

# New minerals recently apporved 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  
Commission on New Minerals and Mineral Names  
International Mineralogical Association

## **1994 Proposals**

IMA No. 94-001

The Fe<sup>3+</sup>-dominant analogue of warwickite.

Mg(Fe<sup>3+</sup>, Fe<sup>2+</sup>, Al, Ti, Mg)(BO<sub>3</sub>)O

Orthorhombic: Pnam

a 9.258(6), b 9.351(4), c 3.081(2) Å

Black; adamantine to submetallic; subtranslucent to nearly opaque.

In reflected light: light grey, weak anisotropism, indistinct bireflectance, pleochroic from dark red to dark brown.  $R_{\max.}$ : (9.99%) 470 nm, (9.66%) 540 nm, (9.29%) 589 nm, (8.79%) 650 nm.

6.563 (23), 4.176 (38), 2.957 (30), 2.570 (100), 2.088 (20), 1.591 (18), 1.550 (19).

IMA No. 94-002

Mn<sub>2</sub>SiO<sub>3</sub>(OH)<sub>2</sub> · H<sub>2</sub>O

Orthorhombic: Pca2<sub>1</sub>

a 12.682(4), b 7.214(2), c 5.337(1) Å

Brown-yellowish; vitreous; transparent.

Biaxial (–), α 1.681, β 1.688, γ 1.690,  
2V(meas.) 54.4°, 2V(calc.) 56.1°.

7.220 (60), 4.083 (60), 3.011 (100), 2.547 (80),  
2.456 (80), 2.440 (80), 1.552 (60).

IMA No. 94-004

A member of the amphibole group.

NaNa<sub>2</sub>Mn<sub>2</sub><sup>2+</sup>Mn<sub>3</sub><sup>3+</sup>Si<sub>8</sub>O<sub>24</sub>

Monoclinic: C2/m

a 9.89(2), b 18.04(3), c 5.29(1) Å,  
 $\beta$  104.6(1)°  
 Cherry red to very dark red; adamantine;  
 transparent.  
 Biaxial (–),  $\alpha$  1.717,  $\beta$  1.780,  $\gamma$  1.800,  
 2V(meas.) 51°, 2V(calc.) 57°.  
 3.400 (8), 3.146 (9), 2.544 (9), 2.176 (10),  
 1.656 (8), 1.447 (9).

## IMA No. 94-005

$(\text{Zn,Cu})_6\text{Zn}_2(\text{OH})_{13}[(\text{Si,S})(\text{O,OH})_4]_2$   
 Hexagonal (trigonal):  $P\bar{3}$   
 a 8.322(1), c 7.376(1) Å  
 Light green; vitreous; transparent.  
 Uniaxial (–),  $\omega$  1.705,  $\varepsilon$  1.611.  
 7.37 (100), 3.623 (25), 3.282 (30), 2.724 (30),  
 2.556 (50), 2.191 (15), 1.572 (20).

## IMA No. 94-006

$(\text{Mg}_{1-x}\square_x)_2\text{Mg}_{12}(\text{PO}_4)_6(\text{PO}_3\text{OH})_2\text{O}_6\text{H}_{6+4x}$   
 $x = 0$  to 0.3  
 Hexagonal:  $P6_3mc$   
 a 12.47(1), c 5.036(6) Å  
 Azure blue; vitreous; transparent.  
 Uniaxial (–),  $\bar{n} \sim 1.61$ ,  $\Delta \sim 0.01$ .  
 3.66 (65), 3.15 (100), 3.109 (100), 2.692 (95),  
 2.213 (70), 1.803 (50), 1.552 (50).

## IMA No. 94-007

$\text{Na}_3(\text{Fe}^{2+}, \text{Fe}^{3+})_6[\text{Ti}_2\text{Si}_{12}\text{O}_{30}(\text{O,OH})_4]$   
 $(\text{OH,O})_7 \cdot 2 \text{H}_2\text{O}$   
 Monoclinic:  $P2_1/c$   
 a 5.353(4), b 16.18(1), c 21.95(2) Å,  
 $\beta$  94.6(2)°  
 Dark brown-green; vitreous to silky;  
 translucent.  
 Biaxial (–),  $\alpha$  1.627,  $\beta$  1.667,  $\gamma$  1.693,  
 2V(meas.) 75°, 2V(calc.) 76°.  
 13.00 (30), 10.94 (100), 4.44 (30), 2.728 (50),  
 2.641 (40), 2.547 (30), 2.480 (30).

## IMA No. 94-008

$\text{AgFeS}_2$   
 Tetragonal:  $P4_2mc$   
 a 5.64(1), c 10.34(3) Å  
 Megascopic colour not observed; metallic;  
 opaque.  
 In reflected light: cream with a greyish tint,  
 moderate anisotropism, no bireflectance,  
 nonpleochroic.  $R_{\min}$  &  $R_{\max}$ : (27.2, 30.1%)  
 470 nm, (32.3, 36.4%) 546 nm, (33.0, 37.1%)  
 589 nm, (31.2, 35.3%) 650 nm.  
 3.15 (10), 2.445 (2), 2.340 ( $\leq$  2), 1.910 (4),  
 1.692 (2).

## IMA No. 94-010

A member of the milarite group.

$\text{K}(\text{K,Na},\square)(\text{Mn,Zr,Y})_2(\text{Zn,Li})_3\text{Si}_{12}\text{O}_{30}$   
 Hexagonal:  $P6/mcc$   
 a 10.196(5), c 14.284(8) Å  
 Dark blue, violet blue, greyish brown-blue;  
 vitreous; transparent.  
 Uniaxial (–),  $\omega$  1.590,  $\varepsilon$  1.586.  
 7.13 (30), 4.15 (45), 3.75 (50), 3.25 (100),  
 2.924 (39), 2.777 (32), 2.548 (520).

## IMA No. 94-011

$(\text{NH}_4,\text{K})\text{NO}_3$   
 Orthorhombic:  $Pbnm$   
 a 7.075(5), b 7.647(5), c 5.779(5) Å  
 White; vitreous; transparent.  
 Biaxial (–),  $\alpha$  1.458,  $\beta$  1.527,  $\gamma$  1.599,  
 2V(meas.)  $\sim 90^\circ$ , 2V(calc.)  $87^\circ$ .  
 3.863 (75), 3.364 (85), 3.212 (95), 3.194 (100),  
 2.805 (35), 2.595 (90), 2.400 (50).

## IMA No. 94-012

$(\text{Na,Mn,Fe,Al,REE})_{15}(\text{Y,REE,Ca,Na})_2$   
 $(\text{CO}_3)_9(\text{SO}_3\text{F})\text{Cl}$   
 Hexagonal:  $P\bar{3}$   
 a 8.773(1), c 10.746(2) Å  
 Yellow to orange-brown; vitreous; trans-  
 parent.  
 Uniaxial (–),  $\omega$  1.548,  $\varepsilon$  1.537.  
 6.20 (40), 4.39 (80), 2.774 (80), 2.532 (100),  
 2.240 (80), 2.067 (30), 1.657 (40).

## IMA No. 94-013

$\text{Cu}_2\text{Zn}[(\text{As,Sb})\text{O}_4](\text{OH})_3$   
 Hexagonal (trigonal):  $P\bar{3}$   
 a 8.201 (1), c 7.315 (1) Å  
 Emerald green; adamantine; transparent.  
 Uniaxial (–),  $\omega$  1.801,  $\varepsilon$  1.796.  
 2.522 (100), 2.166 (88), 1.805 (92), 1.550 (100),  
 1.513 (85).

## IMA No. 94-014

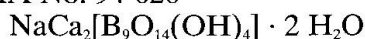
$\text{CuNiSb}_2$   
 Hexagonal (trigonal):  $P\bar{3}m1$   
 a 4.0489(2), c 5.1358(3) Å  
 Silver-white; metallic; opaque.  
 In reflected light: white with yellowish hue,  
 distinct anisotropism, weak bireflectance,  
 nonpleochroic.  $R_o$  &  $R_e$ : (59.3, 52.4%)  
 470 nm, (63.0, 56.8%) 546 nm, (65.5, 60.9%)  
 589 nm, (68.6, 64.9%) 650 nm.  
 2.901 (100), 2.572 (10), 2.074 (65), 2.023 (51),  
 1.660 (11), 1.284 (10).

## IMA No. 94-016

The Zn-dominant analogue of högbomite-8H.  
 $(\text{Zn,Fe}^{2+})_{1-2x}\text{Ti}_x\text{Al}_2\text{O}_4$ ,  $x \sim 0.12$   
 Hexagonal: most probably  $P6_3mc$   
 a 5.708(4), c 18.31(2) Å

- Deep brown to black; adamantine; transparent in thin sections.  
Uniaxial (–),  $\omega$  1.878,  $\varepsilon$  1.832.  
2.85 (50), 2.60 (80), 2.42 (100), 1.592 (60), 1.550 (50), 1.470 (70), 1.425 (80).
- IMA No. 94-017  
 $\text{Na}_8(\text{Mn}, \text{Fe}^{3+}, \text{Ti})_2\text{Si}_{10}\text{O}_{25}(\text{OH}, \text{Cl})_4 \cdot 10 \text{H}_2\text{O}$   
Orthorhombic: C222<sub>1</sub>  
a 13.46(2), b 14.98(1), c 17.51(2) Å  
Yellow to orange; vitreous; transparent.  
Biaxial (+),  $\alpha$  1.532,  $\beta$  1.540,  $\gamma$  1.550, 2V(meas.) 89°, 2V(calc.) 84°.  
10.049 (100), 8.823 (50), 5.025 (20), 3.806 (20), 2.718 (50).
- IMA No. 94-018  
 $\text{PbCa}_2\text{Al}(\text{F}, \text{OH})_9$   
Monoclinic: A2, A2/m or Am  
a 23.905(5), b 7.516(2), c 7.699(2) Å,  $\beta$  92.25(2)°  
White to colourless; vitreous; transparent.  
Biaxial (–),  $\alpha$  1.510,  $\beta$  1.528,  $\gamma$  1.531, 2V(meas.) 36°, 2V(calc.) 44°.  
11.9 (100), 3.71 (70), 3.51 (85), 2.98 (60), 2.94 (60), 2.027 (60), 1.971 (60).
- IMA No. 94-019  
The cobalt-dominant member of the halotrichite group.  
 $(\text{Co}, \text{Mg}, \text{Ni})\text{Al}_2(\text{SO}_4)_4 \cdot 22 \text{H}_2\text{O}$   
Monoclinic: P2<sub>1</sub>/c  
a 6.189(4), b 24.23(1), c 21.20(1) Å,  $\beta$  100.33(5)°  
Empire rose; silky; transparent.  
Biaxial (sign unknown),  $\alpha$  1.477,  $\beta$  unknown,  $\gamma$  1.484, 2V unknown.  
6.03 (22), 4.790 (100), 4.295 (27), 4.106 (22), 3.945 (26), 3.768 (33), 3.494 (92).
- IMA No. 94-020  
A member of the magnetoplumbite group.  
 $\text{Pb}(\text{Zn}, \text{Fe}^{3+})_3(\text{Fe}^{3+}, \text{Mn}^{3+}, \text{Mn}^{4+}, \text{Al}, \text{Ti})_9\text{O}_{19}$   
Hexagonal: P6<sub>3</sub>/mmc  
a 5.854(1), c 22.882(6) Å  
Black; metallic; opaque.  
In reflected light: black, isotropic, no birefractance, nonpleochroic.  
 $R_{\text{mean}}$ : (23.8%) 470 nm, (22.4%) 546 nm, (21.7%) 589 nm, (20.7%) 650 nm.  
11.39 (45), 3.811 (100), 2.858 (75), 2.745 (50), 2.605 (40), 2.407 (25), 1.6361 (30).
- IMA No. 94-021  
The gallium-dominant analogue of beudantite.  
 $\text{Pb}(\text{Ga}, \text{Al}, \text{Fe})_3(\text{AsO}_4)(\text{SO}_4)(\text{OH})_6$
- Hexagonal: R3m  
a 7.225(4), c 17.03(2) Å  
Pale yellow; vitreous; transparent.  
Uniaxial (–),  $\omega$  1.763,  $\varepsilon$  1.750.  
5.85 (90), 3.59 (40), 3.038 (100), 2.851 (30), 2.513 (30), 2.271 (40), 1.948 (30).
- IMA No. 94-022  
The F-analogue of thalenite-(Y).  
 $\text{Y}_3\text{Si}_3\text{O}_{10}\text{F}$   
Monoclinic: P2<sub>1</sub>/n  
a 7.321(2), b 11.133(4), c 10.375(6) Å,  $\beta$  97.17(2)°  
Colourless to white; adamantine; translucent.  
Biaxial (–),  $\alpha$  1.719,  $\beta$  1.739,  $\gamma$  1.748, 2V(meas.) 73°, 2V(calc.) 67°.  
5.60 (5), 3.81 (5), 3.12 (10), 2.828 (8), 2.253 (8), 2.187 (4), 2.131 (4).
- IMA No. 94-023  
The Ir-dominant analogue of isoferroplatinum.  
 $\text{Ir}_3\text{Fe}$   
Cubic: Pm3m  
a 3.792(5) Å  
Steel black; metallic; opaque.  
In reflected light: bright white with yellowish tint, isotropic, nonbirefractant, nonpleochroic. R: (66.2%) 470 nm, (69.3%) 546 nm, (71.1%) 589 nm, (72.5%) 650 nm.  
2.18 (80), 1.89 (60), 1.34 (70), 1.26 (20), 1.200 (15), 1.142 (100), 1.094 (80).
- IMA No. 94-024  
An orthorhombic polymorph of walpurgite.  
 $(\text{UO}_2)\text{Bi}_4\text{O}_4(\text{AsO}_4)_2 \cdot 2 \text{H}_2\text{O}$   
Orthorhombic: Pbcm  
a 5.492(1), b 13.324(2), c 20.685(3) Å  
Yellow; adamantine; transparent.  
Biaxial (–),  $\alpha$  1.90,  $\beta$  1.99,  $\gamma$  2.00 (calc.), 2V(meas.) 36°.  
10.354 (94), 5.610 (40), 3.277 (56), 3.208 (100), 3.088 (76), 2.999 (50), 2.852 (46).
- IMA No. 94-025  
 $(\text{UO}_2)_8(\text{SO}_4)(\text{OH})_{14} \cdot 13 \text{H}_2\text{O}$   
Monoclinic: P2<sub>1</sub>/a  
a 18.553(8), b 9.276(2), c 13.532(7) Å,  $\beta$  125.56(2)°  
Yellow; vitreous; translucent.  
Biaxial (–),  $\alpha$  1.715,  $\beta$  1.718,  $\gamma$  1.720, 2V(calc.) 78°.  
7.56 (100), 7.13 (48), 3.771 (34), 3.554 (20), 3.234 (10), 3.206 (13), 2.052 (8).

## IMA No. 94-026

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

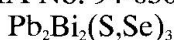
$a$  11.4994(8),  $b$  12.5878(9),  $c$  10.5297(1) Å,  
 $\beta$  99.423(6)°

Colourless to light dirty-yellow and light grey;  
 vitreous; transparent.

Biaxial (+),  $\alpha$  1.532,  $\beta$  1.538,  $\gamma$  1.564,  
 $2V(\text{meas.})$  54°,  $2V(\text{calc.})$  52°.

5.41 (66), 5.20 (57), 4.20 (56), 3.35 (89),  
 3.27 (59), 3.04 (100), 2.210 (59).

## IMA No. 94-030

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

$a$  4.191(2),  $c$  39.60(3) Å

Silver-grey; metallic; opaque.

In reflected light: yellowish-white, distinct

anisotropism, practically absent bire-

flectance, bluish-grey to brownish

pleochroism. R1 &amp; R2: (49.7, 48.5%)

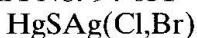
470 nm, (48.4, 47.4%) 546 nm, (47.9, 46.8%)

589 nm, (47.9, 46.2%) 650 nm.

3.42 (5), 3.04 (10), 2.096 (8), 1.806 (6),

1.725 (5), 1.298 (7), 1.233 (6).

## IMA No. 94-031

Hexagonal:  $\text{P}6_2$ ,  $\text{P}6_4$ ,  $\text{P}6_222$  or  $\text{P}6_422$ 

$a$  8.234(4),  $c$  19.38(1) Å

Red to brownish red; adamantine; trans-  
 lucent.

Uniaxial (–),  $\omega$  2.3 (from polished section),  
 $\varepsilon$  could not be measured).

6.47 (20), 4.124 (30), 3.357 (60), 3.237 (30),

3.127 (50), 2.879 (100), 2.009 (50).

## IMA No. 94-032

Hexagonal (trigonal):  $\text{P}31\text{c}$ 

$a$  7.758(5),  $c$  5.623(5) Å

Brownish red to colourless; probably adaman-  
 tine; transparent.

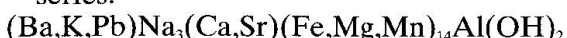
Uniaxial (–),  $\omega$  2.03,  $\varepsilon$  2.02.

2.893 (85), 2.599 (75), 2.547 (100), 2.320 (60),

1.486 (70), 1.418 (60), 1.351 (75).

## IMA No. 94-033

Isostructural with the arrojadite-dickonsonite  
 series.

Monoclinic:  $\text{C}2/\text{c}$ 

$a$  16.406(5),  $b$  9.945(3),  $c$  24.470(5) Å,

$\beta$  105.73(2)°

Greenish-grey; greasy; translucent.

Biaxial (sign unknown),  $n_{\text{average}}$  1.65.

3.186 (45), 3.018 (100), 2.824 (39), 2.813 (36),  
 2.685 (50), 2.530 (35).

## IMA No. 94-034

The magnesium-analogue of coulsonite.

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

$a$  8.385(3) Å

Black; metallic; opaque.

In reflected light: light grey, isotropic, no

bireflectance, nonpleochroic. R: (14.0%)

470 nm, (13.7%) 546 nm, (13.7%) 589 nm,

(13.7%) 650 nm.

4.84 (9), 2.52 (10), 2.093 (8), 1.612 (8),

1.482 (9), 1.092 (7), 1.048 (5).

## IMA No. 94-035

Tetragonal:  $\text{P}4_22_12$  or  $\text{P}4_222$ 

$a$  10.085(2),  $c$  23.836(8) Å

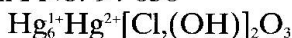
Intense blue to emerald green; vitreous;  
 translucent.

Uniaxial (–),  $\omega$  1.686,  $\varepsilon$  1.635.

11.90 (100), 9.29 (60), 7.132 (50), 5.043 (60),

4.641 (40), 3.098 (80), 3.061 (70).

## IMA No. 94-036

Orthorhombic:  $\text{Pbma}$ 

$a$  11.790(3),  $b$  13.881(4),  $c$  6.450(2) Å

Black to very dark brown; metallic; opaque.

In reflected light: white, strong anisotropism,

moderate bireflectance, pleochroic from

white to a higher reflecting blue-white.

R1 & R2: (22.8, 29.6%) 470 nm,

(20.7, 25.7%) 546 nm, (20.3, 24.6%) 589 nm,

(20.2, 23.2%) 650 nm.

5.25 (80), 3.164 (60), 3.053 (100), 2.954 (70),

2.681 (50), 2.411 (50).

## IMA No. 94-038

Tetragonal:  $\text{I}4/\text{amd}$ 

$a$  5.499(5),  $c$  33.91(4) Å

Grey; metallic; opaque.

In reflected light: greyish white with bluish

tint; anisotropism, bireflectance and

pleochroism not observed. R<sub>0</sub>: (31.3%)

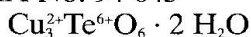
470 nm, (30.4%) 543 nm, (29.3%) 587 nm,

(27.1%) 657 nm.

3.19 (50), 2.77 (100), 1.960 (80), 1.679 (70),

1.598 (70), 1.274 (60).

## IMA No. 94-043

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

a 9.204(2), b 9.170(2), c 7.584(1) Å,  
β 102.32(3)°

Emerald green; adamantine; transparent.

Biaxial (sign unknown), n 1.91–1.92.

6.428 (100), 3.217 (70), 2.601 (40), 2.530 (50),  
2.144 (35), 1.750 (35).

IMA No. 94-045

Fe<sup>3+</sup>(Mn,Fe<sup>2+</sup>,Mg)(PO<sub>4</sub>)O

Monoclinic: I2/a

a 9.977(2), b 6.339(2), c 11.836(3) Å,  
β 105.77(3)°

Black; weakly submetallic; opaque.

Optical properties could not be measured due  
to the opaque nature of the mineral.

3.256 (23), 2.970 (100), 2.861 (35), 2.810 (98),  
2.064 (25), 1.778 (22).

IMA No. 94-046

A member of the amphibole group.

(K,Na)Ca<sub>2</sub>(Mg,Fe<sup>2+</sup>,Al,Fe<sup>3+</sup>,Ti)<sub>5</sub>(Si,Al)<sub>8</sub>

O<sub>22</sub>[(OH),F,O]<sub>2</sub>

Monoclinic: C2/m

a 9.9199(4), b 18.0591(8), c 5.3180(3) Å,  
β 105.36(1)°

Black; vitreous; opaque, but translucent in  
thin splinters.

Biaxial (–), α 1.654, β 1.664, γ 1.670,  
2V(meas.) = 79°, 2V(calc.) = 75°.

8.45 (95), 3.283 (45), 3.140 (100), 2.707 (35),  
2.344 (70), 2.018 (35), 1.652 (40).

IMA No. 94-047

(Cu,Fe)(Sn,Sb)

Tetragonal: space group unknown

a 4.22(1), c 5.10(3) Å

Megascopic colour was not observed; metal-  
lic; opaque.

In reflected light: pinkish-white, distinct an-  
isotropism, distinct bireflectance, pleoch-  
roic from light pink to pinkish-white.

R<sub>max</sub> & R<sub>min</sub>: (72.6, 64.8%) 470 nm, (77.4,  
68.2%) 546 nm, (78.5, 68.9%) 589 nm,  
(79.0, 69.0%) 650 nm.

2.96 (9), 2.10 (10), 1.72 (3), 1.488 (3), 1.214 (4),  
1.092 (4).

IMA No. 94-048

A member of the epidote group.

(Mn<sup>2+</sup>,Ca)(La,Ce,Ca)(Al,Mn<sup>3+</sup>,Mn<sup>2+</sup>)<sub>3</sub>(Si<sub>3</sub>O<sub>11</sub>)  
O(OH)

Monoclinic: P2<sub>1</sub>/m

a 8.891(3), b 5.704(3), c 10.107(8) Å,  
β 113.99(2)°

Brown-red; vitreous; transparent.

Because of the small grain size, most of the  
optical properties could not be determined.

2.897 (100), 2.857 (45), 2.707 (60), 2.615 (60),  
2.178 (60), 2.145 (60).

IMA No. 94-049

Mn<sub>3</sub>(Nb,Ta)<sub>3</sub>(Nb,Mn)<sub>2</sub>W<sub>2</sub>O<sub>20</sub>

Monoclinic: P2<sub>1</sub>

a 24.73(2), b 5.056(3), c 5.760(3) Å,  
β 103.50(7)°

Red to brown-red; metallic; opaque.

In reflected light: light grey, weak anisotro-  
pism, weak bireflectance, nonpleochroic.

R<sub>max</sub> & R<sub>min</sub>: (19.2, 18.0%) 470 nm, (18.5,  
17.5%) 546 nm, (19.3, 18.5%) 589 nm,  
(16.5, 16.0%) 650 nm.

6.0 (5), 3.74 (8), 3.69 (8), 2.98 (10), 1.783 (5),  
1.744 (6), 1.732 (7), 1.456 (5).

IMA No. 94-050

An F-dominant, triclinic polymorph of  
canasite, with additional H<sub>2</sub>O.

K<sub>3</sub>Na<sub>3</sub>Ca<sub>3</sub>(Si<sub>12</sub>O<sub>30</sub>)(F<sub>3</sub>OH) · H<sub>2</sub>O

Triclinic: P1

a 10.0941(3), b 12.6913(2), c 7.2405(1) Å  
a 90.00(2)°, β 111.02(2)°, γ 110.20(2)°

Lilac-grey, blue-grey, rarely greenish;  
vitreous; translucent.

Biaxial (–), α 1.536, β 1.539, γ 1.542,  
2V(meas.) = 70°, 2V(calc.) = 89.8°.

5.88 (37), 4.70 (54), 4.21 (40), 3.01 (25),  
2.915 (100), 2.354 (30), 2.307 (21).

IMA No. 94-051

Pb<sub>2</sub>Bi<sub>2</sub>Te<sub>2</sub>S<sub>3</sub>

Hexagonal: space group unknown

a 4.230(4), c 33.43(2) Å

Dark grey to black; metallic; opaque.

In reflected light: greyish-white with a slight  
pinkish tint, very faint anisotropism, very  
weak bireflectance, nonpleochroic.

R<sub>o</sub> & R<sub>E</sub>: (40.4, 39.3%) 470 nm (42.1,  
40.8%) 546 nm, (41.3, 40.8%) 589 nm,  
(41.9, 40.9%) 650 nm.

3.35 (40), 3.06 (100), 2.22 (25), 2.115 (50),  
1.311 (25), 1.213 (25).

IMA No. 94-052

K<sub>2</sub>Na<sub>4</sub>Ca<sub>3</sub>Ti<sub>2</sub>Be<sub>4</sub>Si<sub>12</sub>O<sub>38</sub>

Orthorhombic: Fddd

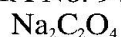
a 12.778(4), b 14.343(3), c 33.69(1) Å

Pink, dark red, seldom white; vitreous;  
transparent.

Biaxial (+), α 1.630, β 1.644(calc.), γ 1.675,  
2V(meas.) = 70°.

9.23 (9), 4.15 (10), 3.30 (10), 3.16 (10),  
2.53 (10), 2.42 (10), 1.582 (9).

## IMA No. 94-053

Monoclinic: P2<sub>1</sub>/a

a 10.426(9), b 5.255(5), c 3.479(3) Å,  
 $\beta$  93.14(8)°

Pale yellow; vitreous; transparent.

Biaxial (–),  $\alpha$  1.415,  $\beta$  1.524,  $\gamma$  1.592,

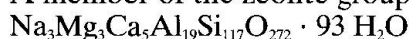
2V(meas.) = 72°, 2V(calc.) = 72°.

5.203 (13), 2.898 (27), 2.826 (100), 2.602 (56),

2.334 (33), 2.177 (13), 2.041 (14).

## IMA No. 94-054

A member of the zeolite group.



Orthorhombic: Cmca

a 13.698(2), b 25.213(3), c 22.660(2) Å

Colourless to light straw; vitreous;  
transparent.Biaxial (–),  $\alpha$  1.480,  $\beta$  1.485,  $\gamma$  1.486,

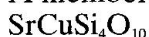
2V(meas.) &lt; 60°, 2V(calc.) 48°.

11.34 (100), 10.64 (31), 4.64 (35), 4.37 (79),

4.01 (57), 3.938 (36), 3.282 (68).

## IMA No. 94-055

A member of the cuprorivaite group.



Tetragonal: P4/ncc

a 7.366(1), c 15.574(3) Å

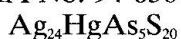
Colour; vitreous; transparent.

Uniaxial (–),  $\gamma$  1.630,  $\varepsilon$  1.590.

7.79 (35), 3.444 (40), 3.330 (100), 3.119 (55),

3.033 (50), 2.605 (30), 2.322 (30).

## IMA No. 94-056



Hexagonal: space group unknown

a 15.00(1), c 15.46(3) Å

Wine-red to violet; metallic; opaque.

In reflected light: grey, weak to moderate

anisotropism, very low bireflectance, weak

pleochroism.  $R_{\text{max}}$  &  $R_{\text{min}}$ : (31.0, 30.3%)

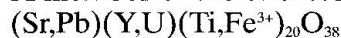
470 nm, (29.2, 27.6%) 546 nm, (27.6, 26.0%)

589 nm, (24.6, 23.9%) 650 nm.

3.17 (6), 3.091 (10), 2.998 (4), 2.755 (3),  
1.878 (8).

## IMA No. 94-057

A member of the crichtonite group.

Hexagonal (rhombohedral):  $R\bar{3}$ a 9.197(1),  $\alpha$  68.75(2)°

Black; metallic; opaque.

In reflected light: ash-grey with pale bluish

tones, weak anisotropism, low bireflec-

tance, very weak pleochroism.  $R_1$  &  $R_2$ :

(17.73, 17.22%) 470 nm, (17.14, 16.50%)

546 nm, (16.54, 16.11%) 589 nm, (16.48,

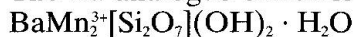
16.00%) 650 nm.

3.412 (m), 2.902 (m), 2.846 (mw), 2.499 (mw),

1.916 (mw), 1.603 (m), 1.441 (m).

## IMA No. 94-058

The Ba-analogue of hennomartinite.



Orthorhombic: Cmcn (?)

a 6.325(1), b 9.120(1), c 13.618(1) Å

Dark brown; earthy to brilliant; translucent to  
transparent.Biaxial (–),  $\alpha$  1.82,  $\beta$  1.845 (calc.),  $\gamma$  1.85,

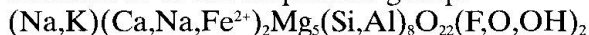
2V(meas.) 46°.

4.85 (100), 4.557 (50), 4.322 (59), 3.416 (77),

2.869 (80), 2.729 (82).

## IMA No. 94-059

A member of the amphibole group.



Monoclinic: C2/m

a 9.893(4), b 18.015(5), c 5.279(3) Å,

 $\beta$  104.61(4)°Grey to black; vitreous; opaque, but thin  
fragments are transparent.Biaxial (–),  $\alpha$  1.603,  $\beta$  1.613,  $\gamma$  1.623,

2V(meas.) 90°, 2V(calc.) 89°.

9.06 (6), 8.46 (8), 3.282 (9), 3.140 (10),

2.703 (6), 1.443 (7).