NEW MINERALS

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Anorthominasragrite
V^4+O(SO_4•5H_2O)

Locality: North Mesa mine group (west ½, southwest ¼ of section 35, Township 224 South, Range 11 East), Temple Mountain mining district, Emery County, Utah, USA.

Occurrence: In a silicified tree approximately 46 cm wide by 30 cm high surrounded by a rim of coal 6 to 25 mm thick. Associated minerals are: orthominasragrite and bobjonesite.

General appearance: Crusts and spherical granular aggregates (<1 mm across) of irregular grains (<0.1 mm).

Physical, chemical and crystallographic properties: Luster: vitreous. Diaphaneity: not stated, but probably transparent. Color: pale blue. Streak: white. Luminescence: nonfluorescent. Hardness: approximately 1. Tenacity: not given. Cleavage: none. Fracture: not given. Density: could not be measured, 2.12 g/cm³ (calc.). Crystallography: Triclinic, P̅1, a 7.548, b 7.805, c 7.821 Å, α 79.03°, β 71.94°, γ 65.31°, V 397.1 Å³, Z = 2, a:b:c = 0.9671:1:1.0020. Morphology: no forms were observed. Twinning: none mentioned. X-ray powder-diffraction data: 7.053(80)(010), 6.617(100)(100), 5.314(30)(011), 4.116(80)(110), 3.712(80)(121,002,211), 3.206(70)(221), 2.934(50)(112,102), 2.555(30)(131). Optical data: Biaxial (+), α 1.548, β 1.555, γ 1.574, 2V(meas.) 86°, 2V(calc.) 63°; dispersion not mentioned; nonpleochroic; X ∩ c ≈ 18° in obtuse angle β, Y ≈ a, Z ∩ b ≈ 19° in obtuse angle γ. Chemical analytical data: Electron-microprobe data: VO 33.93, SO_3 30.78, H_2O (35.52), Total (100.23) wt.%. Empirical formula: V_{1.04}O_{1.08}(SO_4)_{0.98}•5.00H_2O. Relationship to other species: It is the triclinic polymorph of V^4+O(SO_4•5H_2O; minasragrite is monoclinic, and orthominasragrite is orthorhombic.

Name: Reflects the relationship to minasragrite and orthominasragrite.


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Carbokentbrooksite

\((\text{Na, Ce})_{12} \text{Ca}_6 \text{Mn}_3 \text{Zr}_3 \text{Nb} (\text{Si}_{25} \text{O}_{73}) (\text{OH})_3 (\text{CO}_3) \cdot \text{H}_2 \text{O}\)

**Locality:** Dara-i-Pioz alkaline massif, Tajikistan.

**Occurrence:** In the quartz core of a zoned pegmatite. Associated minerals are: zirsilite-(Ce), quartz, microcline, aegirine, stillwellite-(Ce), ekanite, polylithionite, pyrochlore, fluorite, calcite and galena.

**General appearance:** As zoned rhombohedral crystals up to 2 cm across, with a carbokentbrooksite core and a zirsilite-(Ce) rim.

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** transparent.
- **Color:** yellow.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** 5.
- **Tenacity:** brittle.
- **Cleavage:** not observed.
- **Fracture:** conchoidal.
- **Density:** 3.14 g/cm³ (meas.), 3.10 g/cm³ (calc.).
- **Crystallography:** Trigonal, \(\text{R}3\text{m}, a = 14.239, c = 30.039 \text{Å}, V = 5274 \text{Å}^3, Z = 3, c:a = 2.1096\).
- **Morphology:** \{101\}, \{102\}, \{010\}, \{001\}.
- **Twinning:** none mentioned.
- **Optical data:** Uniaxial (–), \(\omega = 1.645, \epsilon = 1.635\), non-pleochroic.

**Chemical analytical data:** Electron-microprobe data:
- \(\text{Na}_2\text{O} 10.17, \text{K}_2\text{O} 0.51, \text{CaO} 10.61, \text{SrO} 1.42, \text{MnO} 5.41, \text{FeO} 2.22, \text{La}_2\text{O}_3 1.79, \text{Ce}_2\text{O}_3 1.79, \text{Pr}_2\text{O}_3 0.24, \text{Nd}_2\text{O}_3 0.76, \text{Y}_2\text{O}_3 0.43, \text{SiO}_2 45.55, \text{TiO}_2 0.41, \text{ZrO}_2 11.07, \text{Nb}_2\text{O}_5 3.55, \text{H}_2\text{O} 1.18, \text{Cl} 0.29, \text{CO}_2 0.29\), sum 99.36, less O = \(\text{Cl}\) 0.06, Total 99.30 wt.%.

**Relationship to other species:** It is a member of the eudialyte group.

**Name:** Recalls the relationship with kentbrooksite.

**Comments:** IMA No. 2002–056. The indexing of the powder pattern in the paper is somewhat different from that given here.

**Khomyakov, A.P., Dismatov, V.D., Ferraris, G., Guha, A., Ivaldi, G. & Nechelyustov, G.N. (2003):** Zirsilite-(Ce), \((\text{Na, Ce})_{12} (\text{Ce, Na})_3 \text{Ca}_6 \text{Mn}_3 \text{Zr}_3 \text{Nb} (\text{Si}_{25} \text{O}_{73}) (\text{OH})_3 (\text{CO}_3) \cdot \text{H}_2 \text{O}\) and carbokentbrooksite, \((\text{Na, Ce})_{12} (\text{Na, Ce})_3 \text{Ca}_6 \text{Mn}_3 \text{Zr}_3 \text{Nb} (\text{Si}_{25} \text{O}_{73}) (\text{OH})_3 (\text{CO}_3) \cdot \text{H}_2 \text{O}\), two new eudialyte group minerals from Dara-i-Pioz alkaline massif, Tajikistan. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* 132(5), 40-51 (in Russ.).
**Locality:** Mt. Yukspor, Khibina alkaline massif, Kola Peninsula, Russia.

**Occurrence:** In a strongly mineralized rischorrite – ijolite – urtite pegmatite. Associated minerals are: nepheline, sodalite, K-feldspar, natrolite, pectolite, aegirine, shcherbakovite, lamprophylite, magnesium astrophyllite, delindeite, wadeite, umbite and kostevite.

**General appearance:** A fan-shaped intergrowth (2 to 3 mm) of subhedral platy crystals (1 to 2 mm).

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** transparent to translucent.
- **Color:** yellowish orange.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** 5.
- **Tenacity:** brittle.
- **Cleavage:** not observed.
- **Fracture:** conchoidal.
- **Density:** 3.68 g/cm³ (meas.), 3.75 g/cm³ (calc.).
- **Crystallography:** Trigonal, \( R\bar{3}, a = 10.713, c = 60.67 \text{ Å}, V = 6030 \text{ Å}^3, Z = 6, \frac{a}{c} = 5.6632. \)
- **Morphology:** \{001\}.
- **Twinning:** none observed.
- **X-ray powder-diffraction data:**
  - 10.12(27)(006), 3.236(100)(1.1.15), 3.094(21)(300), 2.654(38)(223), 2.642(44)(3.0.12), 2.234(19)(2.2.15), 2.026(61)(0.0.30).
- **Optical data:** Uniaxial (+), \( \omega \) 1.705, \( \varepsilon \) 1.708, pleochroism strong, O pale yellow, E yellowish orange.

**Chemical analytical data:** Mean of three sets of electron-microprobe data:
- Na₂O 2.76, K₂O 5.81, CaO 0.10, MnO 1.09, FeO 3.10, SrO 0.42, BaO 24.85, La₂O₃ 4.84, Ce₂O₃ 6.72, Pr₂O₃ 0.74, Nd₂O₃ 1.21, Sm₂O₃ 0.16, SiO₂ 32.46, TiO₂ 9.17, Nb₂O₅ 1.62, H₂O 6.15, Total 101.20 wt.%. Empirical formula: Na₂(2.75Ba₂.64K₂.77)Ce₂.92La₂.67Nd₀.16Pr₀.10Sm₀.02Mn₀.18Sr₀.09Ca₀.04)Σ₂.16(Fe₀.97Mn₀.03)Σ₁.00(Ti₂.58Nb₀.27Mn₀.15)Σ₁.30Si₁₂₂.12O₆₃(ΣOH)₇.27(ΣH₂O)₇.13(Σ1.64. The crystallochemical formula is Na₂(2.75Ba₂.64K₂.77)Ce₂.92La₂.67Nd₀.16Pr₀.10Sm₀.02Mn₀.18Sr₀.09Ca₀.04)Σ₂.16(Fe₀.97Mn₀.03)Σ₁.00(Ti₂.58Nb₀.27Mn₀.15)Σ₁.30Si₁₂₂.12O₆₃(ΣOH)₇.27(ΣH₂O)₇.13(Σ1.64. **Relationship to other species:** It is chemically similar to ilimaussite-(Ce) and joaquinite-(Ce).

**Name:** From the Latin *diversus* (heterogeneous) and *silicate*, reflecting its main structural features and its composition.

**Comments:** IMA No. 2002–043.
**Ganterite**

\[ [\text{Ba}_{0.5}(\text{Na},\text{K})_{0.5}]\text{Al}_2\text{(Si}_{2.5}\text{Al}_{1.5}\text{O}_{10})(\text{OH})_2 \]

**Locality:** The Berisal Complex, Wasenhorn, Simplon Region, Switzerland.

**Occurrence:** In schists associated with muscovite, quartz, epidote-group minerals, zircon and apatite. Also in zoisite–celsian gneiss associated with margarite and quartz.

**General appearance:** Average grain-size 0.5 \(\times\) 0.15 \(\times\) 0.01 mm.

**Physical, chemical and crystallographic properties:** Luster: vitreous. Diaphaneity: presumably transparent. Color: light grey to silver. Streak: white. Luminescence: nonfluorescent, but shows very strong general fluorescence under a green argon laser (514.5 nm). Hardness: VHN\(_{100}\) 260 kg/mm\(^2\), corresponding to Mohs 4 to 4½. Tenacity: flexible. Cleavage: {001} perfect. Fracture: laminated. Density: 3.11 g/cm\(^3\) (calc.). **Crystallography:** Monoclinic, \(\text{C}_{2/c}\), \(a\) 5.212, \(b\) 9.046, \(c\) 19.978 Å, \(\beta\) 95° 48', \(V\) 937.6 Å\(^3\), \(Z\) = 4, \(a:b:c = 0.5762:1:2.2085\). Morphology: no forms were observed. Twinning: none mentioned. **X-ray powder-diffraction data:** 4.481(71){110}, 3.887(76){113}, 3.737(77){023}, 3.495(71){114}, 2.602(95){130,131}, 2.571(100){202,131}, 1.5054(91){060,2.0.10}. **Optical data:** Biaxial (−), \(\alpha\) 1.600 (calc.), \(\beta\) 1.619, \(\gamma\) 1.622, 2V(meas.) 42.5°, dispersion not given; nonpleochroic; orientation not given. **Chemical analytical data:** Mean of 32 sets of electron-microprobe data gave: Na\(_2\)O 1.91, K\(_2\)O 3.02, MgO 0.86, CaO 0.03, MnO 0.03, FeO 0.69, BaO 15.54, Al\(_2\)O\(_3\) 36.5, SiO\(_2\) 37.47, TiO\(_2\) 0.73, H\(_2\)O 3.90, Total 100.68 wt.%. Empirical formula: \(\text{Ba}_{0.44}\text{K}_{0.28}\text{Na}_{0.27}\text{Al}_{1.94}\text{Mg}_{0.09}\text{Fe}_{0.04}\text{Ti}_{0.04}\text{O}_{10}\). **Relationship to other species:** It is the Ba- and Al-dominant member of the mica group.

**Name:** After the Gantertal, a famous valley in the region in which the mineral was found.

**Comments:** IMA No. 2000–033.

**Locality:** Reapook Hill, South Australia, Australia.

**Occurrence:** In a gossan-like mass covering unmetamorphosed, poorly sorted argillaceous siltstones of the Lower Cambrian Parachilna Formation. Associated minerals are: scholzite, tarbuttite, parahopeite, zincian collinsite, switzerite and phosphophyllite.

**General appearance:** Euhedral, doubly terminated crystals and clusters (up to 50 μm long).

**Physical, chemical and crystallographic properties:**
- **Luster:** Vitreous.
- **Diaphaneity:** Transparent to translucent.
- **Color:** Colorless or grey with a greenish or bluish tint.
- **Streak:** Not given, probably white.
- **Luminescence:** Greenish yellow fluorescence in short-wave UV.
- **Hardness:** 3½.
- **Tenacity:** Not given.
- **Cleavage:** {010} and {001} perfect.
- **Fracture:** Not given.
- **Density:** 3.16 g/cm³ (meas.), 3.16 g/cm³ (calc.).
- **Crystallography:** Triclinic, \( P\bar{1} \), \( a = 5.736 \), \( b = 6.767 \), \( c = 5.462 \) Å, \( \alpha = 97.41° \), \( \beta = 108.59° \), \( \gamma = 107.19° \), \( V = 186.05 \) Å³, \( Z = 1 \), \( a:b:c = 0.8476:1.0:0.8072 \). Morphology: no forms were mentioned. Twinning: none mentioned. X-ray powder-diffraction data: 6.24(34)(010), 3.512(16)(011,111), 3.230(22)(112), 3.130(37)(020), 3.038(40)(101), 2.690(100)(112,110), 1.668(22)(213). Optical data: Biaxial (+), \( \alpha = 1.635 \), \( \beta = 1.650 \), \( \gamma = 1.667 \), 2V(calc.) 83°; dispersion not given; nonpleochroic; orientation not given. Chemical analytical data: Mean of fifteen sets of electron-microprobe data (with H₂O calculated to give 2H₂O): Na₂O 0.11, MgO 4.34, CaO 30.36, FeO 0.04, ZnO 14.79, P₂O₅ 40.85, H₂O (10.23), Total (100.72) wt.%. Empirical formula: \((\text{Ca}_{1.91}\text{Na}_{0.01})(\text{Zn}_{0.64}\text{Mg}_{0.38})_{1.02}(\text{PO}_{4})_{2.03}\cdot2.00\text{H}_{2}\text{O}\). Relationship to other species: It is the Ca- and Zn-dominant member of the fairfieldite group.

**Name:** After Dr. Roderick Hill (b. 1949), Chief of the Mineral Research Division, CSIRO, Melbourne, Australia, who first described the mineral and recognized it as a potentially new species. Comments: IMA No. 2003–005.

Ikranite

\[(\text{Na,H}_3\text{O})_{15}(\text{Ca,Mn,REE})_6\text{Fe}^{3+2}\text{Zr}_3(\text{Si})\text{Si}_{24}\text{O}_{66}(\text{O,OH,Cl})\cdot n\text{H}_2\text{O}\]

Locality: Mount Karnasurt, Lovozero alkaline massif, Kola Peninsula, Russia.

Occurrence: In peralkaline pegmatites. Associated minerals are: aegirine, microcline, lorenzenite, nepheline, lamprophyllite, murmanite and arfvedsonite.

General appearance: Grains up to 3 cm.

Physical, chemical and crystallographic properties:

- Luster: vitreous.
- Diaphaneity: transparent.
- Color: brownish yellow.
- Streak: yellowish white.
- Luminescence: nonfluorescent.
- Hardness: 5.
- Tenacity: brittle.
- Cleavage: none.
- Fracture: conchoidal.
- Density: 2.82 g/cm$^3$ (meas.), 2.63 g/cm$^3$ (calc.).
- Crystallography: Trigonal, $R3m$, $a = 14.167$, $c = 30.081$ Å, $V = 5228.5$ Å$^3$, $Z = 3$, $c:a = 2.1233$.
- Morphology: no forms were mentioned. Twinning: none mentioned.
- Optical data: Uniaxial (+), $\omega = 1.612$, $\epsilon = 1.615$, pleochroism colorless to yellow, weak.
- Chemical analytical data: Mean of three sets of electron-microprobe data: Na$_2$O 7.95, K$_2$O 0.44, CaO 6.29, MnO 3.40, FeO 0.38, SrO 1.61, Fe$_2$O$_3$ 4.80, La$_2$O$_3$ 0.62, Ce$_2$O$_3$ 1.53, Nd$_2$O$_3$ 0.19, SiO$_2$ 48.91, TiO$_2$ 0.37, ZrO$_2$ 13.94, HfO$_2$ 0.28, Nb$_2$O$_5$ 0.28, H$_2$O 7.70, F 0.10, Cl 0.89, sum 99.68, less O = F + Cl 0.24, Total 99.44 wt.%. Empirical formula: Na$_{15}$Ca$_3$Fe$_3$(Na,Zr)$_3$Zr$_3$(Si,Nb)Si$_{22}$O$_{73}$(OH,H$_2$O)$_3$(Cl,OH), the new eudialyte-group minerals from Lovozero massif, Kola Peninsula. Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva 132(5), 22-33 (in Russ.).

Name: Recalls the Russian acronym IKRAN (Institut Kristallografi Rossiskoy Akadameii Nauky).


Chukanov, N.V., Pekov, I.V., Zadoy, A.E., Korovushkin, V.V., Ekimenkova, I.A. & Rastsvetaeva, R.K. (2003): Ikranite, (Na,H$_3$O)$_{15}(\text{Ca,Mn,REE})_6\text{Fe}^{3+2}\text{Zr}_3(\text{Si})\text{Si}_{24}\text{O}_{66}(\text{O,OH,Cl})\cdot n\text{H}_2\text{O}

**Kozoite-(La)**

La(CO$_3$)(OH)

**Orthorhombic**

**Locality:** Mitsukoshi, Hizen-cho, Saga Prefecture, Japan.

**Occurrence:** In cavities of alkali olivine basalt. Associated minerals are: kozoite-(Nd), lanthanite-(Nd), kimuraite-(Y), lokkaite-(Y), calcite, aragonite and opal (variety hyalite).

**General appearance:** Spherical aggregates less than 1 mm in diameter.

**Physical, chemical and crystallographic properties:**

- **Luster:** vitreous.
- **Diaphaneity:** presumably transparent.
- **Color:** extremely pale purple to white.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** could not be determined.
- **Tenacity:** could not be determined.
- **Cleavage:** could not be determined.
- **Fracture:** not given.
- **Density:** could not be determined, 4.16 g/cm$^3$ (calc.).
- **Crystallography:** Orthorhombic, $Pmcn$, $a$ 4.986, $b$ 8.513, $c$ 7.227 Å, $V$ 306.7 Å$^3$, $Z$ = 2, $a:b:c$ = 0.5857:1:0.8489. Morphology: no forms were observed. Twinning: none mentioned.
- **X-ray powder-diffraction data:** 5.54(32)(011), 4.31(100)(110, 020), 3.69(72)(111, 021), 2.93(57)(121, 102), 2.33(50)(131), 2.06(48)(221), 1.994(35)(212).
- **Optical data:** could not be determined, but the abstracter calculated the mean index of refraction from the Gladstone–Dale relationship as 1.730.
- **Chemical analytical data:** Mean of four sets of electron-microprobe data with (CO$_2$ and H$_2$O calculated): CaO 6.30, SrO 1.36, La$_2$O$_3$ 35.55, Ce$_2$O$_3$ 0.00, Pr$_2$O$_3$ 4.68, Nd$_2$O$_3$ 17.60, Sm$_2$O$_3$ 1.15, Eu$_2$O$_3$ 0.00, Gd$_2$O$_3$ 1.49, Tb$_2$O$_3$ 0.00, Dy$_2$O$_3$ 0.09, Er$_2$O$_3$ 0.04, Y$_2$O$_3$ 3.88, CO$_2$ (23.17), H$_2$O (5.87), Total (101.19) wt.%. Empirical formula: \((\text{La}_{0.41}\text{Ca}_{0.21}\text{Nd}_{0.20}\text{Y}_{0.07}\text{Pr}_{0.03}\text{Sr}_{0.02}\text{Gd}_{0.02}\text{Sm}_{0.01})_{0.99}(\text{CO}_3)_{0.74}(\text{H}_2\text{O})_{0.25})_{2.899}\). **Relationship to other species:** It is a member of the ancylite group, specifically the La-dominant analogue of kozoite-(Nd).

**Name:** Recalls the relationship with kozoite-(Nd).

**Comments:** IMA No. 2002–054.

Kukharenkoite-(La)

Ba$_2$(La,Ce)(CO$_3$)$_3$F

**Locality**: Kirovsky mine, Mount Kukisvumchorr, Khibina massif, Kola Peninsula, Russia.

**Occurrence**: In late hydrothermal assemblages in cavities of two pegmatites. In the Hilairitovoye pegmatite, holotype material is associated with: microcline, albite, calcite, nanadkevichite, hilairite, catapleiite, strontianite, donnayite-(Y), synchysite-(Ce), pyrite, among others; in a pectolite – aegirine – microcline vein, other associated minerals are: natrolite, calcite, neodymian ewaldite, among others.

**General appearance**: Flattened prismatic to needle-like crystals up to 0.5 mm long.

**Physical, chemical and crystallographic properties**:

- **Luster**: vitreous.
- **Diaphaneity**: transparent.
- **Color**: colorless, white, pale green.
- **Streak**: white.
- **Luminescence**: nonfluorescent.
- **Hardness**: about 4.
- **Tenacity**: brittle.
- **Cleavage**: not observed.
- **Fracture**: uneven.
- **Density**: could not be measured, 4.60 g/cm$^3$ (calc.).
- **Crystallography**: Monoclinic, $P2_1/m$, $a$ 13.396, $b$ 5.111, $c$ 6.672 Å, $\beta$ 106.628°, $V$ 437.7 Å$^3$, $Z$ = 2, $a:b:c$ = 2.6210:1:1.3054. Morphology: {010}, {001}, {100} and {001}. Twinning: rotation about [100] forming trillings.
- **X-ray powder-diffraction data**: 4.01(100)(111,201), 3.27(100)(310,401,202), 2.54(50)(020,112), 2.14(80)(221,512,600), 1.998(80)(421,222,511,313), 1.370(20)(910,424,712,714).
- **Optical data**: Biaxial (–), $\alpha$ 1.581, $\beta$ 1.715, $\gamma$ 1.715, 2V (meas.) $^5\circ$, 2V (calc.) $^0\circ$; dispersion not observed; nonpleochroic; $X\wedge a = 9^\circ$ in acute angle $\beta$, $Y = b$, $Z\wedge c = 26^\circ$ in obtuse angle $\beta$; the drawing of the optical orientation given in the paper does not appear to be correct.

**Chemical analytical data**: Mean of nine sets of electron-microprobe data (with CO$_2$ calculated to give 3CO$_3$; actually, 2.97): Na$_2$O 0.23, K$_2$O 0.27, CaO 0.99, SrO 2.38, BaO 44.10, La$_2$O$_3$ 11.18, Ce$_2$O$_3$ 5.36, Pr$_2$O$_3$ 0.87, Nd$_2$O$_3$ 0.76, CO$_2$ (21.30), ThO$_2$ 9.41, F 3.38, sum (100.23), less O = F 1.42, Total (98.81) wt.%. Empirical formula: (Ba$_{1.76}$Sr$_{0.14}$K$_{0.04}$)$_{1.94}$ (La$_{0.42}$Th$_{0.22}$Ce$_{0.20}$Ca$_{0.11}$Na$_{0.09}$Pr$_{0.03}$Nd$_{0.03}$)$_{1.06}$(CO$_3$)$_{2.97}$F$_{1.09}$. **Relationship to other species**: It is the La-dominant analogue of kukharenkoite-(Ce).

**Name**: Recalls the relationship to kukharenkoite-(Ce).

**Comments**: IMA No. 2002–019. The empirical formula derived here differs slightly from that given in the paper.


**Kupčíkite**

\[ \text{Cu}_{3.4}\text{Fe}_{0.6}\text{Bi}_{5}\text{S}_{10} \]

**Locality:** In orebodies K7 and K8 of the Felbertal scheelite deposit, Tauern Window of the Alps, Austria.

**Occurrence:** Associated minerals are: quartz, chalcopyrite, pyrrhotite, molybdenite, sphalerite, bismuth, makovickyite, cupromakovickyite, hodrushite, cuprobismutite and derivatives of the bismuthinite–aikinite series.

**General appearance:** Elongate aggregates up to 0.5 mm.

**Physical, chemical and crystallographic properties:**
- **Luster:** metallic.
- **Diaphaneity:** opaque.
- **Color:** grey.
- **Streak:** not given, but presumably grey.
- **Hardness:** VHN$_{50}$ 192 kg/mm$^2$, corresponding to about 3½ on the Mohs scale.
- **Tenacity:** brittle.
- **Cleavage:** not observed.
- **Fracture:** uneven.
- **Density:** could not be measured, 6.42 g/cm$^3$ (calc.).
- **Crystallinity:** Monoclinic, \( C2/m \), \( a = 17.512 \), \( b = 3.9103 \), \( c = 12.869 \) Å, \( \beta = 108.56^\circ \), \( V = 835.4 \) Å$^3$, \( Z = 2 \), \( a:b:c = 4.4784:1:3.2911 \).
- **Morphology:** no forms were mentioned.
- **Twinning:** none mentioned.
- **Optical data:** In reflected light: greyish white, anisotropism moderate in air and strong in oil, bireflectance perceptible in air and moderate in oil, pleochroism weak in air white with bluish tints and enhanced in oil. \( R_1 \) & \( R_2 \) in air: 33.55, 40.56% (470 nm), 33.92, 41.14% (546 nm), 34.16, 41.35% (589 nm), 34.20, 41.32% (650 nm).
- **Chemical analytical data:** Mean of six sets of electron-microprobe data: Cu 13.22, Ag 0.04, Cd 0.14, Pb 0.09, Fe 2.09, Sb 0.08, Bi 64.64, S 19.94, Total 100.24 wt.%. Empirical formula: \( (\text{Cu}_{3.35}\text{Fe}_{0.60})_{2.95}(\text{Bi}_{4.98}\text{Cd}_{0.02}\text{Sb}_{0.01}\text{Pb}_{0.01}\text{Ag}_{0.01})_{2.95}\text{S}_{10.02} \).
- **Relationship to other species:** Closely structurally related to cuprobismutite and hodrushite.

**Name:** After Vladimir Kupčík (1934–1990), Professor of Mineralogy at the University of Bratislava and the University of Göttingen, for his outstanding contributions to the crystal chemistry of sulfosalts.

**Comments:** IMA No. 2001–017. The crystal structure has been solved.

**References:**
Paravinogradovite

\[ \text{Na}_2\text{Ti}_3\text{Fe}^{3+}(\text{Si}_2\text{O}_6)_2(\text{Si}_3\text{AlO}_10)(\text{OH})_4\cdot\text{H}_2\text{O} \]

**Locality:** Mount Kukisvumchorr, Khibina alkaline massif, Kola Peninsula, Russia.

**Occurrence:** In miarolitic cavities in a nepheline–feldspar pegmatite. Associated minerals are: albite, carbonate-fluorapatite, ancylic-(Ce), natrolite, aegirine, a glauconite-like mineral, nordstrandite, anatase, fluorite, galena, cerussite and vinogradovite.

**General appearance:** Fan-shaped aggregates of columnar and acicular crystals up to 1.0 cm long.

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** transparent to translucent.
- **Color:** colorless to white.
- **Streak:** white.
- **Luminescence:** fluoresces weak yellow-green under 240-400 nm radiation.
- **Hardness:** 5.
- **Tenacity:** brittle.
- **Cleavage:** {001} perfect and {010} indistinct.
- **Fracture:** splintery.
- **Density:** 2.77 g/cm³ (meas.), 2.74 g/cm³ (calc.).
- **Crystallography:** Triclinic, \( P_1, a = 5.246, b = 8.734, c = 12.968 \) Å, \( \alpha = 70.32, \beta = 79.01, \gamma = 89.90^\circ \), \( V = 547.65 \) Å³, \( Z = 1, a:b:c = 0.6006:1:1.4848 \). Morphology: no forms were mentioned. Twinning: none mentioned.
- **X-ray powder-diffraction data:** 11.9(58)(001), 5.98(35)(002), 5.88(65)(011,012), 4.35(38)(121,102), 3.182(100) (013,014), 3.085(29)(123), 2.735(21)(122,030).
- **Optical data:** Biaxial (–), \( \alpha = 1.707, \beta = 1.741, \gamma = 1.755 \), 2\( V \) (meas.) 64°, 2\( V \) (calc.) 64°; dispersion \( r > v \); nonpleochroic; X: Y: Z = 30°, Z ≈ b.

**Chemical analytical data:** Mean of eighteen sets of electron-microprobe data (BeO calculated by stoichiometry, H₂O by Penfield method): Na₂O 7.77, K₂O 0.87, MgO 0.13, BeO 0.76, Al₂O₃ 6.12, Fe₂O₃ 4.11, SiO₂ 43.54, TiO₂ 29.59, Nb₂O₅ 0.50, H₂O 6.23, Total 99.62 wt.%. Empirical formula: \( (\text{Na}_{2.28}\text{K}_{0.17})_2(\text{Ti}_{3.37}\text{Fe}^{3+}_{0.03})_4(\text{Si}_2\text{O}_6)_2(\text{Si}_3\text{AlO}_{10})(\text{OH})_4\cdot\text{H}_2\text{O} \).

**Relationship to other species:** It is chemically and structurally related to vinogradovite.

**Name:** Recalls the relationship to vinogradovite.

**Comments:** IMA No. 2002–033.

Khomyakov, A.P., Khilikova, I.E., Sokolova, E., Hawthorne, F.C. & Kartashov, P.M. (2003): Paravinogradovite, \( (\text{Na}_{\cdot\cdot\cdot})_2[(\text{Ti}^{4+},\text{Fe}^{3+})_4(\text{Si}_2\text{O}_6)_2(\text{Si}_3\text{AlO}_{10})(\text{OH})_4]\cdot\text{H}_2\text{O} \), a new mineral species from the Khibina alkaline massif, Kola Peninsula, Russia: description and crystal structure. *Canadian Mineralogist* 41, 989-1002.
**Percleveite-(Ce)**

\[(Ce,La,Nd)_{2}Si_{2}O_{7}\]

**Locality:** The Bastnäs Fe–Cu–REE deposit, Skinnskatteberg, Västmanland, Sweden (Lat. 59° 51’N, Long. 15° 35’E).

**Occurrence:** Known from a single old specimen in the Swedish Museum of Natural History. Associated minerals are: cerite-(Ce), bastnäsite-(Ce), magnetite, chalcopyrite and a clinoamphibole close to the borderline between actinolite and tremolite. Rarer associates are: allanite-(Ce), törnebohmite-(Ce), scheelite and quartz.

**General appearance:** Anhedral grains (up to 0.5 mm) across in aggregates several mm wide.

**Physical, chemical and crystallographic properties:**
- **Luster:** greasy to resinous.
- **Diaphaneity:** transparent in thin section.
- **Color:** yellowish gray to white.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** about 6.
- **Tenacity:** not given but probably brittle.
- **Cleavage:** {001} imperfect.
- **Fracture:** not given.
- **Density:** could not be measured, 5.20 g/cm³ (calc.).
- **Crystallography:** Tetragonal, \(P4_1, a = 6.7805, c = 24.689 \text{ Å}, V = 1135.1 \text{ Å}^3, Z = 8, \text{ca} = 3.6412\). Morphology: no forms were observed. Twinning: none mentioned. **X-ray powder-diffraction data:** 3.271(31)(202), 3.135(27)(203), 3.121(24)(116), 3.084(100)(008), 3.011(18)(211), 2.846(22)(213), 2.034(19)(219). **Optical data:** Uniaxial (+), \(\omega = 1.840, e = 1.846\), nonpleochroic. **Chemical analytical data:** Mean of four sets of electron-microprobe data: MgO 0.00, CaO 0.10, Al₂O₃ 0.00, Fe₂O₃ 0.01, Y₂O₃ 2.93, La₂O₃ 14.66, Ce₂O₃ 31.36, Pr₂O₃ 3.41, Nd₂O₃ 12.97, Sm₂O₃ 2.69, Gd₂O₃ 2.26, Dy₂O₃ 0.53, Ho₂O₃ 0.07, Er₂O₃ 0.21, Yb₂O₃ 0.04, SiO₂ 26.55, Total 97.79 wt.%. **Empirical formula:** \((\text{Ce}_{0.87}\text{La}_{0.41}\text{Nd}_{0.33}\text{Y}_{0.13}\text{Pr}_{0.03}\text{Sm}_{0.07}\text{Gd}_{0.06}\text{Dy}_{0.01}\text{Gd}_{0.01})\text{Si}_{2.01}\text{O}_{7.00}\). **Relationship to other species:** None apparent.

**Name:** After Per Theodor Cleve (1840–1905), professor of chemistry at Uppsala University and the discoverer of the elements holmium and thulium. "Cleveite", a REE-bearing variety of uraninite, was named after him by Nordenskiöld in 1878.

**Comments:** IMA No. 2002–023.

Raslakite

\[
\text{Na}_{15}\text{Ca}_3\text{Fe}_3(\text{Na,Zr})_3\text{Zr}_3(\text{Si, Nb})(\text{Si}_{25}\text{O}_{73})(\text{OH},\text{H}_2\text{O})_3(\text{Cl, OH})
\]

**Locality:** Mount Karnasurt, Lovozero alkaline massif, Kola Peninsula, Russia.

**Occurrence:** In peralkaline pegmatites. Associated minerals are: microcline, aegirine, nepheline, lamprophyllite, kazakovite, terskite and fluorapatite.

**General appearance:** Grains up to 3 cm.

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** transparent.
- **Color:** brownish red.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** 5.
- **Tenacity:** brittle.
- **Cleavage:** none.
- **Fracture:** conchoidal.
- **Density:** 2.95 g/cm\(^3\) (meas.), 2.92 g/cm\(^3\) (calc.).
- **Crystallography:** Trigonal, \(R3\), \(a = 14.229\), \(c = 30.019\) Å, \(V = 5263.5\) Å\(^3\), \(Z = 3\), \(c/a = 2.1097\). Morphology: no forms were mentioned. Twinning: none mentioned.
- **Optical data:** Uniaxial (+), \(\omega = 1.608\), \(\varepsilon = 1.611\), pleochroism colorless to brown, weak.
- **Chemical analytical data:** Mean of five sets of electron-microprobe data: \(\text{Na}_2\text{O} 15.97\), \(\text{K}_2\text{O} 0.48\), \(\text{MgO} 0.28\), \(\text{CaO} 5.64\), \(\text{MnO} 2.01\), \(\text{FeO} 5.02\), \(\text{SrO} 0.69\), \(\text{Al}_2\text{O}_3 0.26\), \(\text{La}_2\text{O}_3 0.44\), \(\text{Ce}_2\text{O}_3 0.87\), \(\text{Nd}_2\text{O}_3 0.42\), \(\text{SiO}_2 49.10\), \(\text{TiO}_2 0.37\), \(\text{Zr}_2\text{O}_3 15.07\), \(\text{HFO}_2 0.43\), \(\text{Nb}_2\text{O}_5 0.71\), \(\text{H}_2\text{O} 1.35\), \(\text{Cl} 1.34\), sum 100.45, less O = Cl 0.30, Total 100.15 wt.%.
- **Empirical formula:** \(\text{Na}_{15.88}\text{K}_{0.31}\text{Ca}_{3.10}\text{Sr}_{0.21}\text{Mg}_{0.21}\text{Fe}_{2.15}\text{Mn}_{0.87}\text{Ce}_{0.16}\text{La}_{0.08}\text{Nd}_{0.08}\text{Ti}_{0.14}\text{Zr}_{3.77}\text{H}_2\text{O}_{0.06}\text{Nb}_{0.16}\text{Al}_{0.10}\text{Si}_{25.19}\text{Cl}_{1.17}\text{H}_2\text{O}_{75.83}\). **Relationship to other species:** It is a member of the eudialyte group.

**Name:** After the Raslak cirques near Mount Kedykverpakhk.

**Comments:** IMA No. 2002–067.

Chukanov, N.V., Pekov, I.V., Zadoy, A.E., Korovushkin, V.V., Ekimenkova, I.A. & Rastsvetaeva, R.K. (2003): Ikranite, (Na,H\(_2\)O\(_{15}\)(Ca,Mn,REE)\(_4\)Fe\(_{2+}\)Zr\(_3\)(\(\Box\),Zr)\(_\Box\)Si\(_{12}\)O\(_{46}\)(O,OH,Cl)\(_\Box\)\(n\)H\(_2\)O and raslakite, Na\(_3\)Ca\(_3\)Fe\(_3\)(Na,Zr)\(_3\)Zr\(_3\)(Si,Nb)(Si\(_{25}\)O\(_{73}\))(OH,H\(_2\)O)\(_3\)(Cl,OH), the new eudialyte group minerals from Lovozero massif, Kola Peninsula. Zapiski Vserossiyskogo Mineralogicheskogo Obschestva 132(5), 22-33 (in Russ.).
**Sailaufite**

$$(\text{Ca}, \text{Na}, \square)_2\text{Mn}^{3+}3\text{O}_2(\text{AsO}_4)2(\text{CO}_3)\cdot3\text{H}_2\text{O}$$

**Locality:** Hartkoppe Hill, north of Ober–Sailauf, Spessart Mountains, northwest Bavaria, Germany. Starlera manganese deposit in the Eastern Alps, Switzerland.

**Occurrence:** In veins of manganese ore in rhyolite. Associated minerals are: hausmannite, arseniosiderite, kutnohorite, dolomite, quartz, calcite and manganoo calcite. In a second occurrence in the lower parts of the quarry, the mineral is associated with rhodochrosite, brandtite, tilasite and dolomite. A third occurrence is in the Starlera manganese deposit in the Eastern Alps, Switzerland, where the mineral is associated with manganolitharmeyerite, tilasite and calcite.

**General appearance:** Strongly intergrown tabular crystals forming aggregates mostly <0.5 mm.

**Physical, chemical and crystallographic properties: Luster:** given as vitreous, but the optical data indicate adamantine. **Diaphaneity:** presumably transparent to translucent. **Color:** dark red-brown to black. **Streak:** brown. **Luminescence:** nonfluorescent. **Hardness:** about 3½. **Tenacity:** brittle. **Cleavage:** {001} perfect. **Fracture:** uneven to conchoidal. **Density:** could not be measured, 3.33 g/cm$^3$ (calc.). **Crystallography:** Monoclinic, $Cm$, $a$ 11.253, $b$ 19.628, $c$ 8.932 Å, $\beta$ 100.05°, $V$ 1942.6 Å$^3$, $Z = 6$, $a:b:c = 0.5733:1:0.4551$. **Optical data:** Biaxial (−), $\alpha$ 1.757, $\beta$ 1.806, $\gamma$ 1.811, 2$V$(meas.) 32°, 2$V$(calc.) 31°; dispersion not given; pleochroism not given; $X \wedge c = 10^\circ$ in obtuse angle $\beta$, $Y = b$, $Z = a$. **Chemical analytical data:** A single set of electron-microprobe data gave: Na$_2$O 1.76, CaO 11.80, Mn$_2$O$_3$ 38.20, As$_2$O$_3$ 34.92. Total 86.68 wt.%. In order to get a formula consistent with the structure, these chemical data require CO$_2$ 6.90 and H$_2$O 8.48, which gives a total of 102.06 wt.% (calculations done by the abstractor). **Empirical formula** (based on 16 atoms of oxygen including one CO$_3$ and 3H$_2$O) 
$$(\text{Ca}_{1.34}\text{Na}_{0.36} \square_{1.70})\text{Mn}_{3.09}\text{O}_{2.24}(\text{AsO}_4){2.94}(\text{CO}_3)_{1.00}3.00\text{H}_2\text{O}.\) **Relationship to other species:** It is structurally related to mitridatite, Ca$_2$Fe$^{3+}3$O$_2$(PO$_4$)$\cdot$3H$_2$O, and pararobertsite Ca$_2$Mn$^{3+}3$O$_2$(PO$_4$)$\cdot$3H$_2$O.

**Name:** After the locality.

**Comments:** IMA No. 2000–005.

WILDNER, M., TILLMANNES, E., ANDRUT, M. & LORENZ, J. (2003): Sailaufite, (Ca,Na,□)$_2$Mn$^{3+}3$O$_2$(AsO$_4$)$_2$(CO$_3$)$\cdot$3H$_2$O, a new mineral from Hartkoppe Hill, Ober–Sailauf (Spessart Mountains, Germany), and its relationship to mitridatite-group minerals and pararobertsite. European Journal of Mineralogy 15, 555-564.
**Santabarbaraite**

Fe$^{3+}_3$(PO$_4$)$_2$(OH)$_3$$\cdot$5H$_2$O

**Locality:** Valdarno Superiore (Upper Arno River Valley), Santa Barbara mining district, Tuscany, Italy. Beneath the Wannon Falls, about 7 km west of Hamilton, Victoria, Australia.

**Occurrence:** In clays at both localities. It is associated with metavivianite at the type locality.

**General appearance:** At the type locality, as concretionary nodules (up to 6 cm in diameter) with cavities filled by aggregates (up to 3 mm across) of submillimetric pseudocrystals with the morphology of vivianite. Some of the aggregates show a core of metavivianite. At Wannon Falls, it occurs as pseudomorphs after vivianite crystals up to 9 cm across.

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous to greasy.
- **Diaphaneity:** translucent.
- **Color:** brown or light brown in hand specimens, but yellow-amber under the microscope.
- **Streak:** yellow-amber.
- **Luminescence:** nonfluorescent.
- **Hardness:** was not determined.
- **Tenacity:** brittle.
- **Cleavage:** nothing distinct, but shows a good parting parallel to the original perfect cleavage of vivianite.
- **Fracture:** not given.
- **Density:** 2.42 g/cm$^3$ (meas.).
- **Crystallography:** Amorphous.
- **Twinning:** none observed.
- **X-ray powder-diffraction data:** None.
- **Optical data:** Isotropic, $n$ 1.695.
- **Chemical analytical data:** Mean of thirty sets of electron-microprobe data (with H$_2$O by TGA): MgO 0.61, Mn$_2$O$_3$ 2.23, Fe$_2$O$_3$ 43.97, P$_2$O$_5$ 29.48, H$_2$O 23.90, Total 100.19 wt.%. Empirical formula: (Fe$_{2.71}$Mn$_{0.14}$Mg$_{0.07}$)$_{2.92}$(PO$_4$)$_{2.05}$(OH)$_{2.54}$$\cdot$5.26H$_2$O.
- **Relationship to other species:** None apparent.

**Name:** After the mining district of the type locality and after the Christian martyr Santa Barbara, the patron saint of miners, who was born in Nicomedia, now Izmid (Turkey) in the IVth century AD.

**Comments:** IMA No. 2000–052A.

Shirokshinite

K(NaMg₂)Si₄O₁₀F₂

**Locality:** The +252 meter level of the Kirovskii apatite mine, Kukisvumchorsk Mountain, Khibina alkaline massif, Kola Peninsula, Russia.

**Occurrence:** In a small hyperalkaline pegmatite embedded in rischorrite near the contact with nepheline-apatite rock. Associated minerals are: microcline, kupletskite, aegirine, natrolite, lorenzenite, calcite, remondite-(Ce), donnayite-(Y), mckelveyite-(Y) and galena.

**General appearance:** Coarse, hexagonal prismatic crystals up to 2.5 × 1 × 0.8 mm grouped in sheaf-like clusters up to 2.5 mm. The crystals are usually skeletal and look like hollow "cases" and snowflakes.

**Physical, chemical and crystallographic properties:** Luster: pearly to vitreous. Diaphaneity: transparent to translucent. Streak: white. Luminescence: nonfluorescent. Hardness: 2½. Tenacity: flexible but almost inelastic. Cleavage: {001} perfect. Fracture: laminated. Density: could not be measured, 2.91 g/cm³ (calc.). Crystallography: Monoclinic, C2/m, a 5.269, b 9.092, c 10.198 Å, β 100.12°, V 481.0 Å³, Z = 2, a:b:c = 0.5795:1:1.1216. Morphology: {001}, {110}, {011} and possibly {111}. Twinning: none mentioned. X-ray powder-diffraction data: 10.0(70)(001), 3.67(60)(11 2), 3.36(90)(022,003), 2.59(90)(201,130,200,131), 2.41(100)(201,132), 2.14(60)(202,133), 1.665(80)(204,135), 1.522(100)(208,135,331,060), 1.359(60)(207,136,046). Optical data: Biaxial (−), α 1.526, β 1.553, γ 1.553, 2V(meas.) 5°, 2V(calc.) 0°; dispersion not observed; nonpleochroic; X ∩ c = 3° in obtuse angle β, Y = b, Z ∩ a = 7° in obtuse angle β (corrected here by abstracter). Chemical analytical data: Mean of three sets of electron-microprobe data: Na₂O 7.01, K₂O 10.18, MgO 19.17, MnO 0.23, FeO 1.54, Al₂O₃ 0.24, SiO₂ 57.64, TiO₂ 0.16, F 0.19, sum 105.36, less O = F 3.87, Total 101.49 wt.%. Empirical formula: (Na₀.₉₀Na₀.₀₂)₂₇₀.₀₂(Mg₁.₉₇Na₀.₀₉Fe₀.₀₂Mn₀.₀₁Ti₀.₀₁)₂₃₀.₀₀(Si₁.₉₉Al₀.₀₂)₂₄₀₀.₀₀O₃.₉₉F₂.₀₁. Relationship to other species: It is a member of the mica group, specifically, the Na-dominant analogue of tainiolite, K(LiMg)Si₄O₁₀F₂.

**Name:** After Russian geologist Nikolay Vasilievich Shirokshin (1809–?), a Captain in the Russian Mining Corps who was the first investigator of the Khibina alkaline massif.

**Comments:** IMA No. 2001–063. This is the -1M polytype.

**Sphaerobertrandite**

\[ \text{Be}_3\text{SiO}_4(\text{OH})_2 \]


**Occurrence:** (1) In a large, schlieren-like pegmatite in eudialyte lujavrite near the margin of poikilitic nepheline–sodalite syenites; associated minerals are: microcline, eudialyte, nepheline, sodalite, arfvedsonite, aegirine, analcime, natrolite, albite, manganese-neptunite, fluorite, thorite, sérandite, epididymite and beryllite. (2) In several pegmatites related to naujaite and tawite at upper Tavaiok River; associated with microcline, nepheline, sodalite, arfvedsonite, aegirine, eudialyte, murmanite, lamprophyllite, lorenzenite, sphalerite, polylithionite, epididymite, natrolite, analcime, albite, manganese-neptunite, fluorapatite, kuzmenkoite-Mn, organovaite-Mn, monazite-(Ce) and rhabdophane-(Ce). (3) In a single large specimen of epididymite. (4) In pegmatites with epididymite inside pseudomorphs after chkalovite at Qeqertaussaq, northern coast of Kangerluarsuk fjord. (5) With epididymite in pseudomorphs after chkalovite in pegmatite. (6) As a product of hydrothermal alteration of a greisen-like metasomatic assemblage with hsianghualite and brohmellite. (7) In pegmatite dikes with hambergite, analcime, calcite, chiavenite and montmorillonite. (8) With hambergite.

**General appearance:** Compact spherulites and aggregates, finely crystalline crusts and spherulites. These are usually made up of small crystals (up to \(0.5 \times 0.2 \times 0.05\) mm).

**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* transparent to translucent. *Color:* colorless, yellow, brownish, grayish, beige. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* 5. *Tenacity:* brittle. *Cleavage:* {001} perfect. *Fracture:* uneven. *Density:* 2.46 g/cm\(^3\) (meas.), 2.53 g/cm\(^3\) (calc.). *Crystallography:* Monoclinic, \(P_2_1/c\), \(a = 5.081\), \(b = 4.639\), \(c = 17.664\) Å, \(\beta = 106.09^\circ\), \(V = 400.0\) Å\(^3\), \(Z = 4\), \(a:b:c = 1.0953:1:3.8077\). Morphology: \{001\}, \{012\}, \{102\}, \{102\}, flattened on \{001\} and elongate along [100]. Twinning: invariably twinned by pseudo-merohedry, producing a strongly pseudo-orthorhombic unit cell. *X-ray powder-diffraction data:* 4.885(90)(100), 4.236(62)(004), 3.161(100)(111,113), 2.836(70)(104), 2.538(55)(202), 2.318(90)(020), 2.174(55)(108,117). *Optical data:* Biaxial (−), \(\alpha = 1.597\), \(\beta = 1.607\), \(\gamma = 1.616\), 2V(meas.) 70°, 2V(calc.) 86°; dispersion not observed; nonpleochroic; \(X \approx Y \approx a = -10^\circ\), \(Z = c\). *Chemical analytical data:* Analysis (Be by wet-chemical means, Si by electron microprobe, and H2O by TGA) gave: BeO 45.88, SiO\(_2\) 38.46, H\(_2\)O 12.54, Total 96.88 wt.%. Empirical formula: \(\text{Be}_{2.80}\text{Si}_{1.01}\text{O}_{3.81}(\text{OH})_{2.19}\). *Relationship to other species:* None apparent.

**Name:** Recalls the typical spherulitic morphology of aggregates and the chemical similarity to bertrandite, \(\text{Be}_3\text{Si}_2\text{O}_7(\text{OH})_2\).
Comments: Grandfathered. The mineral was first described by Semenov in 1957, but was not accepted as a valid species by many mineralogists. The Commission on New Minerals and Mineral Names of the International Mineralogical Association decided that the mineral is valid and should have the status of grandfathered.

**Surkhobite**

$(Ca,Na)(Ba,K)(Fe^{2+},Mn)_{4}Ti_{2}(Si_{4}O_{14})O_{2}(F,OH,O)_{3}$

**Locality:** In the Surkhob River basin, Dara-i-Pioz massif, Alai Ridge, Tajikistan.

**Occurrence:** In a rare-metal-enriched syenite pegmatite. Associated minerals are: aegirine, microcline, albite, quartz, amphibole, annite, bafertisite, astrophyllite, zircon, fluorite, polylithionite, stillwellite-(Ce), sogdianite, tadzhikite.

**General appearance:** Platy crystals up to 1 mm and grains up to $2 \times 1 \times 0.4 \text{ cm}$. 

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** translucent.
- **Color:** brownish red.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** $VHN 259 \text{ kg/mm}^2$ perpendicular to (001) and $482 \text{ kg/mm}^2$ on (001), Mohs $4.5$.
- **Tenacity:** brittle.
- **Cleavage:** {001} perfect.
- **Fracture:** uneven.
- **Density:** 3.84 g/cm$^3$ (meas.), 3.83 g/cm$^3$ (calc.).
- **Crystallography:** Monoclinic, $C_2$, $a = 10.723$, $b = 13.826$, $c = 20.791 \AA$, $\beta = 95.00^\circ$, $V = 3071 \AA^3$, $Z = 8$, $a:b:c = 0.7756:1:1.5038$. Morphology: {001}, habit platy. Twinning: on (001).
- **Optical data:** Biaxial (−), $\alpha$ 1.790(calc.), $\beta$ 1.858, $\gamma$ 1.888, $2V(\text{meas.})$ 65$^\circ$; dispersion $r<v$, strong; pleochroism $X$ yellow, $Y$ orange, $Z$ bright yellow, absorption $Y>Z\geq X$; $X=b$, $Z\perp a=34^\circ$.
- **Chemical analytical data:** A wet-chemical analysis gave: $Na_2O 1.57$, $K_2O 1.30$, $CaO 4.74$, $MnO 12.75$, $FeO 13.00$, $SrO 0.06$, $BaO 14.45$, $Al_2O_3 1.10$, $Fe_2O_3 3.47$, $SiO_2 26.68$, $TiO_2 14.00$, $ZrO_2 2.40$, $Nb_2O_5 1.00$, $H_2O 1.17$, $F$ 4.06, sum 101.75, less O = F 1.71, Total 100.04 wt.%. Empirical formula: $(Ca_{0.75}Na_{0.45})_{1.20}(Ba_{0.83}K_{0.24})_{1.08}(Fe^{2+}_{1.60}Mn_{1.59}Fe^{3+}_{0.38}Al_{0.19})_{3.76}(Ti_{1.55}Zr_{0.17}Nb_{0.07})_{2.19}(Si_{3.93}O_{14.24})O_{1.72}[F_{1.85}(OH)]_{1.13}]_{3.04}$.

**Relationship to other species:** It is closely related to jinshajiangite and perrualite.

**Name:** After the Surkhob River at the type locality.

**Comments:** IMA No. 2002–037.


**Tillmannsite**

\[(\text{Ag}_3\text{Hg})(\text{V,As})\text{O}_4\]

**Locality:** Roua copper occurrences, upper Var valley (Daluis gorge), at the western margin of the Barrot Dome, Alpes-Maritimes, France.

**Occurrence:** It is a secondary alteration mineral and is associated with pecoraite, vésigniéite, olivenite, kolfanite, janggunite, chlorargyrite, cuprite, copper, silver, mercurian silver, domeykite, djurleite and algodonite in small geodes.

**General appearance:** Aggregates up to 0.2 mm in diameter made up of pseudo-octahedral crystals up to 50 μm across.

**Physical, chemical and crystallographic properties:**
- **Luster:** adamantine.
- **Diaphaneity:** translucent.
- **Color:** red to brownish red.
- **Streak:** brownish red.
- **Luminescence:** nonfluorescent.
- **Hardness:** could not be determined.
- **Tenacity:** very brittle.
- **Cleavage:** none.
- **Fracture:** conchoidal.
- **Density:** could not be measured, 7.71 g/cm³ (calc.).
- **Crystallography:** Tetragonal, \(I\overline{4}\), \(a = 7.727\), \(c = 4.648\) Å, \(V = 277.5\) Å³, \(Z = 2\), \(c:a = 0.6015\). Morphology: pseudo-octahedral with \{111\}, \{110\}, \{100\}, \{101\} and minor \{001\}. Twinning: by contact on \{100\}. **X-ray powder-diffraction data:** 5.45(25)(110), 2.772(100)(211), 2.324(30)(002), 2.254(20)(301), 1.740(15)(411), 1.683(15)(312). **Optical data:** Uniaxial (+), \(\omega \approx 2.3, \epsilon \approx 2.5\), pleochroism intense, O orange-brown, E intense red-orange. **Chemical analytical data:** Mean of fourteen sets of electron-microprobe data: Ag 49.82, Hg 30.40, V 5.32, As 4.23, O 9.90, Total 99.67 wt.%. Empirical formula: \(\text{Ag}_{2.98}\text{Hg}_{0.98}\text{V}_{0.67}\text{As}_{0.38}\text{O}_{4.00}\). **Relationship to other species:** None apparent.

**Name:** After Professor Ekkehart Tillmanns (b. 1941), Institute of Mineralogy and Crystallography, Vienna, Austria.

**Comments:** IMA No. 2001–010.

Tsepinite-Ca

\[(\text{Ca,K,Na}_{\text{□}})_{2} (\text{Ti,Nb})_{2} (\text{Si}_{4}\text{O}_{12}) (\text{OH},\text{O})_{2} \cdot 4\text{H}_{2}\text{O}\]

**Locality:** Lovchorrite mine, Hackman Valley, Yukspor Mountain, Khibina massif, Kola Peninsula, Russia.

**Occurrence:** In the hydrothermally altered zone of a large aegirine – nepheline – K-feldspar pegmatite. Associated minerals are: microcline, aegirine, natrolite, kentbrooksite, kupertksite, Mn-rich lamprophyllite, fluorapatite, catapleiite, ancyliite-(Ce), ancyliite-(La), fluorapophyllite, leucophanite and chabazite-Ca.

**General appearance:** Coarse long-prismatic to needle-shaped crystals up to 0.2 × 0.6 × 5 mm. They occur as sheaf-like clusters up to 2 × 6 mm and chaotic open-work aggregates up to 1 cm.

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** transparent.
- **Color:** colorless to white and pale brownish.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** 5.
- **Tenacity:** brittle.
- **Cleavage:** not observed.
- **Fracture:** uneven.
- **Density:** 2.73 g/cm³ (meas.), 2.77 g/cm³ (calc.).

**Crystallography:** Monoclinic, \(C_2/m\), \(a = 14.484\), \(b = 14.191\), \(c = 7.907\) Å, \(\beta = 117.26°\), \(V = 1445\) Å³, \(Z = 4\), \(a:b:c = 1.0206:1:0.5572\).

**Morphology:** by analogy with tsepinite-Na, the major forms probably are \{100\} and \{001\}. Twinning: none mentioned. X-ray powder-diffraction data: 7.02\((60)(020,001)\), 6.38\((40)(201)\), 3.53\((45)(131)\), 3.16\((100)(041,022)\), 2.62\((45)(203,202)\), 2.51\((85)(44\bar{1},40\bar{3},042)\), 1.718\((50)(463,461,444,442,081)\), 1.450\((40)(483,481)\).

**Optical data:** Biaxial (+), \(\alpha = 1.666\), \(\beta = 1.676\), \(\gamma = 1.780\), 2\(V\)(meas.) 30°, 2\(V\)(calc.) 36°; dispersion \(r < v\), very weak; nonpleochroic; \(Y = b\).

**Chemical analytical data:** Mean of ten sets of electron-microprobe data: Na\(_2\)O 1.32, K\(_2\)O 2.23, CaO 5.29, MnO 0.16, FeO 0.04, ZnO 0.12, SrO 3.01, BaO 3.52, Al\(_2\)O\(_3\) 0.04, SiO\(_2\) 41.06, Ti\(_2\)O\(_2\) 21.95, Nb\(_2\)O\(_5\) 9.08, H\(_2\)O 13.30, Total 101.12 wt.%. Empirical formula: \((\text{Ca}_{1\text{.12}}\text{K}_{0\text{.56}}\text{Na}_{0\text{.55}}\text{Sr}_{0\text{.35}}\text{Ba}_{0\text{.27}}\text{Mn}_{0\text{.03}}\text{Zn}_{0\text{.02}}\text{Fe}_{0\text{.01}})_{2.87}(\text{Ti}_{3\text{.27}}\text{Nb}_{0.81})_{3.04}\)\(\text{Si}_{8.14}\text{Al}_{0.01}\)\(\text{O}_{24.42}\)\(\text{OH}_{2.45}\)\(\text{O}_{1.55}\)\(\text{H}_{2}\) \(\cdot 7.57\text{H}_{2}\)\(_2\)\(_\text{O}\).

**Relationship to other species:** It is a member of the labuntsovite group.

**Name:** Recalls the relationship to tsepinite-Na. The suffix is in accord with the IMA-approved nomenclature for the group.

**Comments:** IMA No. 2002–020.


**Tsumgallite**

GaO(OH)

**Locality:** Tsumeb mine, Tsumeb, Namibia.

**Occurrence:** In vugs of rich germanite ore. Associated minerals are: söhngeite, zincian siderite, chalcocite and quartz.

**General appearance:** Very thin platelets up to 40 × 40 μm and 0.5 to 1 μm thick.

**Physical, chemical and crystallographic properties:**
- **Luster:** pearly.
- **Diaphaneity:** translucent.
- **Color:** pale greenish yellow to beige.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** soft.
- **Tenacity:** not given.
- **Cleavage:** {010} perfect.
- **Fracture:** not given.
- **Density:** could not be determined, 5.08 g/cm³ (calc.).
- **Crystallography:** Orthorhombic, Pbnm, a 4.512, b 9.772, c 2.967 Å, V 130.8 Å³, Z = 4, \( a:b:c = 0.4617:1:0.3036 \). Morphology: only \( \{010\} \) was observed. Twinning: none mentioned.
- **X-ray powder-diffraction data:**
- **Optical data:** Biaxial, no other data could be determined. The mean index of refraction calculated from the Gladstone–Dale relationship is 1.97.
- **Chemical analytical data:** Mean of fifteen sets of electron-microprobe data (with H₂O calculated to give 1 OH): ZnO 0.78, Ga₂O₃ 78.13, Fe₂O₃ 3.99, GeO₂ 4.01, SiO₂ 1.07, H₂O (8.77), Total (96.75) wt.%. Empirical formula: \((\text{Ga}_{0.86}\text{Fe}_{0.05}\text{Ge}_{0.04}\text{Si}_{0.02}\text{Zn}_{0.01})\text{O}_{1.00}(\text{OH})_{1.00}\). **Relationship to other species:** It is the Ga-dominant member of the diaspore group.

**Name:** Recalls the type locality and the chemical composition.

**Comments:** IMA No. 2002–011.

Vasilyevite

\((\text{Hg}_2)^{2+} \text{O}_{6\frac{1}{2}} \text{Br}_2 \text{Cl}(\text{CO}_3)\)

**Locality:** Clear Creek mercury mine, New Idria district, San Benito County, California, USA.

**Occurrence:** In vugs in a brecciated silicate–carbonate rock composed of quartz and ferroan magnesite. Associated minerals in adjacent vugs are: mercury, eglestonite, montroydite, cinnabar and an undefined Hg oxyhalide.

**General appearance:** Anhedral masses less than 0.5 mm.

**Physical, chemical and crystallographic properties:**
- **Luster:** adamantine to metallic.
- **Diaphaneity:** opaque but translucent on thin edges.
- **Color:** silvery grey to black to dark red-black.
- **Streak:** red-brown.
- **Luminescence:** nonfluorescent.
- **Hardness:** approximately 3.
- **Tenacity:** very brittle.
- **Cleavage:** none.
- **Fracture:** uneven.
- **Density:** could not be measured, 9.80 g/cm\(^3\) (calc.).
- **Crystallography:** Triclinic, \(P\bar{1}\), \(a = 9.344\), \(b = 10.653\), \(c = 18.265\) Å, \(\alpha = 93.262\), \(\beta = 90.548\), \(\gamma = 115.422\)°, \(V = 1638.3\) Å\(^3\), \(Z = 2\), \(a:b:c = 0.877:1:1.7145\). Morphology: no forms were observed. Twinning: none observed. X-ray powder-diffraction data: \(7.645(60)(\bar{1}1\bar{1}), 4.205(80)(01\bar{4}), 3.296(50)(115,105), 3.132(90)(123,\bar{1}33), 2.894(100)(\bar{3}12,322), 2.722(80)(124), 2.629(50)(130,\bar{1}40)\). Optical data: In reflected light: grey, distinct anisotropism, weak bireflectance, nonpleochroic. \(R_1, R_2; \text{im}R_1, \text{im}R_2:\ (28.6, 29.5; 13.0, 13.9%) 470\text{ nm}, (26.2, 27.1; 11.1, 11.8%) 546\text{ nm}, (24.6, 25.7; 10.2, 10.9%) 589\text{ nm}, (22.8, 24.0; 9.1, 9.8%) 650\text{ nm}.
- **Chemical analytical data:** Electron-microprobe data and crystal-structure data gave: Hg\(_2\)O 89.1, I 7.0, Br 2.5, Cl 0.6, CO\(_2\) 0.8, S 0.1, sum 100.1, less O = I + Br + Cl + S 0.88, Total 99.22 wt.%. Empirical formula: Hg\(_{2.80}\)O\(_{6.86}\)I\(_{3.14}\)Br\(_{1.52}\)Cl\(_{0.82}\)S\(_{0.15}\)(CO\(_3\))\(_{0.89}\). **Relationship to other species:** none apparent.

**Name:** After Vladimir Ivanovich Vasilyev (b. 1929), of the Institute of Geology of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia.

**Comments:** IMA No. 2003–016.

**References:**
- COOPER, M.A. & HAWTHORNE, F.C. (2003): The crystal structure of vasilyevite, \((\text{Hg}_2)^{2+} \text{O}_{6\frac{1}{2}} \text{Br}_2 \text{Cl}(\text{CO}_3)\). *Canadian Mineralogist* 41, 1173-1181.
**Vitimite**

\[ \text{Ca}_6\text{B}_{14}\text{O}_{19}(\text{SO}_4)(\text{OH})_{14}\cdot5\text{H}_2\text{O} \]

**Monoclinic**

**Locality:** The Solongo boron deposit, Vitim River basin, southern part of the Vitimskoe plateau, Buryatia, Transbaikal Region, Russia (350 km north of the town of Ulan–Ude). The mineral was found in drill core from a depth of 129.4 m. Also found in the Novofrollovskoe copper deposit, Polar Urals, Russia.

**Occurrence:** It is a low-temperature hydrothermal mineral in veinlets. Associated minerals are: at Solongo: calcite, priceite, federovskite, kurchatovite, ludwigite, magnetite, sphalerite and pyrite; at Novofrollovskoe: calcite, uralborite and serpentine.

**General appearance:** Fibrous aggregates 0.2 mm thick with fibers up to 0.2 mm long.

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** transparent.
- **Color:** white.
- **Streak:** white.
- **Luminescence:** nonfluorescent.
- **Hardness:** 1½.
- **Tenacity:** sectile.
- **Cleavage:** not observed.
- **Fracture:** uneven.
- **Density:** 2.29 g/cm³ (meas.), 2.24 g/cm³ (calc.).
- **Crystallography:** Monoclinic, \( P2/m, P2 \) or \( Pm \), \( a \) 14.10, \( b \) 19.53, \( c \) 14.05 Å, \( \beta \) 120.0°, \( V \) 3350.6 Å³, \( Z \) = 4, \( a:b:c = 0.7220:1:0.7194 \).
- **Morphology:** no forms were observed. Twinning: none observed. X-ray powder-diffraction data: 12.2(10)(100,001), 4.42(4)(230,032), 3.45(5)(333), 3.036(6)(400,004), 2.911(4)(424,420), 2.720(7)(171,170,071), 2.108(4)(343), 1.992(5)(403,626,541,304,417).
- **Optical data:** Biaxial (–), \( \alpha \) 1.532, \( \beta \) 1.537, \( \gamma \) 1.540, 2V(meas.) 75°, 2V(calc.) 75°; dispersion \( r > v \); medium; nonpleochroic; orientation given as \( Z \wedge b = 5° \), but in the monoclinic system, one of the directions of principal vibration must coincide with \( b \).
- **Chemical analytical data:** Mean of six sets of electron-microprobe data (H₂O by TGA): CaO 31.25, B₂O₃ 43.51, SO₃ 7.16, H₂O 18.9, Total 100.82 wt.%. Empirical formula: \( \text{Ca}_6\text{B}_{14.00}\text{O}_{19.48}(\text{SO}_4)_{1.00}(\text{OH})_{13.52}\cdot4.99\text{H}_2\text{O} \). **Relationship to other species:** None apparent.

**Name:** After the locality.

**Comments:** IMA No. 2001–057.

Watatsumiite

$\text{KNa}_2\text{LiMn}_2\text{V}_2\text{Si}_8\text{O}_{24}$

**Locality:** Tanohata mine, Iwate Prefecture, Japan.

**Occurrence:** In a metamorphosed manganese ore deposit. Associated minerals are: quartz, K-feldspar, sérandite, potassicleakeite, suzukiite, rosoelite, vanadian aegirine, copper, chalcopryte and yarrowite.

**General appearance:** Short, prismatic crystals less than 0.8 mm long and massive aggregates less than 2 mm in diameter.

**Physical, chemical and crystallographic properties:**
- **Luster:** vitreous.
- **Diaphaneity:** transparent.
- **Color:** yellowish green.
- **Streak:** white with a greenish tint.
- **Luminescence:** not mentioned.
- **Hardness:** VHN$_{100}$ 707 to 946 kg/mm$^2$, Mohs 5 to 6.
- **Tenacity:** brittle.
- **Cleavage:** poor, direction not given.
- **Fracture:** conchoidal.
- **Density:** could not be measured, 3.24 g/cm$^3$ (calc.).
- **Crystalllography:** Monoclinic, $C_c$, $a$ 16.450, $b$ 12.492, $c$ 9.995 Å, $\beta$ 115.32°, $V$ 1857 Å$^3$, $Z$ = 4, $a$:$b$:$c$ = 1.3168:1:0.8001. Morphology: stated to be prismatic, elongate along [001] and terminated by pyramidal faces; no forms were mentioned. Twinning: none mentioned.
- **Optical data:** Biaxial (+), $\alpha$ 1.686, $\beta$ 1.694 (calc.), $\gamma$ 1.720, 2$V$(meas.) 60°; dispersion not given; pleochroism moderate with yellowish tint to pale yellowish green; orientation not given.
- **Chemical analytical data:** Mean of six sets of electron-microprobe data and laser-ablation microprobe – inductively coupled plasma – mass spectrometry: Li$_2$O 1.6, Na$_2$O 7.10, K$_2$O 4.89, MgO 1.61, CaO 0.03, MnO 12.28, FeO 0.35, BaO 0.88, SiO$_2$ 52.64, TiO$_2$ 3.13, VO$_2$ 15.10, Total 99.61 wt.%. Empirical formula: (K$_{9.94}$Ba$_{0.05}$)$_{0.99}$Na$_{2.08}$Li$_{0.97}$(Mn$_{1.57}$Mg$_{0.36}$Fe$_{0.04}$)$_{2.1}$(V$_{1.66}$Ti$_{0.34}$)$_{2.02}$(Si$_{7.97}$O$_{24.00}$).

**Relationship to other species:** It is a member of the neptunite group, specifically the V-dominant analogue of mangan-neptunite.

**Name:** After Watatsumi, the Japanese god of the sea; neptunite was named for Neptune, the Roman god of the sea.

**Comments:** IMA No. 2001–043.

Zincostaurolite

\[ \square_4 \text{Zn}_4 \text{Al}_{16} (\text{Al}_2 \square_2) \text{Si}_8 \text{O}_{40} [\text{OH}]_2 \text{O}_6 \]

**Locality:** Zermatt valley, Western Alps, Switzerland.

**Occurrence:** In a metabauxite pocket of the Mesozoic Barrhorn series. Associated minerals are: muscovite, staurolite s.l., kyanite, margarite, cookeite, chloritoid, diaspore, paragonite, gahnite, rutile, apatite, pyrite, zircon, allanite, a REE–Al phosphate (florencite ?), ankerite, tourmaline, pyrophyllite and kaolinite.

**General appearance:** Prismatic crystals up to 3 mm long.

**Physical, chemical and crystallographic properties:**
- **Luster:** probably vitreous to resinous.
- **Diaphaneity:** transparent.
- **Color:** colorless.
- **Streak:** probably white.
- **Luminescence:** nonfluorescent.
- **Hardness:** probably 7 to 7½.
- **Tenacity:** probably brittle.
- **Cleavage:** not observed.
- **Fracture:** not observed.
- **Density:** could not be measured, 3.78 g/cm³ (calc.).

**Crystallography:** Monoclinic, \( \text{C}_2/\text{m} \), \( a = 7.853 \), \( b = 16.534 \), \( c = 5.639 \) Å, \( \beta = 90.00° \), \( V = 732.2 \) Å³, \( Z = 1 \). \( a \cdot b \cdot c = 0.4750 \cdot 1.0 3411 \). Morphology: \( \{100\} \), in parallel growth with \( \{100\} \) of kyanite. Twinning: mostly untwinned. **X-ray powder-diffraction data:** 3.001(60.6) (221), 2.678(70.5) (151), 2.390(86.6) (132), 2.363(46.2) (330), 2.349(44.6) (311), 1.968(61.4) (062), 1.964(47.8) (400), 1.391(100.0) (462).

**Optical data:** Biaxial (+), \( \alpha = 1.722 \), \( \gamma = 1.734 \), nonpleochroic; \( Z = c \).

**Chemical analytical data:** Mean of three sets of electron-microprobe data:
- \( \text{Li}_2\text{O} 0.45 \), \( \text{MgO} 0.45 \), \( \text{MnO} 0.01 \), \( \text{FeO} 1.40 \), \( \text{ZnO} 11.82 \), \( \text{Al}_2\text{O}_3 54.12 \), \( \text{SiO}_2 28.47 \), \( \text{TiO}_2 0.11 \), \( \text{H}_2\text{O} 1.96 \), Total 98.79 wt.%. Empirical formula: \( (\square 3.77 \text{Mg}_{1.01} \text{Fe}_{0.13})_2 \square_{1.84} (\text{Li}_{0.53} \text{Zn}_{2.45} \text{Fe}_{0.20} \square_{0.84})_2 \square_{2.00} (\text{Al}_{13.96} \text{Ti}_{0.02})_2 \square_{18.00} (\text{Al}_{1.94} \text{Mg}_{0.09} \square_{1.77})_2 \square_{4.00} \text{Si}_{8.00} \text{O}_{39.96} [\text{OH}]_{1.67} \text{O}_{1.31} \square_{2.80} \). **Relationship to other species:** It is the Zn-dominant analogue of staurolite and magnesiostaurolite.

**Name:** Recalls the relationship to staurolite.

**Comments:** IMA No. 1992–036.

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