

New minerals recently approved by the Commission on New Minerals and Mineral Names, International Mineralogical Association

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**New minerals recently approved
by the
Commission on New Minerals and Mineral Names
International Mineralogical Association**

The information given here is provided by the Commission on New Minerals and Mineral Names, I.M.A. for comparative purposes and as a service to mineralogists working on new species.

Each mineral is described in the following format:

IMA No.

(any relationship to other minerals)

Chemical Formula

Crystal system, space group

unit cell parameters

Colour; lustre; diaphaneity.

Optical properties

Strongest lines in the X-ray powder diffraction pattern

The names of these approved species are considered confidential information until the authors have published their descriptions or released information themselves.

No other information will be released by the commission

J. A. Mandarino, Chairman

Commission on New Minerals and Mineral Names

International Mineralogical Association

1991 Proposals

IMA No. 91-001

$\text{Hg}_2^{+1}\text{Hg}_3^{+2}\text{Cr}^{+6}\text{O}_5\text{S}_2^{-2}$

Triclinic: $P\bar{1}$

a 8.116, b 9.501, c 6.891 Å, α 100.43°,

β 110.24°, γ 82.80°

Orange-red; adamantine; transparent.

Biaxial (sign unknown), all indices of refraction are greater than 2.

5.72 (90), 3.373 (60), 3.008 (100), 2.864 (50b),
2.774 (50), 2.536 (50), 2.486 (50), 2.425 (60).

Biaxial (+), α 2.38, β 2.42, γ 2.47, 2V(calc.) 85°.

3.164 (100), 2.934 (90), 2.842 (45), 2.495 (45),
1.769 (45), 1.734 (80).

IMA No. 91-005

$(\text{Zn}, \text{Co}, \text{Ni})_6(\text{SO}_4)(\text{OH}, \text{Cl})_{10} \cdot 5 \text{H}_2\text{O}$

Hexagonal: $P6_3$, $P6_3/m$ or $P6_322$

a 8.344, c 21.59 Å

Bright to deep pink; vitreous to pearly;
transparent.

Uniaxial (–), ω 1.584, ϵ 1.544

10.8 (100), 3.300 (90), 2.725 (60), 2.563 (50),
2.351 (40), 1.575 (30).

IMA No. 91-003

The niobium analogue of bismutotantalite.

$\text{Bi}(\text{Nb}, \text{Ta})\text{O}_4$

Orthorhombic: $Pcmm$

a 4.992, b 5.677, c 11.731 Å

Black; semi-metallic; transparent in small
(< 0.03 mm) fragments.

IMA No. 91-007

$\text{Mn}_3(\text{OH})_4(\text{VO}_4)_2$

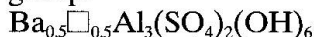
Monoclinic: $C2/m$

a 9.604, b 9.558, c 5.393 Å, β 98.45°

Orange-red; vitreous; transparent.
Biaxial (–), α' 1.803, γ' 1.810, 2V(meas.) large.
4.76 (S), 3.00 (M), 2.680 (VS), 2.656 (M),
2.155 (M), 1.565 (M), 1.510 (M).

IMA No. 91-008

The Ba-dominant end-member of the alunite group.



Hexagonal: $R\bar{3}m$

a 6.992, c 17.22 Å

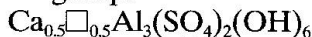
White to light yellowish; vitreous; transparent.

Uniaxial (+), ω 1.588, ε 1.604.

5.73 (50), 3.49 (55), 2.98 (100), 2.283 (80),
1.909 (70), 1.747 (60).

IMA No. 91-009

The Ca-dominant end-member of the alunite group.



Hexagonal: $R\bar{3}m$

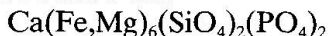
a 6.983, c 16.759 Å

White to light yellowish; vitreous; transparent.

Uniaxial (+), indices of refraction unknown.

4.91 (69), 2.97 (100), 2.231 (51), 1.899 (43),
1.745 (37), 1.375 (40).

IMA No. 91-010



Hexagonal: $R\bar{3}m$

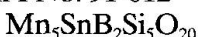
a 6.240, c 26.784 Å

Yellow-brown; vitreous; transparent.

Uniaxial (–), ω 1.770, ε 1.759.

5.00 (60), 3.119 (100), 2.689 (80), 2.558 (100),
2.505 (80), 1.560 (80).

IMA No. 91-012



Monoclinic: $P2_1/m$

a 28.77, b 7.01, c 13.72(2) Å, β 96.6(2)°

Orange-yellow; vitreous; transparent.

Biaxial (–), α 1.696, β 1.711, γ 1.715,

2V(meas.) 57°, 2V(calc.) 54°.

3.41 (8), 3.22 (8), 2.83 (10), 2.81 (10), 2.24 (7),
1.750 (6).

IMA No. 91-013



Orthorhombic: Cmcm , $\text{Cmc}2_1$ or $\text{C}2\text{cm}$

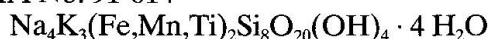
a 29.77, b 11.03, c 17.111(5) Å

Colourless (white or grey in aggregates);
vitreous; transparent.

Biaxial (–), α 1.532, β 1.548, γ 1.559(2),
2V(meas.) 79°, 2V(calc.) 79°.

10.38 (100), 4.516 (75), 3.220 (65), 3.097 (80),
2.972 (65), 2.773 (90).

IMA No. 91-014



Triclinic: $P\bar{1}$

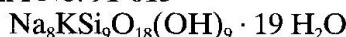
a 10.244, b 11.924, c 5.276 Å, α 103.491°,
 β 96.960°, γ 91.945°

Olive-green with brownish or yellowish shades;
vitreous; transparent.

Biaxial (+), α 1.569, β 1.574, γ 1.590,
2V(meas.) 58°, 2V(calc.) 59°.

11.57 (100), 3.386 (19), 3.006 (21), 2.992 (28),
2.716 (22), 2.598 (26).

IMA No. 91-015



Monoclinic: $P2_1/c$

a 24.91, b 11.94, c 14.92 Å, β 94.47(9)°

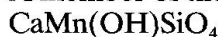
Colourless; vitreous; transparent.

Biaxial (–), α 1.460, β 1.478, γ 1.481,
2V(meas.) 43°, 2V(calc.) 44°.

4.26 (60), 3.08 (100), 2.938 (70B), 2.649 (60B),
2.400 (35), 2.289 (35).

IMA No. 91-016

A member of the adelite-descloizite group.



Orthorhombic: $P2_12_12_1$

a 5.838, b 7.224, c 8.690(1) Å

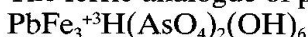
Deep red; vitreous; transparent.

Biaxial (+), α 1.840, β (calc.) 1.854, γ 1.920,
2V(meas.) 50°.

5.558 (S), 3.070 (S), 2.687 (S), 2.584 (VS),
1.565 (M).

IMA No. 91-017

The ferric-analogue of philipsbornite.



Hexagonal: $R\bar{3}m$

a 7.359, c 17.113(8) Å

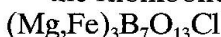
Greenish-yellow; vitreous to adamantine;
translucent to transparent.

Uniaxial (–), ω 1.975, ε 1.955.

5.966 (50), 3.678 (40), 3.092 (100), 2.283 (30),
1.992 (30), 1.840 (25).

IMA No. 91-018

The Mg-dominant analogue of congolite and
the rhombohedral dimorph of boracite.



Hexagonal: $R3c$

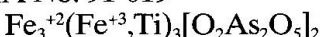
a 8.574, c 20.99 Å

Colourless; vitreous; transparent.

Uniaxial (–), ω 1.684, ε 1.668.

3.497 (34), 3.028 (100), 2.711 (66), 2.144 (37),
2.050 (73), 1.828 (25).

IMA No. 91-019



Monoclinic: $P2_1/m$

a 10.625, b 3.264, c 8.990 Å, β 109.15°.

Dark brown to black; submetallic to metallic; opaque (translucent in thin fragments).

In reflected light: creamy white (in oil, white with a weak brown tint); no internal reflections; anisotropy visible along grain boundaries (in oil, clearly visible); birefractance not visible (in oil, very weak along grain boundaries); nonpleochroic. R-values: (15.5–15.9%) 470 nm, (15.0–15.5%) 546 nm, (14.8–15.0%) 589 nm, (14.2–14.5%) 650 nm.

2.985 (67), 2.811 (94), 2.749 (100), 2.391 (85), 1.779 (48), 1.709 (35).

IMA No. 91-020

$Ba(Al,Mg)(PO_4,CO_3)(OH)_2 \cdot H_2O$

Orthorhombic: $Pnna$ or $Pnnn$

a 8.939, b 5.669, c 11.073(3) Å

Pale blue; silky; translucent.

Biaxial (–), α 1.616, β 1.629, γ 1.640,

2V(meas.) 70–90°, 2V(calc.) 85°.

5.54 (79), 3.479 (82), 3.345 (59), 2.768 (100), 2.543 (61), 2.072 (41).

IMA No. 91-021

A polymorph of mundrabillaite.

$Ca(NH_4)_2(HPO_4)_2 \cdot H_2O$

Orthorhombic: space group unknown

a 20.959, b 7.403, c 6.478(5) Å

White; vitreous; transparent.

Biaxial (–), α 1.506, β 1.510, γ 1.512,

2V(meas.) 65°, 2V(calc.) 70°.

10.5 (57), 6.99 (100), 4.739 (36), 3.705 (89), 3.651 (39), 3.177 (55).

IMA No. 91-022

$KZr_2(PO_4)_3$

Hexagonal: $R\bar{3}c$

a 8.687, c 23.877(7) Å

Pale blue to blue-green to nearly colourless; vitreous; transparent.

Uniaxial (+), ω 1.656, ϵ 1.682.

6.41 (50), 4.679 (50), 4.329 (100), 3.806 (90), 2.928 (90), 2.502 (50).

IMA No. 91-023

The Cs-analogue of gainesite.

$NaCs(Be,Li)Zr_2(PO_4)_4$

Tetragonal: $I4_1/amd$

a 6.573, c 17.28 Å

White to colourless; vitreous; translucent to transparent.

Uniaxial (+), ω 1.634, ϵ 1.645.

6.159 (90), 4.326 (80), 4.099 (40), 3.281 (80), 3.060 (100), 2.896 (30), 1.849 (30).

IMA No. 91-024

$Sb_6(SO_4)O_8 \cdot H_2O$

Triclinic: $P1$

a 11.434, b 29.77, c 11.314(4) Å, α 91.07°, β 119.24°, γ 92.82°

Colourless to white; adamantine; transparent to translucent.

Biaxial (+), mean n 2.08, birefringence low, 2V(meas.) $\gg$ 60°.

14.835 (50), 9.270 (41), 6.810 (67), 3.304 (93), 3.200 (39), 3.092 (100).

IMA No. 91-025

$Cu_4(As,Sb)_2S_5$

Orthorhombic: space group unknown

a 14.51, b 13.30, c 17.96(1) Å

Silvery lead grey; metallic; opaque.

In reflected light: grey, weak anisotropism, weak birefractance, nonpleochroic. R_{min} .

and R_{max} : (31.5, 32.5%) 470 nm, (31.1, 32.0%) 546 nm, (30.3, 31.15%) 589 nm, (27.2, 23.4%) 650 nm.

3.36 (7), 2.999 (100), 2.594 (20), 2.238 (6), 1.833 (40), 1.564 (15b).

IMA No. 91-026

$(Co,Zn,Ni)_6(SO_4)(OH,Cl)_{10} \cdot 8 H_2O$

Hexagonal: space group unknown

a 8.363, c 26.18(7) Å

Pink to light pink; pearly; transparent.

Uniaxial (–), ω 1.568, ϵ 1.542.

13.1 (100), 3.523 (30), 2.985 (30), 2.681 (40), 2.527 (90).

IMA No. 91-027

The fluorine-analogue of britholite-(Ce) of the apatite group.

$(REE,Ca)_5(Si,P)_3O_{12}F$, where Ce is the dominant REE.

Hexagonal: $P6_3/m$

a 9.517, c 6.983(4) Å

Tan, reddish-brown; adamantine; opaque to translucent.

Uniaxial (–), ω 1.792, ϵ 1.786.

2.845 (100), 2.822 (40), 2.747 (30), 1.970 (30), 1.870 (40).

IMA No. 91-028

A member of the amphibole group.

$(Na,K)Na_2[Mg_2(Fe^{3+},Mn^{3+})_2Li]Si_8O_{22}(OH,F)_2$

Monoclinic: $C2/m$

a 9.808, b 17.850, c 5.289(1) Å, β 104.22(2)°

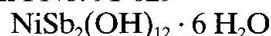
Dark red; vitreous; translucent.

Biaxial (+), α 1.667, β 1.675, γ 1.691,

2V(meas.) 59–71°, 2V(calc.) 71°.

8.399 (56), 3.383 (18), 3.254 (20), 3.122 (100), 2.798 (48), 2.696 (15).

IMA No. 91-029

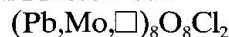
Hexagonal: $\text{P}\bar{3}1\text{m}$, $\text{P}31\text{m}$ or $\text{P}312$

a 16.016, c 9.789(2) Å

Light-blue; vitreous; transparent.

Uniaxial (+), ω 1.600, ϵ 1.605.4.6195 (100), 3.3537 (100), 2.3431 (80),
2.0909 (60), 1.8050 (70), 1.7496 (60).

IMA No. 91-030

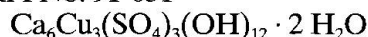
Tetragonal: $\text{I}4/\text{mmm}$, $\text{I}42\text{m}$, $\text{I}4\text{m}2$, $\text{I}4\text{mm}$
or $\text{I}422$

a 3.9922, c 22.514(2) Å

Carmine; adamantine; translucent.

In reflected light: grey, weak to moderate
anisotropy, moderate bireflectance, weak
pleochroism, internal reflections abundant,
 R_1 and R_2 (19.6, 22.0%) 470 nm, (18.0,
20.5%) 546 nm, (17.4, 19.6%) 589 nm,
(16.95, 18.8%) 650 nm.3.507 (32), 2.983 (100), 2.816 (78), 1.989 (75),
1.658 (51), 1.586 (33).

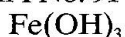
IMA No. 91-031

Monoclinic: $\text{P}2_1/\text{c}$ (pseudo $\text{C}2/\text{c}$)a 15.122, b 14.358, c 22.063 Å, β 108.68°.

Dark blue; vitreous; transparent.

Biaxial (–), α 1.590, β 1.610, γ 1.619,
2V(meas.) 65°, 2V(calc.) 67°.3.393 (100), 3.368 (55), 3.200 (53), 3.188 (65),
3.120 (85), 3.098 (57).

IMA No. 91-032

Orthorhombic Immm (pseudocubic)

a 7.544, b 7.558, c 7.560(4) Å

Dark bottle green; vitreous to adamantine;
transparent.Biaxial (–), the indices of refraction are
between 1.92 and 1.94.3.774 (100), 2.671 (35), 2.395 (30), 1.904 (15),
1.697 (60), 1.548 (40).

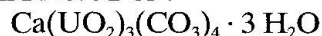
IMA No. 91-033

Cubic: $\text{Fd}3\text{m}$

a 7.933(5) Å

Colour unknown because of the small grain
size; metallic; opaque.In reflected light: silvery grey, dark grey when
highly oxidized; no anisotropy, bireflect-
ance, pleochroism or internal reflections;
 R (56.0%) 470 nm, (59.5%) 546 nm,
(60.0%) 589 nm, (62.0%) 650 nm.4.595 (21), 2.810 (30), 2.391 (100), 2.301 (25),
1.526 (23), 1.196 (26).

IMA No. 91-034

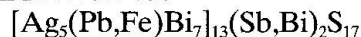
Orthorhombic: Pmmn , $\text{Pmn}2_1$ or $\text{P}2_1\text{nm}$

a 15.337, b 17.051, c 6.931 Å

Canary yellow; vitreous; transparent.

Biaxial (–), α 1.603(calc.), β 1.690, γ 1.710,
2V(meas.) 49°.8.55 (100), 6.94 (50), 4.11 (60), 3.723 (60),
3.460 (50), 2.772 (70).

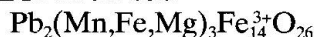
IMA No. 91-037

Monoclinic: $\text{C}2/\text{m}$ or Cm a 13.515, b 4.098, c 26.000 Å, β 93.00°

Grey; metallic; opaque.

In reflected light: white, distinct anisotropy,
very weak bireflectance, no pleochroism,
no internal reflections, R_{max} and R_{min} .
(42.2, 39.7%) 470 nm, (41.4, 38.8%) 546 nm,
(40.8, 37.9%) 589 nm, (39.8, 36.9%) 650 nm.3.49 (8), 3.37 (9), 3.24 (9), 2.82 (10), 2.01 (7),
1.992 (8), 1.967 (6).

IMA No. 91-038

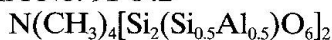
Hexagonal: $\text{P}6_3/\text{mmc}$, $\text{P}6_3\text{mc}$ or $\text{P}6_2\text{c}$

a 5.951, c 33.358 Å

Black; submetallic; opaque.

In reflected light: grey with pale brownish tint,
moderate anisotropy, weak bireflectance,
no pleochroism, no internal reflections, R_o
and R_e (23.6, 22.3%) 470 nm, (22.8, 21.9%)
546 nm, (22.2, 21.5%) 589 nm, (21.3, 21.0%)
650 nm.4.168 (55), 3.011 (60), 2.9750 (70), 2.8017 (95),
2.6236 (100), 2.6125 (90).

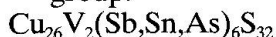
IMA No. 91-042

Orthorhombic: $\text{I}222$

a 8.984, b 8.937, c 8.927 Å

White, colourless, light yellow; vitreous;
transparent.Biaxial (–), α 1.529, β (calc.) 1.530, γ 1.531,
2V(meas.) 76°.6.33 (8), 4.46 (8), 3.66 (10), 2.60 (8), 1.760 (8),
1.351 (8).

IMA No. 91-043

The Sb-dominant member of the colusite
group.Cubic: $\text{P}\bar{4}3\text{n}$

a 10.705 Å

Colour not observed because of the small size;
metallic; opaque.

In reflected light: grey with a light-brown tint; no anisotropy, bireflectance, pleochroism or internal reflections; R (25.2%) 470 nm, (28.3%) 546 nm, (29.9%) 589 nm, (31.0%) 650 nm.

3.10 (10), 1.892 (9), 1.614 (7), 1.226 (4), 1.094 (6), 1.030 (4).

IMA No. 91-044

The Ge-dominant member of the colusite group.

$\text{Cu}_{26}\text{V}_2(\text{Ge,As})_6\text{S}_{32}$

Cubic: $P4_3n$

a 10.568 Å

Grey-black; metallic; opaque.

In reflected light: greenish-yellow, olive-yellowish-cream; no internal reflections, anisotropy, bireflectance or pleochroism; R (23.8%) 470 nm, (27.3%) 546 nm, (27.9%) 589 nm, (27.9%) 650 nm.

3.05 (10), 2.64 (4), 1.870 (5), 1.595 (3), 1.320 (3), 1.212 (3), 1.079 (3), 1.017 (5).

IMA No. 91-045

$(\text{Ca,Mg})_{14}\text{Mn}_3\text{Zn}_3\text{Be}_6\text{Si}_{14}\text{O}_{50}(\text{OH,F})_8$

Monoclinic: $P2_1/c$

a 9.08, b 18.03, c 14.59(4) Å, β 104.8°

Colourless; vitreous; transparent.

Biaxial (–), α 1.674, β 1.680, γ 1.681, $2V(\text{meas.})$ 29.0°, $2V(\text{calc.})$ 44°.

2.863 (100), 2.771 (40), 2.653 (50), 2.388 (50), 2.272 (30), 1.832 (30).

IMA No. 91-046

The Cu-dominant analogue of geigerite and chudobaite.

$(\text{Cu,Co})_5(\text{AsO}_4)_2(\text{AsO}_3\text{OH})_2 \cdot 10 \text{H}_2\text{O}$

Triclinic: $P1$ or $P\bar{1}$

a 8.033, b 10.374, c 6.446(5) Å, α 79.62°, β 84.95°, γ 86.21°

Green; vitreous; transparent.

Biaxial (+), α 1.634, β 1.662, γ 1.720, $2V(\text{meas.})$ 75°, $2V(\text{calc.})$ 72°.

10.2 (100), 8.01 (60), 4.001 (50), 3.667 (60), 3.151 (50), 3.063 (50).

IMA No. 91-047

Ti_3AsS_4

Orthorhombic: $Pnma$

a 8.894, b 10.855, c 9.079 Å

Dark red; adamantine to submetallic; opaque to translucent.

In reflected light: red, red internal reflections, strong anisotropy, strong bireflectance, no pleochroism. $R_{\text{max.}}$ and $R_{\text{min.}}$ are: (4.78, 3.93%) 481 nm, (4.64, 3.86%) 547 nm, (8.64, 7.81%) 591 nm, (13.72, 11.78%) 644 nm.

4.14 (M), 3.99 (S), 3.80 (M), 3.47 (MSb), 3.35 (M), 2.813 (VS), 2.537 (M), 2.264 (MSb).

IMA No. 91-048

$\text{Na}_{25}\text{Ba}(\text{Y,Gd,Dy})_2(\text{CO}_3)_{11}(\text{HCO}_3)_4(\text{SO}_4)_2\text{F}_2\text{Cl}$

Hexagonal: $P6_3/m$

a 8.811, c 37.03(3) Å

Light green to yellowish-green; vitreous; transparent.

Uniaxial (–), ω 1.536, ϵ 1.510.

4.79 (42), 3.32 (40), 2.829 (100), 2.659 (51b), 2.531 (71b), 2.270 (90).

IMA No. 91-050

$(\text{Ca,REE,Th})_{15}\text{As}^{+5}(\text{As}_{0.5}^{+3}\text{Na}_{0.5})\text{Fe}^{+3}\text{Si}_6\text{B}_4\text{O}_{40}\text{F}_7$

Hexagonal: $R3m$

a 10.795, c 27.336(4) Å

Yellowish-green; vitreous; transparent.

Uniaxial (–), ω 1.757, ϵ 1.722.

2.993 (S), 2.950 (S), 1.839 (MS), 1.802 (MS), 1.686 (MS), 1.572 (MS).

IMA No. 91-051

$\text{Ag}_9\text{SbTe}_3(\text{S,Se})_3$

Monoclinic: $P2_1$, $P2_1/m$ or Pm

a 8.900, b 8.302, c 19.49 Å, β 82.98°

Colour unknown because of the small grain size; metallic; opaque.

In reflected light: grey with faint green-blue hue, anisotropy present with brownish-grey tone, weak bireflectance, no pleochroism, no internal reflections, $R_{\text{max.}}$ and $R_{\text{min.}}$ (38.0, 34.2%) 470 nm, (36.6, 32.2%) 546 nm, (35.7, 31.8%) 589 nm, (34.0, 30.2%) 650 nm.

3.82 (6), 2.89 (4), 2.83 (4), 2.22 (10), 2.14 (3), 2.13 (4).

IMA No. 91-052

The Sb-analogue of skutterudite.

CoSb_3

Cubic: $Im\bar{3}$

a 9.0411 Å

Tin-white; metallic; opaque.

In reflected light: tin-white, isotropic, no bireflectance, nonpleochroic, no internal reflections, R (59.0%) 470 nm, (58.7%) 546 nm, (58.7%) 589 nm, (58.7%) 650 nm.

2.85 (100), 2.01 (80), 1.92 (80), 1.84 (80), 1.50 (80), 1.185 (80), 1.147 (80), 0.780 (100).

IMA No. 91-053

$\text{Zn}_{12}(\text{CO}_3)_3(\text{SO}_4)(\text{OH})_{16}$

Orthorhombic: $P22_12$

a 15.724, b 6.256, c 5.427(5) Å

White; vitreous; translucent.

Biaxial (probably +), α 1.635(3), β 1.650(3), γ could not be measured, $2V$ about 60°.

15.44 (100), 7.88 (100), 5.25 (20), 2.714 (40),
2.577 (20), 2.397 (20), 1.565 (30b).

IMA No. 91-054

$\text{Na}_{26}\text{Ce}_6(\text{SiO}_3)_6(\text{PO}_4)_6(\text{CO}_3)_6(\text{SO}_2)\text{O}$

Hexagonal: $R\bar{3}$

a 16.025, c 19.773 Å

Colourless to pale brown; vitreous; transparent.

Uniaxial (–), ω 1.589, ε 1.586.

8.076 (80), 6.544 (90), 4.659 (75), 3.776 (90),
3.159 (85), 2.683 (100).

IMA No. 91-055

A member of the epidote group, related to dollaseite-(Ce).

$(\text{Ca}, \text{REE})\text{REE}(\text{Mg}, \text{Fe})\text{MnAlSi}_3\text{O}_{11}(\text{OH})(\text{F}, \text{O})$

Monoclinic: $P2_1/m$

a 8.903, b 5.748, c 10.107 Å, β 113.41°

Dark greyish-brown; vitreous; transparent.

Biaxial (–), α 1.773, β 1.790, γ 1.803,

$2V(\text{meas.})$ 83°, $2V(\text{calc.})$ 82°.

9.32 (2), 5.23 (2), 4.67 (2), 3.52 (4), 2.91 (10),
2.73 (7), 2.63 (8), 1.437 (2).