EUDIALYTE 3248


An apparently new member of the eudialyte group, conditionally designated “eudialyte 3248” has been found in intimate intergrowths with alluaivite at the Lovozero massif, Kola Peninsula, Russia. It has a low iron content (0.5 oxide wt%), and high contents of Mn and S. The empirical formula of the key features of the modules are the predominance of Mn at M4' and M2' of module 1 and the presence of Na at M2" and in cation sites surrounding M2' of module 2. Module 1 is thus a kentbrooksite unit and module 2 is an alluaivite unit. T.S.E.

F-ANALOG OF SCHORL


The F-analog of schorl occurs as pale brownish to pale grayish blue 1 mm prismatic crystals growing on 1 cm quartz crystals. It is also found as larger crystals intergrown with quartz. Electron microprobe analyses and Mössbauer spectroscopy for Fe of the F-rich tourmaline gave SiO2 34.38, TiO2 0.17, B2O3 10.12, Al2O3 31.76, Cr2O3 0.001, FeOtotal 15.84, FeO 13.15, Fe2O3 2.99, MnO 0.89, MgO 0.07, CaO 0.02, ZnO 0.12, Na2O 2.35, K2O 0.04, F 1.40, H2O 2.83, O = F – 0.59, sum 99.71 wt%, corresponding to (Na0.50K0.00)[Al1.47Fe3+0.53Fe2+0.13Mn1.28Ti0.27Mg0.00Zn0.00][Si0.96Al1.04O10]2−(BO3)3−(OH)−(OH)−3−(F,OH)−3− based on the sum of 31 anions. The ideal formula is [NaFe3+Al4Si6O24](BO3)3(\OH)^3(F,OH)−

The crystal structure of the F-analog of schorl was solved and refined by single X-ray diffraction methods, using a 0.10 x 0.10 x 0.13 mm fragment to R = 0.016 for 1682 reflections with Fc > 4σ(Fc). The mineral is trigonal, R3m with refined unit-cell parameters a = 15.997(2), c = 7.179(1) Å, V = 1591.0(4) Å3, Z = 3. This mineral is the F analog of the hydroxyl end-member schorl, in the tourmaline group.

The F-rich and Fe-rich tourmaline was found at Grasstein, Sachsenklemme, Trentino, South Tyrol, Italy, in pegmatites from the Permian Brixener granite. It was found in F-saturated quartz veins associated with fluorite, axinite, epidote, pyrrhotite, molybdenite, galena, chalcopyrite, and pyrite. Fluorine was found to occupy only the W site in this tourmaline and the presence of F in Fe-rich tourmaline seems to require a significant amount of Fe3+ in the structure. X-site vacancies were low in the F-rich tourmaline, showing the influence of the W-site on the neighboring X-site when F is abundant. R.R.

GOLYSHEVITE*


* Before publication, minerals marked with an asterisk were approved by the Commission on New Minerals and Mineral Names, International Mineralogical Association.
† E-mail: ppilonen@mus-nature.ca

NEW MINERAL NAMES*

T. SCOTT ERCIT, PAULA C. PIILONEN,† AND RALPH ROWE

Research Division, Canadian Museum of Nature, P.O. Box 3443, Stn. D, Ottawa, Ontario K1P 6P4, Canada

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HYPERZIRCONIUM SULFATE ANALOG OF EUDIALYTE


A calcium-poor and zirconium- and sulfate-rich member of the eudialyte group has been found in an ultra-agnatic pegmatite at Mt. Alluaiv of the Lovozero massif, Kola Peninsula, Russia. It’s empirical formula and range in composition (Z = 3) is: Na_{1.4–1.1} K_{0.4–0.2} Na_{0.8–0.6} RE_{Fe_{0.4–0.6}} Ca_{0.2–0.4} Zr_{0.2–0.4} Fe_{0.4–1.1} Mn_{1.1–5.1} Ti_{0.2–0.4} Nb_{0.2–0.6} Si_{1.8–0.8} Al_{0.5–0.6} Cl_{2–0.2} O_{12}·(OH)_4·nH_2O, where x ~ 75 and n ~ 1. The ideal formula is Na_{4.2} Ca_{3} (Mn,Fe)_{0.8} Zr_{0.2} [Zr_{0.6} Na_{0.4} Si_{0.8} (O,OH)]·Si_{3} O_{12} [Si_{3} O_{12}]. Cell parameters a = 14.192(5), c = 30.20(1) Å, space group R3, D_{calc} = 2.88 g/cm³. The crystal structure has been refined from 2455 observed [F > 5σ(F), MoKα] single-crystal data to R_{int} = 0.049. It shows the basic features of the eudialyte structure of three- and nine-membered rings of silicate tetrahedra and six-membered rings of RO₆ octahedra, which are cross-linked by ZrO₆ octahedra. Specific features of the structure include: (1) twelve A sites/subsites are dominated by Na except for 4Ac, which is dominated by Sr; (2) two different populations of RO₆ octahedra, one dominated by Ca, the other, Mn; (3) split-over of excess Zr to the M₂ site, which is partly four-coordinated, partly five-coordinated; (4) splitting of the M₃ site into two subsites, one occupied by Ti and Si, the other S; (5) splitting of the M₄ site into three subsites, one occupied by Nb, the other two by Si. The structure is most similar to the eudialyte-group mineral raslakte. T.S.E.

HIGHLY CATION-ORDERED MEMBER OF THE LABUNTSOVITE GROUP


An apparently new members of the labuntsovite group has been found in a hydrothermal vein in the Khibiny massif, Kola Peninsula, Russia. Its average chemical composition is K₂O 6.96, Na₂O 2.64, BaO 10.42, FeO 0.48, MgO 0.34, MnO 1.24, TiO₂ 22.26, Nb₂O₅ 3.59, SiO₂ 39.68, H₂O 12.39 (by difference), total 100 wt%, giving the semi-empirical formula Na₁.₀₂K₃.₅₈Ba₁.₆₅Si₉₀.₂₈O₃₉.₈₀·H₂O. The mineral is trigonal, space group R₃m, a = 14.233(1), c = 29.984(8) Å (single-crystal diffractometry). The strongest lines in the X-ray powder diffractogram are [210], 3.200, 46 (208); 2.971, 78 (315, 135); 2.848, 100 (404); 2.793, 122 (432, 217); 2.692, 148 (254, 114). Crystal-structure analysis is presented elsewhere (Rozenberg et al., 2005, Krista llogeal. Sci., 409A, 985–989 (in English).

LUOBUSAITE*


Luobusaite is found as irregular microcrystalline grains, 0.1 to 0.2 mm in size. The studied material was recovered from a crushed and sieved fraction, and minerals were separated using magnetic, electric and heavy liquid separation methods. It is steel gray with a black streak, metallic luster, is opaque and non-fluorescent. The mineral has a Mohs hardness of 7 and microindentation VHN100 of 1012–1145 (mean 1086) kg mm⁻², it is brittle with conchoidal fracture and has no apparent cleavage. Electron microprobe analyses (average of 8 analyses) gave Si 55.24, Fe 44.40, Al 0.63, Cr 0.06, sum 100.33 wt% corresponding
to Fe$_{0.90}$Si$_{1.8}$ based on 2 atoms of Si. Reflectance percentages for \( R_{\text{min}} \) and \( R_{\text{max}} \) are 49.63 (400 nm), 44.41 (470 nm), 46.46 (540 nm), 49.71 (580 nm), 46.89 (650 nm), 47.74 (700 nm)

Single-crystal data was not acquired due to the lack of suitable material. Luobusite is orthorhombic, \( Cmca \), with unit-cell parameters refined from X-ray diffraction data \( a = 9.784(14), b = 7.784(5), c = 7.829(7) \, \text{Å}, V' = 6017.9(9) \, \text{Å}^3, Z = 16, D_{\text{calc}} = 4.55 \, \text{g/cm}^3 \). The strongest lines of the X-ray diffraction pattern (SMART APEX with CCD detector MoKα, 17 lines) include 3.06(82.220), 2.849(20.221), 2.402(25.312), 1.977(40.313), 1.889(60,041), 1.865(40,114), 1.844(100,422). Luobusite is a part of a Fe-Si phase series including minerals such as gupeite, fexigente, hapkeite, fersilicate and ferdiisicate from which it differs clearly by either its chemical composition, crystal system, space group or unit-cell parameters. It has a similar X-ray diffraction pattern to synthetic orthorhombic FeSi$_2$.

The mineral is from the Luobusua mine in a podiform chromitite of ophiolite 200 km southeast of Lhasa, in the Indus-Yarlung Zangbo suture zone in Tibet, China. Luobusua is associated with diamond, moissantite, coesite, wustite, CrCc, PGEM, SiFe alloys, base metal alloys, silicates, and various native elements. The mineral is named after the locality. Type material has been deposited at the Geological Museum of China.

**MOGOVIDITE**


The holotype sample of the new species mogovidite occurs in a narrow (<1 cm thick) nepheline-pegelite vein within the fine-grained jilinite of the northern face of the iron-ore quarry at the 115 m horizon of the Kolvov massif, Kola Peninsula, Russia. Other minerals in the vein are aegirine-augite, zircon, titanite, hübemaite, andradite, scolecite and calcite. It is dark reddish brown in hand sample, with a white streak and glassy luster. Crystals (to 2 cm long) are tabular, less commonly idiomorphic; [001], [101], and [012] are dominant. Brittle, imperfect [001] cleavage, conchoidal fracture, Mohs’ hardness 5.5, \( D_{\text{max}} = 2.90, D_{\text{calc}} = 2.908 \, \text{g/cm}^3 \). Uniaxial (−), weakly pleochroic (colorless to yellow), \( \varepsilon = 1.611(2), \alpha = 1.618(1) \). Analysis by electron microprobe, IR spectroscopy, Mössbauer spectroscopy and thermogravimetric studies have the average composition: Na$_9$O 9.78, K$_2$O 0.58, CaO 18.13, MnO 0.57, FeO 4.53, ZrO$_2$ 11.74, Nb$_2$O$_5$ 1.70, SiO$_2$ 49.63, Cl 0.31, O = Cl$_2$ – 0.07, total 97.28, which gives the empirical formula: Na$_9$K$_{0.3}$Ca$_{7.0}$Fe$_{1.9}$Mn$_{0.2}$Zr$_{2.3}$Nb$_{0.3}$Si$_{2.0}$O$_{72}$CO$_{3}$OH$_2$F_2(OH, O, H$_2$O) (per 25 Si atoms). Type material has been deposited with the A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow (catalog nos. 3221/1 and 3290/1).

**Discussion.** No data are presented on compositional zoning in the mineral. The extremely similar Na:Ca ratios for mogovidite from ijolite-hosted pegmatite veins vs. mogovidite from veins hosted by calcite carbonate seem to contradict to the authors’ genetic model. T.S.E.

**NEW DATA**

**Epidote Group**


The recommended nomenclature presented here is the result of the work of the IMA-CNMMN Subcommittee on Epidote-Group Mineral Nomenclature, which was established in 2003. The Subcommittee presents obvious problems with the epidote group, a historical synopsis, and finally a recommended nomenclature which will minimize proliferation of unrelated mineral names, and which will provide a simple scheme to derive a species name for any epidote-group mineral based on electron-microprobe data. The general formula for any epidote-group mineral is given as $A_2M_3$[(T$_O$)$_2$][(TO)$_3$](O,F)(OH)O$_2$. All species are monoclinic, space group $P2_1/m$. Zoisite is an orthorhombic polymorph of clinozoisite and is thus not considered a member of the epidote-group. Three main subgroups are recognized:

1. Clinozoisite subgroup: members are derived from the mineral clinozoisite Ca$_2$Al$_3$Si$_2$O$_7$[SiO$_4$]O(OH)$_2$ by homovalent substitutions only.

2. Allanite subgroup: REE-rich minerals that may be derived from the mineral clinozoisite by homovalent substitutions and one couple heterovalent substitution.

3. Dollaseite subgroup: REE-rich minerals that may be derived from the mineral clinozoisite by homovalent substitutions and two coupled heterovalent substitutions.

A mineral name can be assigned only after determination of.
the proper subgroup by assessing the dominant cation valence at M3, M1, and A2. In addition, the dominant valence on O4 (X' or X^2) must be determined. Several old epidote-group mineral names have been reviewed and revised. Formal guidelines and examples are provided in the report. P.C.P.

**OTWAYITE**, PARAOTWAYITE


Otwayite, ideally Ni(OH)2–x(SO4,CO3)x/2 (where x ~ 0.6), was first described from the Otway Ni prospect, 23 km north of the town of Nullagine, Pilbara region, Western Australia. Otwayite and paraotwayite are virtually indistinguishable in hand sample. Single-crystal studies of the two minerals have not been performed due to their fibrous habit. This study utilizes SEM, EDX and vibrational spectroscopy (Raman, FTIR) to characterize the species. Otwayite appears fractured in SEM images, whereas paraotwayite shows a porous, network texture. Raman spectroscopy studies were performed and are deemed to be useful in the identification of otwayite and paraotwayite, and as a means of determining the approximate ratio of CO3 and SO4, therefore determining the position of the species in the otwayite-paraotwayite solid solution. P.C.P.

**PERHAMITE**


Perhamite was encountered at the Moculta quarry, Mount Lofty Ranges, South Australia, where it occurs as crandallite-like bladed rosettes on a matrix of apatite and quartz. Crystal quality precluded single-crystal structure analysis; however, crystals of perhamite from the Emmons pegmatite, Greenwood, Maine were sufficient for structure analysis. Four electron microprobe analyses of perhamite samples from the Emmons quarry gave an average of P2O5 21.24, CaO 11.66, SiO2 13.47, Al2O3 29.33, H2O (by diff.) 24.2 wt%, very similar to the analysis of the type sample from the Bell pit, Newry, Maine. Upper-level precession photographs about ε show trigonal symmetry. Single-crystal X-ray intensity data collection involving a CCD area detector (295 K; MoKα; 847 total unique reflections, 618 unique observed [F > 4σ(F)] reflections; R1 = 0.070, Riao 0.044, wR2 = 0.157) gave a = 7.021(1), c = 20.218 Å, average space group P31/m, Dcalc = 2.49 g/cm3. The crystal structure consists of ordered blocks of a well-defined crandallite-type structure separated by ill-defined, disordered regions. The crandallite-type region shows six-coordinated Al and four-coordinated P; the disordered region shows TO4 tetrahedra predominantly occupied by Si, and is cross-linked to the crandallite region by tetrahedra predominantly occupied by Al. Corner linking of the AlO4 and SiO4 tetrahedra results in 4-member rings that are interconnected in (001) planes to form chains. Framework connectivity between the crandallite and disordered regions results in zeolitic cavities occupied by Ca and H2O. The average structure combined with the chemical analysis indicates that the formula of perhamite is (Ca,Sr)Al2−xSi3P2−xO2+x(OH)x·xSH2O. The authors discuss two possibilities for local ordering in the disordered region of the structure. One of these involves a non-centrosymmetric arrangement of AlO4 and SiO4 tetrahedra; the other involves five-coordinated Si. At the present it is not possible to state which model is more likely. T.S.E.

**ZN-RICH KUPLETSKITE**


The chemistry and crystal structure of a unique Zn-rich kupletskite: (K1.55Na0.64Rb0.08Sr0.01)Σ1.68(Na2.42Ca0.86Al0.02)Σ2.26(Mn4.72Zn1.85Nb0.11Hf0.03)Σ6.69O26(OH)4(F0.77OH0.23)Σ1.75O25.85H2O. From single-crystal X-ray diffraction refinement, it is clear that Zn2+ shows a preference for the smaller, F2 site (69%), yet is distributed amongst all three octahedral sites coordinated by the larger, OH- and H2O-free sites with only one ligand species (O, S, Cl, B, I). In alkaline systems, Zn is only present in early sphalerite or in late-stage zeolite-like minerals. The bulk of Zn in alkaline systems is present as discrete Zn phases such as members of the astrophyllite, labuntsovite, milarite and nordite groups, a result of the formation of network-forming Zn(OH)2 complexes in low-temperature, low-P, high-alkalinity, and highly oxidizing systems. P.C.P.