ABELLAITE


Abellaite (IMA 2014-111), ideally NaPb$_2$(CO$_3$)$_3$(OH), is a new mineral from the abandoned Eureka uranium mine (42°23′10″N, 0°57′27″E), in the southern Pyrenees (Lleida province), Catalonia, Spain. The primary U–V–Cu mineralization is hosted within the fluvial continental Buntsandstein red beds and represented by millimeter-sized grains of various sulfides, sulfofats, selenides, U–V oxides, silicates containing Cu, V, U, Bi, Ag, Se, As, Ni, and Co. Abellaite is a post-mining secondary mineral that resulted of supergene enrichment. It forms sparse coatings most often on a substrate of quartzite, in association with primary minerals (roscoelite, pyrite, uraninite, coffinite, carbon, galena, sphalerite, native bismuth, Ni-rich cobaltite, covellite, tennantite, and chalcocypirite), and supergene minerals (hydrozincite, aragonite, gordaite, As-vanadinite, andersonite, čejetka, malachite, and devilline). In general, the mineral forms subhedral microcrystals not larger than 10 μm, but some larger (10–30 μm) idiomorphic, pseudohexagonal crystals with a prominent pinacoid face (and more poorly developed prism faces) have been observed. The more euhedral microcrystals have a tabular to lamellar habit and form disordered aggregates. Abellaite aggregates are colorless to white. Crystals are translucent with a vitreous to nacreous luster and a white streak. Abellaite does not show fluorescence under UV radiation. It is not soluble in water, but incongruently dissolves in 20% HCl at room temperature with separation of PbCl$_2$. Due to the small crystal size the cleavage, fracture, hardness, and density were not determined; $D_{\text{calc}} = 5.93$ g/cm$^3$. The synthetic analog of abellaite has a perfect cleavage on {001}. For the same reason most of optical properties were not obtained. The mineral is non-pleochroic and refractive indexes are estimated to be between 1.8 and 2; $n_{\text{calc}} = 1.90$. The Raman spectrum shows a sharp band at ~1058 cm$^{-1}$ and a weaker, broader feature at ~1391 cm$^{-1}$, which can be attributed to symmetric (v$_1$) and asymmetric (v$_3$) stretching modes of CO$_3^2-$ groups, respectively. A weak peak is observed at 3504 cm$^{-1}$, is assigned to O–O stretching vibrations. The main absorption bands of the IR spectrum (cm$^{-1}$; w = weak, m = medium, s = strong, vs = very strong, br = broad) are: 688s [v$_1$(CO$_3^2-$)], 844m [v$_2$(CO$_3^2-$)], 998w,br (ðPbOH), 1053w [v$_3$(CO$_3^2-$)], 1425s,br [v$_3$(CO$_3^2-$)], 1750w,br (second order), 3500w,br (O–H stretching). The average of 10 electron probe WDS analyses is [wt% (range)]: Na 3.88 (3.69–4.03), Ca 0.29 (0.14–0.51), Pb 72.03 (71.14–72.7), C 4.17, O 19.47, H 0.17, total 100.01. H, C, and O were determined by stoichiometry. This gives the empirical formula Na$_{0.82}$Ca$_{1.31}$Pb$_{1.81}$(CO$_3$)$_3$(OH) based on 7 O pfu. The strongest lines in the X-ray powder-diffraction pattern [d Å (%; hkl)] are: 3.193 (100; 013), 2.627 (84; 110), 2.275 (29; 020), 2.242 (65; 021,006), 2.029 (95; 023). Single-crystal X-ray diffraction data was not done due to the mineral being too fine grained. Rietveld refinements using crystallographic data for synthetic analog of abellaite as a starting model show the mineral is hexagonal, space group P6$_3$mc, $a = 5.254(2)$ Å, $c = 13.450(5)$ Å, $V = 321.5$ Å$^3$, $Z = 2$. Abellaite is named after the amateur mineralogist and mineral collector Joan Abella i Creus (b. 1968) from Sabadell, Catalonia, Spain, who collected the mineral. Co-type material is deposited in the Natural History Museum of Barcelona, Catalonia, Spain. O.C.G.

BABÁNEKITE


Babánekite (IMA 2012-007), ideally Cu$_5$(AsO$_4$)$_2$8H$_2$O, monoclinic, is a new member of the vivianite group $Me_4$(XO$_4$)$_2$(H$_2$O)$_2$ where $Me$ = divalent cations and $X$ = $P$ or $As$$. Four P-dominant members [vivianite (Fe), arupite (Ni), barite (Mg, Fe), and pakhomovskyite (Co)] and six As-dominant members [annabergite (Ni), erythrite (Co), hörnesite (Mg), manganohörnesite (Mn), köttigite (Zn), and parasymplesite (Fe)] of this group were known to date. The new member was found in an old ore-stope (so called “lindackerite stope”) on the Geister vein at the third Geister level of the Rovnost (former Werner) mine, Jáchymov, Western Bohemia, Czech Republic. The Jáchymov ore district represents a classic example of Ag–As–Bi–Co–Ni–U hydrothermal vein-type deposit. Babánekite was found in a supergene oxidation zone in a rich association constituted by arsenates of the vivianite group and lindackerite supergroup, as well as supergene uranyl-bearing minerals. The richness of the locality results from the occurrence of both the recently/sub-recently formed minerals connected with the post-mining processes and the supergene minerals formed in-situ in the oxidation zone (association of uranyl arsenates and vanadates; association of Pb–Cu supergene minerals and minerals containing Y+REE). Babánekite aggregates grow in cavities and on the surface of ore fragments closely associating with members of the lindackerite supergroup (lindackerite, veselovskykite, hloušekite, pradetite, and klajite), lavendulan, gypsum, and an X-ray amorphous Cu–Al–Si–O–H phase. These minerals crystallize on the strongly pretreated ore-body consisting mainly of massive tennantite, galena and arsenic anvilite, among other minerals containing Y+REE. Babánekite aggregates grow in cavities and on the surface of ore fragments closely associating with members of the lindackerite supergroup (lindackerite, veselovskykite, hloušekite, pradetite, and klajite), lavenderite, gypsum, and an X-ray amorphous Cu–Al–Si–O–H phase. These minerals crystallize on the strongly pretreated ore-body consisting mainly of massive tennantite, galena and arsenic anvilite, among other minerals containing Y+REE. Babánekite crystals are pinkish to peach-colored, elongated, and prismatic up to 1.5 mm in length. They grouped in hemispherical aggregates up to 2 mm. Crystal forms are: {010}, {100}, {110}, {101}, and less frequently {001}. The mineral has a light pinkish streak and is transparent to translucent with

* All minerals marked with an asterisk have been approved by the IMA CNMMC.
† For a complete listing of all IMA-validated unnamed minerals and their codes, see http://pubsites.uws.edu.au/ima-cnmmc/.
NEW MINERAL NAMES

Delhuyarite-(Ce)*


Delhuyarite-(Ce) (IMA 2016-091), ideally Ce,Mg(Mg3Fe2W)2([Si2O5]2O2)(OH)2 - monoclinic, is a new member of the chevkinite group as discovered in the only known old museum specimen nRM 19060375 from the Swedish Museum of Natural History, Sweden. This specimen is considered as holotype and is also the holotype for percevilleite-(Ce). It was found at the Nyå Bastnäs Fe-Cu-REE deposit (Riddarhyttan ore field), Skinnskatteberg, Västmanland, Sweden (59°50'47''N, 15°35'15''E, 220 m a.s.l.). This deposit is famous for being the type locality for more than 20 REE mineral species including cercite-(Ce), bastnäsite-(Ce), and others. At the deposit, quartz-banded hematite ore occurs in proximity with a magnetite-skarn ore, the latter replacing a dolomitic carbonate horizon. The dominant host rock is a quartz-rich, cordierite-bearing mica-schist, interpreted as an extensively metamassitized (Mg–K alteration) and regionally metamorphosed (amphibolitic facies) felsic volcaniclastic unit originally deposited at ~1.9 Ga. Identified associated minerals are cerite-(Ce), tremolite-actinolite, bastnäsite-(Ce), magnetite, quartz, chalcopyrite, ferrillanite-(Ce), törnbohmite-(Ce), and scheelite. The late-formed quartz appears in interstices and microcracks in the REE mineral assemblage. Delhuyarite-(Ce) forms brown–black translucent subbedral crystals up to 0.3 × 0.06 mm appearing essentially isolated in a mass of cercite-(Ce) and percevilleite-(Ce). It has a dark brown streak, an adamantine luster, irregular to sub-conchoidal fracture, and no cleavage. Mohs hardness is estimated as 5–6, by analogy with chevkinite-group minerals. The density was not measured due to the minute size and the paucity of the material; \( D_{\text{calc}} = 5.196 \text{ gc/cm}^3 \). Delhuyarite-(Ce) is strongly pleochroic from rust-red to nearly opaque. It is optically biaxial (−). The strong absorption and high refraction did not allow to determine refractive indexes and other optical properties, \( n_{\text{calc}} = 1.94 \). The average of four point electron-probe WDS analyses [wt% (range)] is La2O3 14.58 (13.70–15.06), Ce2O3 22.29 (23.14–24.30), Pr6O11 1.89 (1.84–1.94), Nd2O3 6.13 (5.96–6.34), Sm2O3 0.74 (0.67–0.82), Gd2O3 0.37 (0.31–0.40), Dy2O3 0.03 (0.02–0.09), Er2O3 0.04 (0.06–0.06), Yb2O3 0.12 (0.06–0.06), Y2O3 0.22 (0.10–0.17), CaO 0.76 (0.69–0.93), Fe2O3 12.86 (12.23–14.11) (considered to be trivalent based on bond distances and charge balance), MgO 2.43 (2.17–2.67), Al2O3 0.73 (0.50–0.88), SiO2 18.16 (17.47–18.89), TiO2 0.09 (0.07–0.12), WO3 15.53 (15.21–16.01), F 0.05 (0.03–0.06), Cl 0.03 (0.02–0.03), H2O1.33 (by structure based on 2 OH+F p.f.u.), –O=F 0.02, –O=C1; 0.01, total 99.35. The Na, K, Sr, Ba, Mn, Th, U, Zr, Nb, Ho, and Lu contents were found to be below detection limits (<0.01 wt%). Confinement of Eu was not measured due to interference with other REE. An empirical formula based on 22 O is

\[
\text{Ca}_{0.04} \text{Nd}_{0.69} \text{Sm}_{0.01} \text{Gd}_{0.01} \text{Y}_{0.22} \text{Ce}_{0.76} \text{Fe}_{2.86} \text{W}_{0.02} \text{As}_{6.13} \text{P}_{3.11} \text{O}_{39.79} \text{Si}_{4.74} \text{Al}_{20.02} \text{H}_{0.05} \text{Cl}_{0.03} \text{F}_{0.03} \text{O}_{0.12}
\]

Delhuyarite-(Ce) structure has the same topology as chevkinite subgroup. The crystal structure was refined to \( a = 10.9485(4) \text{ Å}, b = 10.1729(3) \text{ Å}, c = 13.5555(5) \text{ Å}, \beta = 100.481(4)°, \) with \( Z = 2 \). The unit-cell parameters for the calculated X-ray powder diffraction pattern (based on single-crystal data for untreated crystal) are [\( d \text{ Å (calc %, hkl):} 7.936 (11, 110), 6.743 (100, 020), 5.215 (14, 137), 2.715 (11, 041), 2.333 (10, 151), 2.082 (5, 350), 1.686 (16, 080), 1.611 (4, 557)]. The unit-cell parameters refined from the powder data are \( a = 10.1850(6), b = 13.4852(6), c = 4.7484(3) \text{ Å}, \beta = 105.316(5)°, V = 629.01 \text{ Å}^3 \). The single-crystal X-ray data obtained from the crystal of 0.035 × 0.050 × 0.055 mm in size shows babánekite is monoclinic, \( C2/m \), with \( a = 10.717(3), b = 13.5588(4), c = 4.7496(1) \text{ Å}, \beta = 105.399(2)°, V = 629.28 \text{ Å}^3 \). The crystal structure of babánekite, refined to \( R = 2.18 % \) for 864 unique observed reflections, confirmed to be similar to other members of the vivianite group where of Me6O2(H2O)octahedra and dimers of Me2O2(H2O)octahedra that are linked via \( \text{XO}_4 \) tetrahedra and hydrogen bonds to form complex layers parallel to (010). Adjacent layers are linked by hydrogen bonds only. The mineral is named for Senior Mining Counselor (“Oberbergath”) Ing. František Babánek (1836–1910), Czech mining expert, geologist and mineralogist who worked in the Jáchymov and Příbram mines. The type specimen is deposited in the Department of Mineralogy and Petrology of the National Museum, Prague, Czech Republic. D.B.

Murakamite*


Murakamite (IMA 2016-066), ideally LiCa3Si5O15(OH), triclinic, is a new mineral and Li-analog of peclotite. It was discovered in an aegirine-augite albite at the in the eastern part of Iwagi Islet, Ehime Prefecture, Japan (34.263°N, 133.161°E). The albities hosted by Late Cretaceous biotite granitoids and consist of albite (~80 vol%), aegirine-augite, feldspar, and quartz (3%), peclotite (1%), orthoclase (9%), and aegirine-augite (~3%), quartz (~3%), and phlogopite (~2%).
NEW MINERAL NAMES

5.89

0.01 (0–0.03)

4.21 (4.03–4.33)

3

d

2+

2−

, Na

6

6

3

CaO

34.14 (33.11–34.84)/

F

and Telč, Moldanubian, Czech Republic (Povondra 1981; Novák et al. 2004); that sample was further studied in this work followed by oxy-foitite approval by CNMNC IMA. At Cooma Complex the holotype specimen originated from granitic pegmatites in leucosomes and pegmaticritic patches occurring in high-grade migmatitic gneisses of pelitic composition. The oxy-foitite formation is related to the partial melting of these gneisses. Associated minerals are muscovite, K-feldspar and quartz. Oxy-foitite forms black, vitreous subhedral prismatic crystals up to ~1 cm striated parallel to {001}. Frequent and evenly distributed micro-fractures in these crystals filled with muscovite and other phases. Crystals are brittle with a gray streak, sub-conchoidal fracture, and no observed cleavage or parting. Mols hardness is ~7. The density was not measured; \( \Delta_d = 3.143 \text{ g/cm}^3 \). No fluorescence under UV light was observed. In transmitted light, oxy-foitite is pleochroic from pale (E) to dark (O) brown. It is uniaxial (+), \( \epsilon = 1.660(5), \epsilon = 1.630(5) \) (white light). Polarized optical absorption spectra in the range 3000–5000 cm\(^{-1} \) on the polished single-crystal fragment show three broad absorption bands caused by electronic 3d-transitions: at 22730 cm\(^{-1} \) (440 nm) (Fe\(^{2+}\)-Ti\(^{4+}\) intervalence charge transfer), 13990 cm\(^{-1} \) (715 nm) and 9090 cm\(^{-1} \) (1110 nm) (enhanced spin-allowed d–d transitions in octahedrally coordinated Fe\(^{3+} \)). A number of relatively sharp and weak bands at 7112 (1406 nm), 7092 (1410 nm), and 6599 (1437 nm) cm\(^{-1} \) represent overtones of the fundamental (OH)-stretching bands observed at ~3500 cm\(^{-1} \). The OH content estimated from the absorbance of the overtone bands in that range indicates 3.0 wt% H\(_2\)O in agreement with the chemical data. The polarized FTIR spectra were recorded on the same sample in the range 3000–2000 cm\(^{-1} \). Those recorded parallel to the c–axis direction contain a major absorption feature in the 3450–3600 cm\(^{-1} \) range being related to the occurrence of (OH) at \( \nu \) position. A band at 3375 cm\(^{-1} \) is assigned to the hydrogen bond \( \text{O}–\text{H} \cdots \text{O} \). Two sharp bands at 3632 and 3726 cm\(^{-1} \) are consistent with the minor concentrations of \( \text{H}_2\text{O} \)\(_{31} \) (see empirical formula below). The average of 10 point electron probe analyses [wt% (range)] is SiO\(_2\) 34.95–36.06, TiO\(_2\) 0.22 (0.21–0.24), B\(_2\)O\(_3\) 10.52 (by stoichiometry), Al\(_2\)O\(_3\) 36.49 (36.29–36.81), FeO\(_{\text{tot}}\) 9.40 (9.07–9.89) (FeO 8.37 and Fe\(^{2+}\) 1.15 based on Mössbauer spectroscopy), MgO 2.48 (2.46–2.51), MnO 0.36 (0.32–0.43), ZnO 0.09 (0–0.12), CaO 0.06 (0.05–0.07), Na\(_2\)O 1.41 (1.35–1.45), K\(_2\)O 0.03 (0.04), F 0.07 (0–0.15), H\(_2\)O (by stoichiometry) 3.08, O=F; 0.03, total 99.97. The empirical structural formula based on (OH+F+O) = 3247 unique reflections. The combination of the chemical, structural, and spectroscopic data is consistent with site population in the empirical structural formula above and the end-member formula \( \text{Fe}^{2+}\text{Al} \text{SiO}_{3} \text{BO}_{3}\text{(OH)}\text{O} \). The name is given in parallel with the naming of other tourmaline-supergroup species, e.g., oxy-schorl and oxy-dravite, considering that the closest end-member composition among valid tourmaline supergroup species is foitite, ideally \( \text{Fe}^{2+}\text{Al} \text{SiO}_{3} \text{BO}_{3}\text{(OH)}\text{O} \). Oxy-foitite shows chemical relationships with foitite through the substitution \( \text{Al}^{3+} + \text{O}^2− \rightarrow \text{Fe}^{2+} + \text{O}^2− \). The holotype is deposited in the Museum of Earth Sciences, Sapienza University of Rome, Italy. D.B.
References cited

SHENZHUANGITE*

Shenzhuangite (IMA 2017-018), NiFeS, is a new mineral species ofchalcopyrite group discovered in the shocked Suzhou L6 chondrite fell on April 15, 1986, in Dayanpo, 12.5 km southeast of Suzhou in Hubei, China. The shock stage classified as S5. Thin shock melt veins less than 300 µm thick contain a number of high-pressure polymorphs including ringwoodite, pyro-meteor gynite, akimotoite, magnesiowüstite, lingunite, tuite, xieite, hemleyite, and a (Mg,Fe)SiO3. The empirical formula based on 4 apfu and assuming the crystal-chemical exchange: Cu3+ + Fe2+ ↔ Ni2+ + Fe3+ is (Ni0.69Fe0.31)Cu(OH)(OH,F). The crystal structure was refined to I42d, a = 3.1241(4) Å, c = 10.4772(7) Å, V = 295.65 Å3, Z = 4. The crystal structure was refined to R1 = 0.0369 for 836 unique reflections and shows shenzhuangite is the Ni- analogue ofchalcopyrite. It likely formed as alteration of pre-existing taenite when pF2O3 ratios allowed sulfidation of the FeNi metal. Shenzhuangite is named in honor of Shangyou Shen and Xiaoli Zhuang who first discovered the Ni-rich variety ofchalcopyrite in the Suzhou meteorite. Holotype material is deposited in the Museo di Storia Naturale, Università degli Studi di Firenze, Italy. D.B.

SIDRAITE*

Sidraite (IMA 2016-038), ideally Pb2Cu(OH)I4, is a new mineral from the classic Broken Hill deposit in New South Wales, Australia. It was discovered on a single specimen BM 84642 registered as marshite at the Natural History Museum, London, obtained from the mineral dealer A.E. Foote of Philadelphia in 1899. Specific locality within the deposit is unknown. This specimen is now considered as holotype ofsidraite along with the polished probe block and single-crystal mount removed from it. The specimen is a mass ofcuprite and native copper, with cavities incurred by well-formed cuprite octahedra with a small relict blebs and broken shards of the characteristic Broken Hill galena–Mn-silicate ore and quartz. Some cavities contain a suite of secondary minerals: orange/ pale-brown translucent marhshte tetrahedra (dominated), linarite, connelite, brochantite, tsuitebite, angleseite, plumbogummite-group minerals (traces), and occasionally, tiny yellow granular aggregates of the sidraite. It is suggested that sidraite formed from the secondary alteration of cuprite due to the local availability of Pb mobilized from the small galena “blesbs” and shards at the contacts with cuprite. Sidraite forms patches up to 2 mm, although individual crystal aggregates are up to 0.3 mm across with the largest single crystal of 0.1 mm long. It is yellow and translucent with a yellowish streak, with vitreous luster and no parting or cleavage. Sidraite is non-fluorescent in mixed-wavelength UV light. Crystal forms are indistinct. Due to the crystal size and the scarcity of the material the Mohs hardness (estimated as ~2.5–3%), density (Dcalc = 6.505 g/cm3), optical properties (n(calc) = 2.18), and X-ray powder diffraction data were not obtained. The Raman spectrum shows peaks below 400 cm−1 attributed to modes of the cubane group [Pb4O6] and CuI dimer units, and internal modes of the CuI tetrahedra, and peaks at 3443 and 3455 cm−1 attributed to two non-equivalent OH groups. The average of 10 electron probe WDS analyses is [wt% (range)]: Cu:O 7.22 (6.96–7.35), Pb:O 51.8 (50.1–53.4), I 42.5 (42.2–42.8), H2O (by stoichiometry) 2.03 (1.99–2.08), (OH)=1.26, total 100.94. The empirical formula based on 5 anions pfu is Pb2(0.66Cu,0.34)(OH)I4. The strongest lines in the calculated X-ray powder-diffraction pattern [d(hkl) Å (I(%)]: 4.246 (63), 3.926 (63), 3.484 (53), 2.948 (34), 2.840 (32), 2.494 (30) Å. The structure of sidraite consists of a framework that involves two structural elements, a cubane-like [Pb4O6] group and a [CuI4]4+ dimer of edge-sharing CuI tetrahedra. Six halocuprate groups surround each [Pb4I6(OH)4]2− nucleus, and each halocuprate group is shared between six adjacent [Pb4I6(OH)4]2− groups. Long Pb-I bonds complete the coordination of each Pb atom resulting in Pb(OH)I4 polyhedra centred on a tetrahedron of O atoms to form a Pb(OH)I4 cluster. Sidraite is named after Russian mineralogist and crystallographer Oleg I. Siidra (b. 1981) for his extensive work on secondary lead oxysalts and, in particular, on synthetic iodine-rich phases. O.C.G.
mineralization, formed by fluids rich in REEs and other metals that have reacted with carbonate layers in the volcano-sedimentary pile. More than 20 REE minerals have been reported from the area. The new mineral discovered in the specimen collected in 1986 from mine dumps and originally catalogued as cerite-(Ce) in the Mineralogical Museum of Uppsala University, under the number 318/77. The specimen appeared to be consisted mainly of västmanlandite-(Ce) and a new mineral —ulfanderssonite-(Ce). The similar mineral was previously mentioned as unnamed “mineral E” (Holstam and Andersson 2007), which is reported as UM2007-39 in the official list of valid unnamed mineral species (Smith and Nickell 2007). Ca- and Cl-rich REE-silicate intergrown with fluorbritholite-(Ce) from Malmkärna was noted by Sahlinström (2014) with no more detailed information. The grains with composition very similar to that of ulfanderssonite-(Ce) (with Fe > Mn) were found in contact with cerite-(Ce) at the Nya Bastnäs ore field, ~30 km to the SSW of the Malmkärna mine (Holstam and Andersson 2007). That may represent an unnamed Fe analog of ulfanderssonite-(Ce) (Smith and Nickell 2007). The “Cl- and F-rich cerite-(Ce)” from the Crosetto talc mine, Germanasca valley, Torino Province, Italy (Piccoli et al. 2007; Chukanov 2014) may be closely related to ulfanderssonite-(Ce) based also on similarity of IR spectra. The type specimen ulfanderssonite-(Ce) is associated with vastmanlandite-(Ce), bastnaesite-(Ce), philgopite, talc, magnetite, pyrite, fluorbritholite-(Ce), and scheelite. Alteration to bastnaesite-(Ce) and other unidentified fluor-carbonates locally occurs along grain boundaries and micro-cracks. The mineral forms pinkish, translucent subhedral grains, 100–300 mm, in flesh-pink to colorless-gray vitreous to greasy aggregates up to 2 mm. It is non-fluorescent under UV radiation. The streak is white. The indistinct cleavage is on (001); fracture is uneven. Ulfanderssonite-(Ce) is brittle with Mohs hardness 5–6. The density was not measured due to impurities; Dcalc = 4.97 g/cm³. In transmitted light ulfanderssonite-(Ce) is nearly colorless, non-pleochroic, has a slight undulatory extinction. It is optically biaxial (−), 2Vmeas = 55°. The refractive indices were not measured (n > 1.81); ncalc = 1.82. An unpolarized single-crystal FTIR-spectrum in the range 600–5000 cm⁻¹ shows broad band features at ~2850 and ~3250 cm⁻¹, and relatively sharp bands at 3400, 3510, and 3635 cm⁻¹ (O–H stretching vibrations); very intense absorption in the range 600–5000 cm⁻¹ (e.g. Si-O-Si bands). LA-ICP-MS analyses show the presence of O, H, F, Cl, Ca, and Mg, with O = 97.04, H = 0.46, F = 0.46, Cl = 0.64, total 97.04. Elements Na, K, Sr, Ba, Al, Mn, and Ti were below detection limits. LA-ICP-MS analyses show the presence of Ho, Er, Tm, Yb, Lu, Bi, Cu, W, U, and Th in trace amounts. No specific explanation for the low totals found beside a partial sample degradation under the electron beam. The empirical formula calculated on the basis of 29 cations pfu is (Ca₇₋₈Nd₁₋₂Pr₂₋₁Sm₂₋₃Y₂₋₃Gd₁₋₂₂D₂₋₃Eu₁₋₂₂Tb₁₋₂₂Ce₁₋₂₂)⁵⁺(Mg₁₋₂Fe₂₋₃Si₁₋₃₁₁₁₂₆₆O₄⁻₁₂OH₂Cl₁₋₃₄. The strongest lines in the X-ray powder-diffraction pattern [d(Å) (%)] are: 4.350 (21; 022), 3.524 (26; 401), 2.948 (100; 421), 2.923 (47; 204), 2.683 (24; 040), 2.660 (32; 225), 1.760 (25; 623). The monoclinic unit-cell parameters, refined from the powder data are a = 14.140(8), b = 10.7430(7), c = 15.498(1) Å, β = 106.615(6)°, V = 2256.2 Å³. Single-crystal X-ray data shows ulfanderssonite-(Ce) is monoclinic, Cm, with a = 14.140(8), b = 10.7430(7), c = 15.498(1) Å, β = 106.615(6)°, V = 2256.0 Å³ for Z = 2. The crystal structure has been solved by direct methods and refined to R = 2.97% for 5280 observed Fobs > 4σ(Fcal). The basic structural elements of ulfanderssonite-(Ce) are 11 distorted (REE,Ca)O₁₋₃Cl₈₋₉, 2 polyhedra, 2 regular MgO₆, octahedra, and 7 SiO₄ tetrahedra (one of which is protonated). Although strictly not a layer topology, the crystal structure can be described as a regular alternation of the two kinds of layers alternated along the c-axis. The layer with composition [((Ca,Ce,Mg)Si₂O₇(OH,F))₈₋₉ (~9 Å thick) is topologically and chemically closely related to cerite-(Ce). The layer with composition [(Ce,Mg)Si₂O₇(OH,F),(Cl)]₈₋₉ (~6.5 Å thick) has a novel topology. Ulfanderssonite-(Ce) along with fluorbritholite-(Ce) are interpreted as primary minerals formed by a magmatic-hydrothermal fluid with REE, Si, F, and Cl ion complexes reacting with dolomite marble. The presence of ulfanderssonite-(Ce) is direct evidence of a Cl-rich mineral-forming aqueous solution, normally not reflected in the composition of skarn minerals in Bastnäs-type deposits. The mineral name honors Ulf B. Andersson, a Swedish geologist and petrologist contributed significantly to the understanding of the Bastnäs deposits genesis. The holotype material, including a polished thin section, is deposited in the, Swedish Museum of Natural History. D.B.References citedChukanov, N.V. (2014) Infrared Spectra of Mineral Species. Extended library. Springer, 1726 p.Holstam, D., and Andersson, U.B. (2007) The REE minerals of the Bastnäs-type deposits, South-Central Sweden. Canadian Mineralogist, 45, 1073–1114.Piccoli, G.C., Maletto, G., Bosio, P., and Lombardo, B. (2007) Minerali del Piemonte e della Valle d’Aosta. Associazione Amici del Museo “F. Eusebio”, Alba, Ed., Alba (Cuneo), 607.Sahlström, F. (2014) Stable isotope systematics of skarn-hosted REE silicate-magnetite mineralisations in central Bergslagen, Sweden. M.Sc. thesis, Department of Earth Sciences, Uppsala University, 83 p.Smith, D.G.W., and Nickel, E.H. (2007) A system for codification for unnamed minerals: report of the Subcommittee for Unnamed Minerals of the IMA Commission on New Minerals, Nomenclature and Classification. Canadian Mineralogist, 45, 983–1055.
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