

## NEW MINERALS

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### Almarudite



HEXAGONAL

**Locality:** A quarry at the Bellerberg volcano lava field, near Ettringen, 2 km north of Mayen, Laacher See region, eastern Eifel area, Germany.

**Occurrence:** In xenoliths in leucite tephrite lava. Associated minerals are: tridymite, sanidine, a clinopyroxene, an amphibole, quartz, hematite and braunite.

**General appearance:** Euhedral crystals, thick tabular on {001}; maximum diameter 1.5 mm and 0.2 mm thick.

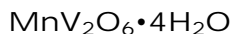
**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* presumably transparent to translucent. *Color:* yellow to orange. *Streak:* light orange. *Luminescence:* nonfluorescent. *Hardness:* not given. *Tenacity:* brittle. *Cleavage:* none. *Fracture:* irregular. *Density:* not measured, 2.72 g/cm<sup>3</sup> (calc.). *Crystallography:* Hexagonal, *P6/mmc*, *a* 9.997, *c* 14.090 Å, *V* 1219.5 Å<sup>3</sup>, *Z* = 2, *c:a* = 1.4100. *Morphology:* {001}, {100}, {102} and {110}. *Twinning:* none mentioned. *X-ray powder-diffraction data:* 7.047(40)(002), 5.000(40)(110), 4.076(80)(112), 3.522(40)(004), 3.187(90)(211), 2.882(100)(300), 2.732(50)(204), 1.826(40)(315). *Optical data:* Uniaxial (-),  $\omega$  1.560,  $\varepsilon$  1.559, pleochroism strong, O orange, E colorless. **Chemical analytical data:** Mean of seven sets of electron-microprobe data (BeO by LAM-ICP-MS): Na<sub>2</sub>O 0.66, K<sub>2</sub>O 4.05, BeO 5.18, MgO 1.51, CaO 0.12, MnO 7.31, FeO 4.48, ZnO 0.24, Al<sub>2</sub>O<sub>3</sub> 4.09, SiO<sub>2</sub> 72.31, Total 99.95 wt.%. Empirical formula: K<sub>0.86</sub>Na<sub>0.21</sub>(Mn<sub>1.03</sub>Fe<sub>0.62</sub>Mg<sub>0.38</sub>Zn<sub>0.03</sub>Ca<sub>0.02</sub>)<sub>Σ2.08</sub>(Be<sub>2.07</sub>Al<sub>0.80</sub>)<sub>Σ2.87</sub>Si<sub>12.05</sub>O<sub>30.00</sub>. **Relationship to other species:** It is a member of the milarite group.

**Name:** After the authors' hosting and supporting institution, "Universität Wien", and is derived from the university's proper name "ALma MAter RUDolphina".

**Comments:** IMA No. 2002-048.

MIHAJLOVIĆ, T., LENGAUER, C.L., NTAFLAS, T., KOLITSCH, U. & TILLMANN, E. (2004): Two new minerals, rondorfite, Ca<sub>8</sub>Mg[SiO<sub>4</sub>]<sub>4</sub>Cl<sub>2</sub>, and almarudite, K(□,Na)<sub>2</sub>(Mn,Fe,Mg)<sub>2</sub>(Be,Al)<sub>3</sub>[Si<sub>12</sub>O<sub>30</sub>]. *Neues Jahrbuch für Mineralogie, Abhandlungen* 179, 265-294.

## Ansermetite



MONOCLINIC

**Locality:** The Faniel iron–manganese mine near Ausserferrera, Ferrera Valley, Graubünden, Switzerland.

**Occurrence:** In thin fractures near or across palenzonaite-bearing veinlets. Associated minerals are: fanielite and iron oxyhydroxides.

**General appearance:** As crusts up to about 500  $\mu\text{m}$  and several square centimeters in area. Also as rare single crystals up to 100  $\mu\text{m}$  across.

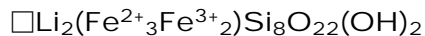
**Physical, chemical and crystallographic properties:** *Luster:* adamantine. *Diaphaneity:* transparent. *Color:* crusts are bordeaux-colored, crystals are carmine red. *Streak:* orange. *Luminescence:* nonfluorescent. *Hardness:* about 3. *Tenacity:* brittle. *Cleavage:* {110} good. *Fracture:* uneven. *Density:* 2.57  $\text{g}/\text{cm}^3$  (meas.), 2.43  $\text{g}/\text{cm}^3$  (calc.). **Crystallography:** Monoclinic,  $C2/c$ ,  $a$  13.171,  $b$  10.128,  $c$  6.983 Å,  $\beta$  111.572°,  $V$  866.3 Å<sup>3</sup>,  $Z = 4$ ,  $a:b:c = 1.3005:1:0.6895$ . *Morphology:* only {110} could be identified. *Twinning:* none observed. **X-ray powder-diffraction data:** 7.82(100)(110), 5.69(20)( $\bar{1}11$ ), 5.06(20)(020), 4.51(30)(111), 3.91(30)(220), 3.029(70)( $\bar{1}31$ ). **Optical data:** Biaxial (sign unknown),  $n_{\min}$  1.797,  $n_{\max}$  1.856,  $2V$ (meas.) unknown, dispersion unknown; pleochroism strong,  $X$  yellow orange,  $Z$  ruby red; orientation not given. **Chemical analytical data:** Mean of eight sets of electron-microprobe data ( $\text{H}_2\text{O}$  calculated): MnO 20.85, SrO 0.14,  $\text{V}_2\text{O}_5$  53.80,  $\text{As}_2\text{O}_5$  0.44,  $\text{H}_2\text{O}$  (24.77), Total (100.00) wt.%. Empirical formula:  $\text{Mn}_{0.93}(\text{V}_{1.87}\text{As}_{0.01})_{\Sigma 1.88}\text{O}_{5.66} \bullet 4.35\text{H}_2\text{O}$ . **Relationship to other species:** None apparent.

**Name:** After Stefan Ansermet (b. 1964), an amateur mineralogist, in recognition of his contribution to the descriptive mineralogy and to the photography of the Alpine mineral wealth.

**Comments:** IMA No. 2002–017.

BRUGGER, J., BERLEPSCH, P., MEISSER, N. & ARMBRUSTER, T. (2003): Ansermetite,  $\text{MnV}_2\text{O}_6 \cdot 4\text{H}_2\text{O}$ , a new mineral species with  $\text{V}^{5+}$  in five-fold coordination from Val Ferrera, Eastern Swiss Alps. *Canadian Mineralogist* 41, 1423–1431.

## Ferri-clinoferroholmquistite



MONOCLINIC

**Locality:** Arroyo de la Yedra valley, in the eastern sector of the Pedriza Massif, Sierra de Guadarrama, Spanish Central System, Spain.

**Occurrence:** The three types of occurrences and their associated minerals are as follows. (1) magmatic: quartz, calcic plagioclase, microcline, annite and zircon; (2) episyenitic: albite, Li-rich aegirine-augite, sodic ferripedrizite, ferriwhittakerite, ferri-ottoliniite, sodic-ferri-clinoferroholmquistite, titanite, andradite, magnetite and "apatite"; (3) late retrograde: tainiolite, microcline, quartz, ferro-actinolite, "chlorite", muscovite, hematite, clay minerals and clinozoisite.

**General appearance:** Intergranular aggregates of subhedral to euhedral habit (size not stated, but extremely small).

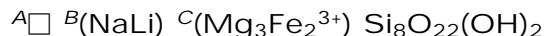
**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* not given, but probably transparent to translucent. *Color:* black. *Streak:* gray. *Luminescence:* nonfluorescent. *Hardness:* 6. *Tenacity:* brittle. *Cleavage:* {110} good. *Fracture:* uneven. *Density:* could not be measured, 3.24 g/cm<sup>3</sup> (calc.). *Crystallography:* Monoclinic, *C2/m*, *a* 9.462, *b* 17.898, *c* 5.302 Å,  $\beta$  101.88°, *V* 878.6 Å<sup>3</sup>, *Z* = 2, *a:b:c* = 0.5287:1:0.2962. *Morphology:* no forms were mentioned. *Twinning:* none observed. *X-ray powder-diffraction data:* 8.224(100)(110), 4.474(31)(040), 3.420(30)(131), 3.042(54)(310), 2.717(70)(151), 2.492(32)(202), 2.165(22)(261). *Optical data:* could not be determined, but the mean index of refraction calculated from the Gladstone-Dale relationship is 1.710. *Chemical analytical data:* Electron-microprobe data (Li<sub>2</sub>O, H<sub>2</sub>O and F by SIMS): Li<sub>2</sub>O 3.80, Na<sub>2</sub>O 1.29, K<sub>2</sub>O 0.01, MgO 5.04, CaO 0.13, MnO 1.14, FeO 12.98, ZnO 0.21, Al<sub>2</sub>O<sub>3</sub> 1.51, Fe<sub>2</sub>O<sub>3</sub> 15.63, SiO<sub>2</sub> 56.11, TiO<sub>2</sub> 0.07, H<sub>2</sub>O 1.88, F 0.54, sum 100.34, less O = F 0.23, Total 100.11 wt.%. Empirical formula: Na<sub>0.28</sub>(Li<sub>1.90</sub>Na<sub>0.08</sub>Ca<sub>0.02</sub>)<sub>Σ2.00</sub>(Fe<sup>3+</sup><sub>1.68</sub>Fe<sup>2+</sup><sub>1.55</sub>Mg<sub>1.07</sub>Li<sub>0.28</sub>Al<sub>0.25</sub>Mn<sub>0.14</sub>Zn<sub>0.02</sub>Ti<sub>0.01</sub>)<sub>Σ5.00</sub>Si<sub>8.00</sub>O<sub>21.97</sub>[(OH)<sub>1.79</sub>F<sub>0.24</sub>]<sub>Σ2.03</sub>. *Relationship to other species:* It is a member of the amphibole group.

**Name:** It conforms with the latest revision of amphibole-group nomenclature.

**Comments:** IMA No. 2001-066.

OBERTI, R., CÁMARA, F., CABALLERO, J.M. & OTTOLINI, L. (2003): Sodic-ferri-ferropedrizite and ferri-clinoferroholmquistite: mineral data and degree of order of the A-site cations in Li-rich amphiboles. *Canadian Mineralogist* 41, 1345-1354.

## Ferri-ottoliniite



MONOCLINIC

**Locality:** East sector of the Pedriza Massif, Sierra de Guadarrama, Spanish Central System, Spain.

**Occurrence:** In episyenitic bodies. Associated minerals are: (1) (magmatic association) quartz, anorthite, microcline, annite and zircon; (2) (episyenitic association) albite, aegirine-augite, sodic-ferripedrizite, sodic-ferri-ferropedrizite, ferriwhittakerite, ferri-clinoferroholmquistite, sodic-ferri-clinoferroholmquistite, titanite, andradite, magnetite and apatite; (3) (late retrograde associations) (a) tainiolite and microlite; (b) quartz, ferro-actinolite, chlorite; (c) muscovite, hematite, clay minerals, clinozoisite.

**General appearance:** not given.

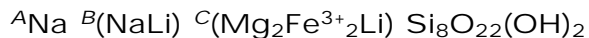
**Physical, chemical and crystallographic properties:** *Luster:* not given but probably vitreous. *Diaphaneity:* translucent. *Color:* black. *Streak:* gray. *Luminescence:* nonfluorescent. *Hardness:* not given but probably 5 to 6. *Tenacity:* brittle. *Cleavage:* {110} perfect. *Fracture:* uneven. *Density:* could not be measured, 3.26 g/cm<sup>3</sup> (calc.). *Crystallography:* Monoclinic, *C2/m*, *a* 9.535, *b* 17.876, *c* 5.294 Å, β 102.54°, *V* 880.82 Å<sup>3</sup>, *Z* = 2, *a:b:c* = 0.5334:1:0.2962. *Morphology:* no forms were mentioned. *Twinning:* none mentioned. *X-ray powder-diffraction data:* 8.256(100)(110), 4.469(33)(040), 3.407(45)(131), 3.057(56)(310), 2.709(81)(151), 2.581(26)(061), 2.501(43)(202), 2.160(25)(261). *Optical data:* Not given, but the mean index of refraction calculated here from the Gladstone–Dale relationship is 1.710. *Chemical analytical data:* Electron-microprobe data (Li<sub>2</sub>O and H<sub>2</sub>O by SIMS): Li<sub>2</sub>O 2.84, Na<sub>2</sub>O 3.84, K<sub>2</sub>O 0.40, MgO 6.28, CaO 0.41, MnO 1.08, FeO 7.61, ZnO 2.90, Al<sub>2</sub>O<sub>3</sub> 0.60, Fe<sub>2</sub>O<sub>3</sub> 15.70, SiO<sub>2</sub> 55.25, TiO<sub>2</sub> 0.52, H<sub>2</sub>O 1.57, F 1.03, sum 100.03, less O = F 0.43, Total 99.60 wt.%. Empirical formula: <sup>A</sup>(Na<sub>0.38</sub>K<sub>0.07</sub>)<sub>Σ0.45</sub> <sup>B</sup>(Li<sub>1.24</sub>Na<sub>0.70</sub>Ca<sub>0.06</sub>)<sub>Σ2.00</sub> <sup>C</sup>(Fe<sup>2+</sup><sub>0.92</sub>Mg<sub>1.35</sub>Mn<sub>0.13</sub>Zn<sub>0.31</sub>Fe<sup>3+</sup><sub>1.71</sub>Al<sub>0.10</sub>Ti<sub>0.06</sub>Li<sub>0.41</sub>)<sub>Σ4.99</sub> <sup>T</sup>Si<sub>8.00</sub>O<sub>22.00</sub> <sup>X</sup>[(OH)<sub>1.52</sub>F<sub>0.47</sub>]<sub>Σ1.99</sub>. **Relationship to other species:** It is a member of the amphibole group.

**Name:** After Luisa Ottolini (b. 1954), of CNR – Istituto di Geoscienze e Georisorse, Pavia, Italy, for her fundamental contributions to the advancement of ion-probe analysis of rock-forming minerals.

**Comments:** IMA No. 2001–067A. Chemical analytical data are not given in the paper, so the data submitted in the IMA proposal are given here.

OBERTI, R., CÁMARA, F. & CABALLERO, J.M. (2004): Ferri-ottoliniite and ferriwhittakerite, two new end-members of the new Group 5 for monoclinic amphiboles. *American Mineralogist* 89, 888–893.

## Ferriwhittakerite



MONOCLINIC

**Locality:** East sector of the Pedriza Massif, Sierra de Guadarrama, Spanish Central System, Spain.

**Occurrence:** In episyenitic bodies. Associated minerals are: (1) (magmatic association) quartz, anorthite, microcline, annite and zircon; (2) (episyenitic association) albite, aegirine-augite, sodic-ferripedrizite, sodic-ferri-ferropedrizite, ferri-ottoliniite, ferri-clinoferroholmquistite, sodic-ferri-clinoferroholmquistite, titanite, andradite, magnetite and apatite; (3) (late retrograde associations) (a) tainiolite and microlite; (b) quartz, ferro-actinolite, chlorite; (c) muscovite, hematite, clay minerals, clinozoisite.

**General appearance:** not given.

**Physical, chemical and crystallographic properties:** *Luster:* not given but probably vitreous. *Diaphaneity:* translucent. *Color:* black. *Streak:* gray. *Luminescence:* nonfluorescent. *Hardness:* not given but probably 6. *Tenacity:* brittle. *Cleavage:* {110} perfect. *Fracture:* uneven. *Density:* could not be measured, 3.23 g/cm<sup>3</sup> (calc.). **Crystallography:** Monoclinic, C2/m, a 9.712, b 17.851, c 5.297 Å, β 103.63°, V 892.5 Å<sup>3</sup>, Z = 2, a:b:c = 0.5441:1:0.2967. *Morphology:* no forms were mentioned. *Twinning:* none mentioned. **X-ray powder-diffraction data:** 8.344(98)(110), 4.463(44)(040), 3.392(74)(131), 3.098(72)(310), 2.701(100)(151), 2.576(36)(061), 2.524(67)(202), 2.157(35)(261). **Optical data:** Not given, but the mean index of refraction calculated here from the Gladstone–Dale relationship is 1.694. **Chemical analytical data:** Electron-microprobe data (Li<sub>2</sub>O and H<sub>2</sub>O by SIMS): Li<sub>2</sub>O 2.28, Na<sub>2</sub>O 6.71, K<sub>2</sub>O 0.72, MgO 6.69, CaO 0.67, MnO 0.97, FeO 4.68, ZnO 3.66, Al<sub>2</sub>O<sub>3</sub> 0.57, Fe<sub>2</sub>O<sub>3</sub> 13.36, SiO<sub>2</sub> 54.26, TiO<sub>2</sub> 1.07, H<sub>2</sub>O 1.32, F 1.55, sum 98.51, less O = F 0.65, Total 97.86 wt.%. Empirical formula:  ${}^A(\text{Na}_{0.64}\text{K}_{0.14})_{\Sigma 0.78} {}^B(\text{Li}_{0.62}\text{Na}_{1.28}\text{Ca}_{0.11})_{\Sigma 2.01} {}^C(\text{Fe}^{2+}_{0.58}\text{Mg}_{1.47}\text{Mn}_{0.12}\text{Zn}_{0.40}\text{Fe}^{3+}_{1.48}\text{Al}_{0.10}\text{Ti}_{0.12}\text{Li}_{0.73})_{\Sigma 5.00} {}^T\text{Si}_{8.00}\text{O}_{22.00} {}^X[(\text{OH})_{1.30}\text{F}_{0.72}]_{\Sigma 2.02}$ . **Relationship to other species:** It is a member of the amphibole group.

**Name:** After Eric J.W. Whittaker (b. 1921), of Oxford University, who did pioneering work in amphibole crystal-chemistry, and greatly contributed to the settling of basic interpretative criteria and nomenclature.

**Comments:** IMA No. 2001–067A. Chemical analytical data are not given in the paper, so the data submitted in the IMA proposal are given here.

OBERTI, R., CÁMARA, F. & CABALLERO, J.M. (2004): Ferri-ottoliniite and ferriwhittakerite, two new end-members of the new Group 5 for monoclinic amphiboles. *American Mineralogist* 89, 888–893.

## Fluorvesuvianite



TETRAGONAL

**Locality:** The abandoned Lupikko iron mine, Pitkäranta, Karelia, Russia.

**Occurrence:** In cavities of chloritized diopside skarn. Associated minerals are: calcite, clinocllore and sphalerite.

**General appearance:** Radiating aggregates of acicular crystals 5 to 30  $\mu\text{m}$  thick and up to 1.5 cm long.

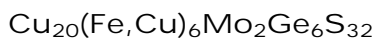
**Physical, chemical and crystallographic properties:** *Luster:* vitreous, silky. *Diaphaneity:* transparent. *Color:* colorless. *Streak:* presumably white. *Luminescence:* nonfluorescent. *Hardness:* 6. *Tenacity:* brittle. *Cleavage:* none observed. *Fracture:* not given. *Density:* 3.46  $\text{g}/\text{cm}^3$  (meas.), 3.43  $\text{g}/\text{cm}^3$  (calc.). *Crystallography:* Tetragonal,  $P4/nnc$ ,  $a$  15.516,  $c$  11.772 Å,  $V$  2834 Å<sup>3</sup>,  $Z = 2$ ,  $c:a = 0.7587$ . *Morphology:* {100} and {110}. *Twinning:* none mentioned. *X-ray powder-diffraction data:* 3.465(30)(420), 3.040(30)(510), 2.945(35)(004), 2.743(90)(432), 2.589(50)(224), 2.453(100)(620), 1.619(30)(526). *Optical data:* Uniaxial (-),  $\omega$  1.702,  $\varepsilon$  1.699, nonpleochroic. *Chemical analytical data:* Mean of four sets of electron-microprobe data: MgO 1.90, CaO 36.10, MnO 0.10, FeO 2.80, Al<sub>2</sub>O<sub>3</sub> 17.90, SiO<sub>2</sub> 36.60, H<sub>2</sub>O 0.50 (by TGA), F 4.60, sum 100.50, less O = F 1.94, Total 98.56 wt.%. Empirical formula: Ca<sub>19.13</sub>(Al<sub>10.43</sub>Mg<sub>1.40</sub>Fe<sub>1.16</sub>Mn<sub>0.04</sub>) $\Sigma$ 13.03 Si<sub>18.10</sub>O<sub>68.00</sub>[F<sub>7.19</sub>(OH)<sub>1.65</sub>O<sub>1.16</sub>] $\Sigma$ 10.00. *Relationship to other species:* It is the F-dominant member of the vesuvianite group.

**Name:** Reflects its relationship to vesuvianite.

**Comments:** IMA No. 2002-037.

BRITVIN, S.N., ANTONOV, A.A., KRIVOVICHEV, S.V., ARMBRUSTER, T., BURNS, P.C. & CHUKANOV, N.V. (2003): Fluorvesuvianite, Ca<sub>19</sub>(Al,Mg,Fe<sup>2+</sup>)<sub>13</sub>[SiO<sub>4</sub>]<sub>10</sub>[Si<sub>2</sub>O<sub>7</sub>]<sub>4</sub>O(F,OH)<sub>9</sub>, a new mineral species from Pitkäranta, Karelia, Russia: description and crystal structure. *Canadian Mineralogist* 41, 1371-1380.

## Maikainite



CUBIC

**Locality:** (1) Maikain deposit, Kazakhstan and (2) Tsumeb deposit, Namibia.

**Occurrence:** (1) In a gold-bearing massive-sulfide base-metal deposit. Associated minerals are: germanite, ovamboite, germanocolusite, sphalerite, bornite, tennantite, gallite, galena and barite. (2) In a germanium-bearing massive-sulfide base-metal deposit. Associated minerals are: ovamboite, germanite and germanocolusite.

**General appearance:** (1) Tiny (up to 45  $\mu\text{m}$ ) oval particles and rare crystals {111} and {110}. (2) Round segregations usually 3 to 40  $\mu\text{m}$  across, but up to 150  $\mu\text{m}$ .

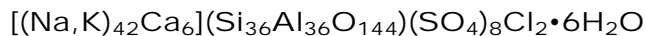
**Physical, chemical and crystallographic properties:** *Luster:* metallic. *Diaphaneity:* opaque. *Color:* megascopic color not given. *Streak:* not given. *Hardness:* VHN<sub>30</sub> 275 to 345 (average 305) kg/mm<sup>2</sup>. *Tenacity:* not given. *Cleavage:* absent. *Fracture:* not given. *Density:* could not be measured, 4.54 g/cm<sup>3</sup> (calc.). *Crystallography:* Cubic, *P43n* by analogy with the germanite group, *a* 10.64 Å, *V* 1205 Å<sup>3</sup>, *Z* = 1. *Morphology:* {111} and {110}. *Twinning:* none mentioned. *X-ray powder-diffraction data:* 3.07(10)(222), 2.66(2)(400), 1.884(8)(440), 1.603(4)(622), 1.331(1)(800), 1.220(2)(662), 1.190(1)(840). *Optical data:* In reflected light: bright yellow to grayish yellow, isotropic, no internal reflections. *R:* (23.7%) 470 nm, (25.5%) 546 nm, (25.7%) 589 nm, (25.6%) 650 nm. *Chemical analytical data:* Three sets of electron-microprobe data are given. The data corresponding to the material used to derive the unit-cell parameter are: Cu 42.55, Zn 0.56, Fe 6.35, As 2.28, Mo 5.21, W 1.24, S 31.40, V 0.12, Ge 10.86, Ga 0.15, Total 100.72 wt.%. Empirical formula: (Cu<sub>21.91</sub>Fe<sub>3.72</sub>Zn<sub>0.28</sub>)<sub>Σ25.91</sub>(Mo<sub>1.78</sub>W<sub>0.22</sub>V<sub>0.08</sub>)<sub>Σ2.08</sub>(Ge<sub>4.90</sub>As<sub>1.00</sub>Ga<sub>0.07</sub>)<sub>Σ5.97</sub>S<sub>32.04</sub>. *Relationship to other species:* A member of the germanite group.

**Name:** Reflects the type locality.

**Comments:** IMA No. 1992-038.

SPRIDONOV, E.M. (2003): Maikainite  $\text{Cu}_{20}(\text{Fe,Cu})_6\text{Mo}_2\text{Ge}_6\text{S}_{32}$  and ovamboite  $\text{Cu}_{20}(\text{Fe,Cu,Zn})_6\text{W}_2\text{Ge}_6\text{S}_{32}$ : new minerals in massive sulfide base metal ores. *Doklady Earth Sciences* 393A, 1329-1332.

## Marinellite



TRIGONAL

**Locality:** Sacrofano, Biacchella Valley, Latium, Italy

**Occurrence:** In an ejected volcanic block. Associated minerals are: giuseppettite, sanidine, nepheline, haüyne, biotite and kalsilite.

**General appearance:** Anhedral grains 1 to 2 mm across.

**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* colorless. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* 5½. *Tenacity:* brittle. *Cleavage:* {001} poor. *Fracture:* conchoidal. *Density:* 2.405 g/cm<sup>3</sup> (meas.), 2.43 g/cm<sup>3</sup> (calc.). *Crystallography:* Trigonal, *P31c* or *P2c*, *a* 12.880, *c* 31.761 Å, *V* 4563.1 Å<sup>3</sup>, *Z* = 1, *c:a* = 2.4659. *Morphology:* no forms were observed. *Twinning:* none observed optically, but merohedral twinning on (001) probably is present if the space group is *P31c*. *X-ray powder-diffraction data:* 4.20(42)(210), 3.725(100)(214), 3.513(80)(215), 3.296(35)(216), 3.089(40)(217), 2.555(35)(405), 2.150(40)(330). *Optical data:* Uniaxial (+), *ω* 1.495, *ε* 1.497, nonpleochroic. *Chemical analytical data:* Mean of several sets of electron-microprobe data (with H<sub>2</sub>O by difference): Na<sub>2</sub>O 14.95, K<sub>2</sub>O 7.94, CaO 5.14, Al<sub>2</sub>O<sub>3</sub> 27.80, SiO<sub>2</sub> 32.73, SO<sub>3</sub> 9.84, H<sub>2</sub>O (0.93), Cl 0.87, sum 100.20, less O = Cl 0.20, Total (100.00) wt.%. Empirical formula (based on 184 anions) (Na<sub>32.19</sub>K<sub>11.25</sub>)<sub>Σ43.44</sub>Ca<sub>6.12</sub> (Si<sub>36.35</sub>Al<sub>36.39</sub>) O<sub>146.12</sub>(SO<sub>4</sub>)<sub>8.20</sub>Cl<sub>1.64</sub>•3.44H<sub>2</sub>O. On the basis of Si + Al = 72 *apfu*, it is (Na<sub>31.86</sub>K<sub>11.13</sub>)<sub>Σ42.99</sub>Ca<sub>6.06</sub> (Si<sub>35.98</sub>Al<sub>36.02</sub>)<sub>Σ72.00</sub>O<sub>144.60</sub>(SO<sub>4</sub>)<sub>8.12</sub>Cl<sub>1.62</sub>•3.41H<sub>2</sub>O. *Relationship to other species:* It is a feldspathoid belonging to the cancrinite–sodalite group.

**Name:** After Giorgio Marinelli (1922–1993), Professor, Department of Earth Sciences, University of Pisa, specialist in magma genesis and tectonic settings, and in the geochemistry of volcanic rocks.

**Comments:** IMA No. 2002–021.

BONACCORSI, E. & ORLANDI, P. (2003): Marinellite, a new feldspathoid of the cancrinite–sodalite group. *European Journal of Mineralogy* 15, 1019–1027.



## Neskevaarite-Fe



MONOCLINIC

**Locality:** (1) Drillcore from the Neskevaara Hill, central part of the Vuoriyarvi alkaline-ultra-basic massif, northern Karelia, Russia (type locality). (2) The Kirovskii apatite mine, southern part of Mount Kukisvumchorr, Khibina peralkaline massif, Kola Peninsula, Russia.

**Occurrence:** (1) In a hydrothermally altered carbonatite body. Associated minerals are: dolomite, calcite, phlogopite, fluorapatite, pyrite, pyrrhotite, chalcopyrite, serpentine and nenadkevichite. (2) In cavities in a vein composed of equal parts of medium-grained calcite and K-feldspar; neskevaarite-Fe is closely intergrown with labuntsovite-Fe; it is also associated with donnayite-(Y) and bitumen coatings.

**General appearance:** prismatic crystals up to 6 mm long; in the Khibina sample, crystals are up to 1.8 cm long and 1 mm thick.

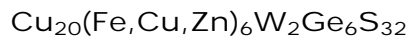
**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* translucent to transparent. *Color:* pale brown. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* about 5. *Tenacity:* brittle. *Cleavage:* none. *Fracture:* uneven. *Density:* 2.88 g/cm<sup>3</sup> (meas.), 2.90 g/cm<sup>3</sup> (calc.). *Crystallography:* Monoclinic, *Cm*, *a* 14.450, *b* 13.910, *c* 7.836 Å,  $\beta$  117.42°, *V* 1398 Å<sup>3</sup>, *Z* = 2, *a:b:c* = 1.0388:1:0.5633. *Morphology:* {201}, {100}, {101}, {010} and {021}; the authors list {001} rather than {010}, but the crystal drawing shows {010}. *Twinning:* microtwinning on (001) and (401) were found in the structural study. *X-ray powder-diffraction data:* 6.93(100)(001,020), 4.93(80)(021), 3.21(100)(421,402), 3.11(90)(041,022), 2.62(60)(241,242,202), 2.49(50)(401,403), 1.687(40)(821,823,081), 1.422(40)(483,443). *Optical data:* Biaxial (+),  $\alpha$  1.677,  $\beta$  1.684,  $\gamma$  1.790, 2*V*(meas.) 25°, 2*V*(calc.) 30°; dispersion not observed; nonpleochroic; *Y* = *b*. *Chemical analytical data:* Mean of seven sets of electron-microprobe data: Na<sub>2</sub>O 3.10, K<sub>2</sub>O 8.83, MgO 0.75, MnO 0.50, FeO 1.82, BaO 3.37, SiO<sub>2</sub> 39.29, TiO<sub>2</sub> 15.08, Nb<sub>2</sub>O<sub>5</sub> 17.96, H<sub>2</sub>O 9.26, Total 99.96 wt.%. Empirical formula: Na<sub>1.24</sub>K<sub>2.31</sub>Ba<sub>0.27</sub>(Fe<sub>0.31</sub>Mg<sub>0.23</sub>Mn<sub>0.09</sub>) $\Sigma$ 0.63(Ti<sub>2.33</sub>Nb<sub>1.67</sub>) $\Sigma$ 4.00(Si<sub>8.07</sub>O<sub>24.21</sub>) [O<sub>2.88</sub>(OH)<sub>1.12</sub>] $\Sigma$ 4.00•5.88H<sub>2</sub>O. *Relationship to other species:* It is a member of the labuntsovite group.

**Name:** Reflects the locality and the composition.

**Comments:** IMA No. 2002-007.

CHUKANOV, N.V., SUBBOTIN, V.V., PEKOV, I.V., ZADOV, A.E., TSEPIN, A.I., ROZENBERG, K.A., RASTSVETAeva, R.K. & FERRARIS, G. (2003): Neskevaarite-Fe (sic), NaK<sub>3</sub>Fe(Ti,Nb)<sub>4</sub>(Si<sub>4</sub>O<sub>12</sub>)<sub>2</sub>(O,OH)<sub>4</sub>•6H<sub>2</sub>O, a new labuntsovite group mineral. *New Data on Minerals* 38, 9-14.

## Ovamboite



CUBIC

**Locality:** (1) Tsumeb deposit, Ovamboland, Namibia, and (2) the Maikain deposit, Kazakhstan.

**Occurrence:** (1) In a germanium-bearing massive-sulfide base-metal deposit. Associated minerals are: maikainite, germanite, gallite, tennantite, sphalerite, galena and germanocolusite. (2) In a gold-bearing massive-sulfide base-metal deposit. Associated minerals are: maikainite, sphalerite, bornite and barite.

**General appearance:** Isolated grains (up to 0.1 mm) and coatings.

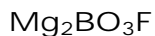
**Physical, chemical and crystallographic properties:** *Luster:* metallic. *Diaphaneity:* opaque. *Color:* megascopic color not given. *Streak:* not given. *Hardness:* VHN<sub>50</sub> 265 to 340 (average 295) kg/mm<sup>2</sup>. *Tenacity:* not given. *Cleavage:* absent. *Fracture:* not given. *Density:* could not be measured, 4.74 g/cm<sup>3</sup> (calc.). *Crystallography:* Cubic,  $P\bar{4}3n$  by analogy with the germanite group,  $a$  10.68 Å,  $V$  1216 Å<sup>3</sup>,  $Z$  = 1. *Morphology:* elongate cubes. *Twinning:* none observed. *X-ray powder-diffraction data:* 3.08(10)(222), 2.67(2)(400), 1.887(7)(440), 1.612(5)(622), 1.543(1)(444), 1.333(1)(800), 1.225(1.5)(662). *Optical data:* In reflected light: pale yellowish pink, isotropic, no internal reflections. *R:* (24.0%) 470 nm, (24.3%) 546 nm, (24.4%) 589 nm, (24.0%) 650 nm. *Chemical analytical data:* Four sets of electron-microprobe data are given. The data corresponding to the material used to derive the unit-cell parameter are: Cu 39.85, Zn 3.34, Fe 4.75, As 2.58, Mo 1.01, W 9.83, Sn 0.04, S 29.65, V 0.09, Ge 10.01, Ga 0.48, Total 101.63 wt.%. Empirical formula:  $(\text{Cu}_{21.41}\text{Fe}_{2.90}\text{Zn}_{1.74})_{\Sigma 26.05}(\text{W}_{1.83}\text{Mo}_{0.36}\text{V}_{0.06}\text{Sn}_{0.01})_{\Sigma 2.26}(\text{Ge}_{4.71}\text{As}_{1.18}\text{Ga}_{0.23})_{\Sigma 6.12}\text{S}_{31.57}$ . *Relationship to other species:* A member of the germanite group.

**Name:** After the area that includes the type locality.

**Comments:** IMA No. 1992-039.

SPIRIDONOV, E.M. (2003): Maikainite  $\text{Cu}_{20}(\text{Fe,Cu})_6\text{Mo}_2\text{Ge}_6\text{S}_{32}$  and ovamboite  $\text{Cu}_{20}(\text{Fe,Cu,Zn})_6\text{W}_2\text{Ge}_6\text{S}_{32}$ : new minerals in massive sulfide base metal ores. *Doklady Earth Sciences* 393A, 1329-1332.

## Pertsevite



ORTHORHOMBIC

**Locality:** Near the mouth of Kebirin'ya Creek, a northern tributary of Dogdo River, in the basin of the River Yana, about 250 km east of Verkhoyansk, Sakha-Yakutia, Russia (approximately Lat. 67.5° N, Long. 139° E).

**Occurrence:** In a kotoite-bearing marble. Associated minerals are: a new member of the hulsite group, calcite, kotoite, forsterite, clinohumite, spinel, ludwigite, szaibelyite, brucite and löllingite.

**General appearance:** Extremely small anhedral grains (up to 150 μm in diameter).

**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* colorless in thin section. *Streak:* probably white. *Luminescence:* could not be determined. *Hardness:* could not be determined. *Tenacity:* could not be determined. *Cleavage:* not observed. *Fracture:* uneven. *Density:* could not be determined, 3.12 g/cm<sup>3</sup> (calc.). *Crystallography:* Orthorhombic, *Pna*2<sub>1</sub>, *a* 20.490, *b* 4.571, *c* 11.890 Å, *V* 1113.61 Å<sup>3</sup>, *Z* = 16, *a:b:c* = 4.4826:1:2.6012. *Morphology:* no forms were observed. *Twinning:* none observed. *X-ray powder-diffraction data:* 2.7425(77)(313), 2.4737(49)(114), 2.4137(46)(711), 2.2409(100)(414), 2.2344(49)(810), 1.7081(92)(424), 1.7053(44)(820). *Optical data:* Biaxial (+), α 1.609, β 1.620, γ 1.642, 2*V*(meas.) 65°, 2*V*(calc.) 71°; dispersion not visible; nonpleochroic; orientation not given. *Chemical analytical data:* Ten sets of electron-microprobe data are given (with H<sub>2</sub>O calculated for charge balance as OH). Data for the material used for the structural and optical measurements are: MgO 57.39, CaO 0.24, MnO 0.65, FeO 3.71, B<sub>2</sub>O<sub>3</sub> 22.44, Al<sub>2</sub>O<sub>3</sub> 0.10, SiO<sub>2</sub> 8.25, H<sub>2</sub>O (1.67), F 7.29, sum 101.74, less O = F 3.07, Total (98.67) wt.%. Empirical formula: (Mg<sub>1.89</sub>Fe<sub>0.07</sub>Mn<sub>0.01</sub>Ca<sub>0.01</sub>)<sub>Σ1.98</sub>(B<sub>0.85</sub>Si<sub>0.18</sub>)<sub>Σ1.03</sub>O<sub>3.24</sub>F<sub>0.51</sub>(OH)<sub>0.25</sub>. *Relationship to other species:* It has the same cation-to-anion ratio as forsterite, Mg<sub>2</sub>SiO<sub>4</sub>.

**Name:** After Nikolai Nikolayewich Pertsev (b. 1930), IGEM, Moscow, in recognition of his work on boron minerals and deposits.

**Comments:** IMA No. 2002-030.

SCHREYER, W., ARMBRUSTER, T., BERNHARDT, H.-J. & MEDENBACH, O. (2003): Pertsevite, a new silicatian magnesioborate mineral with an end-member composition of Mg<sub>2</sub>BO<sub>3</sub>F, in kotoite marble from east of Verkhoyansk, Sakha-Yakutia, Russia. *European Journal of Mineralogy* 15, 1007-1018.

## Protoanthophyllite



ORTHORHOMBIC

**Locality:** Takase mine, Okayama Prefecture, Japan (Lat. 35° N, Long. 133° 20' E).

**Occurrence:** In metamorphosed serpentinite. Associated minerals are: forsterite, talc, serpentine minerals, chlorite, chromian spinel, magnetite, pentlandite and calcite.

**General appearance:** Prismatic crystals less than 5.0 mm long.

**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* presumably transparent to translucent. *Color:* colorless. *Streak:* white. *Luminescence:* not observed. *Hardness:* approximately 6. *Tenacity:* brittle. *Cleavage:* {110} perfect. *Fracture:* uneven. *Density:* could not be measured, 2.99 g/cm<sup>3</sup> (calc.). *Crystallography:* Orthorhombic, *Pnmm*, *a* 9.3553, *b* 17.9308, *c* 5.3117 Å, *V* 891.0 Å<sup>3</sup>, *Z* = 2, *a:b:c* = 0.5217:1:0.2962. *Morphology:* no forms were mentioned; prismatic, elongate along [001]. *Twinning:* none observed. *X-ray powder-diffraction data:* 8.32(71)(110), 3.66(100)(131), 3.27(49)(221), 3.08(81)(310), 2.84(96)(151), 2.56(49)(102), 2.51(57)(161). *Optical data:* Biaxial (–),  $\alpha$  1.593,  $\beta$  1.609 (calc.),  $\gamma$  1.615,  $2V(\text{meas.})$  64°, dispersion not given; pleochroism not observed; orientation not given, but elongation positive. *Chemical analytical data:* Mean of three sets of electron-microprobe data (H<sub>2</sub>O calculated to give 2 OH): Na<sub>2</sub>O 0.24, MgO 31.33, CaO 0.01, MnO 0.12, FeO 5.43, NiO 0.11, Al<sub>2</sub>O<sub>3</sub> 0.87, Cr<sub>2</sub>O<sub>3</sub> 0.02, SiO<sub>2</sub> 58.53, TiO<sub>2</sub> 0.01, H<sub>2</sub>O (2.22), Total (98.89) wt.%. Empirical formula: (Mg<sub>6.31</sub>Fe<sub>0.61</sub>Na<sub>0.06</sub>Mn<sub>0.01</sub>Ni<sub>0.01</sub>) $\Sigma$ 7.00 (Si<sub>7.90</sub>Al<sub>0.14</sub>) $\Sigma$ 8.04O<sub>22.00</sub>(OH)<sub>2.00</sub>. *Relationship to other species:* It is a member of the amphibole group.

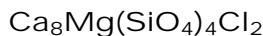
**Name:** Reflects the *proto* analogue of anthophyllite. The prefix *proto* refers to a half-rotation about the **b** axis between successive layers of octahedra.

**Comments:** IMA No. 2001–065.

KONISHI, H., DÓDONY, I. & BUSECK, P.R. (2002): Protoanthophyllite from three metamorphosed serpentinites. *American Mineralogist* 87, 1096–1103.

KONISHI, H., GROU, T.L., DÓDONY, I., MIYAWAKI, R., MATSUBARA, S. & BUSECK, P.R. (2003): Crystal structure of protoanthophyllite: a new mineral from the Takase ultramafic complex, Japan. *American Mineralogist* 88, 1718–1723.

## Rondorfite



CUBIC

**Locality:** A quarry at the Bellerberg volcano lava field, near Ettringen, 2 km north of Mayen, Laacher See region, eastern Eifel area, Germany.

**Occurrence:** In xenoliths in leucite tephrite lava. Associated minerals are: the unnamed natural analogue of  $\text{Ca}_2\text{SiO}_4 \cdot 0.5\text{H}_2\text{O}$ , ettringite–thaumasite, mayenite, ternesite, cuspidine, larnite, “calcio-olivine”, tobermorite, portlandite, hydrocalumite, a member of the ellestadite series, and minor amounts of magnetite and hematite.

**General appearance:** Anhedral grains less than 0.3 mm in diameter.

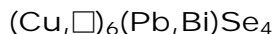
**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* presumably transparent to translucent. *Color:* orange brown to amber. *Streak:* light amber. *Luminescence:* nonfluorescent. *Hardness:* not given. *Tenacity:* brittle. *Cleavage:* none. *Fracture:* conchoidal. *Density:* not measured,  $3.03 \text{ g/cm}^3$  (calc.). *Crystallography:* Cubic,  $Fd\bar{3}$ ,  $a$  15.0850 Å,  $V$  3432.7 Å<sup>3</sup>,  $Z$  = 8. *Morphology:* no forms were observed. *Twinning:* none mentioned. *X-ray powder-diffraction data:* 2.901(40)(511), 2.666(100)(440), 1.964(30)(553), 1.885(30)(800), 1.777(30)(822), 1.540(50)(844), 1.459(30)(951). *Optical data:* Isotropic,  $n$  1.676. *Chemical analytical data:* Mean of eight sets of electron-microprobe data: Na<sub>2</sub>O 0.07, MgO 4.52, CaO 57.05, FeO 0.54, Al<sub>2</sub>O<sub>3</sub> 0.40, SiO<sub>2</sub> 30.51, TiO<sub>2</sub> 0.13, Cl 6.71, sum 99.93, less O = Cl 1.52, Total 98.41 wt.%. Empirical formula:  $(\text{Ca}_{8.09}\text{Na}_{0.02})_{\Sigma 8.11} (\text{Mg}_{0.89}\text{Al}_{0.06}\text{Fe}_{0.06})_{\Sigma 1.01} (\text{Si}_{4.04}\text{Ti}_{0.01})_{\Sigma 4.05} \text{O}_{16.20} [\text{Cl}_{1.51}(\text{OH})_{0.29}]_{\Sigma 1.80}$  (with OH added to give O+Cl+OH = 18). *Relationship to other species:* None apparent.

**Name:** After Alice and Eugen Rondorf, two distinguished mineral collectors, who found the mineral with Bernd Ternes in 1979.

**Comments:** IMA No. 1997–013.

MIHAJLOVIĆ, T., LENGAUER, C.L., NTAFLS, T., KOLITSCH, U. & TILLMANN, E. (2004): Two new minerals, rondorfite,  $\text{Ca}_8\text{Mg}[\text{SiO}_4]_4\text{Cl}_2$ , and almarudite,  $\text{K}(\square, \text{Na})_2(\text{Mn, Fe, Mg})_2(\text{Be, Al})_3[\text{Si}_{12}\text{O}_{30}]$ . *Neues Jahrbuch für Mineralogie, Abhandlungen* 179, 265–294.

## Schlemaite



MONOCLINIC

**Locality:** The Niederschlema-Alberoda uranium deposit, near Hartenstein, western Erzgebirge, Saxony, Germany (Lat. 50° 37' N, Long. 12° 40' E).

**Occurrence:** In a vein-type uranium deposit. Associated minerals are: clausthalite, eucairite, berzelianite, löllingite, dolomite and ankerite.

**General appearance:** Anhedral to subhedral grains intergrown with berzelianite, eucairite and clausthalite in aggregates up to several hundred  $\mu\text{m}$  across.

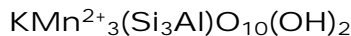
**Physical, chemical and crystallographic properties:** *Luster:* metallic. *Diaphaneity:* opaque. *Color:* black. *Streak:* black. *Hardness:*  $\text{VHN}_{25}$  106  $\text{kg}/\text{mm}^2$ , Mohs 3. *Tenacity:* brittle. *Cleavage:* none. *Fracture:* uneven. *Density:* could not be measured, 7.74  $\text{g}/\text{cm}^3$  (calc.). **Crystallography:** Monoclinic,  $P2_1/m$ ,  $a$  9.5341,  $b$  4.1004,  $c$  10.2546 Å,  $\beta$  100.066°,  $V$  394.72 Å<sup>3</sup>,  $Z = 2$ ,  $a:b:c = 2.3252:1:2.5009$ . Morphology: no forms were observed. Twinning: none observed. **X-ray powder-diffraction data:** 3.189(100)(012), 3.132(100)( $\bar{1}$ 12), 2.788(70)(212), 2.601(70)( $\bar{1}$ 13), 2.505(50)( $\bar{3}$ 11), 2.151(60)(014), 2.058(80)(020), 1.909(50)( $\bar{3}$ 14). **Optical data:** In reflected light: grey, very weak bireflectance and anisotropy, nonpleochroic.  $R_1$ ,  $R_2$ ;  ${}^{\text{im}}R_1$ ,  ${}^{\text{im}}R_2$ : (36.6, 38.1; 21.1, 23.0%) 470 nm, (36.45, 38.1; 20.7, 22.8%) 546 nm, (36.6, 38.3; 20.95, 22.9%) 589 nm, (36.6, 38.5; 21.0, 23.2%) 650 nm. **Chemical analytical data:** Mean of twenty-two sets of electron-microprobe data: Cu 38.86, Pb 13.75, Bi 9.12, Se 35.11, Ag 2.57, Au 0.07, Hg 0.09, Total 99.57 wt.%. Empirical formula:  $(\text{Cu}_{5.65}\text{Ag}_{0.22})_{\Sigma 5.87}(\text{Pb}_{0.61}\text{Bi}_{0.40})_{\Sigma 1.01}\text{Se}_{4.11}$ . **Relationship to other species:** It is chemically similar to furutobeite,  $(\text{Cu}, \text{Ag})_6\text{PbSe}_4$ , but not isostructural with it.

**Name:** After the Schlema-Alberoda ore field, in the ancient mining region of Saxony, Germany.

**Comments:** IMA No. 2003-026.

FÖRSTER, H.-J., COOPER, M.A., ROBERTS, A.C., STANLEY, C.J., CRIDDLE, A.J., HAWTHORNE, F.C., LAFLAMME, J.H.G. & TISCHENDORF, G. (2003): Schlemaite,  $(\text{Cu}, \square)_6(\text{Pb}, \text{Bi})\text{Se}_4$ , a new mineral species from Niederschlema-Alberoda, Erzgebirge, Germany: description and crystal structure. *Canadian Mineralogist* 41, 1433-1444.

## Shirozulite



MONOCLINIC

**Locality:** The Taguchi mine at Yatuhashi, Kita-shitara County, Aichi Prefecture, Japan.

**Occurrence:** In a stratabound manganese ore deposit. Associated minerals are: tephroite, rhodochrosite and "apatite".

**General appearance:** Subhedral micaceous grains up to 0.5 mm across.

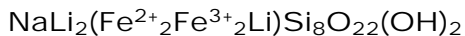
**Physical, chemical and crystallographic properties:** *Luster:* not given, but probably vitreous. *Diaphaneity:* not given, probably transparent to translucent. *Color:* dark reddish brown. *Streak:* not given. *Luminescence:* not given. *Hardness:*  $\text{VHN}_{\text{load not given}}$  100–130 kg/mm<sup>2</sup>, Mohs  $\approx$  3. *Tenacity:* not given. *Cleavage:* {001} perfect. *Fracture:* not given. *Density:* 3.20 g/cm<sup>3</sup> (meas.), 3.14 g/cm<sup>3</sup> (calc.). *Crystallography:* Monoclinic, *C2/m*, *a* 5.3791, *b* 9.319, *c* 10.2918 Å,  $\beta$  100.186°, *V* 507.8 Å<sup>3</sup>, *Z* = 2, *a:b:c* = 0.5772:1:1.1044. *Morphology:* no forms were mentioned. *Twinning:* none mentioned. *X-ray powder-diffraction data:* 10.09(100)(001), 3.426(33)(022), 3.376(51)(003), 2.646(96)( $\bar{1}$ 31), 2.458(46)( $\bar{1}$ 32), 2.194(36)( $\bar{1}$ 33), 1.5537(48)( $\bar{3}$ 31). *Optical data:* Biaxial (–),  $\alpha$  1.592,  $\beta$  1.635,  $\gamma$  1.635, *2V*(meas.) very small, *2V*(calc.) 0°; dispersion not given; pleochroism strong, *X* pale yellow, *Y* = *Z* pale brown, absorption *X* < *Y* = *Z*; orientation not given. *Chemical analytical data:* Mean of an unstated set of electron-microprobe data (*H*<sub>2</sub>*O* calculated to give *OH* + *F* = 2.00): *K*<sub>2</sub>*O* 8.75, *MgO* 7.83, *MnO* 22.38, *FeO* 2.90, *BaO* 2.77, *Al*<sub>2</sub>*O*<sub>3</sub> 18.45, *SiO*<sub>2</sub> 31.40, *TiO*<sub>2</sub> 0.71, *H*<sub>2</sub>*O* (3.66), *F* 0.11, sum (98.96), less *O* = *F* 0.05, Total (98.91) wt.%. Empirical formula:  $(\text{K}_{0.90}\text{Ba}_{0.09})_{\Sigma 0.99} (\text{Mn}_{1.53}\text{Mg}_{0.94}\text{Al}_{0.29}\text{Fe}_{0.20}\text{Ti}_{0.04})_{\Sigma 3.00} (\text{Si}_{2.54}\text{Al}_{1.47})_{\Sigma 4.01} \text{O}_{10.00} [(\text{OH})_{1.97}\text{F}_{0.03}]_{\Sigma 2.00}$ . *Relationship to other species:* It is a member of the mica group.

**Name:** After Haruo Shirozu (b. 1925), Professor Emeritus of Kyushu University, for his outstanding contributions to the crystal chemistry of sheet-silicate minerals.

**Comments:** IMA No. 2001–045.

ISHIDA, K., HAWTHORNE, F.C. & HIROWATARI, F. (2004): Shirozulite,  $\text{KMn}^{2+}_3(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_2$ , a new manganese-dominant trioctahedral mica: description and crystal structure. *American Mineralogist* 89, 232–238.

## Sodic-ferri-ferropedrizite



MONOCLINIC

**Locality:** Arroyo de la Yedra valley, in the eastern sector of the Pedriza Massif, Sierra de Guadarrama, Spanish Central System, Spain.

**Occurrence:** The three types of occurrences and their associated minerals are as follows. (1) magmatic: quartz, calcic plagioclase, microcline, annite and zircon; (2) episyenitic: albite, Li-rich aegirine-augite, sodic ferripedrizite, ferriwhittakerite, ferri-ottoliniite, ferri-clinoferroholmquistite, sodic-ferri-clinoferroholmquistite, titanite, andradite, magnetite and "apatite"; (3) late retrograde: tainiolite, microcline, quartz, ferro-actinolite, "chlorite", muscovite, hematite, clay minerals and clinozoisite.

**General appearance:** Intergranular aggregates of subhedral to euhedral habit (size not stated, but extremely small).

**Physical, chemical and crystallographic properties:** *Luster:* vitreous. *Diaphaneity:* not given, but probably transparent to translucent. *Color:* black. *Streak:* gray. *Luminescence:* nonfluorescent. *Hardness:* 6. *Tenacity:* brittle. *Cleavage:* {110} good. *Fracture:* uneven. *Density:* could not be measured, 3.23 g/cm<sup>3</sup> (calc.). *Crystallography:* Monoclinic, C2/m, a 9.496, b 17.883, c 5.297 Å, β 102.08°, V 879.6 Å<sup>3</sup>, Z = 2, a:b:c = 0.5310:1:0.2962. *Morphology:* no forms were mentioned. *Twinning:* none observed. *X-ray powder-diffraction data:* 8.241(100)( $\bar{1}$ 10), 4.471(33)(040), 3.416(41)(131), 3.050(60)(310), 2.714(72)(151), 2.494(36)( $\bar{2}$ 02), 2.164(24)(261). *Optical data:* could not be determined, but the mean index of refraction calculated from the Gladstone-Dale relationship is 1.708. *Chemical analytical data:* Electron-microprobe data (Li<sub>2</sub>O, H<sub>2</sub>O and F by SIMS): Li<sub>2</sub>O 4.20, Na<sub>2</sub>O 2.47, K<sub>2</sub>O 0.17, MgO 4.48, CaO 0.20, MnO 0.60, FeO 13.04, ZnO 0.15, Al<sub>2</sub>O<sub>3</sub> 1.24, Fe<sub>2</sub>O<sub>3</sub> 13.92, SiO<sub>2</sub> 56.25, TiO<sub>2</sub> 1.19, H<sub>2</sub>O 1.53, F 1.15, sum 100.59, less O = F 0.48, Total 100.11 wt.%. Empirical formula: (Na<sub>0.53</sub>K<sub>0.03</sub>)<sub>Σ0.56</sub>(Li<sub>1.82</sub>Na<sub>0.15</sub>Ca<sub>0.03</sub>)<sub>Σ2.00</sub>(Fe<sup>2+</sup><sub>1.55</sub>Fe<sup>3+</sup><sub>1.49</sub>Mg<sub>0.95</sub>Li<sub>0.59</sub>Al<sub>0.21</sub>Ti<sub>0.13</sub>Mn<sub>0.07</sub>Zn<sub>0.01</sub>)<sub>Σ5.00</sub>Si<sub>8.01</sub>O<sub>21.97</sub>[(OH)<sub>1.45</sub>F<sub>0.52</sub>O<sub>0.03</sub>]<sub>Σ2.00</sub>. *Relationship to other species:* It is a member of the amphibole group.

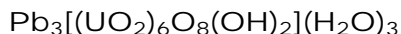
**Name:** It conforms with the latest revision of nomenclature of the amphibole group.

**Comments:** IMA No. 2001-068. Note: the valences of Fe in the empirical formula given in Table 1 (and on page 1350) of the paper are interchanged; they have been corrected here.

OBERTI, R., CÁMARA, F., CABALLERO, J.M. & OTTOLINI, L. (2003): Sodic-ferri-ferropedrizite and ferri-clinoferroholmquistite: mineral data and degree of order of the A-site cations in Li-rich amphiboles. *Canadian Mineralogist* 41, 1345-1354.



## Spriggite



MONOCLINIC

**Locality:** Number 2 workings on Radium Ridge near Mt. Painter, near Arkaroola, Northern Flinders Ranges, South Australia, Australia.

**Occurrence:** In a U–Nb–REE-bearing hydrothermal hematite breccia. Associated minerals are: beta-uranophane, soddyite, kasolite, cerian françoisite-(Nd), metatorbernite, billietite, barian boltwoodite, schoepite, metaschoepite and weeksite.

**General appearance:** Prismatic crystals up to 150  $\mu\text{m}$  long and 40  $\mu\text{m}$  across.

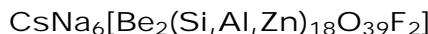
**Physical, chemical and crystallographic properties:** *Luster:* given as vitreous, but the optical data indicate adamantine. *Diaphaneity:* transparent. *Color:* bright orange. *Streak:* pale orange. *Luminescence:* nonfluorescent. *Hardness:*  $\sim 4$ . *Tenacity:* brittle. *Cleavage:* {100} good. *Fracture:* uneven. *Density:* not measured, 7.00  $\text{g}/\text{cm}^3$  (calc.); given as 7.64  $\text{g}/\text{cm}^3$ . *Crystallography:* Monoclinic,  $C2/c$ ,  $a$  28.355,  $b$  11.990,  $c$  13.998 Å,  $\beta$  104.248°,  $V$  4613 Å<sup>3</sup>,  $Z = 8$ ,  $a:b:c = 2.3649:1:1.1675$ . Morphology: {100} dominant. Other forms inferred here from the SEM image are {001} and {021}. Twinning: rotation of about 60° around [100] to form six-legged stars similar to "sagenite" rutile twins. *X-ray powder-diffraction data:* 6.92(60)(400), 6.02(30)(11 $\bar{2}$ ), 3.46(80)(800), 3.10(100)(204 plus others), 2.74(30)(440), 2.01(30)(336), 1.918(60)(10.0.4 plus others), 1.738(30)(536). *Optical data:* Biaxial (sign not given),  $n_{\min}$  1.807,  $n_{\max}$  1.891, pleochroism strong from pale yellow to dark orange; orientation not given. *Chemical analytical data:* Mean of six sets of electron-microprobe data (H<sub>2</sub>O calculated): CaO 0.14, BaO 0.25, PbO 25.51, UO<sub>3</sub> 70.90, H<sub>2</sub>O (2.98), Total (99.78) wt.%. Empirical formula:  $(\text{Pb}_{2.78}\text{Ca}_{0.06}\text{Ba}_{0.04})_{\Sigma 2.88}(\text{UO}_2)_{6.03}\text{O}_{7.89}(\text{OH})_{2.05} \bullet 3.00\text{H}_2\text{O}$ . *Relationship to other species:* It is unique among the other known Pb uranyl oxyhydroxides.

**Name:** After Reginald Claude Sprigg (1919–1994) for his contribution to the understanding and development of the geological, ecological, and historical resources of the Arkaroola station, the type locality of the mineral.

**Comments:** IMA No. 2002–014.

BRUGGER, J., KRIVOVICHEV, S.V., BERLEPSCH, P., MEISSER, N., ANSERMET, S. & ARMBRUSTER, T. (2004) Spriggite,  $\text{Pb}_3[(\text{UO}_2)_6\text{O}_8(\text{OH})_2](\text{H}_2\text{O})_3$ , a new mineral with  $\beta$ -U<sub>3</sub>O<sub>8</sub>-type sheets: description and crystal structure. *American Mineralogist* 89, 339–347.

## Telyushenkoite



TRIGONAL

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

**Occurrence:** In reedmergnerite boulders on the moraine of the Dara-i-Pioz glacier. In a rock consisting of coarse-grained reedmergnerite (85–90%), microcline (~10%) and the remaining 5% of the rock consists of pectolite, hyalotekite, kentbrooksitite, polyolithionite and albite. Minerals closely associated with telyushenkoite are: hyalotekite, shibkovite, nordite-(Ce) and leucophanite.

**General appearance:** Equant anhedral grains up to 2 cm across.

**Physical, chemical and crystallographic properties:** Luster: vitreous. Diaphaneity: transparent. Color: white to colorless. Streak: white. Luminescence: fluoresces very dim dark purple under short-wave UV. Hardness: VHN<sub>100</sub> 714 kg/mm<sup>2</sup>, Mohs 6. Tenacity: brittle. Cleavage: {100} distinct. Fracture: uneven. Density: 2.73 g/cm<sup>3</sup> (meas.), 2.73 g/cm<sup>3</sup> (calc.). Crystallography: Trigonal,  $\bar{3}m1$ , *a* 14.3770, *c* 4.8786 Å, *V* 873.2 Å<sup>3</sup>, *Z* = 1, *c/a* = 0.3393. Morphology: no forms were observed. Twinning: none observed. X-ray powder-diffraction data: 6.226(35)(020), 4.149(50)(030), 3.456(40)(130), 3.382(75)(121), 3.162(100)(031), 3.113(36)(040), 2.465(30)(231). Optical data: Uniaxial (+),  $\omega$  1.526,  $\epsilon$  1.531, nonpleochroic. Chemical analytical data: Mean of seven sets of electron-microprobe data: Na<sub>2</sub>O 13.53, K<sub>2</sub>O 0.47, Cs<sub>2</sub>O 6.76, Rb<sub>2</sub>O 0.15, BeO 3.53, ZnO 1.71, Al<sub>2</sub>O<sub>3</sub> 7.26, SiO<sub>2</sub> 64.32, F 2.84, sum 100.57, less O = F 1.20, Total 99.37 wt.%. Empirical formula: (Cs<sub>0.69</sub>Na<sub>0.30</sub>K<sub>0.14</sub>Rb<sub>0.02</sub>) $\Sigma$ 1.15 Na<sub>6.00</sub>[Be<sub>2.04</sub>(Si<sub>15.46</sub>Al<sub>2.06</sub>Zn<sub>0.30</sub>) $\Sigma$ 17.82 O<sub>38.84</sub>F<sub>2.16</sub>]. Relationship to other species: It is the Cs-dominant analogue of leifite.

**Name:** After Tamara Matveyevna Telyushenko (1930–1997), a petrographer who made major contributions to knowledge of the geology of Central Asia and who headed the Young Geologists' School of Ashkhabad for over thirty years.

**Comments:** IMA No. 2001–012.

AGAKHANOV, A.A., PAUTOV, L.A., BELAKOVSKIY, D.I., SOKOLOVA, E.V. & HAWTHORNE, F.C. (2003): Telyushenkoite, CsNa<sub>6</sub>[Be<sub>2</sub>(Si,Al,Zn)<sub>18</sub>O<sub>39</sub>F<sub>2</sub>] – a new cesium mineral of the leifite group. *New Data on Minerals* 38, 5–8.

SOKOLOVA, E., HUMINICKI, D.M.C., HAWTHORNE, F.C., AGAKHANOV, A.A., PAUTOV, L.A. & GREW, E.S. (2002): The crystal chemistry of telyushenkoite and leifite, ANa<sub>6</sub>[Be<sub>2</sub>Al<sub>3</sub>Si<sub>15</sub>O<sub>39</sub>F<sub>2</sub>], A = Cs, Na. *Canadian Mineralogist* 40, 183–192.

## Tuite



TRIGONAL

**Locality:** Suizhou L6 chondrite meteorite, which fell in 1986 in Dayanpo, 12.5 km southeast of the city of Suizhou, Hubei Province, People's Republic of China (Lat. 35° 18' N, Long. 113° 35' E).

**Occurrence:** In a shock-melt vein of the meteorite. Minerals in the meteorite are: olivine, low-Ca pyroxene, plagioclase (almost totally converted to "maskelynite", Fe-Ni metal, troilite, whitlockite, chlorapatite, chromite and ilmenite. The shock veins contain (in addition to tuite): ringwoodite, majorite, "albite-hollandite" and majorite-pyroxene solid solution.

**General appearance:** Two tabular grains were identified; one is 10 × 20 μm, and the other is 6 × 4 μm.

**Physical, chemical and crystallographic properties:** Luster: vitreous. Diaphaneity: transparent (synthetic material). Color: white to yellowish. Streak: white. Luminescence: not given. Hardness: not given. Tenacity: not given. Cleavage: none. Fracture: not observed. Density: could not be determined, 3.39 g/cm<sup>3</sup> (calc.). Crystallography: Trigonal,  $R\bar{3}m$ ,  $a$  5.258,  $c$  18.727 Å,  $V$  448.4 Å<sup>3</sup>,  $Z$  = 3,  $c/a$  = 3.5616. Morphology: no forms were observed. Twinning: none observed. X-ray powder-diffraction data: 2.891(80.3)(105), 2.628(100)(110), 2.214(20.3)(202), 1.945(47.3)(205), 1.730(24.5)(0.1.10), 1.567(22.2)(125), 1.518(18.6)(300). Optical data: (Synthetic material) Uniaxial (+),  $\omega$  1.701,  $\varepsilon$  1.706, probably nonpleochroic. Chemical analytical data: Mean of three sets of electron-microprobe data: Na<sub>2</sub>O 2.80, K<sub>2</sub>O 0.07, MgO 3.58, CaO 46.14, FeO 0.38, NiO 0.05, TiO<sub>2</sub> 0.04, P<sub>2</sub>O<sub>5</sub> 47.16, Total 100.22 wt.%. Empirical formula: (Ca<sub>2.51</sub>Na<sub>0.28</sub>Mg<sub>0.27</sub>Fe<sub>0.02</sub>) $\Sigma$ 3.08(PO<sub>4</sub>)<sub>2.02</sub>. Relationship to other species: It is the high-pressure polymorph of Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>, whitlockite being the low-pressure one.

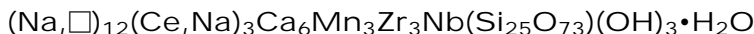
**Name:** After Tu Guangzhi (b. 1920), professor and founding director of the Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou, Guangdong Province, People's Republic of China, in recognition of his contributions to geochemistry and his pioneering work on Chinese meteorites.

**Comments:** IMA No. 2001-070.

XIE, XIANDE, MINITTI, M.E., CHEN, MING, MAO, HO-KWANG, WANG, DEQIANG, SHU, JINFU & FEI, YINGWEI (2003): Tuite,  $\gamma$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>: a new mineral from the Suizhou L6 chondrite. *European Journal of Mineralogy* 15, 1001-1005.

SUGIYAMA, S. & TOKONAMI, M. (1987): Structure and crystal chemistry of a dense polymorph of tricalcium phosphate Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>: a host to accommodate large lithophile elements in the Earth's mantle. *Physics and Chemistry of Minerals* 15, 125-130.

## Zirsilite-(Ce)



TRIGONAL

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

**Occurrence:** In the quartz core of a zoned pegmatite. Associated minerals are: carbokentbrooksite, quartz, microcline, aegirine, stillwellite-(Ce), ekanite, polythionite, 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:* creamy. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* 5. *Tenacity:* brittle. *Cleavage:* not observed. *Fracture:* conchoidal. *Density:* 3.15 g/cm<sup>3</sup> (meas.), 3.10 g/cm<sup>3</sup> (calc.). *Crystallography:* Trigonal, *R*3*m*, *a* 14.248, *c* 30.076 Å, *V* 5288 Å<sup>3</sup>, *Z* = 3, *c/a* = 2.1109. *Morphology:* {101}, {102}, {010}, {001}. *Twinning:* none mentioned. *X-ray powder-diffraction data:* 4.32(51)(025), 3.975(37)(032), 3.536(33)(027), 3.220(100)(028), 3.166(56)(127), 2.979(95)(135), 2.857(66)(044), 2.597(34)(039). *Optical data:* Uniaxial (-),  $\omega$  1.648,  $\varepsilon$  1.637, nonpleochroic. *Chemical analytical data:* Electron-microprobe data: Na<sub>2</sub>O 9.54, K<sub>2</sub>O 0.45, CaO 10.52, MnO 5.67, FeO 1.89, SrO 1.35, Y<sub>2</sub>O<sub>3</sub> 0.47, La<sub>2</sub>O<sub>3</sub> 2.31, Ce<sub>2</sub>O<sub>3</sub> 3.78, Pr<sub>2</sub>O<sub>3</sub> 0.28, Nd<sub>2</sub>O<sub>3</sub> 0.82, CO<sub>2</sub> 0.58, SiO<sub>2</sub> 45.63, TiO<sub>2</sub> 0.45, ZrO<sub>2</sub> 10.48, Nb<sub>2</sub>O<sub>5</sub> 3.76, H<sub>2</sub>O 1.52, Cl 0.32, sum 99.82, less O = Cl 0.07, Total 99.75 wt.%. Empirical formula: (Na<sub>9.04</sub>Ca<sub>0.94</sub>K<sub>0.32</sub>) $\Sigma$ 10.78 (Na<sub>1.12</sub>Ce<sub>0.76</sub>La<sub>0.47</sub>Sr<sub>0.43</sub>Nd<sub>0.16</sub>Pr<sub>0.06</sub>) $\Sigma$ 3.00 (Ca<sub>5.25</sub>Mn<sub>0.61</sub>Y<sub>0.14</sub>) $\Sigma$ 6.00 (Mn<sub>2.03</sub>Fe<sub>0.87</sub>) $\Sigma$ 2.90 (Zr<sub>2.81</sub>Ti<sub>0.19</sub>) $\Sigma$ 3.00 Nb<sub>0.93</sub>Si<sub>25.07</sub>O<sub>74.27</sub>[(OH)<sub>2.70</sub>Cl<sub>0.30</sub>] $\Sigma$ 3.00(CO<sub>3</sub>)<sub>0.43</sub>•1.44H<sub>2</sub>O. **Relationship to other species:** It is a member of the eudialyte group.

**Name:** Reflects the chemical composition.

**Comments:** IMA No. 2002-057. The indexing of the powder pattern in the paper is somewhat different from that given here.

KHOMYAKOV, A.P., DUSMATOV, V.D., FERRARIS, G., GUILA, A., IVALDI, G. & NECHELYUSTOV, G.N. (2003): Zirsilite-(Ce), (Na, □)<sub>12</sub>(Ce, Na)<sub>3</sub>Ca<sub>6</sub>Mn<sub>3</sub>Zr<sub>3</sub>Nb(Si<sub>25</sub>O<sub>73</sub>)(OH)<sub>3</sub>(CO<sub>3</sub>)•H<sub>2</sub>O and carbokentbrooksite, (Na, □)<sub>12</sub>(Na, Ce)<sub>3</sub>Ca<sub>6</sub>Mn<sub>3</sub>Zr<sub>3</sub>Nb(Si<sub>25</sub>O<sub>73</sub>)(OH)<sub>3</sub>(CO<sub>3</sub>)•H<sub>2</sub>O, two new eudialyte group minerals from Dara-i-Pioz alkaline massif, Tajikistan. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* 132(5), 40-51 (in Russ.).