

**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.

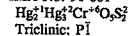
The names of these approved species are considered confidential information until the authors have published their descriptions or released information themselves.

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



Triclinic: P1

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).

IMA No. 91-003 The niobium analogue of bismutotantalite.



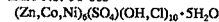
Orthorhombic: Pmmn

a 4.992, b 5.677, c 11.731 Å

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

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

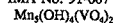
Hexagonal: P6₃, P6₃/m or P6₃2

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. 91-007



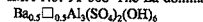
Monoclinic: C2/m

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.



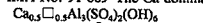
Hexagonal: R3m

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.



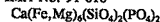
Hexagonal: R3m

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



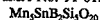
Hexagonal: R3m

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



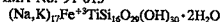
Monoclinic: P2/m

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

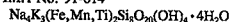
Orthorhombic: Cmc2₁, Cmc2, or C2cm

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



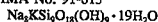
Triclinic: P1

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).

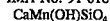
IMA No. 91-015

Monoclinic: P2₁/ca 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.

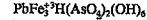
Orthorhombic: P2₁2₁2₁

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: R3m

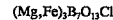
a 7.359, c 17.113(8) Å

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

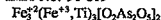
a 8.574, c 20.99 Å

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: P2₁/ma 10.625, b 3.264, c 8.990 Å, β 109.15°.

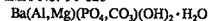
Dark brown to black; submetallic to metallic; opaque (translucent in thin fragments).

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); bireflectance not visible (in oil, very weak along grain boundaries); nonpleochroic.

R-values: (15.5-15.9 %)/470nm, (15.0-15.5 %)/546nm, (14.8-15.0 %)/589nm, (14.2-14.5 %)/650nm.

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

IMA No. 91-020



Orthorhombic: Pnna or Pnmm

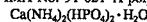
a 8.939, b 5.669, c 11.073(3) Å

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.



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



Hexagonal: R3c

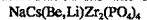
a 8.687, c 23.877(7) Å

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



Tetragonal: I4/amd

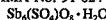
a 6.573, c 17.28 Å

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



Triclinic: P1

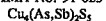
a 11.434, b 29.77, c 11.314(4) Å, α 91.07°, β 119.24°, γ 92.82°.

Colourless to white; adamantine; transparent to translucent.

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

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

IMA No. 91-025



Orthorhombic: space group unknown

a 14.51, b 13.30, c 17.96(1) Å

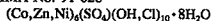
Silvery lead grey; metallic; opaque.

In reflected light: grey, weak anisotropism, weak bireflectance, nonpleochroic. R_{max}.& R_{max}: (31.5, 32.5 %)/470nm, (31.1, 32.0 %)/546nm, (30.3, 31.15 %)/589nm,

(27.2, 23.4 %)/650nm.

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

IMA No. 91-026



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)₂(Ca)₂(Si₂P₂)₂F₁₀, where Ce is the dominant REEHexagonal: P6₃/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)Na₂[Mg₂(Fe²⁺, Mn²⁺)₂Li]Si₄O₁₀(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

NiSb₂(OH)₁₂·6H₂OHexagonal: P3₁m, P3₁m or P3₁2

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

(Pb,Mo,□)₂O₄Cl₂Tetragonal: I4/mmm, I4₂m, I4m2, I4mm or I422

a 3.9922, c 22.514(2) Å

Carmine; adamantine; translucent.

In reflected light: grey, weak to moderate anisotropy, moderate birefractance, weak pleochroism, internal reflections abundant, R₁ & R₂ (19.6, 22.0 %)470nm, (18.0,

20.5 %)546nm, (17.4, 19.6 %)589nm, (16.95, 18.8 %)650nm.

3.507 (32), 2.983 (100), 2.816 (78), 1.989 (75), 1.658 (51), 1.586 (33).

IMA No. 91-031

Ca₂Cu₄(SO₄)₂(OH)₁₂·2H₂OMonoclinic: P2₁/c (pseudo C2/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

Fe(OH)₂

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

Au₂Pb

Cubic: Fd3m

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,

birefractance, pleochroism or internal reflections; R (56.0%)470nm, (59.5%)546nm,

(60.0%)589nm, (62.0%)650nm.

4.595 (21), 2.810 (30), 2.391 (100), 2.301 (25), 1.526 (23), 1.196 (26).

IMA No. 91-034

Ca(UO₂)₂(CO₃)₄·3H₂OOrthorhombic: Pmmn, Pmm2, or P2₁nm

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

[Ag₂(Pb,Fe)Bi₂]₂(Sb,Bi)₂S₇

Monoclinic: C2/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 birefractance, no pleochroism,

no internal reflections. R_{max} & R_{min} (42.2, 39.7 %)470nm, (41.4, 38.8 %)546nm,

(40.8, 37.9 %)589nm, (39.8, 36.9 %)650nm.

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

Pb₂(Mn,Fe,Mg)₂Fe²⁺₂O₂₀Hexagonal: P6₃/mmc, P6₃mc or P6₂2c

a 5.951, c 33.358 Å

Black; submetallic; opaque.

In reflected light: grey with pale brownish tint, moderate anisotropy, weak birefractance,

no pleochroism, no internal reflections, R₀ & R_π (23.6, 22.3%) 470nm, (22.8,

21.9%) 546nm, (22.2, 21.5%) 589nm, (21.3, 21.0%) 650nm.

4.168 (55), 3.011 (60), 2.9750 (70), 2.8017 (95), 2.6236 (100), 2.6125 (90).

IMA No. 91-042

N(CH₃)₂[Si₂(Al_{0.5}Al_{0.5})O₆]₂

Orthorhombic: I222

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.

Cu₂₀V₂(Sb,Sn,As)₆S₂₂

Cubic: P43n

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, birefractance,

pleochroism or internal reflections; R (25.2 %) 470nm, (28.3 %) 546nm, (29.9 %)

589nm, (31.0 %) 650nm.

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.

Cu₂₀V₂(Ge,As)₆S₂₂

Cubic: P43n

a 10.568 Å

Grey-black; metallic; opaque.

In reflected light: greenish-yellow, olive-yellowish-cream; no internal reflections,

anisotropy, birefractance or pleochroism; R (23.8 %) 470nm, (27.3 %) 546nm,

(27.9%)589nm, (27.9%)650nm.

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

(Ca,Mg)₁₂Mn₂Zn₂Be₂Si₁₄O₃₆(OH,F)₂Monoclinic: P2₁/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(meas.) 29.0°, 2V(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 chudobaita.

(Cu,Co)₂(AsO₄)₂(AsO₄OH)·10H₂O

Triclinic: P1 or P1

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(meas.) 75°, 2V(calc.) 72°.

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

IMA No. 91-047

Ti₂As₂

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 birefractance,

no pleochroism. R_{max} and R_{min} are: (4.78, 3.93 %) 481nm, (4.64, 3.86 %) 547nm,

(8.64, 7.81 %) 591nm, (13.72, 11.78 %) 644nm.

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

Na₂₂Ba(Y,Gd,Dy)₁₁(CO₃)₁₁(HCO₃)₄(SO₄)₂F₂ClHexagonal: P6₃/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

(Ca,REE,Th)₁₀As³⁺₅(As³⁺₂Na₂)₃Fe²⁺Si₄B₂O₄F₇

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

Ag₅SbTe₃(S,Se)₃Monoclinic: P2₁, P2₁m 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 birefractance, no pleochroism, no internal reflections, R_{max} and R_{min}

(38.0,34.2%)470nm, (36.6,32.2%)546nm, (35.7,31.8%)589nm, (34.0,30.2%)650nm.

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.

CoS₃

Cubic: Im3

a 9.0411 Å

Tin-white; metallic; opaque.

In reflected light: tin-white, isotropic, no birefractance, nonpleochroic, no internal

reflections, R (59.0 %)470nm, (58.7 %)546nm, (58.7 %)589nm, (58.7 %)650nm.

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

Zn₁₂(CO₃)₃(SO₄)(OH)₁₆Orthorhombic: P22₂

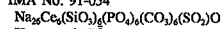
a 15.724, b 6.256, c 5.427(5) Å

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



Hexagonal: R3

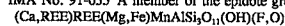
a 16.025, c 19.773 Å

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).

Monoclinic: P2₁/ma 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(meas.) 83°, 2V(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).