the International Mineralogical Association (IMA) (Mitchell et al. 2017), parascandolaite belongs to the neighborite subgroup of the single perovskites $ABX_3$ and lacks any octahedron tilting. Parascandolaite, has also been found as nano-inclusions in diamonds from Juina by Kaminsky et al. (2016).

### References cited

Hermann, P., Vandenstetten, R., and Hubaux, A. (1960) Sublimés du Nyiragongo (Kivu). Bulletin des Séances de l'Academie Royal des Sciences d'Outr-mer, 6, 961–971.

Kaminsky, F.V., Zakarchenko, O.D., Davies, R., Griffin, W.L., Khachtryan-Blinova, G.K., and Shiryaev, A.A. (2001) Super-deep diamonds from the Juina area, Mato Grosso State, Brazil. Contributions to Mineralogy and Petrology, 140, 734–753.

Mitchell, R.H., Welch, M.D., and Chakhmouradian, A.R. (2017) Nomenclature of the perovskite supergroup: A hierarchical system of classification based on crystal structure and composition. Mineralogical Magazine, 81(3), 411–461.

## PETERSITE-(CE)*

S.M. Morrison, K.J. Domanik, H. Yang, and R.T. Downs (2016) Petersite-(Ce), $Cu^{2+}_6Ce(PO_4)_3(OH)_6\cdot 3H_2O$, a new mixite group mineral from Yavapai County, Arizona, U.S.A. Canadian Mineralogist, 54(6), 1505–1511.

Petersite-(Ce) (IMA 2014-002), ideally $Cu^{2+}_6Ce(PO_4)_3(OH)_6\cdot 3H_2O$, was discovered in a micromount specimen from the Cherry Creek District of Yavapai County, Arizona, U.S.A., donated by Arthur Roe to the Mineral Museum of the University of Arizona. The new mineral named for its chemistry as the Ce-analog of petersite-(Y). Petersite-(Ce) occurs as a rare secondary mineral in the unnamed prospecting pit in weathered Bradshaw granite crossed by veins of milky quartz with a small amount of tourmaline (mined for gold and silver in early 1900s) in association with malachite, chlorite, biotite, quartz, albite, orthoclase, hematite, chalcopyrite, and a hisingerite-like phase. Petersite-(Ce) forms radial clusters of acicular crystals 20 × 20 × 50 μm in size. It is yellowish green, translucent, has a white streak and vitreous luster. It is brittle with uneven fracture and no cleavage or parting. The Mohs hardness is ~3½. The density was not measured; $D_{calc}$ = 3.42(2) g/cm$^{-3}$. Optical properties of petersite-(Ce) were not measured due to the small crystal size. The bands in the Raman spectrum are (cm$^{-1}$): 3499, 3411, and 3292 (O-H stretching modes of $H_2O$ groups); 3072, 2934, 2873, and 2862 (O-H stretching modes of OH groups); 1095, 1084, 1043, and 945 ($PO_4$ stretching modes); 580, 528, and 472 (O-P-O bending modes of $PO_4$); 393 ($CuO_5$ stretching); bands below 350 (corresponding to [$PO_4$] rotations, [$CuO_5$] bending, [$CeO_9$] interactions, and other lattice modes). The averaged 7-point WDS electron probe analyses is [wt% (range)]: $P_2O_5$ 21.671 (20.992–22.480), $SiO_2$ 0.921 (0.623–1.240), $Ce_2O_3$ 3.097 (3.006–3.255), $Y_2O_3$ 1.988 (1.830–2.124), $La_2O_3$ 2.176 (2.017–2.364), $Pr_2O_3$ 0.361 (0.274–0.460), $Nd_2O_3$ 1.575 (1.479–1.730), $Sm_2O_3$ 0.268 (0.189–0.332), $Gd_2O_3$ 0.617 (0.578–0.655), $Dy_2O_3$ 0.190 (0.151–0.221), CuO 51.489 (50.615–52.360), CaO 2.528 (2.405–2.610), $H_2O$ 13.120 (12.100–14.061) (by difference), total 100.00. The empirical formula is $Cu_{6.05}(Ce_{0.18}Y_{0.16}La_{0.12}Nd_{0.09}Gd_{0.03}Pr_{0.02}Dy_{0.01}Sm_{0.01}Ca_{0.42})_{\Sigma 1.04}[(PO_4)_{2.54}(SiO_4)_{0.14}(PO_3OH)_{0.32}(OH)_6]\cdot 3.65H_2O$ based on (P+Si) = 3 pfu. The strongest lines of the powder X-ray diffraction pattern are [*d* Å (*I*%; *hkl*)]: 11.6 (100; 100); 4.36 (7; 210); 3.32 (12; 220); 2.877 (9; 400); 1.961 (2; 322). Petersite-(Ce) is hexagonal, $P6_3/m$, $a$ = 13.2197(18), $c$ = 5.8591(9) Å, $V$ = 886.8 Å$^3$, and $Z$ = 2. The crystal structure was refined to $R$ = 8.55%. Petersite-(Ce)belongs to mixite-group. Its structure is based on the chains of edge-sharing $CuO_5$ square-pyramids extending along the $c$ axis. These chains are connected by edge-sharing $CeO_9$ polyhedra and corner-sharing $PO_4$ tetrahedra. Hydroxyl groups are located in each corner of the $CuO_5$ polyhedra not shared by a neighboring P or Ce atom. Each $CeO_9$ polyhedron is surrounded by three zeolitic channels. The walls of the channels, parallel to $c$, are six-membered rings composed of $CuO_5$ and $PO_4$ polyhedra in a ratio of 2:1, and contain $H_2O$ molecules. The holotype specimens are deposited in the Mineral Museum of the University of Arizona and the RRUFF Project, Tucson, Arizona, U.S.A. **Yu.U.**

### RIETVELDITE*

A.R. Kampf, J. Sejkora, T. Witzke, J. Plášil, J. Čejka, B.P. Nash, and J. Marty (2017) Rietveldite, $Fe(UO_2)(SO_4)_2(H_2O)_5$, a new uranyl sulfate mineral from Giveaway-Simplot mine (Utah, U.S.A.), Willi Agatz mine (Saxony, Germany) and Jáchymov (Czech Republic). Journal of Geosciences, 62(2), 107–120.

Rietveldite (IMA 2016-081), ideally $Fe(UO_2)(SO_4)_2\cdot 5H_2O$, is a new uranyl sulfate described from three localities. In underground Giveaway-Simplot mine, Utah, U.S.A. the mineral formed as a result of postmining oxidation in the humid underground environment of the primary ore minerals deposited as replacements of wood and other organic material and as disseminations in the enclosing sandstone. Rietveldite from that location found on asphaltum in association with ferricopiapite, gypsum, römerite, and shumwayite and on pyrite-impregnated sandstone in association with gypsum, halotrichite, and römerite. At the Willi Agatz mine, Gittersee mining field, Dresden, Saxony, Germany, rietveldite is a weathering product of U-bearing coal and pyrite and is associated with halotrichite, krausite, melanterite, native sulfur, and voltaite. In Jáchymov, Western Bohemia, Czech Republic, the new mineral was identified on one historical museum specimen on the strongly altered gangue in association with rozenite, shumwayite, and a yet unnamed Al-uranyl sulfate. Rietveldite occurs in subparallel to random intergrowths of elongated on [001] and flattened on (010) crystals up to 0.5 mm long (Giveaway-Simplot mine). Crystals from the Willi Agatz mine are acicular to ruler-shaped blades up to 0.5 mm in length usually growing in radiating aggregates and intimately intergrown with halotrichite. Rietveldite from Jáchymov occurs as microcrystalline powdery aggregates up to several millimeters consisting of irregular prismatic crystals up to 60 μm. The individual crystals are transparent, brownish yellow while powdery aggregates have yellowish-beige color. The mineral has a white streak and a vitreous luster. It does not exhibit fluorescence under either long- or short-wave UV radiation. Rietveldite is brittle, with curved fracture and Mohs hardness ~2. Cleavage is good on {010}, and fair on {100} and {001}. $D_{meas}$ = 3.31 g/cm$^3$, $D_{calc}$ = 3.274 g/cm$^3$. It is easily soluble in water at room-temperature. In transmitted plane-polarized light rietveldite is very weakly pleochroic in shades of light brownish yellow color, $Y < X \approx Z$. The mineral is optically biaxial (+), $\alpha$ = 1.570, $\beta$ = 1.577, and $\gamma$ = 1.586 (white light); $2V_{meas}$ = 82(1)°, $2V_{calc}$ = 83.3°; $X$ = **b**, $Y$ = **a**, $Z$ = **c**. Dispersion of an optical axes is very strong $r > v$. Prominent features in the Raman and infrared spectra include the O-H stretching vibrations, symmetric and antisymmetric stretching vibrations of $(UO_2)^{2+}$ ion, and stretching and bending vibrations of symmetrically non-equivalent $(SO_4)^{2-}$ groups. Thermal-gravimetry analyses of rietveldite from Jáchymov shows the mineral dehydrates in two steps: at 20–150 °C, 4.70 wt% (~1.5 $H_2O$) and at 150–320 °C, 10.05 wt% (~3.5 $H_2O$). At 320–900 °C, $FeSO_4$ and $\beta$-$UO_2SO_4$ are formed (a small amount of $SO_3$ may be released). $U_3O_8$ and $Fe_2O_3$ are expected to be end-products of the thermal decomposition of rietveldite. The average of electron probe WDS analysis of rietveldite from Giveaway-Simplot (4 spots on 2 crystals)/*Willi Agatz (6 points)*/**Jáchymov (7 points)** [wt% (range)] is: FeO 9.56 (9.31–9.91)/*9.02 (8.57–9.60)*/**10.34 (10.07–10.83)**, ZnO 1.06 (0.56–1.48)/ – /**0.61 (0.36–0.86)**, MgO 0.14 (0.10–0.18)/*0.48 (0.45–0.51)*/**0.06 (0–0.15)**, MnO 0.10 (0.04–0.16)/*2.32 (1.96–2.99)*/**0.36 (0.22–0.52)**, $SO_3$ 26.99 (26.70–27.19)/*25.39 (24.88–25.98)*/**26.46 (25.61–28.74)**, $UO_3$ 47.32 (46.85–47.66)/*46.62 (45.56–48.30)*/**47.39 (46.50–48.87)**, $H_2O$ (by structure) 15.39/*15.80*/**14.75**, total 100.56/*99.63*/**99.97**. The empirical formulae based on 15 O apfu are, respectively, $(Fe_{0.79}Zn_{0.08}Mg_{0.02}Mn_{0.01})_{\Sigma 0.90}(UO_2)_{0.99}(SO_4)_{2.01}\cdot 5.10H_2O$, $(Fe_{0.76}Mn_{0.20}Mg_{0.07})_{\Sigma 1.03}(UO_2)_{0.98}(SO_4)_{1.91}\cdot 5.29H_2O$, and $(Fe_{0.88}Zn_{0.05}Mn_{0.03}Mg_{0.01})_{\Sigma 0.97}(UO_2)_{1.01}(SO_4)_{2.01}\cdot 4.98H_2O$. The strongest powder X-ray diffraction lines are [*d* Å (*I*%; *hkl*)]: 8.309 (34; 010), 6.477 (100; 200), 5.110 (58; 210), 4.668 (48; 012), 4.653 (36; 211), 3.428 (41; 013), 3.341 (33; 221), 3.238 (49; 400). The unit-cell parameters of rietveldite (Jáchymov) obtained from powder data are: $a$ = 12.9557(5), $b$ = 8.3098(3), $c$ = 11.2915(4) Å, $V$ = 1215.64 Å$^3$. The single crystal X-ray diffraction data shows rietveldite is orthorhombic, $Pmn2_1$, $a$ = 12.9577(9), $b$ = 8.3183(3), $c$ = 11.2971(5) Å, $V$ = 1217.7 Å$^3$, and $Z$ = 4. The crystal structure of rietveldite refined to $R_1$ = 0.037 for 2396 $I_{obs} > 2\sigma(I)$ reflections. It contains $UO_7$pentagonal bipyramids, $SO_4$ tetrahedra and $H_2O$ groups linked to form an infinite chain $[(UO_2)(SO_4)_2(H_2O)]_2$—along [001] identical to those in the structures of svornostite $K_2Mg[(UO_2)(SO_4)_2]_2\cdot 8H_2O$ and synthetic $Mn(UO_2)(SO_4)_2(H_2O)_5$. These chains in the structures of sodium uranyl sulfates oppenheimerite and bobcookite are geometrical isomers to rietveldite ones. The adjacent chains are linked in the [100] direction by $FeO_6$ octahedra, sharing vertices with $SO_4$ tetrahedra into a heteropolyhedral sheets parallel to (010). Adjacent sheets are linked by hydrogen bonding only. Rietveldite is named in honor of Dutch crystallographer Hugo M. Rietveld (1932–2016) the author of well-known Rietveld method of the refinement of neutron and powder X-ray diffraction data who was involved in the study of uranium compounds for much of his scientific career. The description of rietveldite is based on four cotype specimens. Two cotypes from the Giveaway-Simplot mine are deposited in the Natural History Museum of Los Angeles County, California, U.S.A. One cotype from the Willi Agatz mine is deposited in the TU Bergakademie, Freiberg, Germany. The cotype from Jáchymov is deposited in the National Museum, Prague, Czech Republic. **D.B.**

### ROSSOVSKYITE*

S.I. Konovalenko, S.A. Ananyev, N.V. Chukanov, R.K. Rastsvetaeva, S.M. Aksenov, A.A. Baeva, R.R. Gainov, F.G. Vagizov, O.N. Lopatin, and T.S. Nebera (2015) A new mineral species rossovskyite, $(Fe^{3+},Ta)(Nb,Ti)O_4$: crystal chemistry and physical properties. Physics and Chemistry of Minerals, 42(10), 825–833.

Rossovskyite (IMA 2014-056), monoclinic $(Fe^{3+},Ta)(Nb,Ti)O_4$, is a new mineral discovered in granite pegmatites of the Bulgut occurrence, Altai Mts., Western Mongolia (46°36′57.3″N 91°23′40.5″E). Pegmatites of the area are related to the Indertinskiy massif of leucocratic aluminiferous granites of the age of 218 ± 10 Ma. Rossovskyite was found in a lens-shaped zoned pegmatite body (20 × 60 m) at the contact of porphyraceous biotite granite with crystalline schist. The flattened anhedral grains of rossovskyite up to 6 × 6 × 2 cm are present along the contact between smoky to pink quartz of the core and microcline zone with large muscovite crystals up to 70 cm, triplite blocks up to 30 cm), albite, apatite, pyrite, schorl, almandine–spessartine garnet, beryl zircon, pyrite, yttrobetafite-(Y), and tantalo-niobates. Smaller (1–1.5 cm) single-crystal grains of rossovskyite occur in adjacent parts of the microcline zone. Rossovskyite was formed as one of the latest minerals at the autometasomatic albitization stage. Apatite, yttrobetafite-(Y), later generations of muscovite and schorl crystallized after rossovskyite. Yttrobetafite-(Y) forms veinlets in rossovskyite grains. The mineral is black with a black and semi-metallic to dull luster. It is brittle, with uneven fracture with no cleavage or parting observed. The Mohs hardness is 6. $D_{meas}$ = 6.06 and $D_{calc}$ = 6.302 g/cm³. In reflected light rossovskyite is gray. It is distinctly bireflectant and pleochroism from gray on $R_{min}$ to light gray on $R_{max}$. The reflectance values were measured in air in interval between 380 and 700 nm and vary from 15 to 20%. The values for COM wavelengths [$R_{max}$, $R_{min}$ % (λ in nm)] are: 18.9, 17.1 (470); 17.9, 16.2 (546); 17.4, 16.1 (589); 17, 15.9 (650). The mineral is optically biaxial. The IR spectrum contains bands ($cm^{-1}$): 567 strong (with shoulders at 500 and 600) corresponding to cation–oxygen stretching vibrations and weak bands at 1093 and 1185 assigned as overtones. According to the Mössbauer spectrum, the ratio $Fe^{2+}$:$Fe^{3+}$ is 35.6:64.4. The average of five electron probe EDS analyses [wt% (range)] is: MnO 1.68 (1.03–2.21), total Fe as $Fe_2O_3$ 21.24 (19.34–23.20) (apportioned based on Mössbauer data as FeO 5.92, $Fe_2O_3$ 14.66), $TiO_2$ 7.69 (6.47–8.75), $Nb_2O_5$ 26.59 (25.64–28.39), $Ta_2O_5$ 37.51 (35.19–39.15), $WO_3$ 5.61 (not given), total 99.66. The empirical formula based on 4 O apfu is $Mn^{2+}_{0.06}Fe^{2+}_{0.21}Fe^{3+}_{0.47}Ti_{0.25}Nb_{0.51}Ta_{0.43}W_{0.06}O_4$. The strongest lines of the powder X-ray diffraction pattern [*d Å* (*I*%; *hkl*)] are: 3.604 (49; 110), 2.938 (100; $\bar{1}\bar{1}1$), 2.534 (23; 002), 2.476 (29; 021), 2.337 (27; 200), 1.718 (26; $\bar{2}02$), 1.698 (31; $\bar{2}\bar{2}1$), 1.440 (21; $\bar{3}11$). The single-crystal X-ray data shows the mineral is monoclinic, *P*2/*c*, *a* = 4.668(1), *b* = 5.659(1), *c* = 5.061(1) Å, β = 90.21(1)°; *V* = 133.70 Å³, *Z* = 2. The crystal structure of rossovskyite was refined to $R_1$ = 3.98% (all reflections). Topologically the structure is analogous to that of wolframite-group minerals. There are two kinds of zigzag-like chains formed by equivalent *M*-octahedra in which each octahedron shares edges with two neighboring octahedra. Neighboring chains are linked via common vertices of octahedra in such a way that each oxygen atom is coordinated by three cations. Oxygen atoms form close-packed hexagonal layers which are perpendicular to **a** axis. The crystal-chemical formula of rossovskyite is $[(Fe^{3+}_{0.29},Fe^{2+}_{0.21},Mn_{0.06})_{\Sigma 0.56}Ta_{0.32}Nb_{0.11}][Nb_{0.40}Ti_{0.25}Fe^{3+}_{0.18}Ta_{0.11}W_{0.06}]O_4$. Rossovskyite is the only monoclinic Nb-dominant mineral among the members of the columbite family. It is named in honor of Lev Nikolaevich Rossovsky (1933–2009), a specialist in the geology, geochemistry and mineralogy of granite pegmatites for his contributions to investigation of a numerous pegmatite fields in Central Asia and Russia. The type specimen of rossovskyite is deposited in the Mineralogical Museum of the Tomsk State University, Tomsk, Russia. **D.B.**

## TELLUROMANDARINOITE*

M.E. Back, J.D. Grice, R.A. Gault, M.A. Cooper, P.C. Walford, and J.A. Mandarino (2017) Telluromandarinoite, a new tellurite mineral from the El Indio-Tambo mining property, Andes Mountains, Chile. Canadian Mineralogist, 55(1), 21–28.

Telluromandarinoite (IMA 2011-013), ideally $Fe^{3+}_2Te^{4+}_3O_9\cdot 6H_2O$, was discovered in the Wendy open pit, Tambo mine, at the El Indio-Tambo mining property, Coquimbo Province, Andes Mountains, Chile. The deposits of this prolific gold, silver, and copper district are located in strongly hydrothermally altered rhyolitic and dacitic pyroclastic volcanic rocks of Tertiary age (8–11 Ma). Hydrothermal breccias are a common feature of the Tambo mine, and consist of silicified clasts of dacitic tuffs cemented by silica, barite, and alunite. Telluromandarinoite is found in the interstices of the silicified breccias in association with emmonsite, mackayite, poughite, rodalquilarite, and two Fe-tellurite minerals that have now been submitted to the CNMNC for approval. Other minerals identified from the same environment include gold, jarosite, paratellurite, pyrite, scorodite, tellurite, and walfordite. Telluromandarinoite forms isolated platy crystals 0.2 mm or less and aggregates of those. It is pale green, translucent with a white streak and vitreous luster. No fluorescents in short- or long-wave UV light was observed. Telluromandarinoite is brittle with irregular fracture and no cleavage or parting. The Mohs hardness and density were not measured due to small crystal size and paucity of the material; $D_{calc}$ = 3.372 g/cm³. The mineral is non-pleochroic, optically biaxial (+), α = 1.750(3), β = 1.807(3) (589 nm) and γ = 1.910(5) (calculated from retardation measurements using a tilting Berek compensator), $2V_{calc}$ = 76.9°, *Y* = **b**, **c** ^ *Z* = 10° in obtuse β. No dispersion was observed. The average of 10-point electron probe WDS analyses is [wt% (range)]: $SeO_2$ 22.91 (14.72–30.25), $TeO_2$ 44.30 (34.80–52.86), $Fe_2O_3$ 26.43 (25.19–27.54), $H_2O$ 15.81 (by stoichiometry based on the structure and by analogy with mandarinoite), total 111.23. The high total is explained by losses of $H_2O$ in the vacuum. The data normalized to 100 wt% is: $SeO_2$ 20.60, $TeO_2$ 39.83, $Fe_2O_3$ 23.76, $H_2O$ 15.81. The empirical formula is: $Fe^{3+}_{2.03}(Te_{1.71}Se_{1.27})_{\Sigma 2.98}O_9\cdot 6H_2O$, based on 15 O apfu. The strongest lines in the powder X-ray diffraction pattern are [*d* Å (*I*%; *hkl*)]: 8.431 (44; 200), 7.153 (100; $\bar{1}10$), 3.5753 (41; $\bar{2}20$), 3.4631 (21; $\bar{4}02$), 2.9964 (34; $\bar{2}22$), 2.8261 (19; 412). Telluromandarinoite is isostructural with mandarinoite. Its structure was refined to *R* = 3.2% using the initial atomic coordinates of mandarinoite. The new mineral is monoclinic, $P2_1/c$, *a* = 16.9356(5), *b* = 7.8955(3), *c* = 10.1675(3) Å, β = 98.0064(4)°, *V* = 1346.32 Å³. The telluromandarinoite crystal structure has two $Fe^{3+}$ sites, coordinated by O and ($H_2O$) groups forming insular pseudo-octahedra. There are also two $(Te,Se)^{4+}$ and one $(Se,Te)^{4+}$ sites, forming trigonal pyramids with Te atoms at the apex. On the side opposite the trigonal base, there is a non-bonding pair of electrons that manifests itself as a “hole” in the structure. The insular $[FeO_6]$ octahedral and $[TeO_3]$ trigonal pyramids cross-link corners, forming a framework structure. In addition to the three water groups bonded to Fe atoms, there are three other water groups that are not bonded to any cation and are located in the *c*-axis channels being connected via a complex H-bonding scheme. Those are lost under vacuum conditions in the electron microprobe. The mineral is named according to its chemistry as a tellurium analog of mandarinoite $Fe_2Se_3O_9\cdot 6H_2O$. The type specimen is deposited in the Royal Ontario Museum, Natural History Department, Toronto, Canada. **Yu.U.**