# New Mineral Names*,†

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## IN THIS ISSUE

This New Mineral Names has entries for five new minerals, including christofschäferite-(Ce), kasatkinite, osumilite-(Mg), steklite, and vigrishinite. These new minerals have been published in *Zapiski Rossiyskogo Mineralogicheskogo Obshchestva* (Proceedings of the Russian Mineralogical Society) and in *Novye dannye o mineralakh* (New data on minerals).

## CHRISTOFSCHÄFERITE-(CE)*

N.V. Chukanov, S.M. Aksenov, R.K. Rastsvetaeva, D.I. Belakovskiy, J. Göttlicher, S.N. Britvin, and S. Möckel (2012) Christofschäferite-(Ce), $(Ce,La,Ca)_4Mn^{2+}(Ti,Fe^{3+})_3(Fe^{3+},Fe^{2+},Ti)(Si_2O_7)_2O_8$, a new chevkinite-group mineral from the Eifel area, Germany. Novye dannye o mineralakh, 47, 33–42 (in English).

A new mineral, christofschäferite-(Ce), was discovered at the famous outcrop Wingertsbergwand (Wingertsberg Mt.) of the Laacher See volcano near Mendig, Eifel Mountains, Rhineland-Palatinate (Rheinland-Pfalz), Germany. It occurs in a Mn-rich volcanic ejectum, in the association of metasomatic origin with orthoclase, rhodonite, bustamite, tephroite, zircon, fluorapatite, pyrophanite, and jacobsite at the contact of an alkali basalt magma and Mn-rich rock. The new mineral forms coarse crystals or isolated anhedral grains up to 3 mm in size. Christofschäferite-(Ce) is black, resinous, and translucent with a brown streak. It is brittle, with conchoidal fracture. Cleavage or parting were not observed. Mohs hardness is 6. $D_{meas}$ = 4.8(1), $D_{calc}$ = 4.853 g/cm$^3$. The mineral is optically biaxial (–), α = 1.945(10), β = 2.015(10), γ = 2.050(10), $2V_{meas}$ = 70(10)°, $2V_{calc}$ = 68°. It is strongly pleochroic (very dark brown to light brown), $Z > Y > X$. The IR spectrum of christofschäferite-(Ce) is similar to those of other chevkinite-group minerals with the main absorption bands (cm$^{-1}$, s = strong, sh = shoulder): 1119, 1035s, 1010sh, 904s, 849s (Si-O stretching vibrations), 671, 609, 562 (Ti-O stretching vibrations and mixed vibrations of $Si_2O_7$ groups), 511s, 469s, 410sh, 390sh, 374s (combination of Si-O-Si bending vibrations and stretching vibrations in octahedra centered by Mn and Fe). The bands related to H-, B-, or C-bearing groups are absent in IR spectrum. The average (range) of five microprobe

chemical analyses (WDS, valency of Mn by XANES data, wt%) is: CaO 2.61 (2.24–2.98), $La_2O_3$ 19.60 (19.20–19.83), $Ce_2O_3$ 22.95 (22.84–23.06), $Pr_2O_3$ 0.56 (0.43–0.68), $Nd_2O_3$ 2.28 (2.01–2.50), MgO 0.08 (0–0.20), MnO 4.39 (4.27–4.51), total Fe as FeO 6.98 (6.74–7.26) (apportioned in the proportions $Fe^{2+}:Fe^{3+}$ = 3:2, by structural data: FeO 4.18, $Fe_2O_3$ 3.11), $Al_2O_3$ 0.08 (0–0.19), $TiO_2$ 19.02 (18.64–19.39), $Nb_2O_5$ 0.96 (0.83–1.11), $SiO_2$ 19.38 (19.16–19.52), total 99.20. The empirical formula based on 22 O is $(Ce_{1.72}La_{1.48}Nd_{0.17}Pr_{0.04}Ca_{0.57})_{\Sigma 3.98}Mn^{2+}_{0.76}Fe^{2+}_{0.72}$ $Mg_{0.02}Ti_{2.935}Fe^{3+}_{0.48}Al_{0.02}Nb_{0.09}Si_{3.98}O_{22}$. The simplified formula is $(Ce,La,Ca)_4Mn(Ti,Fe^{2+})_3(Fe^{3+},Ti)(Si_2O_7)_2O_8$. Powder X-ray diffraction data were obtained by Gandolfi method (Mo$K\alpha$ radiation). The strongest lines of the powder diffraction pattern [$d_{obs}$(Å) ($I_{obs}$%, *hkl*)] are: 10.96 (24, 001), 4.90 (39, $\bar{1}$11), 4.64(65, $\bar{2}$02), 3.480 (78, 310), 3.169 (81, 311, $\bar{3}$12), 3.095 (43, $\bar{1}$13), 2.730 (100, 004), 2.169 (46, $\bar{4}$21, $\bar{5}$13), 1.737 (46, 603, 504, 315, 025, $\bar{6}$22). The monoclinic unit-cell parameters are: $a$ = 13.3722(4), $b$ = 5.7434(1), $c$ = 11.0862(2) Å, β = 100.580(2)°, $V$ = 836.97(4) Å$^3$, $Z$ = 2. Space group $P2_1/m$. The crystal structure of christofschäferite-(Ce) is similar to that of other chevkinite-group minerals. The sheets of distorted Ti-centred octahedra (with minor $Fe^{3+}$, Al, and Nb) are parallel to the (100). These sheets are interleaved with a layer consisting of $Si_2O_7$ groups and larger octahedra centered by $Mn^{2+}$. The REE ions and subordinate Ca fill the channels formed through the linkage of heteropolyhedral and octahedral layers. Those sites have coordination numbers from 8 to 10. The crystal-chemical formula of christofschäferite-(Ce) is $^X(Ce,REE,Ca)_2{}^{VIII}(Ce,REE,Ca)_2$ $^{VI}(Mn,Fe^{2+})^{VI}(Ti,Fe^{3+},Nb)_3{}^{VI}(Fe^{3+},Fe^{2+},Ti)(Si_2O_7)_2O_8$. The idealized end-member formula is $Ce_3CaMn\ Ti_3Fe^{3+}\ (Si_2O_7)_2O_8$. The mineral was named in honor of Christof Schäfer (b. 1961), a prominent German mineral collector. Both the mineral and its name have been approved by the IMA CNMNC (IMA 2011-107). Type specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. **D.B.**

## KASATKINITE*

I.V. Pekov, N.V. Chukanov, Ya.E. Filinchuk, A.E. Zadov, N.N. Kononkova, S.G. Epanchintsev, P. Kaden, A. Kutzer, and J.

Göttlicher (2012) Kasatkinite, $Ba_2Ca_8B_5Si_8O_{32}(OH)_3\cdot6H_2O$, a new mineral from the Bazhenovskoe deposit (Middle Urals, Russia). Zap. Ross. Mineral. Obshch., 141(3), 39–49 (in Russian, English abstract).

A new mineral kasatkinite has been discovered in associations of hydrothermal origin in rhodingites of the Bazhenovskoe chrysotile-asbestos deposit (eastern part of the open pit Yuzhnyi), near the city of Asbest, Middle Urals, Russia. The new mineral occurs as subparallel or sheaf-like aggregates and spherulites of acicular or hair-like crystals about $500 \times 5$ μm rarely up to $600 \times 20$ μm in the cavity in massive rhodingite. Kasatkinite overgrows a druse of prehnite crystals and associated with pectolite, calcite, and clinochlore. It was also found in cavities of grossular-diopside rock with chrysotile, pectolite, minerals of the tobermorite and hydrotalcite families. The new mineral is colorless to snow-white in aggregates, vitreous to silky, translucent to nearly opaque. The streak is white. The fracture is uneven or jagged with no cleavage or parting observed. The individual crystals of kasatkinite are elastic and resilient while the aggregates are tough similar to nephrite. Mohs hardness is 4–4.5. $D_{meas} = 2.95(5)$, $D_{calc} = 2.89$ g/cm³. The mineral is optically biaxial (+), $\alpha = 1.600(5)$, $\beta = 1.603(2)$, $\gamma = 1.626(2)$, $2V = 30°(20)$, $2V_{calc} = 40°$. In transmitted light it is colorless, nonpleochroic. The main absorption bands of IR spectrum (cm⁻¹, s = strong, w = weak, sh = shoulder) are: 3345s, 3210, 3160sh, (stretching vibrations O-H), 2515w (overtone of B-O valency mode), 1686, 1630sh (bending vibrations of $H_2O$), 1293, 1205sh, 1157 (stretching vibrations B-O), 1050s, 1000sh, 978s, 944s, 910sh, 892s (stretching vibrations Si-O), 820sh, 741w, 723w, 676, 578, 550sh (bending vibrations in $SiO_4$ and $BO_4$ tetrahedra, and libration mode of $H_2O$), 464s, 430sh, 405sh (superposition of bending vibrations Si-O-Si and stretching vibrations Ca-O). No absorbtion bands corresponding to C-O, N-O bonds, $NH_4^+$, hydrocarbon, carboxyl, and carbonyl groups were detected (confirmed by gas chromatography data). The ¹¹B MAS NMR spectrum shows the presence of $BO_4$, with absence of $BO_3$ groups. The average (range) of 17 microprobe analyses (WDS, $H_2O$ by gas chromatography, wt%) is $Na_2O$ 0.23 (0.1–0.4), $K_2O$ 0.57 (0.2–0.9), CaO 28.94 (27.3–30.8), BaO 16.79 (15.7–18.3), $B_2O_3$ 11.57 (9.9–13.8), $Al_2O_3$ 0.28 (0.1–0.6), $SiO_2$ 31.63 (30.1–32.8), F 0.05 (0.00–0.25), $H_2O$ 9.05, –O=$F_2$ 0.02, total 99.09. The differential scanning calorimetry and thermogravimetry analysis show the total water loss 9.1(2) wt% at heating up to 800°C. The endothermic effect at 354 °C accompanied with 7.2–7.5 wt% water loss (molecular water) with the rest of water loss (1.6–1.9 wt%) at 420–430 °C (OH groups). The ratio $H_{OH}$:$H_{H_2O} \approx 1$:4. Endothermic effects at 733–795 °C are related to decomposition of dehydrated kasatkinite to wollastonite and amorphous barium borate (confirmed by IR data). The empirical formula of kasatkinite based on O+F=41 (considering the NMR and TGA data) is $Na_{0.11}K_{0.18}Ba_{1.66}Ca_{7.84}B_{5.05}Al_{0.08}Si_{8.00}O_{31.80}(OH)_{3.06}F_{0.04}\cdot6.10H_2O$. Simplified chemical formula is $Ba_2Ca_8B_5Si_8O_{32}(OH)_3\cdot6H_2O$. The unit-cell parameters $a = 5.74(2)$, $b = 7.234(8)$, $c = 20.81(2)$ Å, $\beta = 90.70(12)°$, $V = 864(2)$ Å³ were obtained on a micrometer size crystal using synchrotron radiation ($\lambda = 0.83212$ Å, IP detector MAR345, room temperature) at the Swiss-Norwegian Beam Lines (SNBL) at the European Synchrotron Radiation Facility

(ESRF), Grenoble, France. The quality of the best crystal did not allow to solve the crystal structure. Powder X-ray diffraction data were obtained using STOE STADI MP diffractometer with CCD detector (Cu$K\alpha_1$ radiation). The refined parameters of monoclinic unit-cell are: $a = 5.745(3)$, $b = 7.238(2)$, $c = 20.79(1)$ Å, $\beta = 90.82(5)°$, $V = 864(1)$ Å³, $Z = 1$. Space group is $P2_1/c$, $P2/c$, or $Pc$. The strongest lines of the powder diffraction pattern [$d_{obs}$ (Å) ($I_{obs}$%, $hkl$)] are: 10.52 (14, 002), 5.89 (24, 012), 3.48 (23, 006), 3.36 (24, 114), 3.009 (100, 12$\bar{1}$, 121, 10$\bar{6}$), 2.925 (65, 106, 12$\bar{2}$, 122), 2.633 (33, 211, 124), 2.116 (29, 13$\bar{3}$, 133, 028). The mineral was named in honor of Russian amateur mineralogist and mineral collector Anatoly V. Kasatkin (b. 1970). Both the mineral and its name have been approved by the IMA CNMNC (IMA 2011-045). Type specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. **DB.**

## OSUMILITE-(MG)*

N.V. Chukanov, I.V. Pekov, R.K. Rastsvetaeva, S.M. Aksenov, D.I. Belakovskiy, K.V. Van, W. Schüller, and B. Ternes (2012) Osumilite-(Mg): validation as a mineral species and new data. Zap. Ross. Mineral. Obshch., 141(4), 27–36 (in Russian, English abstract).

Osumilite, $(K,Na)(Fe^{2+},Mg)_2(Al,Fe^{3+})_3(Si_{10}Al_2)O_{30}$, is the most common member of the milarite group. Its Mg-dominant analogue was described repeatedly from a number of localities (Chinner and Dixon 1973; Berg and Wheeler 1976; Grew 1982; Armbruster and Oberhänsli 1988; Balassone et al. 2008; Seryotkin et al. 2008). The analyses published show complete isomorphism of Mg and $Fe^{2+}$ in octahedral sites where Mg content varies from 5.5 to 98.5%). However osumilite-(Mg) had been listed at the official IMA CNMNC web site as published without CNMNC approval and osumilite-(K,Mg) of Chinner and Dixon (1973) identical to osumilite-(Mg) had been listed as discredited.

The complex study of the mineral was undertaken to resolve that uncertainty and validate the status of the mineral species. The study was performed on a specimen from active Caspar quarry at Bellerberg Mt., near town of Mayen, Eifel volcanic area, Rhineland-Palatinate (Rheinland-Pfalz), Germany. The results were submitted to IMA CNMNC. Both the mineral and the name osumilite-(Mg) are now approved (IMA 2011-083). The holotype specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. Osumilite-(Mg) from the Eifel area occurs inside the cavities in basaltic volcanic glasses at their contact with thermally metamorphosed xenoliths of pelitic rocks. Associated minerals are fluorophlogopite, sanidine, cordierite, mullite, sillimanite, topaz, pseudobrookite, and hematite.

Osumilite-(Mg) forms blue to brown transparent vitreous short prismatic or thick tabular hexagonal crystals up to $0.5 \times 1$ mm in size. The common crystal faces are {100} and {001} with rare {101} and {110}. The streak is white. The mineral is brittle, with Mohs hardness of 6.5. Cleavage was not observed. $D_{meas} = 2.59(1)$, $D_{calc} = 2.592$ g/cm³. Osumilite-(Mg) is uniaxial (+), $\omega = 1.539(2)$, $\varepsilon = 1.547(2)$. Pleochroism is weak, $\varepsilon =$ colorless to $\omega$ = light blue. The IR spectrum is very similar to that of osumilite with the main absorption bands (cm⁻¹, s = strong, sh = shoulder):

1138s,1000sh, 950s [stretching vibrations of (Si,Al)O$_4$ tetrahedra] 770sh, 745, 717, 652, 541s (mixed vibrations of tetrahedral rings), 475, 440, 401s, 378s (combined modes with bending vibrations Si-O-Si and stretching vibrations of Mg octahedra). For osumilite the wavenumber of the latter band is lower (367 cm$^{-1}$) due to the predominance of Fe$^{+2}$ over Mg in the octahedral site. The bands related to H-, B-, or C-bearing groups are absent in IR spectrum. The average (range) of five microprobe chemical analyses (EDS, wt%) is: Na$_2$O 0.08 (0–0.16), K$_2$O 3.41 (3.24–3.60), CaO 0.04 (0–0.09), MgO 7.98 (7.85–8.11), MnO 0.28 (0.22–0.36), Al$_2$O$_3$ 21.57 (21.19–21.93), Fe$_2$O$_3$ 3.59 (3.43–3.78), SiO$_2$ 62.33 (61.88–63.02), total 99.28. The empirical formula based on 30 O is: (K$_{0.72}$Na$_{0.03}$Ca$_{0.01}$)(Mg$_{1.97}$Mn$_{0.04}$)[Al$_{4.21}$Fe$^{3+}_{0.45}$Si$_{10.32}$]O$_{30}$. The simplified formula is KMg$_2$Al$_3$(Al$_2$Si$_{10}$)O$_{30}$. Powder X-ray diffraction data were obtained by Gandolfi method (Mo$K\alpha$ radiation). The strongest lines of the powder diffraction pattern [$d_{obs}$ (Å) ($I_{obs}$%, $hkl$)] are: 7.21 (37, 002), 5.064 (85, 110), 4.137 (45, 112), 3.736 (43, 202), 3.234 (100, 211), 2.932 (42, 114), 2.767 (51, 204). The crystal structure was refined on a single crystal to R = 0.0294 for 1065 independent reflections with $I > 3\sigma(I)$. The crystal structure of osumilite-(Mg) from Bellerberg is identical to that of osumilite-(Mg) and osumilite from other studied localities. Its crystal-chemical formula is [K$_{0.7}$]$^{XII}$[Mg$_2$]$^{VI}$[Al$_{2.5}$Fe$_{0.5}$]$^{IV}$[Si$_{10.3}$Al$_{1.7}$]$^{IV}$O$_{30}$. Osumilite-(Mg) is hexagonal, space group $P6/mcc$; $a$ = 10.0959(1), $c$ = 14.3282(2) Å, $V$ = 1264.79(6) Å$^3$, $Z$ = 2.

**Comments.** Chemical data for osumilite in original paper (Miyashiro 1956) show that it is Mg-dominant. However this analysis shows the sum of cations Si+Al+Fe+Mg+Mn (for O = 30) is 0.78 more then the theoretical value. The study of osumilite type locality material (Armbruster and Oberhänsli 1988; abstracted paper) show the significant Fe$^{2+}$ prevalence over Mg. Anyway, the name osumilite had been assigned by IMA CNMNC Fe$^{2+}$-dominant osumilite. **D.B.**

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### STEKLITE*

M.N. Murashko, I.V. Pekov, S.V. Krivovichev, A.P. Chernyatyeva, V.O. Yapaskurt, A.E. Zadov, and M.E. Zelensky (2012) Steklite, KAl(SO$_4$)$_2$: the find at Tolbachik volcano (Kamchatka, Russia), validation as a mineral species and crystal structure. Zap. Ross. Mineral. Obshch., 141(4), 36–44 (in Russian, English abstract).

A new mineral steklite, KAl(SO$_4$)$_2$, was discovered among the sublimates of Yadovitaya ("Poisonous") fumarole at the Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption (1975–1976), Tolbachik volcano, Kamchatka. This compound was previously mentioned without description in volcanic sublimates of Showashinzan, Hokkaido, Japan (Mizutani 1962) and at volcanoes Izalco, El Salvador and Santiaguito, Guatemala (Stoiber and Rose 1974). As a product of burning coal it was also mentioned at anthracite deposits of Eastern Pennsylvania, U.S.A. (Lapham et al. 1980) and described in details from burnt dumps near Kopeisk, South Ural, Russia (Chesnokov et al. 1995). At Tolbachik the mineral was formed at temperature about 150–170 °C and found in sulfate crusts up to 2 cm thick in close association with euchlorine, fedotovite, chalcocyanite. Other associated minerals are: kamchatkite, atlasovite, alumoklyuchevskite, langbeinite, hematite, melanothallite, tenorite, avdoninite, belloite, ziesite, and Cu-lyonsite. Steclite occurs as hexagonal or irregularly shaped platy (001) crystals up to 30 µm thick, and up to 1 mm wide. Crystals are often split and combined in openwork aggregates or thin crusts on the volcanic scoria surface. The mineral is colorless, transparent or white to grayish-white in aggregates, vitreous with a white streak. The cleavage is perfect on {001}. Steklite is brittle, Mohs hardness is 2.5. $D_{calc}$ = 2.797 g/cm$^3$. The mineral is optically uniaxial (–), ω = 1.546(2), ε = 1.533(3), nonpleochroic. The average (range) of 5 microprobe analyses gave: Na$_2$O 0.09 (0.04–0.17), K$_2$O 18.12 (17.6–18.9), CaO 0.08 (0.03–0.18), MnO 0.03 (0–0.09), Fe$_2$O$_3$ 2.02 (1.6–2.5), Al$_2$O$_3$ 18.18 (17.4–19.3), SO$_3$ 61.80 (60.6–62.6), total 100.37 wt%. Other elements with atomic number more than 8 were below detection limits. The empirical formula based on 8 O is (K$_{1.00}$Na$_{0.01}$)(Al$_{0.93}$Fe$_{0.07}$)S$_2$O$_8$. Ideally KAl(SO$_4$)$_2$. Powder X-ray data were obtained using Gandolfi method on single crystal diffractometer STOE IPDS II (filtered Mo$K\alpha$ radiation). The strongest lines on the diffraction pattern [$d_{obs}$ in Å ($I_{obs}$%, $hkl$)] include: 8.02 (34, 001), 4.085 (11, 100), 3.649 (100, 011, 101), 2.861 (51, 012, 102), 2.660 (19, 003), 2.364 (25, 110), 2.267 (14, 111, 111, 103), 1.822 (12, 022, 202). The cell parameters based on powder X-ray data are: $a$ = 4.728(3), $c$ = 8.001(6). Single-crystal X-ray data were collected using difractometer BRUKER SMART APEX CCD (Mo$K\alpha$ radiation). The crystal structure was solved by direct methods and refined to $R$ = 0.073 based on 408 unique reflections with $I > 2\sigma(I)$. The mineral is trigonal, space group $P321$, $a$ = 4.7281(3), $c$ = 7.9936(5) Å, $V$ = 154.76(17) Å$^3$, $Z$ = 1. In the steklite structure, the SO$_4$ tetrahedra share corners with distorted AlO$_6$ trigonal prisms forming two layered sheets [Al(SO$_4$)] coplanar to (001) with the K cations between those sheets. Chemically and structurally steklite is the natural analogue of well studied synthetic KAl(SO$_4$)$_2$. It is a structural analogue of godovikovite (NH$_4$)Al(SO$_4$)$_2$. The name steklite was given by Chesnokov et al. (1995) for its technogenic analogue from burnt dump of the coal mine N 47 near Kopeisk, South Urals, Russia. This name derived from the Russian word стекло (steklo); glass as an allusion to the visual similarity of the mineral aggregates to the glass. The name has been kept in deference to predecessor researchers and has been approved along with the mineral itself by the IMA CNMNC (IMA 2011-041). Type specimen deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. **D.B.**

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## VIGRISHINITE*

I.V. Pekov, S.N. Britvin, N.V. Zubkova, N.V. Chukanov, I.A. Bryzgalov, I.S. Lykova, D.I. Belakovskiy, and D.Yu. Pushcharovsky (2012) Vigrishinite, $Zn_2Ti_{4-x}Si_4O_{14}(OH,H_2O,\square)_8$, a new mineral from Lovozero alkaline massif (Kola Peninsula, Russia). Zap. Ross. Mineral. Obshch., 141(4), 12–27 (in Russian, English abstract).

A new member of the epistolite group vigrishinite—first layered titanosilicate with Zn as species-defining element—was discovered in the famous pegmatite 71 of Malyi Punkaruaiv Mt., Lovozero alkaline massif, Kola Peninsula, Russia. This peralkaline pegmatite is located in foyaite and lujavrite rocks of the layered alkaline complex. The mineral found at the periphery of ussingite core near its contact with aegirine-eudialyte zone, where it also is associated with microcline, sodalite, sphalerite, and pectolite-serandite. As a result of the intensive low-temperature hydrothermal and hypergenic alterations, ussingite and sodalite mostly were replaced by zeolites (analcime, natrolite, gmelinite-Na, gmelinite-K, and chabazite-Ca), pectolite-serandite turned into soot-like aggregates of Mn oxides (takanelite, rancieite) and sphalerite was leached out with tetrahedral cavities left, which are partly filled with sauconite. Rectangular or irregular plates of vigrishinite up to $0.05 \times 3$ cm in size flattened on (001) found in zeolite aggregate and on microcline. Those plates are usually split and blocky with sub-individuals up to 1 mm in size. Some plates are interlayered with Zn-bearing bornemanite-type mineral (under investigation). Vigrishinite is pale pink, yellowish-pink, or colorless, vitreous, translucent to transparent. The streak is white. The mineral does not fluoresce under UV light nor under electron beam. Mohs hardness is 2.5–3. It is brittle, with stepped fracture. Cleavage is perfect on {001}. $D_{meas} = 3.03(2)$, $D_{calc} = 2.97$ g/cm³. The mineral is optically biaxial (–), $\alpha = 1.755(5)$, $\beta = 1.820(10)$, $\gamma = 1.835(8)$, $2V = 45(10)°$, $2V_{calc} = 50°$. Dispersion of optical axes $r < v$ strong; nonpleochroic. The main absorption IR bands (cm⁻¹, s = strong, sh = shoulder) are: 3450sh, 3330 (stretching vibrations O-H), 1620, 1590sh (bending vibrations H-O-H of $H_2O$), 1080sh, 1012s, 913s (stretching vibrations Si-O of $Si_2O_7$), 800sh, 719 (possibly, stretching vibrations Ti-O and bending vibrations Ti···O-H), 519s, 440sh, 405s (superposition of bending vibrations Si-O-Si and stretching vibrations Zn-O). No bands in regions 1100–1550 and 1700–2500 cm⁻¹, due to possible vibrations of C-O, N-O, B-O, Be-O, and C-H, were detected.

The average (range) of 9 microprobe chemical analyses (WDS and EDS, $H_2O$ by modified Penfield method, wt%) is: $Na_2O$ 0.98 (0.5–1.6), $K_2O$ 0.30 (0.15–0.5), CaO 0.56 (0.2–0.8), SrO 0.05 (0.00–0.2), BaO 0.44 (0.3–0.6), MgO 0.36 (0.1–0.4), MnO 2.09 (1.8–2.6), ZnO 14.39 (13.3–15.8), $Fe_2O_3$ 2.00 (1.7–2.4), $Al_2O_3$ 0.36 (0.1–0.9), $SiO_2$ 32.29 (31.4–33.8), $TiO_2$ 29.14 (28.2–30.2), $ZrO_2$ 2.08 (0.2–2.5), $Nb_2O_5$ 7.34 (6.1–10.0), F 0.46 (0.0–1.1), $H_2O$ 9.1, $-O=F_2$ –0.19, total 101.75. The empirical formula, based on Si + Al = 4 is $H_{7.42}$ $(Zn_{1.30}Na_{0.23}Mn_{0.22}Ca_{0.07}Mg_{0.07}K_{0.05}Ba_{0.02})_{\Sigma1.96}$ $(Ti_{2.68}Nb_{0.41}Fe^{3+}_{0.18}Zr_{0.12})_{\Sigma3.39}(Si_{3.95}Al_{0.05})_{\Sigma4}O_{20.31}F_{0.18}$. The simplified formula is $Zn_2Ti_{4-x}Si_4O_{14}(OH,H_2O,\square)_8$ ($x < 1$). Powder X-ray diffraction data were obtained by Gandolfi method (MoKα radiation). The strongest lines of the powder diffraction pattern [$d_{obs}$ (Å) ($I_{obs}$%, hkl)] are: 11.7 (67, 001), 8.27 (50, 100), 6.94 (43, 011, 110), 5.73 (54, 111, 002), 4.17 (65, 020, 112, 200), 2.861 (100, 310, 222, 004, 131), 2.609 (30, 2$\bar{2}$1, 220, 104, 1$\bar{3}$2). Powder data are very similar to those for murmanite. The triclinic unit-cell parameters refined from the powder data are: $a = 8.74(5)$, $b = 8.70(6)$, $c = 11.60(8)$ Å, $\alpha = 91.6(2)°$, $\beta = 98.4(2)°$, $\gamma = 105.6(1)°$, $V = 839(3)$ Å³, $Z = 2$. The crystal structure of vigrishinite was solved by direct methods and refined based on 3562 independent reflections with $I > 2\sigma(I)$ only to R = 0.1710 due to the low quality of the best available crystals. Space group is $P\bar{1}$ with single-crystal unit-cell parameters: $a = 8.743(9)$, $b = 8.698(9)$, $c = 11.581(11)$ Å, $\alpha = 91.54(8)°$, $\beta = 98.29(8)°$, $\gamma = 105.65(8)°$, $V = 837.2$ Å³. Vigrishinite is a heterophyllosilicate of the bafertisite meroplesiotype series. Its structure is based on three-layer HOH blocks. The heteropolyhedral H layers consist of $Si_2O_7$ groups linked by two small different Ti-centered octahedra (with minor Nb and Zr) and large Zn octahedra. The chains of two different Ti octahedra form the sandwiched O-layer. Holes in O and H layers host low occupied cation sites. The space between HOH blocks contains $H_2O$ molecules, Zn and other cations. The Zn octahedra combine HOH blocks into three-dimensional framework by sharing the edges with two Zn octahedra of neighboring H layers. Vigrishinite HOH blocks are close to those of murmanite but vigrishinite has vacancies in three of the four Ti-dominant sites. Those structures are more different in part of large cations and H-bearing groups between the layers. The simplified structural formula of vigrishinite is $Zn(H_2O)_{1-x}\{(Ti,\square)_2(OH,H_2O)[(Ti,\square)_2Zn(OH,H_2O,\square)_6(Si_2O_7)_2]\}$ where the content of HOH unit is in braces and content of H layers in square brackets. For murmanite, a similar formula is $(H_2O)_2$ $\{Ti_2(Na,\square)_2(OH)_2[Ti_2Na_2(O,H_2O,OH)_4(Si_2O_7)_2]\}$. The suggestion on vigrishinite and murmanite origin as subsequent homoaxial pseudomorphs after protophase (lomonosovite or β-lomonosovite) resulted from natural ion exchange is discussed, on the basis of structural and chemical peculiarities and experimental data. The mineral was named in honor of the Russian amateur mineralogist and mineral collector Viktor G. Grishin (b. 1953) for his significant contribution to the mineralogy of the Lovozero complex. Both the mineral and its name have been approved by the IMA CNMNC (IMA 2011-073). Type specimen is deposited in the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia. **D.B.**