

## New minerals approved in 2002 and nomenclature modifications approved 1998–2002 by the Commission on New Minerals and Mineral Names, International Mineralogical Association

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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.

Chemical Formula (any relationship to other minerals; structure analysis)

Crystal system, space group

unit-cell parameters

Color; luster; 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.

### 2002 PROPOSALS

#### IMA No. 2002-001

(Ce,La,Nd,Ba)(Fe<sup>3+</sup>,Al)<sub>3</sub>[(As,Al)O<sub>4</sub>]<sub>2</sub>(OH)<sub>6</sub>

Fe-dominant analogue of

arsenoflorentite-(Ce)

Trigonal:  $R\bar{3}m$

$a$  7.260,  $c$  16.77 Å

Light-green to brownish; resinous; transparent

Uniaxial(-), mean refractive index = 1.97

5.906(25), 3.636(40), 3.052(100), 2.792(30),

2.239(35), 1.817(35)

#### IMA No. 2002-002

(□,K)<sub>1</sub>(Mg,Fe<sup>2+</sup>)<sub>3</sub>Fe<sup>3+</sup>[Si<sub>12</sub>O<sub>30</sub>] Milarite group;

structure determined

Hexagonal:  $P6/mcc$

$a$  10.050,  $c$  14.338 Å

Deep blue to yellowish-green; vitreous; trans-

lucent

Uniaxial (-),  $\omega$  1.589,  $\epsilon$  1.586

8.70(97), 7.17(100), 5.535(96), 5.026(61),

4.352(53), 3.207(85)

#### IMA No. 2002-003

NaSrKZn(Ti,Nb)<sub>4</sub>(Si<sub>4</sub>O<sub>12</sub>)<sub>2</sub>(O,OH)<sub>4</sub>·7H<sub>2</sub>O

Labuntsovite group;

structure determined

Monoclinic:  $Cm$

$a$  14.495,  $b$  13.945,  $c$  7.838 Å,  $\beta$  117.75°

White, pale-brown; vitreous; translucent to

transparent

Biaxial (+),  $\alpha$  1.680,  $\beta$  1.687,  $\gamma$  1.787,

2V(meas.) 25°, 2V(calc.) 31°

6.96(100), 3.21(80), 3.11(90), 2.60(35),

2.50(40), 1.74(30), 1.70(40)

#### IMA No. 2002-004

CoSO<sub>4</sub>·H<sub>2</sub>O Kieserite group

Monoclinic:  $C2/c$

$a$  6.980,  $b$  7.588,  $c$  7.639 Å,  $\beta$  118.65°

Pink; powdery; transparent

Biaxial (+),  $n \sim 1.65$  (calc.)

4.83(33), 3.405(100), 3.339(34), 3.291(32),

3.062(56), 2.567(30), 2.513(49)

#### IMA No. 2002-005

(K,Ba,Na)<sub>2</sub>(Ti,Nb)<sub>2</sub>(Si<sub>4</sub>O<sub>12</sub>)(OH,O)<sub>2</sub>·3H<sub>2</sub>O

Labuntsovite group; structure determined

Monoclinic:  $Cm$

$a$  14.327,  $b$  13.802,  $c$  7.783 Å,  $\beta$  116.95°

Light brown, white, and colorless; vitreous;

transparent

Biaxial (+),  $\alpha$  1.689,  $\beta$  1.700,  $\gamma$  1.775,

2V(meas.) 35°, 2V(calc.) 43°

6.87(100), 4.85(50), 3.95(50), 3.20(60),

3.05(80), 3.00(60), 2.56(90)

#### IMA No. 2002-006

(Ba,Na,K)<sub>2-x</sub>(Ti,Nb)<sub>2</sub>(Si<sub>4</sub>O<sub>12</sub>)(OH,O)<sub>2</sub>·4H<sub>2</sub>O

Labuntsovite group; structure determined

Monoclinic:  $C2/m$

$a$  14.551,  $b$  14.001,  $c$  15.702 Å,  $\beta$  117.58°

Brown; vitreous; transparent

Biaxial (+),  $\alpha$  1.667,  $\beta$  1.674,  $\gamma$  1.770,

2V(meas.) 30°, 2V(calc.) 31°

7.11(100), 4.08(80), 3.95(100), 3.24(90),

3.11(80), 2.403(80), 1.914(90)

#### IMA No. 2002-007

NaK<sub>3</sub>Fe(Ti,Nb)<sub>4</sub>(Si<sub>4</sub>O<sub>12</sub>)<sub>2</sub>(O,OH)<sub>4</sub>·6H<sub>2</sub>O

Labuntsovite group; structure determined

Monoclinic:  $Cm$

$a$  14.450,  $b$  13.910,  $c$  7.836 Å,  $\beta$  117.42°

Pale-brown; vitreous; translucent to transparent

Biaxial (+),  $\alpha$  1.677,  $\beta$  1.684,  $\gamma$  1.790,

2V(meas.) 25°, 2V(calc.) 30°

6.93(100), 4.93(80), 3.21(100), 3.11(90),

2.62(60), 2.49(50), 1.687(40)

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**NOTE:** new mineral proposals should be sent to the new Chairman:

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**IMA No. 2002-008**Na<sub>2</sub>H(PO<sub>4</sub>)·8H<sub>2</sub>O New structure typeOrthorhombic: *Ibca**a* 11.488, *b* 11.647, *c* 16.435 Å

Colorless; vitreous to resinous; transparent

Biaxial (-),  $\alpha$  1.443,  $\beta$  1.457,  $\gamma$  1.458,2*V*(meas.) 29°, 2*V*(calc.) 30°

5.78(40), 4.90(43), 4.73(62), 3.75(81),

2.876(77), 2.782(100), 2.744(74)

**IMA No. 2002-010**NaNa<sub>2</sub>(Al<sub>1</sub>Mg<sub>3</sub>)(Si<sub>7</sub>Al)O<sub>22</sub>(F,OH)<sub>2</sub> Amphibole group; structure determinedMonoclinic: *C2/m**a* 9.666, *b* 17.799, *c* 5.311 Å,  $\beta$  104.10°

Bluish-grey; luster not given; translucent

Biaxial (-),  $\alpha$  1.633,  $\beta$  1.624,  $\gamma$  1.626, 2*V* medium;

calculated from chemical composition

8.31(64), 4.45(26), 3.38(42), 3.079(58),

2.691(100), 2.571(32), 2.532(47)

**IMA No. 2002-011**

GaO(OH) Isostructural with goethite

Orthorhombic: *Pbnm**a* 4.512, *b* 9.772, *c* 2.967 Å

Pale greenish yellow to beige; pearly;

translucent

Biaxial, *n*(calc.) 1.96.

4.09(100), 2.632(33), 2.530(22), 2.404(100),

1.690(26), 1.538(21)

**IMA No. 2002-012**Na<sub>2</sub>(Na,Ca)<sub>4</sub>Ca<sub>4</sub>(Mn,Ca)<sub>2</sub>Zr<sub>2</sub>Ti<sub>2</sub>(Si<sub>2</sub>O<sub>7</sub>)<sub>4</sub>(O,F)<sub>4</sub>F<sub>4</sub>

Rosenbuschite group;

structure determined

Triclinic: *P* $\bar{1}$ *a* 10.032, *b* 11.333, *c* 7.202 Å,  $\alpha$  90.19,  $\beta$ 100.33,  $\gamma$  111.55°

Colorless to pale shade of brown; vitreous;

transparent

Biaxial (+),  $\alpha$  1.684,  $\beta$  1.695,  $\gamma$  1.718,2*V*(meas.) 73°, 2*V*(calc.) 70°

3.951(30), 3.028(60), 2.908(100), 2.600(80),

1.868(60), 1.670(50)

**IMA No. 2002-013**Ba<sub>3</sub>NaCe(PO<sub>4</sub>)<sub>3</sub>(F,Cl) Ba-dominant analogue of belovite-(Ce); structure determinedTrigonal: *P* $\bar{3}$ *a* 9.909, *c* 7.402 Å

Light rose; vitreous; translucent

Uniaxial (-),  $\omega$  1.694,  $\epsilon$  1.669

4.078(40), 3.693(40), 2.969(100), 2.867(60),

1.965(80), 1.863(60)

**IMA No. 2002-014**Pb<sub>3</sub>[(UO<sub>2</sub>)<sub>6</sub>O<sub>8</sub>(OH)<sub>2</sub>](H<sub>2</sub>O)<sub>x</sub>; *x* ~ 3 New structure typeMonoclinic: *C2/c**a* 28.355, *b* 11.990, *c* 13.998 Å,  $\beta$  104.248°

Bright orange; vitreous; transparent

Biaxial, *n*<sub>min</sub> 1.807, *n*<sub>max</sub> 1.891

6.92(60), 6.02(30), 3.46(80), 3.10(100),

2.74(30), 2.01(30), 1.918(60)

**IMA No. 2002-015**BaBe<sub>2</sub>Si<sub>2</sub>O<sub>7</sub> Dimorphous with barylite; structure determinedMonoclinic: *Pm**a* 11.637, *b* 4.918, *c* 4.668 Å,  $\beta$  89.80°

Colorless; vitreous; transparent

Biaxial (+),  $\alpha$  1.698,  $\beta$  1.700,  $\gamma$  1.705,2*V*(meas.) 70°, 2*V*(calc.) 65°

3.39(84), 3.25(45), 3.04(40), 2.926(55),

2.458(100), 2.335(48), 2.076(38)

**IMA No. 2002-016**CaFe<sup>2+</sup>Fe<sup>3+</sup>(Mn,Fe<sup>2+</sup>)(Si<sub>2</sub>O<sub>7</sub>)O(OH) Mn-dominant analogue of ilvaiteMonoclinic: *P2<sub>1</sub>/a**a* 13.0246, *b* 8.8511, *c* 5.8485 Å,  $\beta$  90.17°

Black; vitreous; opaque

In reflected light (in air): grey to bluish grey;

internal reflections: red; anisotropy: strong in

blue-greyish. *R*<sub>min</sub> and *R*<sub>max</sub>: 8.3–10% (460

nm), 7.5–9.8% (540 nm), 7–9.7% (580 nm),

6.1–9.5% (640 nm)

2.875(85), 2.848(90), 2.718(100), 2.687(70),

2.180(48), 2.111(47), 1.475(48)

**IMA No. 2002-017**MnV<sub>2</sub>O<sub>6</sub>·4H<sub>2</sub>O New structure typeMonoclinic: *C2/c**a* 13.171, *b* 10.128, *c* 6.983 Å,  $\beta$  111.57°

Carmine red; adamantine; transparent

Biaxial, *n*<sub>min</sub> 1.797, *n*<sub>max</sub> 1.856

7.82(100), 5.69(20), 5.06(20), 4.51(30),

3.91(30), 3.029(70)

**IMA No. 2002-018**(Mg,Fe)(Ta,Nb)<sub>2</sub>O<sub>6</sub> Columbite-tantalite groupOrthorhombic: *Pbcn**a* 14.355, *b* 5.735, *c* 5.058 Å

Black; semi-metallic to metallic; opaque

Light-grey; internal reflections (in air): brown-

ish-red; anisotropism: weak; bireflectance:

very weak.

*R*<sub>min</sub> and *R*<sub>max</sub>: 13.97–12.82% (460 nm), 13.33–

13.20% (540 nm), 14.25–13.94% (580 nm),

15.61–15.31% (640 nm)

3.67(60), 2.96(100), 1.774(60), 1.728(70),

1.462(90), 1.196(60), 1.105(60)

**IMA No. 2002-019**Ba<sub>2</sub>(La,Th,Ce)(CO<sub>3</sub>)<sub>2</sub>F La-dominant analogue of kukharenkoite-(Ce);

structure determined

Monoclinic: *P2<sub>1</sub>/m**a* 13.396, *b* 5.111, *c* 6.672 Å,  $\beta$  106.63°

Pale leek-green, colorless, white; vitreous;

transparent to translucent

Biaxial (-),  $\alpha$  1.581,  $\beta$  1.715,  $\gamma$  1.715,2*V*(meas.) 5°, 2*V*(calc.) 0°

4.01(100), 3.27(100), 2.54(50), 2.38(20),

2.14(80), 1.998(80), 1.636(20)

**IMA No. 2002-020**(Ca,K,Na)<sub>2-3</sub>(Ti,Nb)<sub>2</sub>(Si<sub>4</sub>O<sub>12</sub>)(OH,O)<sub>2</sub>·4H<sub>2</sub>O

Labuntsovite group; structure determined

Monoclinic: *C2/m**a* 14.484, *b* 14.191, *c* 7.907 Å,  $\beta$  117.26°

White, pale brownish; vitreous; transparent

Biaxial (+),  $\alpha$  1.666,  $\beta$  1.676,  $\gamma$  1.780,2*V*(meas.) 30°, 2*V*(calc.) 36°

7.02(60), 6.38(40), 3.53(45), 3.16(100),

2.62(45), 2.51(85), 1.718(50)

**IMA No. 2002-021**(Na,K,Ca)<sub>48</sub>Si<sub>36</sub>Al<sub>36</sub>O<sub>144</sub>[(SO<sub>4</sub>)<sub>8</sub>Cl<sub>2</sub>]·3H<sub>2</sub>O

Cancrinite-sodalite group;

structure discussed

Hexagonal or trigonal: *P* $\bar{6}2c$  or *P31c**a* 12.880, *b* 31.761 Å

Colorless; vitreous; transparent

Uniaxial (+),  $\omega$  1.497,  $\omega$  1.495

4.20(42), 3.725(100), 3.513(80), 3.296(35),

3.089(40), 2.555(35), 2.150(40)

**IMA No. 2002-022**Hg<sup>+</sup>Hg<sup>2+</sup>OI Related to terlinguaite; new structure typeMonoclinic: *C2/c**a* 17.580, *b* 6.979, *c* 6.693 Å,  $\beta$  101.71°

Dark grey-black; metallic; opaque

Calculated index of refraction: 2.35–2.38

8.55(70), 3.275(100), 2.993(80), 2.873(80),

2.404(50), 1.878(50)

**IMA No. 2002-023**Ce<sub>2</sub>Si<sub>2</sub>O<sub>7</sub> Isostructural with Ln<sub>2</sub>Si<sub>2</sub>O<sub>7</sub>Tetragonal: *P4<sub>1</sub>**a* 6.781, *c* 24.689 Å

White to colorless; resinous; transparent

Uniaxial (+),  $\omega$  1.840,  $\epsilon$  1.846

3.27(31), 3.14(27), 3.12(24), 3.08(100),

3.011(18), 2.846(22), 2.034(19)

**IMA No. 2002-024**(Cu<sub>4.7</sub>Ag<sub>3.3</sub>)<sub>28</sub>GeS<sub>6</sub> Argentinian variety of  $\alpha$ -Cu<sub>8</sub>GeS<sub>6</sub>Cubic: *F* $\bar{4}3m$ *a* 10.201 Å

Iron-black; vitreous to metallic; opaque

In reflected light (air): pale rose-brownish;

internal reflections: no;

$R_{\min}$  and  $R_{\max}$ : 29.4% (460 nm), 23.6% (560 nm), 26.0% (580 nm), 25.3% (640 nm)  
5.90(30), 3.07(60), 2.943(100), 1.962(50), 1.805(70)

**IMA No. 2002-025**

$\text{Ce}_3\text{CaMg}_2\text{Al}_2\text{Si}_5\text{O}_{19}(\text{OH})_2\text{F}$  Related to epidote group; structure determined

Monoclinic:  $P2_1/m$

$a$  8.939,  $b$  5.706,  $c$  15.855 Å,  $\beta$  94.58

Dark brown; vitreous

Biaxial (+),  $\alpha$  1.781,  $\beta$  1.792(calc.),  $\gamma$  1.810, 2V(meas.) 75°, 2V(calc.) 78°

4.64(10), 3.50(20), 2.979(100), 2.847(10), 2.682(13), 2.622(19), 2.185(15)

**IMA No. 2002-026**

$(\text{Na,Ca})_6(\text{Ca,Na})_3\text{Si}_{16}\text{O}_{38}(\text{F,OH})_2 \cdot 3\text{H}_2\text{O}$  Reyerite group; structure determined

Triclinic:  $P\bar{1}$

$a$  9.613,  $b$  12.115,  $c$  9.589 Å,  $\alpha$  92.95,  $\beta$  119.81,  $\gamma$  96.62°

Colorless; pearly

Biaxial (-),  $\alpha$  1.522,  $\beta$  1.528,  $\gamma$  1.529, 2V(meas.) 48°, 2V(calc.) 44°

11.99(100), 5.97(85), 3.97(40), 2.967(50), 2.888(100), 1.820(50)

**IMA No. 2002-027**

$\text{BaB}_2\text{Si}_2\text{O}_8$  Ba-dominant analogue of danburite; structure determined

Orthorhombic:  $Pnma$

$a$  8.141,  $b$  8.176,  $c$  9.038 Å

White; vitreous; transparent

Biaxial (-),  $\alpha$  1.649,  $\beta$  1.656,  $\gamma$  1.656, 2V(meas.) 5°, 2V(calc.) 0°

6.07(60), 4.86(30), 3.62(100), 3.39(60), 2.83(50), 2.481(40), 2.021(70)

**IMA No. 2002-028**

$\text{Ca}_{0.3}(\text{Fe}^{2+}, \text{Mg}, \text{Fe}^{3+})_3(\text{Si,Al})_4\text{O}_{10}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$  Smectite group

Monoclinic: probably  $C$ -cell

$a$  5.363,  $b$  9.306,  $c$  14.64 Å,  $\beta$  94.98°

Dark-green, brownish-green; vitreous, translucent

Biaxial (-),  $\alpha$  1.448 (calc.),  $\beta$  1.641,  $\gamma$  1.642; 2V(meas.) 5°, 2V(calc.) 7.5°

7.37(90), 4.72(90), 3.80(80), 3.03(100), 2.585(90), 2.429(90), 1.549(90)

**IMA No. 2002-029**

$\text{Na}_6\text{MnTi}_4\text{Si}_8\text{O}_{28} \cdot 4\text{H}_2\text{O}$  Mn-dominant analogue of kukisvumite

Orthorhombic:  $Pccn$

$a$  29.05,  $b$  8.612,  $c$  5.220 Å

Colorless; vitreous; transparent

Biaxial (-),  $\alpha$  (calc.) 1.657,  $\beta$  1.744,  $\gamma$  1.792, 2V(meas.) 70°, 2V(calc.) 70°

14.47(100), 6.43(20), 4.83(10), 3.025(40), 2.881(20)

**IMA No. 2002-030**

$\text{Mg}_2(\text{BO}_3)\text{F}$  Isostructural with  $\text{Mg}_2(\text{BO}_3)\text{F}$ ; structure determined

Orthorhombic:  $Pna2_1$

$a$  20.490,  $b$  4.571,  $c$  11.890 Å

Colorless; vitreous; transparent

Biaxial (+),  $\alpha$  1.609,  $\beta$  1.620,  $\gamma$  1.642, 2V(meas.) 65°, 2V(calc.) 71°

2.743(77), 2.474(49), 2.414(46), 2.241(100), 2.234(49), 1.708(92), 1.705(44)

**IMA No. 2002-031**

$\text{Na}_2\text{K}(\text{Y,REE})[\text{Si}_6\text{O}_{15}]$  K and REE analogue of  $\text{Na}_3\text{Y}[\text{Si}_6\text{O}_{15}]$ ;

structure determined

Orthorhombic:  $Ibmm$

$a$  10.623,  $b$  14.970,  $c$  8.552 Å

White; vitreous; transparent

Biaxial (+),  $\alpha$  1.555,  $\beta$  1.558,  $\gamma$  1.566, 2V(meas.) 64°, 2V(calc.) 63°

5.32(35), 4.98(100), 3.45(50), 3.26(85), 3.05(75), 2.753(42), 2.490(45)

**IMA No. 2002-033**

$\text{Na}_{1.2}(\text{Ti,Fe}^{3+})_4(\text{Si,Al})\text{O}_{22}(\text{OH})_4(\text{H}_2\text{O})$  Related to vinogradovite; structure determined

Triclinic:  $P1$

$a$  5.2533,  $b$  8.7411,  $c$  12.9480 Å,  $\alpha$  70.47,  $\beta$  78.47,  $\gamma$  89.93°

White; vitreous; translucent to transparent

Biaxial (-),  $\alpha$  1.707,  $\beta$  1.741,  $\gamma$  1.755, 2V(meas.) 64°, 2V(calc.) 64°

11.9(58), 5.98(35), 5.88(65), 4.35(38), 3.182(100), 3.085(29), 2.735(21)

**IMA No. 2002-034**

$\text{CdSO}_4 \cdot 4\text{H}_2\text{O}$  Rozenite group

Monoclinic:  $P2_1/n$

$a$  6.5859,  $b$  14.329,  $c$  8.5712 Å,  $\beta$  91.51°

Colorless to light blue; vitreous, transparent

Uniaxial (-),  $\alpha$  1.430,  $\beta$  1.454,  $\gamma$  1.470, 2V(meas.) ~70°, 2V(calc.) 77.3°

5.98(85), 4.84(70), 3.146(85), 2.967(85), 2.708(75), 2.654(100)

**IMA No. 2002-035**

$(\square, \text{Cu}^{2+}, \text{V}^{3+})_8\text{Al}_6(\text{PO}_4)_8\text{F}_8(\text{H}_2\text{O})_{23}$

New structure type

Orthorhombic:  $Pmnm$

$a$  12.123,  $b$  18.999,  $c$  4.961 Å,

Pale green to turquoise; vitreous; translucent

Biaxial (-),  $\alpha$  1.540,  $\beta$  1.548,  $\gamma$  1.553, 2V(meas.) 76°, 2V(calc.) 76°

9.54(80), 6.08(100), 5.62(90), 3.430(40), 2.983(60), 2.661(40)

**IMA No. 2002-036**

$(\text{Ba,Ca})_2\text{Al}_3(\text{Si,Al})_4\text{O}_{10}(\text{CO}_3)(\text{OH})_6 \cdot n\text{H}_2\text{O}$  Surite series

Monoclinic:  $C2/m$ ,  $C2$  or  $Cm$

$a$  5.176,  $b$  8.989,  $c$  16.166 Å,  $\beta$  96.44°

White with light-greenish tint; pearly; translucent

Biaxial (-),  $\alpha$  1.580,  $\beta$  1.625,  $\gamma$  1.625, 2V(meas.) 0–10°, 2V(calc.) 0°

4.49(90), 3.68(60), 2.585(100), 2.230(90), 2.069(80), 1.692(60)

**IMA No. 2002-037**

$(\text{Ca,Na})(\text{Ba,K})(\text{Fe}^{2+}, \text{Mn})_4\text{Ti}_2(\text{Si}_4\text{O}_{14})\text{O}_2(\text{F,OH})_3$  Bafertisite series; structure determined

Monoclinic:  $C2$

$a$  10.723,  $b$  13.826,  $c$  20.791 Å,  $\beta$  95.00°

Brownish red; vitreous; transparent to translucent

Biaxial (-),  $\alpha$  1.790(calc.),  $\beta$  1.858,  $\gamma$  1.888, 2V(meas.) 65°

10.39(20), 3.454(100), 3.186(15), 2.862(15), 2.592(70), 2.074(40), 1.728(15)

**IMA No. 2002-038**

$\text{Mg}_2(\text{Al}_{1-2x}\text{Mg}_x\text{Sn}_x)(\text{BO}_3)\text{O}_2$  Hulsite group; structure determined

Monoclinic:  $P2_1/m$

$a$  5.3344,  $b$  3.0300,  $c$  10.506 Å,  $\beta$  94.46°

Brown to blue-green in transmitted light; luster not observed; transparent

Biaxial (+),  $\alpha'$  1.78,  $\gamma'$  1.805, 2V(meas.) 33°, 2V(calc.) 39°

10.47(29), 5.24(49), 4.90(32), 2.618(50), 2.532(100), 2.318(30), 2.001(54), 1.515(28)

**IMA No. 2002-039**

$\text{Hg}_4^+\text{Al}(\text{PO}_4)_{1.74}(\text{OH})_{1.78}$  New structure type

Monoclinic:  $C2/c$

$a$  17.022,  $b$  9.074,  $c$  7.015 Å,  $\beta$  101.20°

Colorless to white; vitreous; transparent to translucent

Biaxial (+),  $n$ (calc.) 1.94

8.33(100), 4.74(50), 2.979(80), 2.952(50), 2.784(80), 2.660(75)

**IMA No. 2002-041**

$\text{KPb}_{1.5}\text{ZnCu}_6\text{O}_2(\text{SeO}_3)_2\text{Cl}_{10}$  New structure type

Orthorhombic:  $Pnmm$

$\alpha$  9.132,  $b$  19.415,  $c$  13.213 Å

Olive green; vitreous, transparent

Biaxial (-), no refractive indices given

8.26(70), 7.63(60), 4.11(90), 3.660(100), 2.996(40), 2.887(50), 2.642(40)

**IMA No. 2002-043**Na<sub>2</sub>(Ba,K)<sub>6</sub>Ce<sub>2</sub>Fe<sup>2+</sup>Ti<sub>3</sub>Si<sub>12</sub>O<sub>36</sub>(OH)<sub>3</sub>(OH,H<sub>2</sub>O)<sub>3</sub>

New structure type

Trigonal:  $R\bar{3}$  $a$  10.713,  $c$  60.67 Å

Yellowish orange; vitreous; transparent

Uniaxial (+),  $\omega$  1.705,  $\epsilon$  1.708

10.12(27), 3.236(100), 3.094(21), 2.654(38),

2.642(44), 2.234(19), 2.026(61)

**IMA No. 2002-047**Zn<sub>2</sub>Te<sub>3</sub>O<sub>8</sub> Related to spiroffiteMonoclinic:  $C2/c$  $a$  12.676,  $b$  5.198,  $c$  11.781 Å,  $\beta$  99.6(1)°

Grey; vitreous; translucent.

In reflected light (air): grey; internal reflections not observed, anisotropy weak.  $R_{\min}$  and  $R_{\max}$ : 6.7–7.3% (460 nm), 7.4–7.8% (540 nm) 4.76(w), 3.240(w), 2.928(m), 2.820(w), 2.155(w), 1.985(w), 1.599(w)

**IMA No. 2002-048**K(□,Na)<sub>2</sub>(Mn,Fe,Mg)<sub>2</sub>(Be,Al)<sub>3</sub>[Si<sub>12</sub>O<sub>30</sub>]

Milarite group; structure determined

Hexagonal:  $P6/mcc$  $a$  9.997,  $c$  14.090 Å

Yellow to orange; vitreous; transparent

Uniaxial (-),  $\omega$  1.560,  $\epsilon$  1.559

7.05(40), 5.00(40), 4.08(80), 3.187(90),

2.882(100), 2.732(50), 1.826(40)

**IMA No. 2002-049**(Mn<sup>2+</sup>,Ca)(Ce,REE)AlMn<sup>3+</sup>Mn<sup>2+</sup>Si<sub>2</sub>O<sub>7</sub>SiO<sub>4</sub>

O(OH) Epidote group; structure determined

Monoclinic:  $P2_1/m$  $a$  8.901,  $b$  5.738,  $c$  10.068 Å,  $\beta$  113.425°

Dark brown; vitreous to adamantine; transparent

Biaxial (+),  $\alpha > 1.74$ , 2V(meas.) 81°

3.51(37), 2.896(100), 2.713(34), 2.707(43),

2.622(58), 2.591(32), 2.185(31)

**IMA No. 2002-050**Ca<sub>4</sub>AlSi(SO<sub>4</sub>)F<sub>13</sub>·12H<sub>2</sub>O Related to chukhrovite-(Ce)Cubic:  $Fd\bar{3}$  $a$  16.722 Å

White to yellowish; vitreous; transparent

Isotropic;  $n(\text{calc.})$  1.430

9.63(100), 5.91(46), 5.04(27), 4.17(19),

3.219(32), 2.235(28), 2.178(33)

**IMA No. 2002-051**(Na,K)Ca<sub>2</sub>(Mg,Al<sub>2</sub>)Si<sub>5</sub>Al<sub>3</sub>O<sub>22</sub>(OH)<sub>2</sub> Amphibole group; structure determinedMonoclinic:  $C2/m$  $a$  9.905,  $b$  18.00,  $c$  5.322 Å,  $\beta$  105.47°

Brownish black; vitreous; translucent

Biaxial (+),  $\alpha$  1.674,  $\beta$  (calc.) 1.683,  $\gamma$  1.694,

2V(meas.) 85°

8.47(70), 3.38(60), 3.13(70), 2.70(100),

2.59(70), 2.57(100), 2.16(60), 1.447(60)

**IMA No. 2002-052**K[(Al,Zn)<sub>2</sub>(As,Si)<sub>2</sub>O<sub>8</sub>] Feldspar group; structure determinedMonoclinic:  $C2/c$  $a$  13.416,  $b$  13.370,  $c$  8.772 Å,  $\beta$  100.067°

Colorless; vitreous; transparent

Biaxial (-),  $\alpha$  1.532,  $\beta$  1.535,  $\gamma$  1.537,

2V(meas.) 60°; 2V(calc.) 78°

4.33(70), 3.90(70), 3.364(100), 3.300(50),

3.066(40), 2.981(60), 2.646(40)

**IMA No. 2002-053**Tl<sub>6</sub>Ag<sub>3</sub>Cu<sub>6</sub>As<sub>9</sub>S<sub>21</sub> Related to imhofite; structure determinedTriclinic:  $P1bar$  $a$  12.138,  $b$  12.196,  $c$  15.944 Å,  $\alpha$  78.537,  $\beta$ 84.715,  $\gamma$  60.470°

Black; metallic; translucent

In reflected light (air): white; internal reflections frequent, anisotropy weak. R: 30.7% (460 nm), 29.4% (540 nm), 28.2% (580 nm), 26.8% (640 nm)

15.63(100), 3.531(80), 3.263(50), 3.143(90),

2.978(60), 2.911(70), 2.520(60)

**IMA No. 2002-054**La(CO<sub>3</sub>)(OH) Ancylyte groupOrthorhombic:  $Pmcn$  $a$  4.986,  $b$  8.513,  $c$  7.227 Å

Pale pinkish purple to white; vitreous; diaphaneity not given

No optical data

4.31(100), 3.69(72), 2.93(57), 2.64(30),

2.49(29), 2.33(50), 2.06(48), 1.994(35)

**IMA No. 2002-055**Na<sub>12</sub>Sr<sub>3</sub>Ca<sub>6</sub>Fe<sub>3</sub>Zr<sub>3</sub>NbSi<sub>25</sub>O<sub>73</sub>(O,OH,H<sub>2</sub>O)<sub>3</sub>Cl<sub>2</sub>

Eudialyte group; structure determined

Trigonal:  $R3m$  $a$  14.286,  $c$  29.99 Å

Clove brown to yellowish brown; vitreous; transparent

Uniaxial (-);  $\omega$  1.649,  $\epsilon$  1.638

11.49(50), 9.51(90), 3.43(90), 3.19(80),

2.98(100), 2.86(100)

**IMA No. 2002-056**(Na,□)<sub>12</sub>(Na,Ce)<sub>3</sub>Ca<sub>6</sub>Mn<sub>3</sub>Zr<sub>3</sub>Nb(Si<sub>25</sub>O<sub>73</sub>)(OH)<sub>3</sub>(CO<sub>3</sub>)·H<sub>2</sub>O Eudialyte group; structure determinedTrigonal:  $R3m$  $a$  14.239,  $c$  30.039 Å

Yellow; vitreous; transparent

Uniaxial (-);  $\omega$  1.645,  $\epsilon$  1.635

6.39(25), 4.30(24), 3.204(38), 3.155(35),

3.019(34), 2.970(83), 2.849(100), 2.134(23)

**IMA No. 2002-057**(Na,□)<sub>12</sub>(Ce,Na)<sub>3</sub>Ca<sub>6</sub>Mn<sub>3</sub>Zr<sub>3</sub>Nb(Si<sub>25</sub>O<sub>73</sub>)(OH)<sub>3</sub>(CO<sub>3</sub>)·H<sub>2</sub>O Eudialyte group; structure determinedTrigonal:  $R3m$  $\alpha$  14.248,  $c$  30.076 Å

Cream; vitreous; transparent

Uniaxial(-);  $\omega$  1.648,  $\epsilon$  1.637

4.32(51), 3.975(37), 3.536(33), 3.220(100),

3.166(56), 2.979(95), 2.857(88)

**IMA No. 2002-058**Cu<sub>4</sub>AgPb<sub>2</sub>Bi<sub>9</sub>S<sub>18</sub> Related to makovickyite; structure determinedMonoclinic:  $C2/m$  $a$  13.396,  $b$  4.013,  $c$  29.93 Å,  $\beta$  100.07°

Grey; metallic; opaque

In reflected light (air): greyish white; internal reflections not observed, anisotropy moderate.  $R_{\min}$  and  $R_{\max}$ : 42.3–48.5% (460 nm), 41.1–47.1% (540 nm), 40.0–46.0% (580 nm), 39.8–45.2% (640 nm)

3.645(56), 3.486(40), 3.478(100), 3.345(32),

2.964(33), 2.885(29), 2.842(95), 2.282(31)

**IMA No. 2002-059**(Ni,Co,Cu)<sub>30</sub>(As<sub>2</sub>O<sub>7</sub>)<sub>15</sub> New structure typeMonoclinic:  $C2$  $a$  33.256,  $b$  8.482 Å,  $c$  14.191 Å,  $\beta$  104.145°

Dark violet-red to dark brownish red; vitreous; translucent

In reflected light (air): dark grey; internal reflections orange, anisotropy not obvious. R: 9.63% (460 nm), 9.33% (540 nm), 9.27% (580 nm), 9.33% (640 nm)

4.23(30), 3.118(100), 3.005(60), 2.567(50),

1.637(50), 1.507(30)

**IMA No. 2002-060**Cu<sub>2</sub>Pd<sub>3</sub>Se<sub>4</sub> Chrisstanleyite series; structure determinedMonoclinic:  $P2_1/c$  $a$  5.672,  $b$  9.910,  $c$  6.264 Å,  $\beta$  115.40(2)°

Silvery grey; metallic; opaque

In reflected light (air): buff to grey-green; internal reflections not observed, anisotropy moderate.  $R_{\min}$  and  $R_{\max}$ : 40.4–48.4% (460 nm), 44.2–50.7% (540 nm), 44.7–50.6% (580 nm), 45.1–50.6% (640 nm)

2.776(22), 2.759(23), 2.676(100), 2.630(64),

2.508(31), 2.269(27)

**IMA No. 2002-061**Na(H<sub>3</sub>O)(UO<sub>2</sub>)<sub>3</sub>(SeO<sub>3</sub>)<sub>2</sub>·4H<sub>2</sub>O Related to

haynesite; structure determined  
 Monoclinic:  $P11m$   
 $a$  6.9806,  $b$  17.249,  $c$  7.6460 Å,  $\beta$  90.039°  
 Yellow; vitreous; transparent  
 Biaxial (-),  $\alpha$  1.597,  $\beta$  1.770,  $\gamma$  1.775,  
 $2V$ (meas.) 20°,  $2V$ (calc.) 18°  
 8.63(43), 7.67(100), 7.02(33), 3.85(40),  
 3.107(77), 2.874(53), 1.411(30)

IMA No. **2002-062**  
 $Cu_2HgPb_{23}Sb_{27}S_{65.5}$  New structure type  
 Monoclinic:  $C2$  or  $C2/m$   
 $a$  43.113,  $b$  4.059,  $c$  37.874 Å,  $\beta$  117.35°  
 Black; metallic, opaque  
 In reflected light (air): white; internal reflections red, anisotropy distinct. R: 39.0% (460 nm), 36.4% (540 nm), 35.2% (580 nm), 33.4% (640 nm)  
 3.84(31), 3.402(100), 3.369(74), 2.815(70),  
 2.756(36), 2.251(31), 2.116(31), 1.955(30)

IMA No. **2002-063**  
 $(Ni,Zn)Al_4(VO_3)_2(OH)_{12}(H_2O)_{25}$  Ni-dominant analogue of alvanite;  
 structure determined  
 Monoclinic:  $P2_1/n$   
 $a$  17.8098,  $b$  5.1228,  $c$  8.8665 Å,  $\beta$  92.141°  
 Colorless to white, light green to light blue;  
 vitreous; diaphaneity not given  
 Biaxial (-),  $\alpha$  1.653,  $\beta$  1.680,  $\gamma$  1.706,  
 $2V$ (meas.) 86°,  $2V$ (calc.) 88°  
 8.89(100), 7.83(100), 3.266(50), 1.970(80),  
 1.904(70), 1.605(50), 1.481(80)

IMA No. **2002-064**  
 $(K,Na,\square)(Mn^{2+},Fe^{2+},Li)_2(Al,Si)_4Si_4O_{12}(OH)_4$   
 $(F,OH)_4$  Carpholite group  
 Orthorhombic:  $Ccca$   
 $a$  13.715,  $b$  20.302,  $c$  5.138 Å  
 White to straw-yellow; silky; diaphaneity not given  
 Biaxial (-),  $\alpha$  1.578,  $\beta$  1.592  $\gamma$  1.598,  
 $2V$ (meas.) 57°,  $2V$ (calc.) 66°  
 5.70(100), 3.819(80), 3.43(80), 3.048(90),  
 2.744(80), 2.613(100), 2.050(80), 1.467(80)

IMA No. **2002-065**  
 $(Na,K,Sr)_{35}Ca_{12}Fe_3Zr_6TiSi_{15}O_{144}(O,OH,H_2O)_6Cl_3$   
 Eudialyte group; structure determined  
 Trigonal:  $R3$   
 $a$  14.239,  $c$  60.733 Å  
 Pink; vitreous; transparent  
 Uniaxial (+),  $\omega$  1.597,  $\epsilon$  1.601  
 6.45(33), 5.70(34), 4.32(68), 3.55(39),  
 3.230(44), 3.049(36), 2.977(100), 2.853(88)

IMA No. **2002-066**  
 $(H_3O)_8(Na,K,Sr)_5Ca_6Zr_3Si_{26}O_{66}(OH)_9Cl$

Eudialyte group; structure determined  
 Trigonal:  $R3$   
 $a$  14.078,  $c$  31.24 Å  
 Pink; vitreous; translucent  
 Uniaxial (+),  $\omega$  1.569,  $\epsilon$  1.571  
 11.43 (39), 10.50(44), 7.06(42), 6.63(43),  
 4.39(100), 3.624(41), 2.987(100), 2.850(79)

IMA No. **2002-067**  
 $Na_{15}Ca_3Fe_3(Na,Zr)_3Zr_3(Si,Nb)(Si_{25}O_{73})$   
 $(OH,H_2O)_3(Cl,OH)$  Eudialyte group; structure determined  
 Trigonal:  $R3$   
 $a$  14.229,  $c$  30.019 Å  
 Red; vitreous; transparent  
 Uniaxial (+),  $\omega$  1.608,  $\epsilon$  1.611  
 11.48(33), 5.72(35), 4.31(66), 4.09(37),  
 3.209(58), 3.023(40), 2.974(86), 2.853(100)

#### PROPOSALS FROM PREVIOUS YEARS APPROVED IN 2002

IMA No. **2000-010**  
 $(Na,H_3O)_{15}(Ca,Mn,REE)_6Fe_3^{2+}Zr_3(\square,Zr)$   
 $(\square,Si)Si_{24}O_{66}(O,OH)_6Cl \cdot nH_2O$  Eudialyte group; structure determined  
 Trigonal:  $R3m$   
 $a$  14.167,  $c$  30.081 Å  
 Yellow; vitreous; translucent  
 Uniaxial (+),  $\omega$  1.612,  $\epsilon$  1.615  
 6.41(41), 4.30(91), 3.521(57), 3.205(44),  
 2.963(92), 2.841(100), 2.588(37)

IMA No. **2000-028**  
 $Na_{27}K_8Ca_{12}Fe_3Zr_6Si_{52}O_{144}(OH,O)_6Cl_2$   
 Eudialyte group; structure determined  
 Trigonal:  $R3m$   
 $a$  14.249,  $c$  60.969 Å  
 Pink; vitreous; transparent  
 Uniaxial (+),  $\omega$  1.598,  $\epsilon$  1.600  
 6.48(47), 4.34(81), 3.565(41), 3.249(57),  
 2.987(100), 2.861(73), 2.695(40)

IMA No. **2001-069**  
 $Na(Na_{1.0-1.5}Li_{0.5-1.0})_2(Fe_3^{2+}Mg_2Li)Si_8O_{22}(OH)_2$   
 Amphibole group; structure determined  
 Monoclinic:  $C2/m$   
 $a$  9.712,  $b$  17.851,  $c$  5.297 Å,  $\beta$  103.63(2)°  
 Bluish black; vitreous; translucent  
 No optical data could be given  
 3.392(33), 3.098(37), 2.701(100), 2.576(14),  
 2.524(100), 2.157(20), 1.646(20), 1.581(15)

IMA No. **2001-070**  
 $Ca_3(PO_4)$  Related to whitlockite  
 Trigonal:  $R3m$   
 $a$  5.258,  $c$  18.727 Å  
 White to yellowish grey; vitreous; diaphaneity not given

Uniaxial (+),  $\omega$  1.706,  $\epsilon$  1.701  
 2.891(80), 2.628(100), 2.214(20), 2.078(12),  
 2.047(16), 1.945(47), 1.730(25)

#### NOMENCLATURE MODIFICATIONS 1998-2002

IMA Code 98-D – Monsmedite **discredited** = voltaite.

IMA Code 98-E – Arsenobismite **discredited** = mixture of preisingerite, minor atelestite and minor beadantite/signite

IMA Code 99-A – Platynite **discredited** = mixture of laitakarite and selenian galena.

IMA Code 99-B – Pepsosite-(Ce) **redefined** as (Ce,La)(Al<sub>3</sub>O)<sub>2/3</sub>B<sub>3</sub>O<sub>10</sub>.

IMA Code 00-A – **Redefinition** (the new name is the second one): vuoriyarvite = vuoriyarvite-K; kuzmenkoite = kuzmenkoite-Mn; lemmleinite = lemmleinite-K; labuntsovite of Semenov & Burova (1955) = labuntsovite-Mn; labuntsovite of Milton et al. (1958) = paralabuntsovite-Mg.

IMA Code 00-B – Kurgantaite **revalidated**.

IMA Code 00-C – Baiyuneboite-(Ce) **discredited** = cordylite-(Ce).

IMA Code 00-D – Nomenclature of joaquinite group **redefined** to conform with the Levinson system. The members of the group are: joaquinite-(Ce), orthojoaquinite-(Ce), orthojoaquinite-(La), strontiojoaquinite, strontio-orthojoaquinite, bario-orthojoaquinite, byelorussite-(Ce).

IMA Code 00-E. Destinezite **redefined** as triclinic Fe<sub>2</sub>(PO<sub>4</sub>)(SO<sub>4</sub>)(OH)·6H<sub>2</sub>O.

IMA Code 00-F – **Redefinition** (the new name is the second one): hellandite = hellandite-(Y); tadzhikite = tadzhikite-(Ce).

IMA Code 00-G – Neotype approved and magnesium-zippeite **redefined** as monoclinic Mg(UO<sub>2</sub>)<sub>2</sub>(SO<sub>4</sub>)(OH)<sub>4</sub>·1.5H<sub>2</sub>O

IMA Code 01-A – **Redefinition** (the new name is the second one): högbomite-8H = magnesiohögbomite-2N2S; högbomite-10T = magnesiohögbomite-2N3S; högbomite-24R = magnesiohögbomite-6N6S; zincohögbomite-8H = zincohögbomite-2N2S; zincohögbomite-16H = zincohögbomite-2N6S; nigerite-6T = ferronigerite-2N1S; nigerite-24R = ferronigerite-6N6S; pengzhizhongite-6T = magnesionigerite-2N1S; pengzhizhongite-24R = magnesionigerite-6N6S; taaffeite = magnesiotaafeite-2N'2S; musgravite = magnesiotaafeite-6N'3S; pehrmanite = ferrotaafeite-6N'3S;

IMA Code 01-B - Duhamelite **discredited** = mottramite.

IMA Code 02-A - Tripuhyite is **redefined** as FeSbO<sub>4</sub> and squawcreekite of Ford et al. (1991) is **discredited**.

IMA Code 02-B - Arhbarite is **redefined** as triclinic Cu<sub>2</sub>Mg(AsO<sub>4</sub>)(OH)<sub>3</sub>.

IMA Code 02-D - The mineral name mahlmoodyite is **corrected** in mahlmoodyite.

Name change approved – “magnocolumbite” is now magnesiocolumbite