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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,  $\alpha$  100.43°,

$\beta$  110.24°,  $\gamma$  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 (+),  $\alpha$  2.38,  $\beta$  2.42,  $\gamma$  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

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

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 (-),  $\omega$  1.584,  $\epsilon$  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.

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

Orthorhombic: Pcmn

a 4.992, b 5.677, c 11.731 Å

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

IMA No. 91-007

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

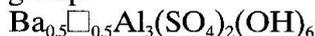
Monoclinic: C2/m

a 9.604, b 9.558, c 5.393 Å,  $\beta$  98.45°

Orange-red; vitreous; transparent.  
Biaxial (-),  $\alpha'$  1.803,  $\gamma'$  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

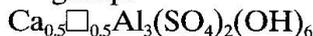
White to light yellowish; vitreous; transparent.

Uniaxial (+),  $\omega$  1.588,  $\varepsilon$  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:  $R\bar{3}m$

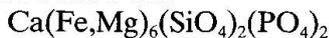
a 6.983, c 16.759 Å

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:  $R\bar{3}m$

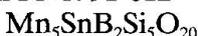
a 6.240, c 26.784 Å

Yellow-brown; vitreous; transparent.

Uniaxial (-),  $\omega$  1.770,  $\varepsilon$  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,  $\beta$  96.6(2)°

Orange-yellow; vitreous; transparent.

Biaxial (-),  $\alpha$  1.696,  $\beta$  1.711,  $\gamma$  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:  $Cmcm$ ,  $Cmc2_1$  or  $C2cm$

a 29.77, b 11.03, c 17.111(5) Å

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

Biaxial (-),  $\alpha$  1.532,  $\beta$  1.548,  $\gamma$  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,  $\alpha$  103.491°,  
 $\beta$  96.960°,  $\gamma$  91.945°

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

Biaxial (+),  $\alpha$  1.569,  $\beta$  1.574,  $\gamma$  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,  $\beta$  94.47(9)°

Colourless; vitreous; transparent.

Biaxial (-),  $\alpha$  1.460,  $\beta$  1.478,  $\gamma$  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.

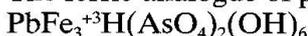
Biaxial (+),  $\alpha$  1.840,  $\beta$  (calc.) 1.854,  $\gamma$  1.920,

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

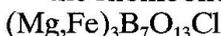
Greenish-yellow; vitreous to adamantine;  
translucent to transparent.

Uniaxial (-),  $\omega$  1.975,  $\varepsilon$  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:  $R3c$

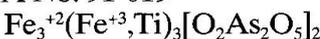
a 8.574, c 20.99 Å

Colourless; vitreous; transparent.

Uniaxial (-),  $\omega$  1.684,  $\varepsilon$  1.668.

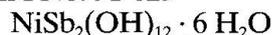
3.497 (34), 3.028 (100), 2.711 (66), 2.144 (37),  
2.050 (73), 1.828 (25).

## IMA No. 91-019



- Monoclinic:  $P2_1/m$   
 a 10.625, b 3.264, c 8.990 Å,  $\beta$  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); bire-  
 flectance 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 Pnnc  
 a 8.939, b 5.669, c 11.073(3) Å  
 Pale blue; silky; translucent.  
 Biaxial (-),  $\alpha$  1.616,  $\beta$  1.629,  $\gamma$  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 mundrabiliaite.  
 $Ca(NH_4)_2(HPO_4)_2 \cdot H_2O$   
 Orthorhombic: space group unknown  
 a 20.959, b 7.403, c 6.478(5) Å  
 White; vitreous; transparent.  
 Biaxial (-),  $\alpha$  1.506,  $\beta$  1.510,  $\gamma$  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 (+),  $\omega$  1.656,  $\epsilon$  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 (+),  $\omega$  1.634,  $\epsilon$  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,  $\alpha$  91.07°,  
 $\beta$  119.24°,  $\gamma$  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 bireflectance, 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 (-),  $\omega$  1.568,  $\epsilon$  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 (-),  $\omega$  1.792,  $\epsilon$  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,  $\beta$  104.22(2)°  
 Dark red; vitreous; translucent.  
 Biaxial (+),  $\alpha$  1.667,  $\beta$  1.675,  $\gamma$  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

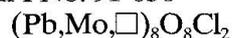
Hexagonal:  $P\bar{3}1m$ ,  $P31m$  or  $P312$ 

a 16.016, c 9.789(2) Å

Light-blue; vitreous; transparent.

Uniaxial (+),  $\omega$  1.600,  $\epsilon$  1.605.4.6195 (100), 3.3537 (100), 2.3431 (80),  
2.0909 (60), 1.8050 (70), 1.7496 (60).

## IMA No. 91-030

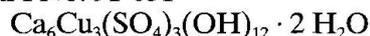
Tetragonal:  $I4/mmm$ ,  $I42m$ ,  $I4m2$ ,  $I4mm$   
or  $I422$ 

a 3.9922, c 22.514(2) Å

Carmine; adamantine; translucent.

In reflected light: grey, weak to moderate  
anisotropy, moderate 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:  $P2_1/c$  (pseudo  $C2/c$ )a 15.122, b 14.358, c 22.063 Å,  $\beta$  108.68°.

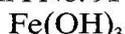
Dark blue; vitreous; transparent.

Biaxial (-),  $\alpha$  1.590,  $\beta$  1.610,  $\gamma$  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:  $Fd3m$ 

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, bireflectance,  
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

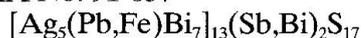
Orthorhombic:  $Pmnm$ ,  $Pmn2_1$  or  $P2_1nm$ 

a 15.337, b 17.051, c 6.931 Å

Canary yellow; vitreous; transparent.

Biaxial (-),  $\alpha$  1.603(calc.),  $\beta$  1.690,  $\gamma$  1.710,  
2V(meas.) 49°.8.55 (100), 6.94 (50), 4.11 (60), 3.723 (60),  
3.460 (50), 2.772 (70).

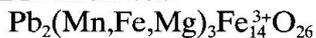
## IMA No. 91-037

Monoclinic:  $C2/m$  or  $Cm$ a 13.515, b 4.098, c 26.000 Å,  $\beta$  93.00°

Grey; metallic; opaque.

In reflected light: white, distinct anisotropy,  
very weak bireflectance, no pleochroism,  
no internal reflections,  $R_{\text{max}}$  and  $R_{\text{min}}$ .  
(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

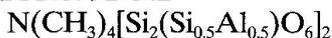
Hexagonal:  $P6_3/mmc$ ,  $P6_3mc$  or  $P62c$ 

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).

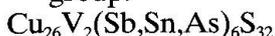
## IMA No. 91-042

Orthorhombic:  $I222$ 

a 8.984, b 8.937, c 8.927 Å

White, colourless, light yellow; vitreous;  
transparent.Biaxial (-),  $\alpha$  1.529,  $\beta$ (calc.) 1.530,  $\gamma$  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:  $P43n$ 

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, 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: P43n  
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<sub>1</sub>/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 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 P1̄  
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  
 $\text{Ti}_3\text{As}_4$   
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<sub>max.</sub> and R<sub>min.</sub> 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<sub>3</sub>/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, P2/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<sub>max.</sub> and R<sub>min.</sub> (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.  
 $\text{CoSb}_3$   
Cubic: Im3̄  
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<sub>1</sub>2  
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 (-),  $\omega$  1.589,  $\epsilon$  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).

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

Monoclinic:  $P2_1/m$

a 8.903, b 5.748, c 10.107 Å,  $\beta$  113.41°

Dark greyish-brown; vitreous; transparent.

Biaxial (-),  $\alpha$  1.773,  $\beta$  1.790,  $\gamma$  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).