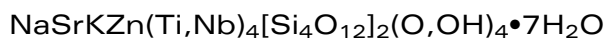


NEW MINERALS

JOSEPH A. MANDARINO

94 Moore Avenue, Toronto, Ontario M4T 1V3, Canada

Alsakharovite-Zn



MONOCLINIC

Locality: Lepkhe–Nelm Mountain, Lovozero alkaline massif, Kola Peninsula, Russia.

Occurrence: A hydrothermal mineral in cavities of a eudialyte – aegirine – feldspar pegmatite. Associated minerals are: lamprophyllite, natrolite, halloysite, ranciéite, kuzmenkoite-Zn, tsepinite-Na, vinogradovite, etc.

General appearance: Coarse, flattened prismatic crystals (up to 8 × 20 × 0.5 mm).

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* translucent to transparent. *Color:* white, pale brown, colorless. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* ~5. *Tenacity:* brittle. *Cleavage:* not observed. *Fracture:* uneven. *Density:* 2.90 g/cm³ (meas.), 2.94 g/cm³ (calc.). **Crystallography:** Monoclinic, *Cm*, *a* 14.495, *b* 13.945, *c* 7.838 Å, β 117.75°, *V* 1402 Å³, *Z* = 2, *a:b:c* = 1.0394:1:0.5621. *Morphology:* probably {100} and {001}; elongate along [010]. *Twinning:* microtwinning on (001) and (401). **X-ray powder-diffraction data:** 6.96(100) (020,001), 3.21(80)(402,421,400), 3.11(90)(041,022,240), 2.60(35)(151,241,202), 2.50(40)(441,403), 1.74(30)(080,004), 1.70(40)(463,444,461,442). **Optical data:** Biaxial (+), α 1.680, β 1.687, γ 1.787, 2*V*(meas.) 25°, 2*V*(calc.) 31°; dispersion not observed; nonpleochroic; *Y = b*. **Chemical analytical data:** Mean of eight sets of electron-microprobe data (with H₂O by TGA): Na₂O 2.04, K₂O 2.43, MgO 0.04, CaO 1.48, MnO 0.11, FeO 0.22, ZnO 5.02, SrO 4.49, BaO 3.65, Al₂O₃ 0.15, SiO₂ 39.23, TiO₂ 18.89, Nb₂O₅ 12.57, H₂O 11.10, Total 101.42 wt.%. Empirical formula: (Na_{0.68}Ca_{0.32})Σ1.00 (Sr_{0.53}Na_{0.13})Σ0.66 (K_{0.63}Ba_{0.29})Σ0.92 (Zn_{0.76}Fe_{0.04}Mn_{0.02}Mg_{0.01})Σ0.83 (Ti_{2.90}Nb_{1.16})Σ4.06 (Si_{8.00}Al_{0.04})Σ8.04 O_{24.00} [O_{2.90}(OH)_{1.10}]Σ4.00 • 7.00H₂O. **Relationship to other species:** It is a member of the gutkovaite subgroup of the labuntsovite group.

Name: After Aleksey S. Sakharov (1910–1996), Russian geologist who actively studied the Lovozero alkaline massif.

Comments: IMA No. 2002–003.

PEKOV, I.V., CHUKANOV, N.V., ZADOV, A.E., ROZENBERG, K.A. & RASTSVETAeva, R.K. (2003): Alsakharovite-Zn, NaSrKZn(Ti,Nb)₄[Si₄O₁₂]₂(O,OH)₄•7H₂O, a new mineral of the labuntsovite group from Lovozero massif, Kola Peninsula. *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva* 132(1), 52-58 (in Russ.).

Cavoite



 ORTHORHOMBIC

Locality: Gambatesa mine, near Reppia, northern Appenines, Val Graveglia, Liguria, Italy.

Occurrence: In micro-cavities in massive bands of caryopilite + calcian rhodochrosite ± quartz. Another associated mineral is an unidentified silicate.

General appearance: Very rare radiating aggregates of strongly elongate prismatic to acicular crystals up to about 0.28 mm long.

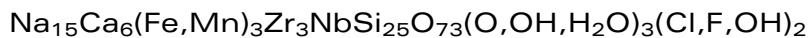
Physical, chemical and crystallographic properties: *Luster:* vitreous to adamantine. *Diaphaneity:* transparent. *Color:* colorless to olive green-brown. *Streak:* near white. *Luminescence:* nonfluorescent. *Hardness:* could not be determined. *Tenacity:* brittle. *Cleavage:* not observed. *Fracture:* not mentioned. *Density:* could not be determined, 3.51 g/cm³ (calc.). **Crystallography:** Orthorhombic, *Pnam*, *a* 10.42, *b* 5.28, *c* 10.34 Å, *V* 568.2 Å³, *Z* = 4, *a:b:c* = 1.9735:1:1.9583. *Morphology:* no forms were mentioned. *Twinning:* none observed. **X-ray powder-diffraction data:** 5.16(M)(200), 3.45(W)(211,112), 3.00(S)(212), 2.88(W)(013,203), 1.85(M)(024), 1.56(W)(612,033,216). **Optical data:** could not be determined, but a value of about 2 was measured roughly for the index of refraction. **Chemical analytical data:** Means of ten sets of electron-microprobe data: K₂O 0.35, CaO 17.76, MnO 0.70, SiO₂ 4.31, VO₂ 76.80, Total 99.92 wt.%. Empirical formula: (Ca_{0.95}Mn_{0.03}K_{0.02})_{Σ1.00}(V_{2.79}Si_{0.22})_{Σ3.01}O_{7.00}. **Relationship to other species:** It is the natural analogue of synthetic CaV₃O₇.

Name: Recalls the chemical composition, calcium, vanadium, oxygen.

Comments: IMA No. 2001-024.

BASSO, R., LUCCHETTI, G., MARTINELLI, A. & PALENZONA, A. (2003): Cavoite, CaV₃O₇, a new mineral from the Gambatesa mine, northern Appenines, Italy. *European Journal of Mineralogy* 15, 181-184.

Ferrokentbrooksit



TRIGONAL

Locality: Poudrette quarry, Mont Saint-Hilaire, Rouville County, Quebec, Canada. The mineral also has been found at the following localities: Narssârssuk pegmatite, Igaliko alkaline complex, southwestern Greenland; Langesundfjord area, Norway (at Brønnebukta, Siktesøya; Barkevik Strand; and the Bjørndalen quarry, Tvedalen); Kariåsen, Sandefjord area, Norway; the Burpala alkaline complex, Baikal area, Russia.

Occurrence: It is a primary but late-stage phase found in a small pegmatite dike in nepheline syenite. Associated minerals are: microcline, nepheline (partially altered to natrolite), fluorite, natrolite, gonnardite, rhodochrosite, aegirine, albite, calcite, sérandite, ancylite-(Ce) and catapleiite.

General appearance: Pseudo-octahedral crystals up to 1 cm in diameter, but much larger crystals and masses have been found in other dikes.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* reddish brown to red. *Streak:* white. *Luminescence:* nonfluorescent in ultraviolet light. *Hardness:* 5 to 6. *Tenacity:* brittle. *Cleavage:* none. *Fracture:* uneven to conchoidal. *Density:* 3.06 g/cm³ (meas.), 3.06 g/cm³ (calc.). **Crystallography:** Trigonal, *R*3*m*, *a* 14.2099, *c* 30.067 Å, *V* 5257.7 Å³, *Z* = 3, *c*:*a* = 2.1159. *Morphology:* {001}, {101} and {012} are dominant; {021} and {110} are minor. *Twinning:* none mentioned. **X-ray powder-diffraction data:** 7.104(38)(110), 5.694(50)(202), 4.300(43)(200), 3.955(31)(214), 3.391(51)(131), 3.207(31)(208), 3.155(31)(217), 2.968(100)(315), 2.847(98)(404), 1.776(31)(440). **Optical data:** Uniaxial (-), *ω* 1.6221, *ε* 1.6186, nonpleochroic. **Chemical analytical data:** Mean of two sets of electron-microprobe data: Na₂O 11.96, K₂O 0.44, CaO 7.99, MnO 3.88, FeO 5.08, SrO 0.45, Al₂O₃ 0.11, Y₂O₃ 0.58, La₂O₃ 1.51, Ce₂O₃ 2.51, Nd₂O₃ 0.53, Sm₂O₃ 0.11, Gd₂O₃ 0.17, SiO₂ 44.70, TiO₂ 0.09, ZrO₂ 11.20, HfO₂ 0.17, Nb₂O₅ 2.51, Ta₂O₅ 0.16, H₂O 0.35, F 0.40, Cl 0.93, sum 95.83, less O = F + Cl 0.38, Total 95.45 wt.%. Empirical formula (based on 77.47 anions determined in the crystal structure with H₂O calculated by stoichiometry): (Na_{13.05}REE_{0.99}K_{0.32}Ca_{0.23}Sr_{0.15})_{Σ14.74} (Ca_{4.59}Mn_{1.24}Y_{0.17})_{Σ6.00} (Fe_{2.39}Mn_{0.61})_{Σ3.00} (Zr_{3.00}Ti_{0.04}Hf_{0.03})_{Σ3.07} (Nb_{0.64}Si_{0.23}Zr_{0.07}Ta_{0.02})_{Σ0.96} (Si_{24.93}Al_{0.07})_{Σ25.00}O_{73.00} (O,OH,H₂O)_{Σ2.47}[Cl_{0.89}F_{0.71}(OH)_{0.40}]_{Σ2.00}. **Relationship to other species:** It is a member of the eudialyte group, specifically the Fe²⁺-dominant analogue of kentbrooksit, Na₁₅Ca₆Mn₃Zr₃NbSi₂₅O₇₄F₂.

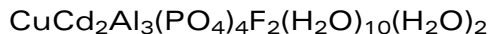
Name: Recalls the relationship to kentbrooksit.

Comments: IMA No. 1999-046. The crystal structure has been solved.

JOHNSON, O., GRICE, J.D. & GAULT, R.A. (2003): Ferrokentbrooksit, a new member of the eudialyte group from Mont Saint-Hilaire, Quebec, Canada. *Canadian Mineralogist* **41**, 55-60.

JOHNSON, O., GRICE, J.D. (1999): The crystal chemistry of the eudialyte group. *Canadian Mineralogist* **37**, 865-891 (crystal #2).

Goldquarryite



TRICLINIC

Locality: Gold Quarry mine, 11 km northwest of Carlin, Eureka County, Nevada, USA.

Occurrence: In brecciated and hydrothermally rounded jasperoid fragments lightly cemented by late-stage silicification. Associated minerals are: opal, carbonate-fluorapatite and hewettite.

General appearance: Isolated clusters of radiating crystals and compact parallel aggregates of crystals. Maximum size of the crystals is 1.5 mm long by 0.1 mm in diameter.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent, but aggregates are translucent. *Color:* very pale blue to blue-gray, masses are blue. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* 3 to 4. *Tenacity:* brittle. *Cleavage:* none observed. *Fracture:* irregular. *Density:* 2.78 g/cm³ (meas.), 2.88 g/cm³ (calc.). **Crystallography:** Triclinic, $\bar{P}1$, a 6.787, b 9.082, c 10.113 Å, α 101.40, β 104.27, γ 102.51°, V 568.7 Å³, $Z = 1$, $a:b:c = 0.7473:1:1.1135$. Morphology: {010} and {001} dominant, {100} very minor. Twinning: multiple on {001}. **X-ray powder-diffraction data:** 9.433(100)(001), 4.726(30)(002), 3.700(30)(022), 3.173(30b)($\bar{1}22, \bar{1}13, 120, 003$), 3.010(30)($\bar{1}22, \bar{2}12$), 2.896(30)($\bar{2}11$), 2.820(50)(022). **Optical data:** Biaxial (+), α 1.570, β 1.573, γ 1.578, $2V(\text{meas.})$ 30°, $2V(\text{calc.})$ 76°; dispersion $r < v$, strong; pleochroic, deep blue parallel to the elongation and very pale blue normal to the elongation; orientation not given. **Chemical analytical data:** Mean of five sets of electron-microprobe data (with H₂O calculated to give 26 H + F): K₂O 0.17, CaO 1.25, NiO 0.23, CuO 5.33, ZnO 0.05, CdO 26.24, Al₂O₃ 15.22, V₂O₃ 0.05, P₂O₅ 28.04, H₂O (22.19), F 3.63, sum (102.40), less O = F 1.53, Total (100.87) wt.%. Empirical formula: [(Cu_{0.66}Ni_{0.03}Zn_{0.01}) Σ 0.70□_{0.30}] Σ 1.00 (Cd_{2.00}Ca_{0.22}K_{0.04}) Σ 2.26 (Al_{2.92}V_{0.01}) Σ 2.93(PO₄)_{3.87}F_{1.89}(H₂O)_{12.06}. **Relationship to other species:** None apparent.

Name: After the locality.

Comments: IMA No. 2001-058.

ROBERTS, A.C., COOPER, M.A., HAWTHORNE, F.C., GAULT, R.A., JENSEN, M.C. & FOORD, E.E. (2003): Goldquarryite, a new Cd-bearing phosphate mineral from the Gold Quarry mine, Eureka County, Nevada. *Mineralogical Record* **34**, 237–240.

Kochite



TRICLINIC

Locality: The northern side of Hvide Ryg in the mountain range of Werner Bjerger on the eastern coast of Greenland (Lat. 72° N, Long. 24° W).

Occurrence: In a loose block of nepheline syenite between the Sirius Glacier and Hvide Ryg. Associated minerals are: nepheline, alkali feldspar and l avenite.

General appearance: Lath-shaped to acicular grains in parallel to subparallel aggregates up to 0.3 × 1.0 mm.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* pale brown. *Streak:* not given. *Luminescence:* not given. *Hardness:* 5. *Tenacity:* brittle. *Cleavage:* {100} perfect. *Fracture:* uneven. *Density:* 3.32 g/cm³ (meas.), 3.35 g/cm³ (calc.). **Crystallography:** Triclinic, $P\bar{1}$, a 10.032, b 11.333, c 7.202 Å, α 90.192, β 100.334, γ 111.551°, V 747.1 Å³, $Z = 1$, $a:b:c = 0.8852:1:0.6355$. *Morphology:* no forms were observed; crystals are elongate along [010]. *Twinning:* none mentioned. **X-ray powder-diffraction data:** 3.951(3)(120,221), 3.028(6)(211), 2.908(10)(122, 222), 2.600(8)(040), 2.462(2)(340,222,122,420), 1.868(6)(422,522,420), 1.670(5)(340), 1.554(2)(542,622). **Optical data:** Biaxial (+), α 1.684, β 1.695, γ 1.718, $2V(\text{meas.})$ 73°, $2V(\text{calc.})$ 70°; dispersion not given; pleochroism weak with X colorless and Z pale yellow; $X = c$, $Z \wedge [100] \sim 20^\circ$. **Chemical analytical data:** Mean of four sets of electron-microprobe data: Na₂O 10.33, MgO 0.01, CaO 21.39, MnO 4.92, FeO 1.08, SrO 0.12, Al₂O₃ 0.05, V₂O₃ 0.03, Y₂O₃ 0.39, La₂O₃ 0.25, Ce₂O₃ 0.57, SiO₂ 31.55, TiO₂ 8.44, ZrO₂ 12.12, HfO₂ 0.09, Nb₂O₅ 1.86, Ta₂O₅ 0.02, F 6.83, sum 100.05, less O = F 2.88, Total 97.17 wt.%. Empirical formula: (Na_{1.92}Sr_{0.02}) Σ 1.94 (Na_{2.77}Ca_{1.23}) Σ 4.00 (Ca_{3.52}Na_{0.48}) Σ 4.00 (Mn_{1.07}Ca_{0.81}Y_{0.05}Ce_{0.05}La_{0.02}) Σ 2.00 (Zr_{1.41}Fe_{0.23}Ca_{0.35}Hf_{0.01}) Σ 2.00 (Ti_{1.64}Nb_{0.22}Zr_{0.11}Al_{0.02}V_{0.01}) Σ 2.00 (Si₂O₇)_{4.07}F_{4.00}(O_{1.94}F_{1.57}) Σ 3.51. **Relationship to other species:** It is a member of the rosenbuschite group.

Name: After Lauge Koch (1892–1964), Danish geologist who made significant contributions to the knowledge of the geology of Greenland and mapped the geology of the type locality of this mineral.

Comments: IMA No. 2002–012.

CHRISTIANSEN, C.C., GAULT, R.A., GRICE, J.D. & JOHNSEN, O. (2003): Kochite, a new member of the rosenbuschite group from Werner Bjerger alkaline complex, East Greenland. *European Journal of Mineralogy* **15**, 551–554.

CHRISTIANSEN, C.C., JOHNSEN, O. & MAKOVICKY, E. (2003): Crystal chemistry of the rosenbuschite group. *Canadian Mineralogist* **41**, 1203–1224.

Mallestigite



 HEXAGONAL

Locality: The dump of a copper-lead-zinc mine, 1 km northwest of the Mallestiger Mittagkogel, Westkarawanken, Carinthia, Austria (Lat. 46° 31'45" N, Long. 13° 52'24" E, altitude 1200 m above sea level).

Occurrence: In narrow fractures of limestones, where it formed during weathering of primary galena and tetrahedrite. Associated minerals are: anglesite, brochantite, langite, linarite and schultenite.

General appearance: Idiomorphic to hypidiomorphic crystals up to 2 mm long and 0.4 mm thick. Also in radial aggregate up to 3 mm in diameter.

Physical, chemical and crystallographic properties: *Luster:* adamantine. *Diaphaneity:* transparent to translucent. *Color:* colorless. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* VHN₁₀ 176 kg/mm², Mohs 4. *Tenacity:* brittle. *Cleavage:* none. *Fracture:* splintery. *Density:* could not be measured, 4.91 g/cm³ (calc.). **Crystallography:** Hexagonal, *P*6₃, *a* 8.938, *c* 11.098 Å, *V* 767.8 Å³, *Z* = 2, *c/a* = 1.2417. *Morphology:* {100} and {101}; elongate on [001]. *Twinning:* none observed. **X-ray powder-diffraction data:** 7.74(25)(100), 6.35(44)(101), 3.655(100)(201), 3.481(80)(112), 3.175(31)(202), 2.675(62)(203), 2.235(35)(220), 1.741(24)(224). **Optical data:** Uniaxial (+), *ω* 1.760, *ε* 1.801, nonpleochroic. **Chemical analytical data:** Mean of fourteen sets of electron-microprobe data (given as elements and converted here to oxides with H₂O calculated to give 12H): PbO 65.67, Sb₂O₅ 14.68, As₂O₅ 9.71, SO₃ 8.64, H₂O (10.38), Total (109.08) wt.%. Empirical formula: Pb_{3.06}Sb_{0.95} [(SO₄)_{1.12}(AsO₄)_{0.88}]_{Σ2.00}(OH)_{5.99}•3.01H₂O. **Relationship to other species:** It is the Sb-dominant analogue of fleischerite, Pb₃Ge⁴⁺(SO₄)₂(OH)₆•3H₂O.

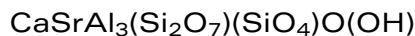
Name: After the locality.

Comments: IMA No. 1996-043. Only an extended abstract of this description has been published (see below), but Prof. Dr. Franz Walter (Universität Graz) kindly supplied additional information. The crystal structure has been solved.

SIMA, I. (2002): Mallestigite, Pb₃Sb(SO₄)(AsO₄)(OH)₆•3H₂O, ein neues Mineral von einer Halde des ehemaligen Cu-Pb-Zn-Bergbaues NW des Mallestiger Mittagkogels in den Westkarawanken, Kärnten, Österreich. *Mitteilungen der Österreichische Mineralogischen Gesellschaft* 143, 200-201.

WALTER, F. (2003): personal communication.

Niigataite



MONOCLINIC

Locality: Miyabana seashore, Ohmi Town, Itoigawa–Ohmi district, Niigata Prefecture, Japan.

Occurrence: In a prehnite boulder. Associated minerals are: prehnite, diaspore and chlorite. Minor constituents are: zircon, galena, cinnabar and strontian clinozoisite.

General appearance: Subhedral grains 0.5 mm across.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent. *Color:* pale gray with a yellowish green tint. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* VHN₁₀₀ 642 to 907 kg/mm², 5 to 5½. *Tenacity:* brittle. *Cleavage:* perfect in one direction. *Fracture:* not given. *Density:* could not be measured, 3.64 g/cm³ (calc.). **Crystallography:** Monoclinic, $P2_1/m$, a 8.890, b 5.5878, c 10.211 Å, β 115.12°, V 459.3 Å³, $Z = 2$, $a:b:c = 1.5910:1:1.8274$. *Morphology:* no forms were observed. *Twinning:* none mentioned. **X-ray powder-diffraction data:** 5.05(23)(10 $\bar{2}$), 3.22(25)(201), 2.90(100)(11 $\bar{3}$), 2.79(48)(020), 2.70(26)(013), 2.60(24)(31 $\bar{1}$), 2.40(21)(31 $\bar{3}$), 2.11(24)(221), .872(21)(224), 1.397(22)(040). **Optical data:** Complete data could not be determined owing to the scarcity of material; indices of refraction are between 1.67 and 1.725. A violet anomalous interference-color was observed. **Chemical analytical data:** Mean of nine sets of electron-microprobe data (with H₂O calculated to give 1 OH): MgO 0.07, CaO 14.09, MnO 0.22, SrO 14.75, Al₂O₃ 24.86, Fe₂O₃ 7.08, SiO₂ 35.49, TiO₂ 0.75, H₂O (1.77), Total (99.08) wt.%. Empirical formula: Ca_{1.00}(Sr_{0.72}Ca_{0.28}) Σ 1.00 (Al_{2.48}Fe_{0.45}Ti_{0.05}Mn_{0.02}Mg_{0.01}) Σ 3.01Si_{3.00}O_{12.00}(OH)_{1.00}. **Relationship to other species:** It is a member of the epidote group, specifically, the strontium-dominant analogue of clinozoisite.

Name: After the locality.

Comments: IMA No. 2001–055.

MIYAJIMA, H., MATSUBARA, S., MIYAWAKI, R. & HIROKAWA, K. (2003): Niigataite, CaSrAl₃(Si₂O₇)(SiO₄)O(OH): Sr-analogue of clinozoisite, a new member of the epidote group from Itoigawa–Ohmi district, Niigata Prefecture, central Japan. *Journal of Mineralogical and Petrological Sciences* **98**, 118-129.

Sewardite



ORTHORHOMBIC

Locality: The 31st level of the Tsumeb mine, Tsumeb, Namibia (Lat. 19° S, Long. 18° E). Also from Mina Ojuela, Mapimi, Durango, Mexico.

Occurrence: Associated minerals are: ferrilotharmeyerite and another species that may be a cuprian zincian ferrilotharmeyerite or the Zn-dominant analogue of lukrahnite.

General appearance: Platy to compact anhedral to subhedral masses (up to 0.3 mm). Individual fragments are 50 to 100 μm.

Physical, chemical and crystallographic properties: *Luster:* given as vitreous but the optical properties indicate adamantine. *Diaphaneity:* translucent to transparent. *Color:* dark red to much lighter red to orange. *Streak:* reddish brown. *Luminescence:* nonfluorescent. *Hardness:* 3½. *Tenacity:* brittle. *Cleavage:* {100} and {011} both imperfect. *Fracture:* splintery to uneven. *Density:* could not be measured, 4.17 g/cm³ (calc.). **Crystallography:** Orthorhombic, *Cccm*, *a* 16.436, *b* 7.425, *c* 12.116 Å, *V* 1479 Å³, *Z* = 8, *a:b:c* = 2.2136:1:1.6318. *Morphology:* no forms were observed. *Twinning:* none observed. **X-ray powder-diffraction data:** 4.874(90)(202), 3.473(50)(113), 3.389(60)(220), 3.167(100)(022), 3.015(50)(510), 2.988(50)(313), 2.919(70)(511), 2.503(90)(422,314), 1.775(50)(533,026). **Optical data:** In reflected light: light bluish gray with weak, but measurable bireflectance, no anisotropism, nonpleochroic. *R*₁, *R*₂: (10.04, 10.60%) 470 nm, (9.49, 10.06%) 546 nm, (9.27, 9.95%) 589 nm, (8.80, 9.49%) 650 nm. Indices of refraction calculated from reflectances in air at 589 nm are *n*₁ 1.87, *n*₂ 1.92. **Chemical analytical data:** Mean of eight sets of electron-microprobe data (with H₂O calculated by stoichiometry): CaO 11.77, CuO 0.28, ZnO 1.68, Fe₂O₃ 31.65, As₂O₅ 48.81, H₂O (4.04), Total (98.23) wt.%. Empirical formula: Ca_{0.99}(Fe_{1.87}Zn_{0.10}Cu_{0.02})_{Σ1.99}(AsO₄)_{2.01}[(OH)_{1.80}(H₂O)_{0.16}]_{Σ1.96}. **Relationship to other species:** It is the calcium-dominant analogue of carminite, PbFe³⁺₂(AsO₄)₂(OH)₂.

Name: After Terry Maxwell Seward (b. 1940), Professor of Geochemistry at the Eidgenössische Technische Hochschule (ETH), Zürich, Switzerland. He collected the mineral and recognized it as a potentially new species.

Comments: IMA No. 2001-054.

ROBERTS, A.C., COOPER, M.A., HAWTHORNE, F.C., CRIDDLE, A.J. & STIRLING, J.A.R. (2002): Sewardite, CaFe³⁺₂(AsO₄)₂(OH)₂, the Ca-analogue of carminite, from Tsumeb, Namibia: description and crystal structure. *Canadian Mineralogist* **40**, 1191-1198.

Tedhadleyite



TRICLINIC

Locality: A small prospect pit near the long-abandoned Clear Creek mercury mine, New Idria district, San Benito County, California, USA (Lat. 36° 22'59"N, Long. 120° 43'58"W).

Occurrence: In a quartz-lined vug of a centimeter-size quartz vein. Associated minerals found in adjacent vugs are: native mercury, calomel, cinnabar, eglestonite and montroydite. Less than 10 µg of the mineral was available for study.

General appearance: A somewhat elongate spheroidal mass, 0.3 mm in longest dimension and as several small anhedral masses within the same vug, which is 2 × 1.5 mm.

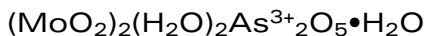
Physical, chemical and crystallographic properties: *Luster:* adamantine to submetallic. *Diaphaneity:* opaque but translucent on thin edges. *Color:* very dark red to black. *Streak:* red. *Hardness:* less than 3. *Tenacity:* brittle. *Cleavage:* {010} poor. *Fracture:* uneven. *Density:* could not be measured, 9.27 g/cm³ (calc.). **Crystallography:** Triclinic, $\bar{A}1$, a 7.014, b 11.855, c 12.601 Å, α 115.56, β 82.57, γ 100.57°, V 927.7 Å³, $Z = 2$, $a:b:c = 0.5916:1:1.0629$. Morphology: no forms were observed. Twinning: none observed. **X-ray powder-diffraction data:** 5.281(50)(020, $\bar{1}\bar{1}1$), 3.143(90)($\bar{1}\bar{3}\bar{1}$, 2 $\bar{2}2$), 3.005(70)($\bar{1}\bar{2}2$), 2.981(50)(211), 2.885(100)(113), 2.675(90)(2 $\bar{3}3$), 2.508(40)($\bar{2}\bar{1}3$). **Optical data:** In reflected light: bluish white, moderate anisotropism, no bireflectance, nonpleochroic. $R_1, 2; {}^{\text{im}}R_1, {}^{\text{im}}R_2$: (27.20, 30.00; 13.20, 15.40%) 470 nm, (24.40, 27.60; 10.95, 13.30%) 546 nm, (22.80, 25.40; 9.83, 11.70%) 589 nm, (21.60, 23.90; 9.24, 10.70%) 650 nm. **Chemical analytical data:** Mean of seven sets of electron-microprobe data: Hg₂O 80.50, HgO 8.36, Cl 2.20, Br 1.62, I 11.11, sum 103.79, less O = Cl + Br + I 1.36, Total 102.43 wt.%. Empirical formula: Hg²⁺_{0.98}Hg¹⁺_{9.75}O_{3.71}I_{2.21}(Cl_{1.57}Br_{0.51}) Σ 2.06. **Relationship to other species:** None apparent.

Name: After Ted A. Hadley (b. 1961), of Sunnyvale, California, who helped collect the samples in which the mineral was discovered. He is a past-president of the Bay Area Mineralogists and a long-time mineral collector.

Comments: IMA No. 2001-035. Note that the structure has been determined.

ROBERTS, A.C., COOPER, M.A., HAWTHORNE, F.C., CRIDDLE, A.J., STIRLING, J.A.R. & DUNNING, G.E. (2002): Tedhadleyite, Hg²⁺Hg¹⁺₁₀O₄I₂(Cl,Br)₂, a new mineral species from the Clear Creek Claim, San Benito County, California. *Canadian Mineralogist* **40**, 909-914.

Vajdakite



MONOCLINIC

Locality: The Geschieber vein on the 12th level of the Svornost mine, Jáchymov (St. Joachimsthal), approximately 20 km north of Karlovy Vary, northwestern Bohemia, Czech Republic.

Occurrence: On fractures near a vein approximately 5 cm thick. Associated minerals are: pyrite, marcasite, nickelskutterudite, löllingite, arsenic, arsenolite, scorodite, parascorodite, kaňkite, annabergite and köttigite.

General appearance: Acicular to lath-shaped crystals from 0.1 to 0.5 mm.

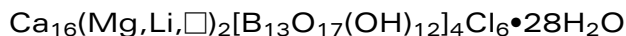
Physical, chemical and crystallographic properties: *Luster:* given as vitreous but the optical data indicate adamantine. *Diaphaneity:* translucent. *Color:* gray-green to grass-green; some aggregates are yellow-green. *Streak:* white to light gray-green. *Luminescence:* nonfluorescent. *Hardness:* could not be measured. *Tenacity:* brittle. *Cleavage:* {100} perfect, {010} good. *Fracture:* even. *Density:* 3.50 g/cm³ (meas.), 3.44 g/cm³ (calc.). **Crystallography:** Monoclinic, $P2_1/c$, a 7.0515, b 12.0908, c 12.2190 Å, β 101.268°, V 1021.7 Å³, $Z = 4$, $a:b:c = 0.5832:1:1.0106$. *Morphology:* {100} and {010}, habit acicular to lath-like, elongate [001] and flattened on {100}. *Twinning:* none observed. **X-ray powder-diffraction data:** 6.915(26)(100), 6.046(100)(020), 3.819(10)(031), 3.457(16)(200), 3.324(59)(023,210), 2.624(15)(230), 2.593(12)(14 $\bar{2}$), 2.2642(19)(310). **Optical data:** Biaxial (+), α 1.757, β 1.778, γ 2.04, $2V(\text{calc.})$ 35°; dispersion not given; pleochroism $X \approx Y$ light gray to light greenish gray, Z yellowish gray; $X = b$, $Y \wedge a = 1^\circ$ in acute angle β , $Z \wedge c = 12^\circ$ in obtuse angle β . **Chemical analytical data:** Mean of three sets of electron-microprobe data: As₂O₃ 36.59, MoO₃ 53.09, H₂O 11.34, Total 101.02 wt.%. Empirical formula: [(MoO₂)_{1.93}(H₂O)_{2.00}(As₂O₅)_{0.97}]•1.30H₂O. **Relationship to other species:** It is a diarsenite. Other diarsenites are paulmooreite, gebhardite, fetiasite, leiteite and manganarsite.

Name: After Josef Vadjak (b. 1930), of Pequa Rare Minerals, Massapequa, New York, USA, who drew attention to the species, and in recognition of his significant contributions to mineralogical research on the Jáchymov ore district.

Comments: IMA No. 1998-031. Some of the data given here are taken from the original IMA proposal. Note that the crystal structure has been solved.

ONDROUŠ, P., SKÁLA, R., ČISAŘOVÁ, I., VESELOVSKÝ, F., FRÝDA, J. & ČEJKA, J. (2002): Description and crystal structure of vajdakite, [(Mo⁶⁺O₂)₂(H₂O)₂As³⁺₂O₅]•H₂O – a new mineral from Jáchymov, Czech Republic. *American Mineralogist* 87, 983-990.

Walkerite



ORTHORHOMBIC

Locality: The Potash Corporation of Saskatchewan (New Brunswick Division) mine, 5 km east of Penobsquis, Sussex area, Cardwell Parish, Kings County, New Brunswick, Canada.

Occurrence: In halite drill-core. Associated minerals are: halite, hydroboracite, hilgardite, volkovskite, boracite, szaibelyite, a mica-group mineral and anhydrite.

General appearance: Bladed crystals elongated on [001] up to 2×0.05 mm and bundles of fibers up to 7 mm long.

Physical, chemical and crystallographic properties: *Luster:* vitreous. *Diaphaneity:* transparent to translucent. *Color:* colorless to white. *Streak:* white. *Luminescence:* nonfluorescent. *Hardness:* approximately 3. *Tenacity:* brittle. *Cleavage:* none apparent. *Fracture:* splintery. *Density:* 2.07 g/cm³ (meas.), 2.05 g/cm³ (calc.). **Crystallography:** Orthorhombic, *Pba*2, *a* 15.52, *b* 22.74, *c* 8.761 Å, *V* 3091 Å³, *Z* = 1, *a:b:c* = 0.6825:1:0.3853. Morphology: {100}, {010} and {001}. Twinning: none observed. **X-ray powder-diffraction data:** 12.820(10)(110), 7.785(8)(200), 6.805(2)(130), 6.319(4)(121), 5.649(3)(211), 4.137(2)(321), 3.176(3)(170), 2.570(3)(610,550), 2.413(2)(333), 2.020(2)(183). **Optical data:** Biaxial (+), α 1.516, β 1.532, γ 1.554, *2V*(meas.) 82°, *2V*(calc.) 82°; no dispersion; nonpleochroic; orientation, *X* = *a*, *Y* = *b*, *Z* = *c*. **Chemical analytical data:** Mean of eighteen sets of electron-microprobe data: Li₂O 0.12, Na₂O 0.13, K₂O 0.07, MgO 0.58, CaO 23.05, FeO 0.32, B₂O₃ 47.17, H₂O 25.48, Cl 4.91, sum 101.83, less O = Cl 1.11, Total 100.72 wt.%. Empirical formula: (Ca_{15.60}Na_{0.16}K_{0.06}) Σ 15.82 (Mg_{0.55}Li_{0.30}Fe_{0.17}) Σ 1.02B_{51.43}O_{68.00}(OH)_{0.48}[Cl_{5.26} (OH)_{0.74}] Σ 6.00H_{2.53}•28.00H₂O. **Relationship to other species:** None apparent.

Name: After Thomas Leonard Walker (1867–1942), former Assistant Superintendent of the Geological Survey of India, Professor of Mineralogy and Petrography at the University of Toronto, and first Director of the Royal Ontario Museum of Mineralogy. He established the journal *Contributions to Canadian Mineralogy*, predecessor of *The Canadian Mineralogist*. Among the minerals he studied were borates from the same formation as that in which walkerite occurs.

Comments: IMA No. 2001–051. The crystal structure has been determined.

GRICE, J.D., GAULT, R.A., VAN VELTHUIZEN, J. & PRATT, A. (2002): Walkerite, a new borate mineral species in an evaporitic sequence from Sussex, New Brunswick, Canada. *Canadian Mineralogist* **40**, 1675–1686.