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NEW MINERALS APPROVED IN 2001 BY THE COMMISSION ON NEW MINERALS AND MINERAL NAMES, INTERNATIONAL MINERALOGICAL ASSOCIATION

JOEL D. GRICE*

Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ontario K1P 6P4, Canada

GIOVANNI FERRARIS**

Dipartimento di Scienze Mineralogiche e Petrologiche, Università di Torino, Via Valperga Caluso 35, I-10125 Torino, Italy

The information given here is provided by the Commission on New Minerals and Mineral Names (CNMMN), International Mineralogical Association (IMA), for comparative purposes and as a service to mineralogists working on new species. Each mineral is described in the following format:

IMA Number
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 [d in Å(I)]

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.

2001 PROPOSALS

IMA No. 2001-001

SmPO₄

Monazite group;
structure determined

Monoclinic: $P2_1/n$

a 6.725, b 6.936, c 6.448 Å, β 104.02°

Yellowish; vitreous to greasy

Biaxial (+), α 1.768, β 1.771, γ 1.808, $2V$ (meas.) 29°, $2V$ (calc.) 32°

5.19(40), 4.65(50), 4.16(80), 3.492(40), 3.264(70), 3.065(100), 2.857(90)

IMA No. 2001-002

Cu₁₇Bi₁₇S₃₅

Related to cuprobismutite

Monoclinic: $C2/m$ (15)

a 35.054, b 3.91123, c 43.192 Å, β 96.713°

Lead grey, metallic; opaque

In reflected light (oil with $N_D = 1.515$): dark brown; internal reflectance: not observed; weakly anisotropic. R_{\min} and R_{\max} : 40.6–42% (460 nm), 41.1–43% (540 nm), 41.1–43.15% (580 nm), 40.9–43.4% (640 nm) 5.36(40), 4.08(50), 3.904(37), 3.585(34), 3.120(40), 3.104 (68), 2.759 (53), 2.752 (44), 1.956(100)

* Chairman, CNMMN. E-mail address: jgrice@mus-nature.ca

** Vice-chairman, CNMMN. E-mail address: ferraris@dsm.unito.it

- IMA No. **2001-004**
 $\text{CaCu}_6[(\text{PO}_4)_2(\text{PO}_3\text{OH})(\text{OH})_6]\cdot 3\text{H}_2\text{O}$ Mixite group
 Hexagonal: $P6_3/m$
 a 13.284, c 5.902 Å
 Olive green; vitreous; translucent to transparent
 Uniaxial (+), ω 1.674, ε >1.739 (~1.75)
 11.51(100), 4.35(88), 4.14(46), 3.837(38), 3.321(44),
 2.888(53), 2.877(37)
- IMA No. **2001-005**
 PdSe_2 New structure-type
 Monoclinic: $C2/m$
 a 6.659, b 4.124, c 4.438 Å, β 92.76°
 Black; metallic; opaque
 In reflected light (air): white; internal reflectance: none;
 moderate anisotropy. R_{\min} and R_{\max} : 47.7–51.8% (460
 nm), 48.8–53.0% (540 nm), 48.5–55.0% (580 nm),
 48.7–56.9% (640 nm)
 4.42(30), 3.496(30), 2.718(100), 2.063(20), 1.955(50),
 1.896(50), 1.815(20)
- IMA No. **2001-006**
 $\text{K}_2\text{Zn}(\text{Nb},\text{Ti})_4(\text{Si}_4\text{O}_{12})_2$ Labuntsovite group;
 $(\text{O},\text{OH})_4\cdot 6\text{H}_2\text{O}$ structure determined
 Monoclinic: $C2/m$
 a 14.535, b 13.927, c 15.665 Å, β 117.6°
 Pink, pinkish brown, white; vitreous; translucent
 Biaxial (+), α 1.683, β 1.688, γ 1.785, $2V$ (meas.) 45°,
 $2V$ (calc.) 27°
 6.96(100), 6.43(24), 4.92(30), 3.222(84), 3.114(66),
 2.514(30), 1.430(22)
- IMA No. **2001-007**
 $(\text{K},\text{Ba})_2\text{Fe}(\text{Ti},\text{Nb})_4(\text{Si}_4\text{O}_{12})_2$ Labuntsovite group;
 $(\text{O},\text{OH})_4\cdot 7\text{H}_2\text{O}$ structure determined
 Monoclinic: $C2/m$
 a 14.410, b 13.880, c 15.587 Å, β 117.53°
 Orange to reddish orange; vitreous; translucent
 Biaxial (+), α 1.687, β 1.689, γ 1.805, $2V$ (meas.) 22°,
 $2V$ (calc.) 16°
 6.91(10), 4.87(60), 3.19(10), 3.09(10), 2.58(7),
 1.524(9), 1.422(8)
- IMA No. **2001-008**
 KAlSiO_4 Close to kalsilite;
 structure determined
 Hexagonal: $P6_3$
 a 18.106, c 8.462 Å
 Colorless; vitreous; transparent
 Uniaxial (–), ω 1.538, ε 1.531
 3.18(50), 3.091(100), 2.612(70), 1.674(50),
 1.585(50), 1.516(50), 1.240(60)
- IMA No. **2001-009**
 $\text{K}_2(\text{H}_2\text{O})_2(\text{Fe},\text{Mn})[(\text{Nb},\text{Ti})_4$ Labuntsovite group;
 $(\text{Si}_4\text{O}_{12})_2(\text{O},\text{OH})_4]\cdot 4\text{H}_2\text{O}$ structure determined
 Monoclinic: $C2/m$
 a 14.529, b 13.943, c 7.837 Å, β 117.61°
- Pale yellow, yellow, orange yellow; vitreous to waxy;
 translucent, rarely transparent
 Biaxial (+): α 1.6676, β 1.7001, γ 1.794, $2V$ (meas.)
 58.5°, $2V$ (calc.) 63.71°
 6.92(80), 6.42(50), 4.94(70), 3.225(100), 3.114(80),
 3.069(20), 2.512(50)
- IMA No. **2001-010**
 $(\text{Ag}_3\text{Hg})(\text{V},\text{As})\text{O}_4$ New structure-type
 Tetragonal: $I\bar{4}$
 a 7.727, c 4.648 Å
 Red, brownish red; adamantine; translucent
 Uniaxial (+), ω ~2.3, ε ~2.5
 5.45(25), 2.772(100), 2.735(100), 2.324(30), 2.254(20),
 1.728(15), 1.683(15)
- IMA No. **2001-012**
 $\text{CsNa}_6[\text{Be}_2(\text{Si},\text{Al})_{18}\text{O}_{39}\text{F}_2]$ Related to leifite;
 structure determined
 Trigonal: $P3$
 a 14.3770, c 4.8786 Å
 White; vitreous; transparent
 Uniaxial (+), ω 1.526, ε 1.531
 6.23(35), 4.15(50), 3.456(40), 3.382(75), 3.162(100),
 3.113(36), 2.465(30)
- IMA No. **2001-013**
 ZrSiO_4 Scheelite structure
 Tetragonal: $I4_1/a$
 a 4.738, c 10.506 Å
 White; adamantine; translucent
 Indices >> 1.64, maximum birefringence roughly 0.015
 4.30(40), 3.29(40), 2.81(100), 2.065(50), 1.805(30),
 1.755(60), 1.55(45), 1.437(50)
- IMA No. **2001-014**
 $\text{CaSr}(\text{Mn}^{3+},\text{Fe}^{3+})_2$ Epidote group;
 $\text{Al}[\text{Si}_3\text{O}_{12}](\text{OH})$ structure determined
 Monoclinic: $P2_1/m$
 a 8.900, b 5.700, c 10.350 Å, β 114.50°
 Deep red; vitreous; transparent
 Biaxial (+), average index of refraction 1.825
 3.513(50), 2.936(100), 2.854(40), 2.703(80), 2.586(80),
 2.415(30), 2.182(80)
- IMA No. **2001-015**
 $\text{Cu}_{2.68}\text{Pb}_{2.68}\text{Bi}_{5.32}\text{S}_{12}$ Derivative of bismuthinite;
 structure determined
 Orthorhombic: $Pmc2_1$
 a 4.0285, b 44.986, c 11.599 Å
 Tin white; metallic; opaque
 In reflected light (air): white; internal reflectance: none;
 moderate anisotropy. R_{\min} and R_{\max} : 39.52–46.88%
 (460 nm), 39.26–48.06% (540 nm), 39.02–48.34% (580
 nm), 38.51–47.35% (640 nm)
 4.04(49), 3.656(100), 3.605(49), 3.567(81), 3.174(71),
 3.152(78), 2.852(95)

- IMA No. **2001-016**
 $\text{Cu}_{1.7}\text{Pb}_{1.7}\text{Bi}_{6.3}\text{S}_{12}$ Derivative of bismuthinite;
 structure determined
 Orthorhombic: *Pmcn*
 a 4.0070, b 55.998, c 11.512 Å
 Tin white; metallic; opaque.
 In reflected light (air): white; internal reflectance: none;
 distinct anisotropy. R_{\min} and R_{\max} : 38.32–48.16% (460
 nm), 37.42–48.56% (540 nm), 36.93–48.09% (580 nm),
 36.20–46.69% (640 nm)
 4.01 (56), 3.63(100), 3.58(55), 3.55(85), 3.155(57),
 3.136(92), 2.836(93), 2.560(41)
- IMA No. **2001-017**
 $\text{Cu}_{3.4}\text{Fe}_{0.6}\text{Bi}_5\text{S}_{10}$ Cuprobismutite series;
 structure determined
 Monoclinic: *C2/m*
 a 17.512, b 3.9103, c 12.869 Å, β 108.57°
 Grey; metallic; opaque.
 In reflected light (air): greyish white; internal reflec-
 tance: none; moderate anisotropy. R_{\min} and R_{\max} :
 33.48–40.29% (460 nm), 33.90–41.06% (540 nm),
 34.15–41.28% (580 nm), 34.26–41.42% (640 nm)
 6.03(42), 3.596(68), 3.239(34), 3.213(44), 3.128(100),
 3.071(70), 2.683(48)
- IMA No. **2001-018**
 $\text{TlAl}[\text{SO}_4]_2 \cdot 12\text{H}_2\text{O}$
 Cubic: *Pa3*
 a 12.212 Å
 Light yellow to white; vitreous; transparent
 Isotropic; n 1.495
 7.03(54), 6.11(27), 4.31(100), 3.676(22), 3.524(24),
 2.801(70), 2.731(35)
- IMA No. **2001-019**
 $[\text{Ca}_3(\text{REE})_4(\text{REE})_2\text{Al}]_2[\text{Si}_4\text{B}_4\text{O}_{22}](\text{OH},\text{F})_2$ Hellandite group;
 structure determined
 Monoclinic: *P2/a*
 a 19.068, b 4.745, c 10.289 Å, β 111.18°
 Pale-brown; vitreous; transparent
 Biaxial (–); cf. **2001-020**
 3.238(50), 2.916(35), 2.855(56), 2.652(100), 2.635(73),
 1.905(49), 1.901(41)
- IMA No. **2001-020**
 $\text{Ca}_4(\text{Ca},\text{Ce})_2\text{AlBe}_2[\text{Si}_4\text{B}_4\text{O}_{22}](\text{O})_2$ Hellandite group;
 structure determined
 Monoclinic: *P2/a*
 a 19.032, b 4.746, c 10.248 Å, β 110.97°
 Brownish; vitreous; transparent
 Biaxial (–), α 1.680(5), β 1.694(2), γ 1.708(5),
 $2V(\text{meas.}) \sim 90^\circ$, $2V(\text{calc.})$ 89.3°
 3.238(39), 3.080(41), 2.916(41), 2.855(48), 2.644(100),
 2.635(80), 1.905(46)
- IMA No. **2001-021**
 $\text{Ca}_4[(\text{Th},\text{U})(\text{REE})_2\text{Al}]_2[\text{Si}_4\text{B}_4\text{O}_{22}](\text{OH},\text{F})_2$ Hellandite group;
 structure determined
 Monoclinic: *P2/a*
 a 19.059, b 4.729, c 10.291 Å, β 111.33°
 Pale brown; vitreous; transparent
 Biaxial (–), cf. **2001-20**
 4.729(72), 3.454(79), 3.089(86), 2.846(100), 2.653(80),
 2.648(79), 2.634(84)
- IMA No. **2001-022**
 $\text{Pb}_2\text{Fe}^{3+}(\text{VO}_4)_2(\text{OH})$ Mn-free brackebuschite
 Monoclinic: *P2₁/m*
 a 7.66, b 6.12, c 8.93 Å, β 112.0°
 Red-orange to red-brown; vitreous or adamantine; trans-
 lucent to transparent
 Indices of refraction > 2.1
 4.89(43), 4.17(34), 3.253(100), 3.062(25), 2.989(48),
 2.755(48), 2.450(20)
- IMA No. **2001-023** Close to astrophyllite
 $(\text{Ca},\text{K},\text{Na},\text{Sr},\text{Ba})_{48}[(\text{Ti},\text{Nb},\text{Fe},\text{Mn})_{12}(\text{OH})_{12}\text{Si}_{48}\text{O}_{144}]$
 $(\text{F},\text{OH},\text{Cl})_{14}$
 Monoclinic: *P*/**, c unique axis
 a 14.069, b 24.937, c 44.31 Å, β 95.02°
 Light brown, yellow; silky; semitransparent
 Biaxial (–), α 1.631, β 1.641, γ 1.647, $2V(\text{calc.})$ 75°
 12.33(51), 6.199(42), 3.127(65), 3.110(52), 2.990(59),
 2.940(45), 2.835(100)
- IMA No. **2001-024**
 CaV_3O_7
 Orthorhombic: *Pnam*
 a 10.42, b 5.28, c 10.34 Å
 Pale olive green; vitreous; transparent
 $n \approx 2$
 5.16(m), 3.45(w), 3.00(s), 2.88(w), 1.85(m)
- IMA No. **2001-026**
 $\text{Ca}(\text{Mn}^{3+},\text{Mg},\square)_2(\text{AsO}_4)_2$ Tsumcorite group;
 structure determined
 Monoclinic: *C2/m*
 a 9.043, b 6.2314, c 7.3889 Å, β 116.392°
 Brown-red to dark reddish orange; vitreous; transparent
 Biaxial (+), α 1.785, β 1.814, γ 1.854, $2V(\text{meas.}) \sim 85^\circ$,
 $2V(\text{calc.})$ 82°
 4.93(80), 3.182(100), 2.927(70), 2.822(70), 2.718(80),
 2.555(100), 2.134(70)

IMA No. **2001-027**(Y,REE)₄Cu(CO₃)₄Cl(OH)₅•2H₂OMonoclinic: *P2*, *Pm*, or *P2/m**a* 8.899, *b* 22.77, *c* 8.589 Å, β 120.06°

Intense royal blue turquoise-blue; pearly on cleavages; transparent

Biaxial (–), α 1.608, β ≈ γ 1.638

22.78(30), 7.46(30), 7.09(50), 6.24(100), 4.22(30), 3.530(40), 3.336(30)

IMA No. **2001-028**(Na,Ca,K)₂Ca(Nb,Ti)₄(Si₄O₁₂)₂(O,OH)₄•7H₂O

Labuntsovite group; structure refined

Monoclinic: *C2/m**a* 14.641, *b* 14.214, *c* 7.9148 Å, β 117.36°

White; vitreous; translucent

Biaxial (+), α 1.656, β 1.662, γ 1.755, 2*V*(meas.) 30°, 2*V*(calc.) 29.7°

7.10(73), 7.03(100), 6.48(45), 5.00(74), 3.253(38), 3.171(56), 3.150(38)

IMA No. **2001-029**Cu(CH₃COO)₂•H₂O

Structure determined

Monoclinic: *C2/c**a* 13.162, *b* 8.555, *c* 13.850 Å, β 117.08°

Bluish green; vitreous; transparent

Biaxial (+), α 1.533, β 1.541, γ 1.554, 2*V*(meas.) 85°, 2*V*(calc.) 76°

6.92(100), 6.18(14), 5.87(9), 5.38(10), 3.592(11), 3.532(28), 2.278(10)

IMA No. **2001-030**CaCu(CH₃COO)₄•6H₂OTetragonal: *I4/m**a* 11.155, *c* 16.236 Å

Deep sky blue; vitreous; translucent

Uniaxial (+), ω 1.439, ε 1.482

9.30(6), 8.13(8), 7.90(100), 5.59(15), 3.530(20), 3.042(3), 2.497(4)

IMA No. **2001-031**Pb₂Al(PO₄)(VO₄)(OH)Brackebuschite group;
structure determinedMonoclinic: *P2₁/m**a* 7.734, *b* 5.814, *c* 8.69 Å, β 112°

Bright yellow; vitreous; translucent

Biaxial (–), α 1.99, β 2.03, γ 2.06, 2*V*(meas.) large, 2*V*(calc.) 80°

4.68(80), 3.57(50), 3.21(100), 2.91(80), 2.71(70), 2.27(40), 2.05(50)

IMA No. **2001-032**NaLi₂(Fe³⁺₂Mg₂Li)Si₈O₂₂(OH)₂Amphibole group;
structure determinedMonoclinic: *C2/m**a* 9.501, *b* 17.866, *c* 5.292 Å, β 102.17°

Black; vitreous; translucent

Biaxial (–), α 1.695, β 1.700, γ 1.702, 2*V*(meas.) 125°, 2*V*(calc.) 116°

8.25(29), 4.47(22), 3.050(100), 2.747(31), 2.711(37), 1.642(39), 1.394(32)

IMA No. **2001-033**(Cu,Ag)Pb₁₀Sb₁₂S₂₇(Cl,S)_{0.6}OZinkenite group;
structure determinedMonoclinic: *C2/m**a* 55.824, *b* 4.0892, *c* 24.128 Å, β 113.14°

Black; metallic; opaque

In reflected light (air): R (polarization direction perpendicular to the elongation of the measured crystal): 38.6% (460 nm), 37.4% (540 nm), 37.0% (580 nm), 35.3% (640 nm)

4.01(25), 3.423(100), 2.779(22), 2.274(32), 2.225(43), 2.142(21), 2.081(23)

IMA No. **2001-034**(Pb,Sr)(Y,Mn)Fe₂(Ti,Fe)₁₈O₃₈Crichtonite group;
structure determinedTrigonal: *R**a* 10.411, *c* 20.97 Å

Black; metallic; opaque

In reflected light (air): black; internal reflectance: none; very weak anisotropy; R : 19.2% (470 nm), 17.9% (546 nm), 17.6% (589 nm), 17.4% (650 nm)

3.002(100), 2.892(70), 2.852(50), 2.258(70), 2.147(50), 1.809(60), 1.606(95)

IMA No. **2001-035**Hg²⁺Hg¹⁺₁₀O₄I₂(Cl_{1.16}Br_{0.84})_{Σ2}

New structure-type

Triclinic: *A1**a* 7.0147, *b* 11.8508, *c* 12.5985 Å, α 115.583, β 82.575, γ 100.619°

Very dark red to black; vitreous to adamantine to submetallic; opaque to translucent

In reflected light (air): bluish white; internal reflectance: deep red to purplish red; moderate anisotropy. R_{min} and R_{max}: 27.40–29.85% (460 nm), 24.60–27.70% (540 nm), 23.10–25.90% (580 nm), 21.80–24.00% (640 nm) 6.52(30), 5.28(50), 3.143(90), 3.005(70), 2.885(100), 2.675(90), 2.508(40)IMA No. **2001-036**(K,Na)Ca₂(Mg,Fe²⁺)₄Al

Amphibole group

(Si₆Al₂O₂₂)(Cl,OH)₂Monoclinic: *C2/m**a* 9.843, *b* 18.130, *c* 5.362 Å, β 105.5°

Black; vitreous; opaque

Biaxial (–), α 1.675, β 1.687, γ 1.690, 2*V*(meas.) 65°, 2*V*(calc.) 53°

8.42(80), 3.12(30), 2.951(30), 2.714(100), 2.562(70), 1.444(30)

- IMA No. 2001-037**
 $\text{K}_2\text{Zn}(\text{Ti,Nb})_4(\text{Si}_4\text{O}_{12})_2(\text{OH},\text{O})_4 \cdot 6\text{--}8\text{H}_2\text{O}$ Labuntsovite group;
 structure determined
 Monoclinic: *Cm*
 a 14.43, b 13.898, c 7.797 Å, β 117.4°
 Colorless, white, grayish, pale pink, light brown; vitreous;
 transparent to translucent.
 Biaxial (+), α 1.680, β 1.688, γ 1.785, $2V(\text{meas.})$ 25°, $2V(\text{calc.})$ 33°.
 6.97(100), 3.20(90), 3.10(80), 2.59(40), 2.48(50), 1.734(40), 1.695(40), 1.422(60)
- IMA No. 2001-038**
 $\text{CaK}_2\text{Mn}(\text{Ti,Nb})_4(\text{Si}_4\text{O}_{12})_2(\text{O},\text{OH})_4 \cdot 5\text{H}_2\text{O}$ Labuntsovite group;
 structure determined
 Monoclinic: *Cm*
 a 14.30, b 13.889, c 7.760 Å, β 117.51°
 Pale yellowish pink; vitreous; transparent.
 Biaxial (+), α 1.688, β 1.700, γ 1.805, $2V(\text{meas.})$ 35°, $2V(\text{calc.})$ 39°.
 7.0(70b), 6.33(50), 3.22(90), 3.05(100), 2.57(50), 2.48(60), 1.520(30), 1.428(30)
- IMA No. 2001-039**
 $\text{NaFe}^{2+}_6\text{Al}_3(\text{SO}_4)_2(\text{OH})_{18}(\text{H}_2\text{O})_{12}$ Halotrichite group;
 structure determined
 Trigonal: $R\bar{3}$
 a 9.347, c 33.000 Å
 Green; dull; transparent
 Uniaxial (–), ω 1.560(1), ε not measurable
 10.98(100), 5.54(60), 4.31(20), 3.67(50), 2.624(25), 2.425(30), 2.176(20), 1.932(30)
- IMA No. 2001-040**
 $\text{VO}(\text{SO}_4)(\text{H}_2\text{O})_5$ Polymorph of minasragrite;
 structure determined
 Triclinic: $P\bar{1}$
 a 7.533, b 7.792, c 7.818 Å, α 78.96, β 71.86, γ 65.41°
 Pale blue, vitreous, transparent
 Biaxial (+), α 1.548, β 1.555, γ 1.574, $2V(\text{meas.})$ 86°, $2V(\text{calc.})$ 63°
 7.05(80), 6.62(100), 5.314(30), 4.12(80), 3.71(80), 3.21(70), 2.934(50), 2.555(30)
- IMA No. 2001-041**
 $\text{Na}_{15}\text{Sr}_{12}\text{Zr}_{14}\text{Si}_{42}\text{B}_6\text{O}_{138}(\text{OH})_6 \cdot 12\text{H}_2\text{O}$ Benitoite group;
 structure determined
 Hexagonal: $P6_3cm$
 a 19.720, c 7.9148 Å
 Grey, pale green, and brown; vitreous, translucent
 Uniaxial (+), ω 1.627, ε 1.645
 9.87(23), 6.46(38), 5.43(33), 3.96(51), 3.76(49), 3.30(23), 3.13(70), 2.752(100)
- IMA No. 2001-042**
 $(\text{La,Ce,Ca})_9(\text{Fe}^{3+},\text{Mg})(\text{SiO}_4)_6[\text{SiO}_3(\text{OH})](\text{OH})_3$ La-dominant
 analogue of cerite-(Ce);
 structure determined
 Trigonal: $R3c$
 a 10.7493, c 38.318 Å
 Light-yellow to pinkish brown; vitreous; translucent
 Uniaxial (+), ε 1.820, ω 1.810
 3.47(40), 3.31(38), 2.958(100), 2.833(37), 2.689(34), 1.949(34)
- IMA No. 2001-043**
 $\text{Na}_2\text{KMn}_2\text{LiV}_2\text{Si}_8\text{O}_{24}$ Isostructural with neptunite;
 structure determined
 Monoclinic: *Cc* or *C2/c*
 a 16.450, b 12.492, c 9.995 Å, β 115.32°
 Yellow green, vitreous, translucent
 Biaxial (+), α 1.686, $\beta(\text{calc})$ 1.694, γ 1.720, $2V$ 60°
 9.58(84), 4.52(85), 3.52(63), 3.19(100), 2.94(90), 2.90(66), 2.49(93)
- IMA No. 2001-044**
 $\text{Ca}_2\text{Be}_4(\text{Fe}^{2+},\text{Mn})_5(\text{PO}_4)_6(\text{OH})_4 \cdot 6\text{H}_2\text{O}$ Fe-dominant
 analogue of roscherite;
 structure determined
 Monoclinic: *C2/c*
 a 15.903, b 11.885, c 6.677 Å, β 94.68°
 Dark olive green; vitreous; transparent
 Biaxial (–), α 1.624, β 1.634, γ 1.638, $2V(\text{meas.})$ 80°, $2V(\text{calc.})$ 64°
 9.48(100), 5.94(80), 4.82(60), 3.96(90), 3.07(60), 2.982(70), 2.783(80), 2.638(70)
- IMA No. 2001-045**
 $\text{KMn}_3(\text{AlSi}_3)\text{O}_{10}(\text{OH},\text{F})_2$ Mn-dominant analogue
 of phlogopite; structure determined
 Monoclinic: *C2/m*
 a 5.3791, b 9.319, c 10.2918 Å, β 100.18°
 Dark reddish brown; pearly to vitreous, transparent
 Biaxial (–), α 1.592, $\beta \approx \gamma$ 1.635, $2V$ very small.
 10.09(100), 3.43(33), 3.38(51), 2.646(96), 2.458(46), 2.194(36)
- IMA No. 2001-048**
 $(\text{Fe,Mg,Zn,Al})_6\text{Al}_{14}(\text{Ti,Fe})_2\text{O}_{30}(\text{OH})_2$ Högbomite group;
 structure determined
 Hexagonal: $P6_3mc$
 a 5.734, c 18.389 Å
 Chestnut brown; adamantine; translucent
 Uniaxial (–), ω 1.852, ε 1.827
 2.948(32), 2.860(53), 2.603(88), 2.427(100), 2.053(34), 1.475(44), 1.430(56)

IMA No. **2001-049**

$\text{KNa}_2\text{Mg}_2\text{Fe}^{3+}_2\text{LiSi}_8\text{O}_{22}(\text{OH})_2$ Amphibole group;
structure determined

Monoclinic: $C2/m$

a 9.922, b 17.987, c 5.286 Å, β 104.07°

Reddish brown; vitreous; translucent

Biaxial (+), α 1.672, β 1.680, γ 1.692, $2V(\text{calc.})$ 79°
8.48(67), 4.50(89), 3.40(46), 3.28(45), 3.16(72),
2.83(49), 2.74(44), 2.71(41), 2.53(100), 2.34(38)

IMA No. **2001-050**

$(\text{Ca,REE})_4(\text{Al,Mg,Fe})_4$ Related to epidote;
 $[\text{Si}_2\text{O}_7][\text{SiO}_4]_3(\text{O,F,OH})_3$ structure determined

Monoclinic: $P2_1/a$

a 17.770, b 5.651, c 17.458 Å, β 116.18°

Colorless; vitreous; transparent to translucent

Biaxial; n_{calc} 1.807

15.67(87), 7.97(27), 4.61(33), 3.49(50), 2.967(100),
2.826(44), 2.740(32), 2.610(56)

IMA No. **2001-051**

$\text{Ca}_{16}(\text{Mg,Li},\square)_2[\text{B}_{13}\text{O}_{17}$ Structure determined
 $(\text{OH})_{12}]_4\text{Cl}_6 \cdot 28\text{H}_2\text{O}$

Orthorhombic: $Pba2$

a 15.52, b 22.74, c 8.761 Å

Colorless to white; vitreous; transparent to translucent

Biaxial (+), α 1.516, β 1.532, γ 1.554, $2V(\text{meas.})$ 82°,
 $2V(\text{calc.})$ 82.0°
12.82(100), 7.78(80), 6.80(20), 6.32(40), 5.65(30),
4.14(20), 3.17(30), 2.570(30), 2.413(20)

IMA No. **2001-052**

$\text{CoFe}^{3+}_2(\text{AsO}_4)_2(\text{OH})_2 \cdot 4\text{H}_2\text{O}$ Co-dominant analogue
of arthurite; structure determined

Monoclinic: $P2_1/c$

a 10.27, b 9.72, c 5.545 Å, β 94.46°

Straw yellow to dark brown; vitreous to silky; translucent

Biaxial (+), α 1.741, β 1.762, γ 1.797, $2V(\text{calc.})$ 76.8°
10.2(95), 7.04(100), 4.81(65), 4.51(20), 4.24(60),
3.05(20), 2.89(25), 2.87(55)

IMA No. **2001-053**

$(\text{Fe,Mg})\text{S}$ Fe-dominant analogue of niningerite
Cubic: $Fm\bar{3}m$

a 5.17 Å

Gray in reflected light; opaque

2.985(8), 2.585(100), 1.828(60), 1.492(15), 1.292(7),
1.156(13), 1.055(10)

IMA No. **2001-054**

$\text{CaFe}^{3+}_2(\text{AsO}_4)_2(\text{OH})_2$ Ca-dominant analogue
of carminite; structure determined

Orthorhombic: $Cccm$

a 16.461, b 7.434, c 12.131 Å

Dark red to lighter red-orange; vitreous; translucent

In reflected light: light bluish grey with internal reflections,
anisotropy absent. R_{min} and R_{max} : 10.12–10.71%
(460 nm), 9.53–10.07% (540 nm), 9.30–9.98% (580
nm), 8.99–9.66% (640 nm)
4.87(90), 3.47(50), 3.39(60), 3.26(40), 3.17(100),
3.02(50), 2.988(50), 2.919(70), 2.696(40), 2.503(90)

IMA No. **2001-055**

$\text{CaSrAl}_3(\text{Si}_2\text{O}_7)(\text{SiO}_4)\text{O}(\text{OH})$ Epidote group;
structure determined

Monoclinic: $P2_1/m$

a 8.890, b 5.5878, c 10.211 Å, b 115.12°

Pale grey; vitreous; transparent

Biaxial; $n \approx 1.725$

5.05(23), 3.22(25), 2.90(100), 2.79(48), 2.70(26),
2.60(24), 2.11(24)

IMA No. **2001-056**

$[\text{Mg}_3(\text{H}_2\text{O})_{28}](\text{UO}_2)_8(\text{SO}_4)_4\text{O}_6(\text{OH})_2$ Zippeite group;
structure determined

Triclinic: $P\bar{1}$

a 10.815, b 11.249, c 13.851 Å, α 66.224, β 72.412,
 γ 69.95°

Yellow-orange; vitreous; transparent

Biaxial; n 1.735–1.750

9.46(100), 8.63(20), 6.46(20), 6.33(20), 4.73(80),
3.44(80), 3.39(70), 3.16(20), 3.11(20), 3.08(20),
2.88(30)

IMA No. **2001-057**

$\text{Ca}_6\text{B}_{14}\text{O}_{19}(\text{SO}_4)(\text{OH})_{14} \cdot 5\text{H}_2\text{O}$

Monoclinic (pseudo-hexagonal): $P2/m$, $P2$, or Pm

a 14.10, b 19.53, c 14.05 Å, β 120.39°

White; vitreous; transparent

Biaxial (–), α 1.532, β 1.537, γ 1.540, $2V(\text{meas.})$ 75°,
 $2V(\text{calc.})$ 75°

12.2(100), 4.42(40), 3.45(50), 3.04(60), 2.911(40),
2.720(70), 2.108(40), 1.992(50)

IMA No. **2001-058**

$(\text{Cu}_{0.70-0.30})(\text{Cd}_{1.68}\text{Ca}_{0.32})_{\Sigma 2.00}\text{Al}_3$ New structure-type
 $(\text{PO}_4)_4\text{F}_2(\text{H}_2\text{O})_{10}(\text{H}_2\text{O,F})_2$

Triclinic: $P\bar{1}$

a 6.787, b 9.082, c 10.113(2) Å, α 101.40, β 104.27,
 γ 102.51°

Pale blue to blue-grey; vitreous to glassy; transparent to
translucent

Biaxial (+), α 1.570, β 1.573, γ 1.578, $2V(\text{meas.})$ 30°,
 $2V(\text{calc.})$ 75.7°

9.43(100), 4.73(30), 3.70(30), 3.17(30), 3.01(30),
2.896(30), 2.820(50)

IMA No. **2001-059**

(Na,□,Ca)₁₁Ca₄(Si,S,B)₁₄
B₂O₄₀F₂•4H₂O
Triclinic: *P* $\bar{1}$

a 9.5437, *b* 14.0268, *c* 9.5349 Å, α 71.057, β 119.788, γ 105.846°
Colorless to purple; vitreous; transparent
Biaxial (–), α 1.529, β 1.549, γ 1.551, 2*V*(meas.) 38°, 2*V*(calc.) 35°
13.18(100), 6.58(43), 3.29(34), 2.968(37), 2.908(27), 1.794(20)

Reyerite group;
structure determined

IMA No. **2001-060**

Ba(Na,Ba) {Na₃Ti[Ti₂O₂Si₄O₁₄](OH,F)₂}
Monoclinic: *P2/m*

a 19.741, *b* 7.105, *c* 5.408 Å, β 96.67°
Brown to yellowish brown; vitreous; translucent
Biaxial (+), α 1.750, β 1.755 (calc.), γ 1.799, 2*V*(meas.) 40°
9.87(96), 3.75(65), 3.45(90), 3.28(78), 3.04(41), 2.797(100), 2.610(43)

Lamprophyllite group;
structure determined

IMA No. **2001-061**

Pd₈Hg₃Se₉
Orthorhombic: *Pmmm*, *P2₁mn* or *Pm2₁n*
a 7.219, *b* 16.782, *c* 6.467 Å

Buff to beige (reflected light); metallic; opaque
In reflected light (air): buff to beige; internal reflections not observed, anisotropy moderate. *R*_{min} and *R*_{max}: 46.2–50.8% (460 nm), 49.3–53.1% (540 nm), 49.9–53.2% (580 nm), 49.3–52.9% (640 nm)
4.82(40), 4.37(40), 2.797(60), 2.743(100), 2.325(40), 2.116(40), 2.091(100)

IMA No. **2001-062**

(UO₂)Bi₄(PO₄)O₄•2H₂O
Triclinic: *P* $\bar{1}$
a 7.060, *b* 10.238, *c* 5.464 Å, α 101.22, β 109.93, γ 87.93°

Brownish grey; vitreous to adamantine: translucent
Biaxial, *n* ≈ 1.9
10.06(100), 3.35(43), 3.25(72), 3.12(86), 3.08(95), 3.00(52), 2.726(42)

P-dominant analogue
of walpurgite

IMA No. **2001-063**

K(NaMg₂)Si₄O₁₀F₂
Monoclinic: *C2/m*
a 5.269, *b* 9.071, *c* 10.178 Å, β 100.03°

Colorless to pale grey; pearly to vitreous; transparent to translucent
Biaxial (–), α 1.526, β 1.553, γ 1.553, 2*V*(meas.) 5°, 2*V*(calc.) 0°
10.0(70), 3.36(90), 2.59(90), 2.41(100), 1.665(80), 1.522(100)

IMA No. **2001-064**

NaMg₆[Si₃AlO₁₀](OH,O)₈•H₂O
Triclinic: *C1* (No.1)

a 5.354, *b* 9.263, *c* 14.653 Å, α 89.860, β 96.844, γ 90.030°
Colorless; vitreous; transparent
Biaxial (+), α 1.569, β 1.569, γ 1.571, 2*V*(meas.) 17°, 2*V*(calc.) 0°
7.27(30), 4.63(30), 2.992(40), 2.597(60), 2.556(100), 2.457(50), 1.544(100)

Structure determined

IMA No. **2001-065**

(Mg,Fe)₇Si₈O₂₂(OH)₂
Orthorhombic: *Pnmm*

a 9.3553, *b* 17.9308, *c* 5.3117 Å
White; vitreous; translucent
Biaxial (–), α 1.593, β (calc.) 1.609, γ 1.615, 2*V*(meas.) 64°
8.32(71), 3.66(100), 3.27(49), 3.08(81), 2.84(96), 2.56(49), 2.51(57)

Amphibole group;
structure determined

IMA No. **2001-066**

□Li₂(Fe³⁺₂Fe²⁺₃)Si₈O₂₂(OH)₂
Monoclinic: *C2/m*

a 9.462, *b* 17.898, *c* 5.302 Å, β 101.88°
Black; vitreous; translucent
Biaxial, no other optical properties given
8.23(40), 3.04(47), 2.718(100), 2.491(51), 1.584(19), 1.389(27)

Amphibole group;
structure determined

IMA No. **2001-067**

□Li₂(Fe³⁺₂Mg₃)Si₈O₂₂(OH)₂
Monoclinic: *C2/m*

a 9.535, *b* 17.876, *c* 5.234 Å, β 102.54°
Black; vitreous; translucent
Biaxial, no other optical properties given
8.27(15), 3.41(18), 3.06(36), 2.710(100), 2.501(68), 1.581(19), 1.399(20)

Amphibole group;
structure determined

PROPOSALS FROM PREVIOUS YEARS APPROVED IN 2001

IMA No. **1997-040**

$(\text{Na,K,Ca})_x(\text{Al,Fe,Mg})_4(\text{Si,Al})_8\text{O}_{20}(\text{OH})_4 \cdot n\text{H}_2\text{O}$, $x = 0.35$, $n = 3.54$
 Pseudomonoclinic: pseudo $2/m$
 a 5.2, b 9.1, c 24.4 Å
 Grey to yellowish grey; dull; transparent
 No optical properties obtainable
 22.3(48), 11.0(100), 7.32(2), 5.48(7), 4.47(3), 3.17(33), 2.01(4)

Pyrophyllite group

IMA No. **1998-070**

$\text{Pb}(\text{U}^{4+}, \text{U}^{6+})(\text{Ti, Fe}^{2+}, \text{Fe}^{3+})_{20}(\text{O, OH})_{38}$
 Trigonal: $R\bar{3}$
 a 10.576, c 21.324 Å
 Black; submetallic, opaque
 In reflected light (air): light grey; internal reflections not observed, isotropic. R: 18.4% (460 nm), 17.5% (540 nm), 17.4% (580 nm), 17.4% (640 nm)
 6.86(30), 5.16(30), 3.41(60), 3.23(25), 3.06(30), 2.993(30), 2.891(60), 2.858(40), 2.248(35)

Crichtonite group

IMA No. **1999-037**

$\text{NaCaCu}_5(\text{AsO}_4)_4\text{Cl} \cdot 5\text{H}_2\text{O}$
 Tetragonal: $P4_122$ or $P4_322$
 a 10.0156, c 36.691 Å
 Dark blue; vitreous; translucent
 Uniaxial (-), ω 1.749, ε 1.647
 9.18(100), 4.59(40), 4.17(11), 3.06(18), 2.610(6)

IMA No. **2000-013**

$\text{Li}_{1+3x}\text{Al}_{4-x}(\text{BSi}_3)\text{O}_{10}(\text{OH})_8$, Chlorite group
 where $0 < x < 0.33$
 Pseudo-monoclinic: pseudo $C2/m$
 a 5.121, b 8.856, c 14.073 Å, β 96.95°
 Light pinkish grey; greasy; opaque
 Biaxial: α 1.574, β 1.580, γ 1.591, $2V(\text{calc.})$ 72°
 14.1(10), 7.05(50), 4.71(70), 3.51(100), 2.807(20), 2.304(16), 1.946(17)

IMA No. **2000-045**

$\text{VO}(\text{SO}_4)(\text{H}_2\text{O})_3$ Structure determined
 Monoclinic: $P2_1/m$
 a 7.3940, b 7.4111, c 12.0597 Å, β 106.55°
 Pale to bright blue; vitreous; transparent
 Biaxial (+), α 1.555, β 1.561, γ 1.574, $2V(\text{meas.})$ 72°, $2V(\text{calc.})$ 69°
 5.79(100), 5.41(37), 4.57(20), 3.88(48), 3.498(90)

IMA No. **2000-052**

$\text{Fe}^{3+}_3(\text{PO}_4)_2(\text{OH})_3 \cdot 5\text{H}_2\text{O}$
 Amorphous
 Light brown to brown; vitreous; translucent
 n 1.695