

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 Emeritus, and J. D. Grice, Chairman
Commission on New Minerals and Mineral Names, International Mineralogical Association

1996 Proposals

IMA No. 96-001

$\text{Cu}_5(\text{Te}^{6+}\text{O}_4)_2(\text{As}^{5+}\text{O}_4)_2 \cdot 3\text{H}_2\text{O}$
Triclinic: P1 or P $\bar{1}$
a 8.984, b 10.079, c 8.975 Å, α 102.68°,
 β 92.45°, γ 70.45°
Emerald green; vitreous to adamantine;
transparent to translucent
Biaxial, indices of refraction calculated from
reflectance measurements are 1.71–1.73
9.28 (70), 4.65 (70), 3.097 (100), 3.018 (60),
2.658 (50), 2.468 (50), 1.740 (50)

IMA No. 96-002

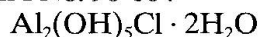
The calcium-dominant analogue of guillemite
[$\text{Ca}_{0.75}(\text{H}_3\text{O})_{0.25}](\text{UO}_2)_3(\text{SeO}_3)_2(\text{OH})_{3.75} \cdot$
2.5H₂O

Orthorhombic: Pmn2₁ or Pmnm
a 7.010, b 17.135, c 17.606 Å
Lemon-yellow; pearly; translucent
Biaxial (–), α 1.54 calc., β 1.73, γ 1.75,
2V(meas.) 33°
8.79 (80), 8.56 (40), 3.51 (100), 3.24 (40),
3.093 (50), 3.032 (100), 1.924 (40)

IMA No. 96-003

The Fe³⁺-dominant analogue of winstanleyite
(Fe³⁺, Te⁶⁺, Ti⁴⁺, Mg²⁺)Te₃O₈
Cubic: Ia $\bar{3}$
a 11.011 Å
Orange; adamantine; translucent
Isotropic, n(calc) = 2.17
4.486 (29), 3.175 (100), 2.943 (23), 2.749 (37),
2.592 (22), 1.944 (44), 1.658 (45)

IMA No. 96-004

Cubic: Im $\bar{3}$ m

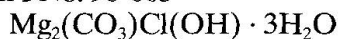
a 19.878 Å

Yellow-orange to yellow-brown; vitreous; transparent

Isotropic, n 1.53–1.55

8.11 (70), 7.03 (50), 4.47 (60), 3.23 (70),
2.706 (100), 2.446 (80), 1.957 (70)

IMA No. 96-005

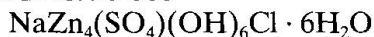
Hexagonal (trigonal): R3c or R $\bar{3}$ c

a 23.163, c 7.221 Å

White; lustre and diaphaneity unknown

Uniaxial, ω 1.510, ε 1.51011.66 (100), 3.396 (17), 3.356 (17), 3.264 (21),
3.218 (21), 3.000 (41), 2.657 (22)

IMA No. 96-006

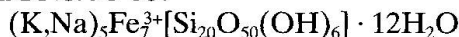
Hexagonal (trigonal): P $\bar{3}$

a 8.359, c 13.059 Å

Colourless to white; pearly; translucent

Uniaxial (–), ω 1.5607, ε 1.538214.244 (100), 6.501 (23), 4.339 (15), 3.258 (14),
2.967 (10)

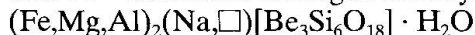
IMA No. 96-007

Triclinic: P $\bar{1}$ a 14.86, b 20.54, c 5.29 Å, α 95.6°, β 92.3°,
 γ 94.4°

Pink-brownish; silky to earthy; translucent

Biaxial (+), α 1.523, β 1.525, γ 1.550,
2V(meas.) 30°, 2V(calc.) 32°12.36 (100), 11.60 (40), 10.21 (14), 3.411 (37),
3.281 (15), 2.896 (12)

IMA No. 96-008

The Fe³⁺-dominant analogue of beryl

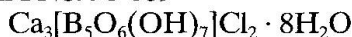
Hexagonal: P6/mcc

a 9.387, c 9.202 Å

Light-blue; vitreous; transparent

Uniaxial (–), ω 1.625, ε 1.6198.12 (S), 4.00 (M), 3.278 (VS), 2.903 (S),
2.553 (MW), 1.752 (MW)

IMA No. 96-009



Monoclinic: Pn

a 17.42, b 8.077, c 17.33 Å, β 121.48°Colourless to white; vitreous; transparent
to translucentBiaxial (–), α 1.506, β 1.527, γ 1.532,
2V(meas.) 56°, 2V(calc.) 51°8.10 (10), 4.04 (4), 3.56 (2), 2.834 (2),
2.535 (2), 2.276 (2)

IMA No. 96-010

The Fe³⁺-dominant analogue of tomichite
(Fe³⁺, Ti)₄Ti₃AsO₁₃(OH)

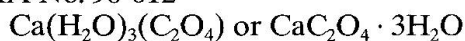
Monoclinic: A2/m

a 7.184, b 14.289, c 5.006 Å, β 105.17°

Black; metallic; opaque

In reflected light: greyish-white, no bire-
flectance, nonpleochroic. R₁ & R₂:(20.1, 20.8%) 460 nm, (18.7, 19.3%) 540 nm,
(18.2, 18.9%) 580 nm, (17.5, 18.1%) 660 nm
3.117 (30), 2.846 (80), 2.681 (100),
2.029 (30), 1.5825 (50)

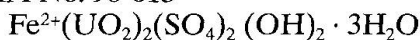
IMA No. 96-012

Triclinic: P $\bar{1}$ a 6.097, b 7.145, c 8.434 Å, α 76.54°,
 β 70.30°, γ 70.75°

Colourless; vitreous; transparent

Biaxial (–), α' 1.483, β 1.516(calc.), γ' 1.533,
2V(meas.) 70°, 2V(calc.) 70°7.92 (M), 5.52 (VS), 5.26 (M), 4.99 (M),
3.642 (M), 2.834 (S), 2.758 (M), 2.732 (M)

IMA No. 96-013



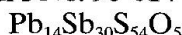
Orthorhombic: Pnnm or Pnn2

a 15.908, b 16.274, c 6.903 Å

Pale yellow to white; vitreous; transparent

Biaxial (–), α 1.470, β 1.492, γ 1.504(calc.),
2V(meas.) 73°7.95 (81), 5.91 (100), 3.941 (71), 3.451 (67),
3.166 (50), 2.894 (41), 2.596 (70)

IMA No. 96-014



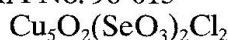
Monoclinic: C2/m

a 52.00, b 8.148, c 24.311 Å, β 104.09°

Bluish-black; metallic; opaque

In reflected light: black with blue-red reflec-
tions, low anisotropism, low bireflectance,
nonpleochroic. R₁ & R₂: (40.03, 42.90%)
470 nm, (36.46, 40.92%) 546 nm, (35.65,
40.25%) 589 nm, (32.40, 36.00%) 650 nm
4.04 (m), 3.47 (s), 3.44 (m), 3.04 (m), 2.96 (s),
2.296 (m)

IMA No. 96-015

Monoclinic: P2₁/ca 6.045, b 13.778, c 5.579 Å, β 95.76°Chestnut to dark brown; very strong vitreous
to adamantine; translucent

Biaxial (–), α 2.06, β 2.11, γ 2.15, 2V(meas.) large, 2V(calc.) 82°
6.88 (68), 5.511 (50), 2.990 (100), 2.963 (94), 2.566 (67), 2.296 (95)

IMA No. 96-017

A triclinic polymorph of clinoclase
 $\text{Cu}_3(\text{AsO}_4)(\text{OH})_3$
Triclinic: P1
a 5.445, b 5.873, c 5.104 Å, α 114.95°, β 93.05°, γ 91.92°
Green-blue; vitreous; transparent
Biaxial (–), α 1.760, β 1.80, γ 1.83, 2V(meas.) 77°, 2V(calc.) 80°
4.613 (100), 4.580 (50), 3.390 (60), 2.713 (40), 2.543 (40), 2.445 (30)

IMA No. 96-019

$\text{NaCa}_3(\text{CO}_3)_2\text{F}_3 \cdot \text{H}_2\text{O}$
Hexagonal (trigonal): P3₂
a 6.718, c 15.050 Å
Colourless to white; vitreous; transparent to translucent
Uniaxial (+), ω 1.538, ε 1.563
5.809 (30), 5.010 (30), 3.358 (30), 2.791 (50), 2.508 (40), 2.010 (100), 1.939 (40)

IMA No. 96-020

$\text{Pb}_{12}\text{O}_6\text{Mn}(\text{Mn},\text{Mg})_4(\text{Mg},\text{Mn})_2(\text{SO}_4)(\text{CO}_3)_4\text{Cl}_4(\text{OH})_{12}$
Tetragonal: P4₂/nnm
a 12.627, c 12.595 Å
Apple green to emerald green; vitreous to adamantine; transparent
Anomalously biaxial (+), α , β , and $\gamma > 1.92$
8.95 (20), 7.30 (20), 3.99 (30), 2.975 (100), 2.752 (30), 2.473 (20), 1.716 (20)

IMA No. 96-022

A polymorph of fluorapatite
 $(\text{Ca},\text{R})_5(\text{PO}_4)_3\text{F}$ R = Sr, Na, REE
Hexagonal: P6₃
a 9.485, c 7.000 Å
Pale yellow; vitreous; transparent
Uniaxial (–), ω 1.649, ε 1.637
3.498 (45), 3.104 (22), 2.838 (100), 2.814 (48), 2.740 (53), 1.963 (21), 1.865 (31)

IMA No. 96-023

A manganese- and fluorine-rich member of the eudialyte group
 $(\text{Na},\text{RE})_{15}(\text{Ca},\text{RE})_6\text{Mn}_3\text{Zr}_3\text{NbSi}_{25}\text{O}_{76}\text{F}_2$
Hexagonal (trigonal): R3m
a 14.1686, c 30.0847 Å
Yellow-brown; vitreous; transparent
Uniaxial (–), ω 1.628, ε 1.623

11.362 (43), 7.084 (41), 5.681 (30), 4.296 (34), 3.382 (37), 2.962 (91), 2.840 (100)

IMA No. 96-024

The scandium-dominant analogue of xenotime-(Y)
 ScPO_4
Tetragonal: I4₁/amd
a 6.589, c 5.806 Å
Pale-pink; vitreous; transparent
Uniaxial (+), ω 1.790, ε 1.86
3.293 (100), 2.464 (8), 2.178 (4), 2.055 (4), 1.693 (6), 1.647 (6)

IMA No. 96-025

A member of the zeolite group
 $\text{Na}_3\text{Ca}_4\text{Al}_{11}\text{Si}_{85}\text{O}_{192} \cdot 60\text{H}_2\text{O}$
Orthorhombic: Pnma
a 20.223, b 20.052, c 13.491 Å
Colourless to milky-white; silky to vitreous; opaque to transparent
Biaxial (–), α 1.485, β 1.487, γ 1.488, 2V(calc.) 70°
11.20 (84), 9.98 (35), 3.85 (100), 3.75 (98), 3.67 (27), 3.00 (32)

IMA No. 96-026

An orthorhombic polymorph of corderoite
 $\gamma\text{-Hg}_3\text{S}_2\text{Cl}_2$
Orthorhombic: Ammm, A222 or A2mm (Am2m, Amm2)
a 9.332, b 16.82, c 9.108 Å
Canary yellow; glassy; transparent
Biaxial (+), mean index of refraction 2.25, 2V(meas.) > 70°
In reflected light: white, anisotropism and bireflectance not observed, R(est.) $\approx$ 15%
3.65 (90), 3.11 (51), 2.83 (36), 2.60 (49), 2.58 (100), 2.33 (41), 2.11 (31)

IMA No. 96-027

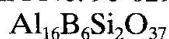
$\text{NaCu}_5\text{O}_2(\text{SeO}_3)_2\text{Cl}_3$
Orthorhombic: Pbnm
a 10.482, b 17.732, c 6.432 Å
Emerald-green; vitreous; transparent
Biaxial (–), α 1.845, β 1.968, γ 1.975, 2V(meas.) 20°, 2V(calc.) 31°
9.01 (10), 8.84 (60), 5.24 (100), 3.251 (40), 2.955 (27), 2.626 (25), 2.513 (12)

IMA No. 96-028

$\text{NaFe}_4^{2+}(\text{PO}_4)_3$
Hexagonal (trigonal): R3
a 14.97, c 41.66 Å
Very pale amber; waxy; transparent
Uniaxial (+), ω 1.72, ε 1.75

4.13 (80), 3.47 (50), 3.21 (50), 3.01 (90),
2.93 (50), 2.85 (50), 2.71 (100), 2.57 (50)

IMA No. 96-029



Monoclinic: C2/m, Cm or C2

a 14.767, b 5.574, c 15.079 Å, β 91.959°

White; vitreous; transparent

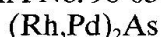
Biaxial (+), α 1.629, β 1.640, γ 1.654,

2V(meas.) 82°, 2V(calc.) 84°

5.41 (70), 5.19 (100), 4.95 (60), 4.31 (70),

3.378 (60), 2.162 (40)

IMA No. 96-030



Orthorhombic: Pnma or Pn2₁a

a 5.866, b 3.893, c 7.302 Å

Colour not observed, metallic, opaque

In reflected light: brownish with a pale green
tinge, anisotropism moderate-distinct from

dark brown to pale greyish green, bire-
flectance weak, pleochroism brownish to

greenish. $R_{\min.}$ & $R_{\max.}$: (45.5, 46.3%)

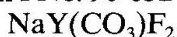
470 nm, (47.6, 48.4%) 546 nm, (48.2,

49.5%) 589 nm, (49.8, 51.2%) 650 nm

2.426 (7), 2.348 (4), 2.237 (10), 2.067 (8),

1.935 (6), 1.860 (5)

IMA No. 96-032



Orthorhombic: Pmcn

a 6.964, b 9.173, c 6.302 Å

Colourless to pale yellow; vitreous;

transparent and translucent

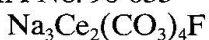
Biaxial (–), α 1.457, β 1.543, γ 1.622,

2V(meas.) 82°, 2V(calc.) 83°

5.19 (90), 3.477 (100), 2.800 (50), 2.087 (50),

2.057 (50), 1.966 (50), 1.849 (50), 1.763 (50)

IMA No. 96-033



Hexagonal: P6₃/mmc

a 5.068, c 22.87 Å

Colourless to slightly beige; vitreous to some-
what pearly; transparent to translucent

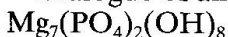
Uniaxial (–), ω 1.728, ε 1.542

4.31 (100), 3.169 (70), 2.877 (60), 2.534 (70),

2.192 (90B), 1.978 (70)

IMA No. 96-034

The magnesium- and phosphate-dominant
analogue of allactite



Monoclinic: P2₁/n

a 5.250, b 11.647, c 9.655 Å, β 95.93°

Colourless; pearly; transparent

Biaxial (–), α 1.5945, β 1.6069, γ 1.6088,

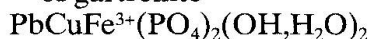
2V(meas.) 46°, 2V(calc.) 43°

4.436 (75b), 3.521 (80), 3.145 (70), 3.087 (70),

2.905 (100), 2.794 (75), 2.199 (80)

IMA No. 96-035

The phosphate-dominant analogue
of gartrellite



Triclinic: P1 or P1

a 5.320, b 5.528, c 7.434 Å, α 67.61°,

β 69.68°, γ 70.65°

Green; vitreous to adamantine; transparent
to translucent

Biaxial (+), α 1.90, β 1.93 (calc.), γ 2.00,

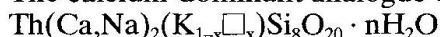
2V(meas.) 70°

4.720 (67), 4.502 (61), 4.360 (100), 3.250 (70),

3.138 (57), 2.885 (89), 2.868 (69)

IMA No. 96-036

The calcium-dominant analogue of steacyite



Tetragonal: P4/mcc

a 7.592, b 7.592, c 14.824 Å

Apple-green to dark-green and brown;
vitreous; transparent

Uniaxial (–), ω 1.611, ε 1.606

5.36 (40), 5.31 (70), 3.40 (100), 3.33 (65),

2.654 (59), 2.231 (50)

IMA No. 96-037



Cubic: $\bar{I}43m$

a 15.470 Å

Pale greenish blue; vitreous; transparent

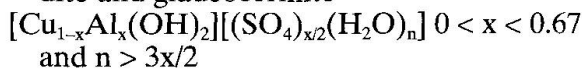
Isotropic, n 1.566

10.8 (29), 7.73 (34), 3.164 (100), 2.827 (28),

2.738 (29), 2.582 (37), 2.445 (36)

IMA No. 96-038

The copper-dominant analogue of carrboy-
dite and glaucocerinite



Hexagonal (trigonal): $R\bar{3}m$

a 3.070, c 31.9 Å

Blue to pale blue; vitreous; translucent

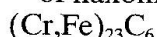
Uniaxial (+), $n_{\min.}$ 1.549, $n_{\max.}$ 1.565

10.5 (100), 5.26 (17), 3.50 (6), 2.60 (5),

2.46 (2), 2.23 (2), 1.524 (5b)

IMA No. 96-039

The chromium-dominant analogue
of haxonite



Cubic: Fm3m

a 10.65 Å

- Iron-grey; metallic; opaque
In reflected light: white. R: (46.5%) 470 nm, (43.7%) 546 nm, (43.2%) 589 nm, (44.4%) 660 nm
2.38 (3), 2.17 (5), 2.05 (10)
- IMA No. 96-040
The antimony-dominant analogue of calzirtite
 $\text{Ca}_2(\text{Zr,Ti})_5(\text{Sb}^{5+},\text{Mn}^{3+})_2\text{O}_{16}$
Tetragonal: $I4_1/a$
a 15.199, c 10.181 Å
Bright red; adamantine; translucent
Uniaxial (+), ω 2.12, ε 2.16
3.45 (40), 2.92 (100), 2.539 (60), 1.794 (90), 1.535 (80), 1.0353 (40)
- IMA No. 96-041
The titanium-dominant analogue of brannockite
 $\text{KLi}_3\text{Ti}_2\text{Si}_{12}\text{O}_{30}$
Hexagonal: $P6/mcc$
a 9.903, c 14.276 Å
White; vitreous; transparent
Uniaxial (-), ω 1.635, ε 1.630
7.15 (40), 4.29 (50), 4.07 (85), 3.57 (80), 3.16 (100), 2.895 (95), 2.742 (30)
- IMA No. 96-043
The antimony-dominant analogue of fleischerite (with AsO_4 replacing one SO_4)
 $\text{Pb}_3\text{Sb}^{5+}(\text{SO}_4)(\text{AsO}_4)(\text{OH})_6 \cdot 3\text{H}_2\text{O}$
Hexagonal: $P6_322$
a 8.939, c 11.102 Å
Colourless; adamantine; transparent
Uniaxial (+), ω 1.760, ε 1.801
6.35 (44), 3.655 (100), 3.481 (80), 3.175 (31), 2.675 (62), 2.235 (35)
- IMA No. 96-044
 $\text{Ag}_2\text{Pd}_3\text{Se}_4$
Monoclinic: $P2_1/m$ or $P2_1$
a 6.350, b 10.387, c 5.683 Å, β 114.90°
Colour unknown, only visible in polished section; metallic; opaque
In reflected light: buff to slightly grey-green buff; moderate anisotropism, rotation tints rose-brown, grey-green, pale bluish grey and dark steel-blue; bireflectance weak (air), moderate (oil); very weak pleochroism. $R_1, R_2; {}^{im}R_1, {}^{im}R_2$: (39.7, 47.2; 26.2, 34.4%) 470 nm, (43.1, 48.8; 29.3, 35.15%) 546 nm, (44.3, 49.4; 30.4, 35.5%) 589 nm, (44.4, 49.2; 31.0, 35.6%) 650 nm
2.868 (50b), 2.742 (100), 2.688 (80), 2.367 (50), 1.956 (100), 1.829 (30)

- IMA No. 96-045
 $\text{Pb}_{7.5}\text{B}_{0.5}(\text{OH})_{3.5}\text{O}_{4.5}\text{Cl}_4$ or $\text{Pb}_8\text{O}_4(\text{OH})_4\text{Cl}_4$
Monoclinic: $C2/c$
a 5.673, b 5.580, c 13.152 Å, β 90.47°
Pale yellow to reddish orange; vitreous, resinous; translucent
In reflected light: grey; internal reflections ubiquitous, amber to light yellow; anisotropism masked (if present) by the internal reflections; bireflectance weak, non-pleochroic. $R_1, R_2; {}^{im}R_1, {}^{im}R_2$: (15.2, 16.3; 4.07, 4.67%) 470 nm, (14.2, 15.3; 3.59, 4.17%) 546 nm, (13.9, 15.0; 3.44, 4.02%) 589 nm, (13.7, 14.7; 3.37, 3.91%) 650 nm
6.581 (37), 3.785 (48), 3.267 (35), 2.930 (100), 2.825 (43), 2.780 (36), 2.182 (37), 1.980 (33)
- IMA No. 96-047
The iron-dominant analogue of cuprorhodsite
 $(\text{Fe,Cu})(\text{Rh,Ir,Pt})_2\text{S}_4$
Cubic: $Fd3m$
a 9.89 Å
Black; metallic; opaque
In reflected light: white, isotropic. R: (41.4%) 470 nm, (41.8%) 546 nm, (41.8%) 589 nm, (41.7%) 650 nm
5.72 (7), 2.99 (10), 2.471 (8), 1.903 (7), 1.750 (9), 1.674 (3), 1.009 (3)
- IMA No. 96-048
 $\text{Cu}_9\text{O}_2(\text{SeO}_3)_4\text{Cl}_6$
Monoclinic: $I2$
a 14.110, b 6.27, c 12.997 Å, β = 113.0°
Tobacco-green; strong vitreous; transparent
Biaxial (-), α 1.87, β 1.92, γ 1.94, $2V(\text{meas.})$ 66°, $2V(\text{calc.})$ 63°
11.29 (63), 5.56 (83), 3.450 (100), 3.239 (39), 2.714 (33), 2.486 (61)
- IMA No. 96-049
 $\text{CaMgNa}_6(\text{IO}_3)_6[(\text{Cr}_{0.84}\text{S}_{0.16})\text{O}_4]_2 \cdot 12\text{H}_2\text{O}$
Monoclinic: $C2/c$
a 23.645, b 10.918, c 15.768 Å, β 114.42°
Pale yellow to bright lemon yellow; vitreous; transparent to translucent
Biaxial (+), α 1.647, β 1.674, γ 1.704, $2V(\text{calc.})$ 88°
10.69 (100), 6.36 (50), 5.65 (50), 3.590 (70), 3.121 (80), 3.051 (80)
- IMA No. 96-050
The cadmium-dominant analogue of briartite
 $\text{Cu}_2\text{CdGeS}_4$
Tetragonal: $I4_2m$
a 5.45, c 10.6 Å

Colour unknown, only visible in polished section; metallic; opaque
 In reflected light: grey with pale violet tint, very weak anisotropism, very weak bireflectance and very weak pleochroism.
 R and ${}^{\text{im}}R$: (24.42, 10.79%) 460 nm, (23.29, 9.85%) 540 nm, (23.04, 9.59%) 580 nm, (23.46, 9.91%) 660 nm
 3.10 (100), 2.79 (10), 1.92 (80), 1.89 (70), 1.64 (60), 1.60 (20)

IMA No. 96-051

A polymorph of sibirskite
 $\text{Ca}_2\text{B}_2\text{O}_5 \cdot \text{H}_2\text{O}$
 Monoclinic: $P2_1/m$
 a 6.722, b 5.437, c 3.555 Å, β 93.00°
 White; weak pearly; translucent
 Biaxial (+), α 1.556, β 1.593, γ 1.663, $2V(\text{calc.})$ 75°
 6.73 (70), 3.354 (30), 2.975 (60), 2.855 (20), 2.237 (100), 1.776 (20)

IMA No. 96-052

The mercury-dominant analogue of černýite and stannite
 $\text{Cu}_2\text{HgSnS}_4$
 Tetragonal: $I\bar{4}$
 a 5.555, c 10.911 Å
 Dark grey; metallic; opaque
 In reflected light: greenish-grey to light grey with greenish-brownish tint, moderate anisotropism with faded colour effects form violet-blue to dark-greenish blue, insignificant bireflectance, weakly pleochroic from yellowish-olive-green to brownish-olive. $R_{\text{max.}}$: (26.0%) 470 nm, (26.3%) 546 nm, (25.6%) 589 nm, (24.8%) 650 nm
 3.17 (10), 1.958 (2.5), 1.941 (8), 1.671 (4), 1.646 (3.5), 1.264 (2.5)

IMA No. 96-053

The sulfate-dominant rhombohedral analogue of hydrocalumite
 $\text{Ca}_4\text{Al}_2(\text{OH})_{12}(\text{SO}_4) \cdot 6\text{H}_2\text{O}$
 Hexagonal (trigonal): $R\bar{3}$ or $R3$
 a 5.76, c 53.66 Å
 White; vitreous; transparent
 Uniaxial (–), ω 1.504, ε 1.485
 8.972 (100), 4.476 (70), 2.362 (40), 2.190 (40), 2.071 (35)

IMA No. 96-054

The Fe^{2+} -dominant analogue of hawthorneite
 $\text{Ba}[\text{Fe}_6^{2+}\text{Ti}_5\text{Mg}]\text{O}_{19}$
 Hexagonal: $P6_3/mmc$
 a 5.926, c 23.32 Å

Colour unknown, only visible in polished section; metallic; opaque
 In reflected light: light grey; very weak anisotropism, nearly isotropic; bireflectance very weak, but measurable; nonpleochroic.
 $R_{\text{E'}}$, R_{O} ; ${}^{\text{im}}R_{\text{E'}}$, ${}^{\text{im}}R_{\text{O}}$, $R_{\text{min.}}$: (16.9, 17.3; 5.13, 5.37%) 470 nm, (16.35, 16.8; 4.90, 5.19%) 546 nm, (16.3, 16.9; 4.92, 5.29%) 589 nm, (16.4, 17.1; 5.00, 5.42%) 650 nm
 2.963 (44), 2.795 (90), 2.641 (100), 2.437 (46), 1.676 (37), 1.634 (47), 1.481 (47)

IMA No. 96-055

The cerium-dominant analogue of 96-057, but structurally different
 $(\text{Ce}, \text{Nd}, \text{La})\text{Al}(\text{SO}_4)_2(\text{C}_2\text{O}_4) \cdot 12\text{H}_2\text{O}$
 Monoclinic: $C2/c$
 a 8.718, b 18.313, c 13.128 Å, β 93.90°
 Very pale pink (incandescent light) and very pale blue (fluorescent light); vitreous; transparent
 Biaxial (+), α 1.455, β 1.485, γ 1.528, $2V(\text{meas.})$ 85°, $2V(\text{calc.})$ 82°
 7.9 (100), 5.36 (50), 5.01 (40), 3.93 (70), 3.74 (20), 3.29 (20), 3.07 (20)

IMA No. 96-056

$(\text{Ce}, \text{Nd}, \text{La})_2(\text{SO}_4)_2(\text{C}_2\text{O}_4) \cdot 12\text{H}_2\text{O}$
 Triclinic: $P\bar{1}$
 a 6.007, b 8.368, c 9.189 Å, α 99.90°, β 105.55°, γ 107.71°
 Pale pink (incandescent light), pale blue (fluorescent light), some cream-coloured; vitreous; transparent
 Biaxial (–), α 1.544, β 1.578, γ 1.602, $2V(\text{meas.})$ 65°, $2V(\text{calc.})$ 78°
 8.52 (70), 6.72 (60), 5.48 (100), 4.26 (50), 3.84 (60), 3.35 (40), 2.744 (40)

IMA No. 96-057

The yttrium-dominant analogue of 96-055, but structurally different
 $(\text{Y}, \text{Nd}, \text{Ce})\text{Al}(\text{SO}_4)_2(\text{C}_2\text{O}_4) \cdot 12\text{H}_2\text{O}$
 Monoclinic: $P2/n$
 a 10.289, b 19.234, c 11.015 Å, β 108.50°
 Colourless; vitreous; transparent
 Biaxial (+), α 1.48, β 1.49, γ 1.55, $2V(\text{meas.})$ 7°, $2V(\text{calc.})$ 46°
 9.3 (100), 6.28 (90), 5.20 (40), 4.89 (60), 4.63 (30), 4.09 (50), 3.700 (30)

IMA No. 96-058

The rubidium-dominant analogue of microcline
 $(\text{Rb}, \text{K})\text{AlSi}_3\text{O}_8$
 Triclinic: $P\bar{1}$

a 8.81, b 13.01, c 7.18 Å, α 90.3°, β 115.7°, γ 88.2°

Colourless; vitreous; transparent

Biaxial, indices of refraction slightly higher than host microcline

5.82, 5.77, 4.62, 3.88, 3.61, 3.60, 3.59, 2.94, 2.65, 2.63, 2.61, 2.56 (electron diffraction, no intensities)

IMA No. 96-059

$\text{Fe}^{3+}\text{Mo}_2\text{O}_6(\text{OH})_3 \cdot \text{H}_2\text{O}$

Triclinic: $\text{P}\bar{1}$

a 5.878, b 7.536, c 9.436 Å, α 71.66°, β 83.43°, γ 72.85°

Green with a yellowish tinge; vitreous to earthy; transparent to opaque

Biaxial (–), α 1.91, β 2.03, γ 2.11, 2V(meas.) ~ 90°, 2V(calc.) 74°

5.620 (70), 4.711 (50), 4.095 (70), 3.319 (100), 3.232 (90), 2.614 (50), 1.956 (50)

IMA No. 96-060

The scandium-dominant analogue of overite and segelerite

$\text{CaMgSc}(\text{PO}_4)_2(\text{OH}) \cdot 4\text{H}_2\text{O}$

Orthorhombic: Pbca

a 15.03, b 18.95, c 7.59 Å

Colourless, light yellow to yellowish brown; vitreous; transparent

Biaxial (–), α 1.574, β 1.579, γ 1.582, 2V(meas.) ~ 50°, 2V(calc.) 75°

9.49 (100), 4.75 (17), 3.440 (31), 2.942 (27), 2.912 (44), 2.890 (35), 2.018 (15)

IMA No. 96-062

$(\text{Ti,Cr,Fe})[\text{O}_{2-x}(\text{OH})_x]$

Monoclinic: $\text{P}2_1/\text{c}$

a 7.688, b 4.5495, c 20.147 Å, β 92.27°

Black; metallic; translucent to opaque

Biaxial, mean n 2.47 (calc.). In reflected light: grey, with R lower than that of rutile, crichtonite, and srilankite and higher than that of pyrope

3.766 (66), 2.835 (100), 2.660 (73), 1.6842 (94), 1.6760 (73), 1.6574 (71)

IMA No. 96-063

The sodium-dominant analogue of lemoynite with additional H_2O

$\text{Na}_4\text{Zr}_2\text{Si}_{10}\text{O}_{26} \cdot 9\text{H}_2\text{O}$

Monoclinic: C2/m

a 10.5150, b 16.2534, c 9.1029 Å, β 105.46°

Colourless to white; vitreous; transparent to translucent

Biaxial (–), α 1.533, β 1.559, γ 1.567, 2V(meas.) 63°, 2V(calc.) 57°

8.832 (30), 8.135 (100), 5.975 (40), 3.974 (35), 3.693 (30), 3.564 (40), 3.490 (35), 2.804 (30)