New Mineral Names*  

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CENTROSYMMETRIC ANALOGUE OF LABYRINTHITE


An apparently new member of the eudialyte group has been found in the central zone of an alkali pegmatite at Mt. Koashva, Khibiny massif, Kola Peninsula, Russia. The mineral occurs in tabular grains intimately intergrown with villiaumite, in associations with lomonosovite, barytolamprophillite, aegirine, and microcline. The authors infer from this assemblage that the formational conditions included relatively high temperature and high sodium and fluoride activity. The mineral is dichroic brown-gray to raspberry-pink. It is reported to have a unique IR spectrum and unusual physical properties. Microprobe analysis gives the empirical formula: Na15Ca6.1K0.7Sr0.2Y0.2REE0.3Fe1–1.2Mn0.7–0.9Zr3.0Ti0.3Nb0.2Si26O72FCl0.5.

It is metallic and opaque. It does not show cleavage, has an a Mohs hardness of 4 to 5 (average VHN50 load of 393 in the matrix by hydroseparation. It is often found attached to sulfide minerals and commonly associated with clinohore. The mineral is metallic and opaque. It does not show cleavage, has an irregular fracture, a ductile behavior (flexibly inelastic), and has a Mohs hardness of 4 to 5 (average VNHO load of 393 in the range 358–418 kg/mm²). Naldrettite is bright creamy white in plane-polarized reflected light, does not show internal reflections, shows weak birefringence, no pleochroism, and distinct anisotropy in shades of deep bright blue, lemon-buff, and mauve to pale pink. Reflectance percentages for Rmin and Rmax in air/oil are 49.0, 50.9/35.9, 37.6 (470 nm), 53.2, 55.1/40.3, 42.1 (546 nm), 55.4, 57.5/42.5, 44.3 (589 nm), 58.5, 60.1/45.4, 47.2 (650 nm), respectively.

Electron microprobe analyses (WDS, average of 69 analyses on 19 grains) gave S 0.02, Fe 0.11, As 0.31, Sb 35.75, Pd 63.49, sum 99.68 wt%, corresponding to (Pd1.995Fe0.007)2Sb(As0.014Sb0.002)2Si2O26 based on three atoms. The ideal formula of naldrettite is Pd,Sb,Z = 8, Dcalc 10.694(1) g/cm3. Naldrettite is isostructural with synthetic Pd,Sb (Bälz and Schubert (1969) Less-Common Metals, 19, 300–304) and is considered to be orthorhombic, Cmc21, a 3.906(1), b 17.5551(5), c 6.957(2) Å, V 414.097(3) Å3. The strongest lines on the powder X-ray diffraction pattern (114.6 mm Gandolfini camera, CuKα radiation, 155 lines given) include 2.7123(21,131), 2.441(17,150), 2.4067(34,112), 2.3029(35,151), 2.2454(100,132), 2.1971(27,080), 2.0979(28,081), 2.0567(52,043), 2.0009(40,152), 1.9058(30,113), 1.8226(22,133), 1.6857(17,200), 1.5229(22,202), 1.4983(15,134), 1.3674(35,193), 1.3513(23,223), 1.3332(19,11.12), 1.3049(23,243), 1.2842(42,115), 1.2565(27,135), 1.2122(50,204), 1.1466(23,10.2), 1.1199(25,0,12.4), 1.0784(21,2.10.3), 1.0434(15,156), 0.9982(15,333), 0.9665(16,047), 0.9506(17,226), 0.9478(23,10.2), 0.9335(17,12.4), 0.9089(30,266), 0.8658(17,3.13.0), 0.8584(56,1.17.4), 0.8409(51,118). Determination of the crystal structure is underway.

Naldrettite was discovered in drill core from the Mesamax Northwest deposit, Cape Smith fold belt, Ungava region, Quebec, Canada. The deposit consists of disseminated to net-textured sulfide mineralization hosted by amphibolite and serpentine
The crystal structure of the mineral (eudialyte-group), via interaction between an alkaline massif, Kola Peninsula, Russia, and is thought to have formed chevite has been found in an alkaline pegmatite in the Kovdor

$\text{Na}_{8.51}\text{Ce}_{0.11}\text{Ca}_{1.8}\text{Na}_{0.96}\text{K}_{0.24}$

$\text{Si}_{0.21–0.58}(\text{Si}_{0.5}\text{Nb}_{0.2}\text{Ti}_{0.1–0.2})(\text{Si}_{3}\text{O}_{9})_{2}(\text{Si}_{9}\text{O}_{27})_{2}(\text{OH})_{2.24}(\text{CO}_{3})_{0.94}\text{Cl}_{0.49}$

Replacing pyroxene and peridotite, as well as a swarm of regionally extensive komatiitic basalt and basaltic komatiite dykes up to several hundred meters thick. The Mesamux Northwest deposit is located at the basal portion of a dyke where it intersected a silicate-facies iron formation ~20 m thick. Lead antimonide minerals are present in the contact zone that separates massive and disseminated sulfide mineralization. The mineral is associated with alataite, chalcopyrite, clinohlore, cobalite, euctrum, galena, magnetite, monoclinc pyrhotite, pentlandite, sphalerite, and sudburyite with rare hessite, michenerite, petzite, sperrylite, and unguavite. Palladium contents in the massive sulfide are low relative to other PGE and base metals as compared to the disseminated sulfide mineralization. This suggests removal of Pd from the massive sulfide body during a late magmatic event or regional metamorphism, followed by repositioning of the mass at the relative position of the massive sulfide body and the ultramafic rock. The Sb is thought to have been derived from an external source that interacted with the high-Pd fluids, resulting in precipitation of a Pd-Sb assemblage. Naldrett is named for Professor Anthony J. Naldrett (b. 1933), University of Toronto and past President of both the Mineralogical Association of Canada and the International Mineralogical Association. Type material has been deposited at the Natural History Museum, Cromwell Road, London, U.K. (BM 2004,34) and the Canadian Museum of Nature (CNMMN 84397).

**NB-DEFICIENT CARBONATE ANALOGUE OF FEKLICHEVITE**


A Nb-deficient carbonate analogue of the mineral feklichevite has been found in an alkaline pegmatite in the Kuvdor massif, Kola Peninsula, Russia, and is thought to have formed via interaction between an alkaline lake fluid and carbonate. The crystal structure of the mineral (eudialyte-group), $R3m$, $a$ 14.232(3), $c$ 3.0.210(3) $\AA$ has been solved to $R_{wp}$ 0.031, $R_{merge}$ 0.044 using 1494 independent $F > 3\sigma(F)$ single-crystal MoK$\alpha$ X-ray diffraction data. The empirical formula (Z = 3; basis of 25 Si atoms) derived mainly from electron microprobe data is:

$\text{Na}_{10–12}\text{Ca}_{9–10}\text{K}_{0.3}\text{Ce}_{0.1}\text{Zr}_{2.8–3.2}\text{Nb}_{0.36–0.45}\text{Fe}_{1.9–2.2}\text{Mn}_{0.2–0.3}\text{Si}_{25}\text{O}_{72}$

$\text{CO}_{3.1–0.4}\text{Cl}_{0.2–0.4}(\text{OH,H}_{2}\text{O})_{2.24}$

and agrees well with the formula from the structural study: $(\text{Na}_{10–9}\text{Ca}_{9–10}\text{K}_{0.3}\text{Ce}_{0.1})$(Ca$_{2.2}$Na$_{0.3}$)(Ca$_{3}$)(Zr$_{2}$)(Fe$_{1.8}$O$_{3.8}$)(Mn$_{0.3}$Fe$_{0.7}$O$_{10}$)(Fe$_{2.2}$O$_{10}$)(Nb$_{2}$ Si$_{32}$O$_{64}$)$_{2}$Si$_{3}$O$_{9}$Si$_{2}$O$_{12}$CO$_{3}$Cl$_{0.2}$Cl$_{0.4}$(H$_{2}$O)$_{1.6}$

The mineral shares common features with other members of the eudialyte group such as three- and nine-membered Si-O rings, sixfold Ca-O rings, all united into a heterogenous body with discrete Zr-O octahedra. However, as the Ca- and CO$_3$-richest member of the eudialyte group, the mineral has some unique structural features such as: (1) Ca in extra-skeletal positions; (2) Nb approximately evenly distributed between M3 and M4, but with vacancies dominant at M3; (3) X positions show different ordering patterns of Cl, C and H$_2$O than other carbonate-bearing members of the group. The IR spectrum of the mineral indicates minor distortion of the various CO$_3$ groups.

**Discussion.** On the basis of the composition and structural parameters this mineral would seem to correspond to IMA 2004-40 (see http://sheba.geo.vu.nl/%7Eima-cnmmn/minerals2004.pdf), the full description of which has not yet been published.

**T.S.E.**

**POTASSICARFVEDSONITE**


Potassicarfvedsonite has been described from three agpaitic complexes: Ilímaussaq, south Greenland (holotype), Lovozero and Khibina, Kola Peninsula, Russia (cotypes). The mineral occurs as euhedral, prismatic to acicular crystals from a few centimeters to 15 × 0.8 cm. It varies in color from black (Ilímaussaq, Khibina) to dark blue-green or blue-gray (Lovozero), is transparent to semitransparent with a pale blue streak and a vitreous luster. Potassicarfvedsonite has perfect (110) cleavage, a splintery fracture, is brittle and has a Mohs hardness of 5.5 to 6. The mineral is biaxial negative, $\alpha = 1.683(2), \beta = 1.692(2), \gamma = 1.699(2), 2V_{\text{ext}} > 60^\circ, 2V_{\text{dich}} = 82^\circ$, the dispersion, $r > v$, is strong. The pleochroism is strong with $X$ dark blue-green, Y gray-green, Z pale green-gray to pale green-brown, absorption $X \cong Y > Z, Z = b, X < c = 20(10)^\circ, Y < a = 30(10)^\circ$.

Electron microprobe analysis, atomic emission spectroscopy (Li), the Alimarin method (H$_2$O), and Mössbauer spectroscopy (Fe$^{3+}$/Fe$^{2+}$) of the Ilímaussaq material (average of 12 analyses) gave Li$_2$O 0.45, Na$_2$O 7.01, K$_2$O 3.29, CaO 0.30, MgO 0.04, MnO 1.37, ZnO 0.20, FeO 24.69, Fe$_2$O$_3$ 11.60, Al$_2$O$_3$ 0.58, SiO$_2$ 48.63, TiO$_2$ 0.43, H$_2$O 1.70, F 0.36, O = F 0.15, sum 100.50 wt%, corresponding to (K$_{0.60}$Na$_{0.25}$Ca$_{0.10}$)(Fe$_{2.26}$Fe$_{0.74}$Mn$_{0.04}$)(Si$_{12}$O$_{36}$)(Al$_{1.6}$)(Fe$_{2.6}$Fe$_{0.4}$Si$_{2}$O$_{12}$)(OH)$_{2.6}$ F$_{0.3}$ based on O$_{22}$(OH,F)$_{2}$. The ideal formula for potassicarfvedsonite is KNa$_2$Fe$_{2+}$Fe$_{3+}$Si$_8$O$_{22}$(OH)$_2$. The D$_{calc}$ is 3.43 g/cm$^3$ for Z = 2. The IR spectrum of potassicarfvedsonite contains bands (sh = shoulder) at 3700, 3675, 1134, 1076, 1025 sh, 990 °C.

The crystal structure of potassicarfvedsonite was solved and refined by direct methods using a 0.11 × 0.08 × 0.34 mm crystal by single-crystal X-ray diffraction methods. $R_{I}$ = 0.0229 for 3296 reflections with $I > 2\sigma(I)$. Potassicarfvedsonite is monoclinc, $C2/m$, $a = 10.002(2), b = 18.054(3), c = 5.319(1)\AA, \beta = 103.90(3)^\circ, V = 932.4(3)\AA^3$. The strongest lines on the X-ray diffraction pattern (DRON UM-1 diffractometer, CoK$_\alpha$ radiation, 33 lines) include 9.02(28,020), 8.53(100,110), 3.419(1.121), 3.303(23,240), 3.184(40,310), 2.847(17,330), and 2.725(10,151). The structure of potassicarfvedsonite does not differ significantly from that determined for arfvedsonite. The distribution of cations over the five cation sites is presented and the absence of dehydroxylation at the O3 site has been confirmed.

Potassicarfvedsonite at Ilímaussaq was found in “ Pegmatite Valley” in the Kangerluuarsuk area. It occurs in pegmatite veins

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(20 m long, 0.5 m thick) and is associated with coarse-grained analcime and fine-grained aegirine, epistolite, euclidite, microcline, sodalite and steenstrupine-(Ce). At Lovozero, the mineral occurs in the Palitra (Palette) pegmatite at the underground lo-parite mine at Mt. Kedkyvmchott. The potassicarfvedsonite occurs as aggregates of acicular crystals up to 2 × 0.1 mm and as massive nodules up to 1.5 cm across in ussingite cavities associated with a suite of hyperalkaline minerals inside partially altered crystals of manaksite. In the peripheral zone of the pegmatite, potassicarfvedsonite occurs as an early mineral (crystals up to 15 cm) associated with aegirine, arfvedsonite, euclidite, microcline, and nepheline, with minor lamprophyllite, lomonosovite, lorenzenite, and villiaumite. At Khibina, potassicarfvedsonite was found in the Hilaritoyovey pegmatite at the Kirovskii apatite mine, Mt. Kuksivumchott. It occurs in the peripheral zone of the pegmatite and is associated with aegirine, euclidite, fluorapatite, fluorite, lamprophyllite, microcline, natrolite, nepheline, rinkite, splahelite, and titantite. Potassicarfvedsonite crystallizes after arfvedsonite, and is an early mineral in K-rich complexes (Khibina) and a late-stage, hydrothermal mineral in Na-rich complexes (Ilímaussaq and Lovozero). The mineral is named for its chemistry as the K-dominant analogue of arfvedsonite. Type and cotype material has been deposited at the Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (catalogue no. 3137/1 for Ilímaussaq and 3137/2 for Lovozero). P.C.P.

**Discussion.** The original “arfvedsonite” studied by Hawthorne (1976, *Can. Mineral.*, 14, 346–356) is compositionally a potassicarfvedsonite.

TOKYOITE*


Tokyoite occurs as small aggregates (250 μm) of irregular grains less than 15 μm. The mineral is red-black, translucent, with a vitreous luster and a dark brownish-red streak. The mineral was not observed and the Mohs hardness is 4–4.5 (VHN25 363–390 μm). In thin section, tokyoite is distinctly pleochroic reddish orange to dark brownish red. It has refractive indices higher than 1.99 and the mean calculated index is 2.03. Reflectance percentages for $R_{\text{min}}$ and $R_{\text{max}}$ in air/oil are 12.8, 13.2/3.3, 3.5 (470 nm), 12.3, 12.6/3.1, 3.4 (546 nm), 12.2, 12.5/3.1, 3.6 (589 nm), and 12.5, 12.6/3.6, 4.3 (650 nm), respectively.

Electron microprobe analysis by WDS gave an average (6 analyses) of 31.77 V$_2$O$_5$, 0.15 SiO$_2$, Al$_2$O$_3$, 0.07, Fe$_2$O$_3$, 2.33, Mn$_2$O$_3$, 11.27, CaO 0.07, BaO 51.90, SrO 0.22 Na$_2$O 0.13, H$_2$Ocalc = 2.48, total 99.51 wt%, corresponding to (Ba$_{1.92}$Na$_{0.02}$Sr$_{0.01}$Ca$_{0.01}$)$_2$Si$_2$O$_7$.$_{11}$ (0.81Fe$_{3+}$,0.17Al$_{0.01}$)$_4$V$_2$O$_8$(OH)$_2$.$_{11}$. The structure of the mineral is related to other cancrinite-group minerals and consists of layers of six-membered (Si,Al) rings of tetrahedra. These rings are packed in the sequence of tetrahedral frameworks of other cancrinite-group minerals. The crystal chemical formula is given as [

NEW MINERAL NAMES

**NEW DATA**

EVENKITE

The hydrocarbon and natural paraffin evenkite has been investigated by gas chromatography, infrared spectroscopy, and powder X-ray diffraction methods. Evenkite is orthorhombic, \( Pbcm \), \( a = 7.47(1), b = 4.980(1), c = 65.85(3) \) Å, \( V = 2450(2) \) Å\(^3\), \( Z = 4 \). It is a polycrystalline orthorhombic solid solution consisting of 10 normal paraffin homologues and \( n \)-numbers, \( C_2H_{2n+2} \), ranging from 19 to 28 with \( C_2H_{32} \) being the dominant homologue. Evenkite undergoes the same stages of thermal deformation and phase transformation as the binary orthorhombic homologue. Evenkite has been solved and refined by single-crystal X-ray diffraction methods (Nonius-KappaCCD diffractometer), \( R = 0.046, \chi^2 = 1.05 \) from powder X-ray diffraction data (Stoe STADI diffractometer, CoK\(\alpha_1 \) radiation). The mineral is trigonal, \( P3c1, a = 8.9232(2), c = 9.296(3) \) Å, \( V = 687.71(3) \) Å\(^3\), \( Z = 6, D_{calc} = 3.358 \) g/cm\(^3\). Parascorodite is a dimorph of scorodite and its structure is composed of mixed octahedral-tetrahedral columns parallel to \( c \) that are interconnected in a 3D framework by the O1 oxygen between \([\text{AsO}_4]\) tetrahedra and Fe1 octahedra, as well as the OW-O2 hydrogen bond. P.C.P.

**Parascorodite***


The crystal structure of parascorodite was solved by \( ab\)-initio methods and refined by the Rietveld method (\( R_p = 0.045, R_{Bragg} = 0.046, \chi^2 = 1.05 \)) from powder X-ray diffraction data (Stoe STADI diffractometer, CoK\(\alpha_1 \) radiation). The mineral is trigonal, \( P3c1, a = 8.9232(2), c = 9.296(3) \) Å, \( V = 687.71(3) \) Å\(^3\), \( Z = 6, D_{calc} = 3.358 \) g/cm\(^3\). Parascorodite is a dimorph of scorodite and its structure is composed of mixed octahedral-tetrahedral columns parallel to \( c \) that are interconnected in a 3D framework by the O1 oxygen between \([\text{AsO}_4]\) tetrahedra and Fe1 octahedra, as well as the OW-O2 hydrogen bond. P.C.P.

**Perroudite***


The crystal structure of perroudite, ideally \( \text{Hg}_2\text{Ag}_4\text{S}_4(\text{I,Br})\text{Cl}_2 \), has been solved and refined using a \( 0.13 \times 0.04 \times 0.01 \) mm crystal by single-crystal X-ray diffraction methods (Nonius-k-CCD diffractometer), \( R_l = 0.00521 \) for 1070 reflections. Perroudite is orthorhombic, \( P2_12_12_1, a = 17.4198(9), b = 12.2032, c = 4.2088(2) \) Å, \( V = 903.20(8) \) Å\(^3\), \( \mu = 51.20 \) mm\(^{-1}\), \( Z = 2, D_{calc} = 6.928 \) g/cm\(^3\). The structure is an improvement on previous determinations on fused bundles of several small crystals. The structure of perroudite is unique; structural relationships with capgaronnite, corderoite, cinnabar and \( \text{HgCuS}Cl \), \( \beta\text{-Hg}_2\text{S}_3\text{Br}_2 \) and \( \text{Hg}_2\text{S}_4\text{I}_4 \) are discussed. P.C.P.

**WHEWELLITE AND CAOXITE***

T. Echigo, M. Kimata, A. Kyono, M. Shimizu, T. Hatta (2005) Re-investigation of the crystal structure of whewellite [\( \text{Ca(C}_2\text{O}_4)\text{I} \)] and the dehydration mechanism of caoxite [\( \text{Ca(C}_2\text{O}_4)\cdot3\text{H}_2\text{O} \)]. Mineral. Mag., 69, 77–88.

The crystal structure of whewellite and the dehydration mechanism of caoxite has been determined by a combination of powder and single-crystal X-ray diffraction, differential thermal analysis and infrared analysis. The crystal structure of whewellite was refined by single-crystal X-ray diffraction methods (Rigaku RAXIS-RAPID, MoK\(\alpha \) radiation) at 123 K on a \( 0.50 \times 0.40 \times 0.30 \) mm crystal, \( R_l = 0.041 \) for 1675 reflections with \( I > 2\sigma(I) \). Starting parameters were taken from Tazzoli and Domeneghetti (Am. Mineral., 65, 327–334) and the unknown H12 position was determined on the 3D difference-Fourier map. Whewellite is monoclinic, \( P2_1/c, a = 6.250(1), b = 14.471(2), c = 10.114(2) \) Å, \( \beta = 109.978(5)^\circ \), \( V = 859.7(3) \) Å\(^3\), \( Z = 8, D_{calc} = 2.258 \) g/cm\(^3\), \( \mu = 13.68 \) cm\(^{-1}\). Results indicate that all four hydrogen atoms in the crystal structure are involved in hydrogen bonding and that each water molecule occupies a distinct atomic position. Thermal analysis of synthetic caoxite was performed in a Rigaku Thermo plus TG8120 thermogravimetric analyzer. Four weight-loss steps were observed: \( 85.1, 166.9, 424.7, \) and \( 724.9 \) °C and end-products were identified by powder X-ray diffraction methods. The four weight-loss steps include (1) dehydration of caoxite to whewellite (25–100 °C), (2) dehydration of whewellite to anhydrous calcium oxalate (120–280 °C), (3) decarbonation of anhydrous calcium oxalate to calcite (280–550 °C), and (4) decarbonation of calcite to lime (550–1000 °C). Results confirm that caoxite transforms into whewellite by dehydration and not via weddelite.