The Canadian Mineralogist
Vol. 37, pp. 247-252 (1999)

NEW MINERALS APPROVED IN 1998 BY THE COMMISSION ON NEW MINERALS AND MINERAL NAMES, INTERNATIONAL MINERALOGICAL ASSOCIATION

JOEL D. GRICE*

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

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.

1998 Proposals

IMA No. **98-001**
$Cu_3(AsO_4)_2 \cdot 4H_2O$ New structure-type
Orthorhombic: *Pnma*
a 5.6906, *b* 17.061, *c* 9.732 Å
Bottle green; vitreous; transparent
Biaxial (–), α 1.745, β 1.755, γ 1.760, 2*V*(meas) 71°, 2*V* (calc) 70° 8.52(100), 3.721(60), 3.221(90), 3.102(40), 2.817(35), 2.795(35), 2.350(25)

IMA No. **98-002**
$Ca_3Ge(OH)_6(SO_4)(CO_3) \cdot 12H_2O$ A member of the ettringite group; structure
Hexagonal: $P6_3/m$
a 11.056, *c* 10.629 Å
White; vitreous; transparent
Uniaxial (–), ω 1.509, ε 1.479
9.57(vs), 5.53(s), 3.83(s), 3.56(ms), 3.44(m), 2.74(ms), 2.53(m)

* Chairman, CNMMN. *E-mail address*: jgrice@mus-nature.ca
** Vice-Chairman, CNMMN. *E-mail address*: ferraris@dsmp.unito.it

IMA No. **98-003**
$(Ca,Fe^{3+})_2Cu_5(Bi,Cu)(PO_4)_4(H_2O,OH,Cl)_{13}$ The Bi–P-dominant analogue of rechelsdorfite
Monoclinic: *C*2/*m*
a 14.200, *b* 13.832, *c* 14.971 Å, β 102.08°
Honey-brown; resinous; translucent
Biaxial (–), α 1.718, β 1.748, γ 1.748, 2*V*(calc) 0°
14.57(100), 6.95(40), 6.28(40), 3.469(30b), 3.104(30), 2.816(40), 2.506(30), 2.452(30)

IMA No. **98-004**
$Pb_{32}As_{40}S_{92}$ A member of the rathite (sartorite) group
Monoclinic: $P2_1$
a 8.368, *b* 115.75, *c* 7.903 Å, β 90.11°
Lead-grey; metallic; opaque
In reflected light: deep red, anisotropic. R_{min} and R_{max}: 37.9, 41.8% (470 nm), 36.5, 40.8% (546 nm), 35.0, 39.7% (589 nm), 32.7, 37.7% (650 nm)
3.663(70), 3.216(48), 2.978(100), 2.872(48), 2.735(60), 2.713(50), 2.339(65)

IMA No. **98-006**
$MnPO_4•H_2O$ Related to the kieserite group
Monoclinic: *C*2/*c*
a 6.914, *b* 7.468, *c* 7.364 Å, β 112.29°
Dark brown to dark greenish black; adamantine; translucent
Biaxial α 1.75, β 1.79, γ >1.79
4.856(12), 4.633(15), 3.503(100), 3.271(10), 2.957(10), 2.516(19), 2.104(12)

IMA No. **98-007**
$(\square,Na)_1Ca_2(Mn^{2+},Mg,Fe^{2+})_2(Fe^{3+},Mg,Al)_2Mn^{2+}_2(PO_4)_6(H_2O)_2$ Isostructural with wicksite and grischunite; structure
Orthorhombic: *Pcab*
a 12.559, *b* 12.834, *c* 11.714 Å
Very dark brown to black; vitreous; transparent
Biaxial (–), α 1.729, β 1.738, γ 1.741, 2*V*(meas) 54°, 2*V*(calc) 60°
6.419(31), 3.006(67), 2.927(78), 2.856(31), 2.814(35), 2.768(100), 2.110(33)

IMA No. **98-009**
$Cu_3O[(Mo,S)O_4SO_4]$ Unique combination of elements; structure
Orthorhombic: *Pnma*
a 7.420, *b* 6.741, *c* 13.548 Å
Olive-green; vitreous; transparent
Average index of refraction 1.925 (calculated from reflectance)
3.391(60), 3.342(60), 3.077(100), 2.542 (60), 2.500(60), 2.275(60)

IMA No. **98-010**
$Ca_4Al_6Si_6O_{24}(SO_4)$ A member of the scapolite group; structure
Tetragonal: *I*4/*m*
a 12.182, *c* 7.604 Å
Colorless to slightly yellow; subvitreous; transparent
Uniaxial (–), ω 1.585, ε 1.553
3.83(20), 3.46(100), 3.08(40), 3.05(15), 2.70(15)

IMA No. **98-012**
$Cu_3(OH)_2(As_2O_7)$ Related to olivenite; structure
Orthorhombic: *Pmma*
a 8.3212, *b* 2.9377, *c* 4.6644 Å
Dark pistachio green; vitreous to adamantine; translucent
Biaxial (+), α 1.81, β 1.82, γ 1.86, 2*V*(meas) 57°, 2*V*(calc) 54°
3.104(100), 2.486(70), 2.400(25), 1.672(30), 1.596(25), 1.330(25)

IMA No. **98-013**
$Cu_4Al_3(OH)_{14}F_3•2H_2O$ New structure-type
Monoclinic: *C*2/*m*
a 12.346, *b* 2.907, *c* 10.369 Å, β 97.90°
Bright blue; vitreous; translucent
Biaxial (+), α 1.585, β 1.615, γ 1.648, 2*V*(calc) 89°
10.29(80), 5.589(90), 4.232(100), 2.828(90), 2.362(100), 2.006(100), 1.871(80)

IMA No. **98-014**
$Pb(Zn,Fe,Cu)_2(AsO_4)_2(OH,H_2O)_2$ The Zn-dominant analogue of gartrellite; structure
Triclinic: $P\bar{1}$
a 5.550, *b* 5.620, *c* 7.621 Å, α 68.59, β 69.17, γ 69.51°
Green-yellow; vitreous; transparent to translucent
Biaxial (–), α 1.91, β 1.94 (calc), γ 1.97, 2*V*(meas) 87°
4.731(74), 4.669(86), 3.283(89), 3.252(91), 2.999(100), 2.894(74), 2.880(70)

IMA No. **98-015**
$Pb(Co,Ni,Zn,)_2(AsO_4)_2•2H_2O$ The Co-dominant analogue of helmutwinklerite; structure
Triclinic: $P\bar{1}$
a 11.216, *b* 10.604, *c* 7.618 Å, α 100.10, β 110.26, γ 98.87°
Red to red-brown; vitreous; translucent
Biaxial (+), α 1.85(calc), β 1.87, γ 1.90, 2*V*(meas) 85°
4.670(97), 3.256(100), 3.170(29), 3.072(56), 2.890(40), 2.760(37), 2.568(46)

IMA No. **98-017**
$Mg(H_2O)_6[Sb(OH)_6]_2$ The Mg-dominant analogue of bottinoite; structure
Trigonal: *P*3
a 16.114, *c* 9.863 Å
Colorless; vitreous; transparent
Uniaxial (–), ω 1.570, ε 1.569
4.946(50), 4.636(100), 4.217(20), 3.392(70), 2.595(20), 2.356(40), 2.103(20)

IMA No. **98-018**
$(Na,Ca,Bi)_2Ta_2O_6F$ A member of the microlite group; structure
Cubic: *Fd3m*
a 10.4451 Å
Green; adamantine; transparent
Isotropic, $n > 2.0$, 2.03(calc)
6.023(31), 3.148(33), 3.015(100), 2.610(27), 1.846(59), 1.574(47), 1.198(23)

IMA No. **98-019**
$Na_{3-x}(Ti,Nb)_2[Si_4O_{12}](OH,O)_2 \cdot 3–4H_2O$ The Ti-dominant analogue of nenadkevichite; structure
Orthorhombic: *Pbam*
a 7.349, *b* 14.164, *c* 7.130 Å
Colorless; vitreous; transparent
Biaxial (+), α 1.646, β 1.654, γ 1.763, 2*V*(meas) 30°, 2*V*(calc) 32°
7.09(72), 6.53(85), 3.262(100), 3.180(52), 2.553(56), 2.075(57), 1.735(50)

IMA No. **98-023**
$(Ni,Fe)_3P$ The Ni-dominant analogue of schreibersite
Tetragonal: $I\bar{4}$
a 8.99, *c* 4.396 Å
White with pinkish yellow-tint; metallic; opaque
In reflected light: weak anisotropy in oil, in yellowish-pinkish colors. R_{min} and R_{max}: 42.3, 43.9% (460 nm), 45.7, 47.5% (540 nm), 47.6, 49.1% (580 nm), 50.3, 51.7% (640 nm)
2.17(10), 2.13(5), 2.08(5), 1.955(7)

IMA No. **98-024**
$(Fe^{3+},Zn)_{12}(As^{3+},Si)_8O_{30}$ New structure-type
Hexagonal: $P6_3mc$
a 12.771, *c* 5.051 Å
Brownish black; vitreous; transparent
Uniaxial (+), $\omega \approx 1.99$, $\varepsilon \approx 2.08$
6.37(80), 3.221(100), 2.531(40), 2.420(70), 1.788(40), 1.672(50), 1.507(50)

IMA No. **98-025**
$NaCa_2Al_2(AsO_4)[AsO_3(OH)](OH)_2F_4(H_2O)$ New structure-type
Monoclinic: $P2_1/m$
a 9.687, *b* 10.7379, *c* 5.5523 Å, β 105.32°
Pale blue-green; vitreous; transparent to translucent
Biaxial (–), α 1.580, β 1.588, γ 1.593, 2*V*(meas) 74°, 2*V*(calc) 76°
5.364(80), 4.796(80), 3.801(80), 3.527(90), 2.966(100), 2.700(90), 2.246(60)

IMA No. **98-026**
$[Zn_{1-x}Al_x(OH)_2][(SO_4)_{x/2}(H_2O)_n]$, $x = 0.33$, $n \approx 0.96$
A member of the hydrotalcite group; polytype 1*T*
Trigonal: $P\bar{3}$
a 3.063, *c* 8.91 Å
Pale blue; waxy; translucent
Uniaxial, *n*(max) 1.558
8.81(100), 4.406(2.5), 2.654(4), 2.545(5)

$[Zn_{1-x}Al_x(OH)_2][(SO_4)_{x/2}(H_2O)_n]$, $0.32 < x < 0.50$, $n = 0.59$ Polytype 3*R*
Trigonal: *Rm*
a 3.065, *c* 25.42 Å
Pale bluish to bluish white; waxy; translucent
Uniaxial, ω 1.5636
8.50(100), 4.248(33), 2.600(5), 2.354(4)

IMA No. **98-027**
$(Al,Mg,Fe)_{16}(Al,Si,Be)_{12}O_{40}$ A member of the sapphirine group
Monoclinic: $P2_1/c$
a 9.9000, *b* 14.369, *c* 11.2537 Å, β 125.53°
Very dark green; vitreous; transparent
Biaxial (–), α 1.725, β 1.740, γ 1.741, 2*V*(meas) 34°, 2*V*(calc) 29°
2.985(38), 2.834(30), 2.826(45), 2.566(36), 2.445(100), 2.439(44), 2.340(43)

IMA No. **98-028**
$Fe^{2+}Ti(Ta,Nb)_2O_8$ A member of the wodginite group
Monoclinic: *C2/c*
a 9.402, *b* 11.384, *c* 5.075 Å, β 90.33°
Very dark brown to black; opaque; submetallic
In reflected light: creamy white, very abundant internal reflections, anisotropic, moderate pleochroism. R_{min} and R_{max}: 18.2, 18.7% (470 nm), 18.1, 19.1% (546 nm), 16.9, 17.9% (589 nm), 15.6, 16.4% (650 nm)
3.626(70), 2.963(100), 2.939(90), 2.484(45), 1.759(45), 1.715(50), 1.711(45)

IMA No. **98-030**
$Ca(HCOO)_2$ β-calcium formate
Tetragonal: $P4_12_12$
a 6.770, *c* 9.463 Å
White, light-blue; vitreous; transparent
Uniaxial (+), ω 1.553, ε 1.573
5.54(90), 3.40(100), 3.19(60), 2.859(80), 2.196(70), 2.046(50), 1.947(60)

IMA No. **98-031**
$(MoO_2)_2As_2O_5 \cdot 3H_2O$ New structure-type
Monoclinic: $P2_1/c$
a 7.0516, *b* 12.0908, *c* 12.2190 Å, β 101.268°
Green to grey-green; vitreous, translucent
Biaxial (+), α 1.757, β 1.778, γ 2.04, 2*V*(calc) 35°
6.92(26), 6.05(100), 3.457(16), 3.325(59), 2.624(15), 2.593(12), 2.264(19)

IMA No. **98-032**
$Cu_{10}(AsO_4)_4(SO_4)(OH)_6 \cdot 8H_2O$ Structure
Monoclinic: *C2/c*
a 21.778, *b* 12.317, *c* 10.716 Å, β 92.81°
Green with a bluish tint; vitreous; transparent

Biaxial (–), α 1.590, β 1.740, γ 1.744, 2*V*(meas) 18°, 2*V*(calc) 17°
10.8(100), 5.43(50), 4.90(30), 3.625(50), 3.090(40), 2.675(40), 2.630(60)

IMA No. **98-033**
$Zn_2AlSb(OH)_{12}$ Related to cualstibite; structure
Trigonal: *P*312
a 5.327, *c* 9.792 Å
Colorless; vitreous; transparent
Optical properties could not be measured
4.897(100), 4.615(35), 4.180(57), 3.366(18), 2.667(31), 2.342(88), 1.887(10)

IMA No. **98-034**
$SrAl_2Si_2O_7(OH)_2•H_2O$ A member of the lawsonite group
Orthorhombic: *Cmcm*
a 6.031, *b* 8.945, *c* 13.219 Å
Blue; vitreous; transparent
Biaxial (+), α 1.664, β 1.674, γ 1.688, 2*V*(calc) 81°
4.68(s), 4.26(vs), 3.31(vs), 2.75(vs), 2.68(vvs), 2.63(s), 2.50(s)

IMA No. **98-035**
$Pb_{10}(SO_4)O_7Cl_4•H_2O$ Related to the nadorite and kombatite groups; structure
Triclinic: $P\bar{1}$
a 8.796, *b* 10.768, *c* 13.096 Å, α 68.87, β 86.52, γ 75.79°
Venetian pink; vitreous; translucent
In reflected light: colorless or pale pink, anisotropic. R_{min} and R_{max}: 14.3, 14.6% (470 nm), 13.6, 13.9% (546 nm), 13.4, 13.75% (589 nm), 13.3, 13.55% (650 nm)
6.573(4), 3.768(4), 3.286(9), 2.955(9), 2.911(10), 2.793(8)

IMA No. **98-036**
$Pb^{2+}{}_4(S^{6+}O_3S^{2-})O_2(OH)_2$ or $Pb_4(S_2O_3)O_2(OH)_2$ New structure-type
Triclinic: $P\bar{1}$
a 7.455, *b* 6.496, *c* 11.207 Å, α 114.33, β 89.65, γ 88.69°
Beige-cream to colorless; vitreous to pearly; opaque to transparent
In reflected light: light grey with yellow-brown internal reflections, bireflectant and slightly pleochroic.
10.13(100), 5.93(50), 4.401(35), 3.414(100), 3.198(80), 2.889(35), 2.805(35), 2.622(40)

IMA No. **98-037**
$□(Mg_2Al)Al_6(Si_6O_{18})(BO_3)_3(OH)_4$ A member of the tourmaline group; structure
Trigonal: *R*3*m*
a 15.884, *c* 7.178 Å
Bluish grey; dull; transparent
Uniaxial (–), ω 1.650, ε 1.624
6.366(6), 4.211(9), 3.969(10), 3.470(6), 2.949(7), 2.567(10), 2.037(5)

IMA No. **98-038**
$Pb_3Cl_4(SeO_3)•H_2O$ Structure
Triclinic: $P\bar{1}$
a 8.115, *b* 8.433, *c* 9.242 Å, α 62.52, β 71.87, γ 75.01°
Colorless to white; vitreous to silky, diaphaneity not given
n 1.96, birefringent
3.548(m), 3.258(s), 3.188(s), 2.728(m), 2.365(s), 2.298(m)

IMA No. **98-039**
$Sr_2Fe(Fe,Mg)_2Al_4(PO_4)_4(OH)_{10}$ New structure-type
Triclinic: $P\bar{1}$
a 5.455, *b* 9.118, *c* 9.769 Å, α 108.48, β 91.62, γ 97.38°
Pale blue to dark yellow green; vitreous; transparent to translucent
Biaxial: α 1.660, γ 1.684
4.473(47), 3.596(75), 3.470(45), 3.215(100), 3.132(75), 3.016(54), 2.878(43), 2.811(60)

IMA No. **98-042**
$Na_{12}Sr_3Ca_6Fe_3WZr_3(Si_{25}O_{73})(O,OH,Cl)_5•(H_2O)$ A member of the eudialyte group; structure
Trigonal: *R*3*m*
a 14.2958, *c* 30.084 Å
Orange-red; vitreous; transparent to translucent
Uniaxial (–): ω 1.6279, ε 1.6254
See X-ray powder data for IMA No. 98-043

IMA No. **98-043**
$Na_{12}Sr_3Ca_6Mn_3WZr_3(Si_{25}O_{73})(O,OH,Cl)_5•(H_2O)$ A member of the eudialyte group
Trigonal: *R*3*m*
a 14.282, *c* 30.12 Å
Orange; vitreous; transparent to translucent
Uniaxial (–): ω 1.629, ε 1.626
11.50(90), 9.535(70), 6.452(50), 6.072(50), 5.735(50), 3.406(50), 3.213(50), 3.167(50), 2.980(100), 2.856(80)

IMA No. **98-044**
$PbMn^{3+}{}_2(VO_4)_2(OH)_2$ A member of the tsumcorite group; structure
Monoclinic: *C*2/*m*
a 9.275, *b* 6.284, *c* 7.682 Å, β 117.97(4)°
Dark brown to black; vitreous to adamantine; translucent to opaque
In reflected light: light grey to light brownish grey, strong anisotropism (dark metallic blue to light purplish brown-grey), distinct bireflectance, slight pleochroism. R_{min} and R_{max}: 15.8, 19.2% (470 nm), 14.8, 17.8% (546 nm), 14.4, 17.3% (589 nm), 14.1, 16.8% (650 nm)
4.695(34), 3.388(95), 3.270(100), 2.946(51), 2.850(49), 2.491(93), 1.869(35), 1.697(83), 1.6378(31)

IMA No. **98-045**
$Pb^{2+}{}_6Sb^{3+}{}_6S^{2-}{}_{14}S^{1-}{}_2S^0$ Structure
Orthorhombic: $P2_122_1$
a 5.328, *b* 4.0400, *c* 23.054 Å
Black; metallic; opaque
Reflectance data could not be obtained
3.724(ms), 3.559(m), 3.427(s), 3.232(m), 3.047(ms), 2.952(m), 2.844(ms), 2.779(ms), 2.753(ms), 2.422(m)

IMA No. **98-046**
$NaNa_2(Mg_3Fe^{3+}Ti^{4+})Si_8O_{22}O_2$ A member of the amphibole group; structure
Monoclinic: C2/*m*
a 9.795, *b* 17.949, *c* 5.290 Å, β 104.19(2)°
Pink; vitreous; transparent
Biaxial (–), α 1.643, β 1.657, γ 1.670, 2*V*(meas) 81°, 2*V*(calc) 87°
8.414(100), 4.467(50), 3.390(60), 3.117(50), 2.705(70), 2.531(50)

IMA No. **98-047**
$Ba(V^{4+}OPO_4)_2{\bullet}4H_2O$ The Ba-dominant analogue of sincosite
Tetragonal: *P*4/*n* or *P*4/*nmm*
a 9.031, *c* 12.755 Å
Pale green; vitreous; transparent
Uniaxial (–), ω 1.721, ε 1.715
5.722(100), 4.519(40), 3.548(30b), 3.192(60), 3.101(40), 2.858(50), 2.794(50), 2.375(70), 2.022(50)

IMA No. **98-048**
$BaV^{3+}{}_3(PO_4)_2(OH,H_2O)_6$ A member of the crandallite group
Trigonal: $R\bar{3}m$, *R*3*m* or *R*32
a 7.258, *c* 17.361 Å
Black; adamantine to semimetallic; opaque
Uniaxial (–), ω 1.858, ε 1.817
5.90(9), 3.627(4), 3.073(10), 2.301(4), 1.971(5), 1.814(4)

IMA No. **98-049**
$YbPO_4$ A member of the xenotime group
Tetragonal: $I4_1/amd$
a 6.866, *c* 6.004 Å
Colorless to slightly yellow or brown; vitreous; transparent
Uniaxial (+), ω 1.717, ε 1.802
4.515(7), 3.437(10), 2.730(3), 2.556(8), 2.138(3), 1.760(5)

IMA No. **98-054**
Cu(OH)Cl
Monoclinic: $P2_1/a$
a 5.552, *b* 6.668, *c* 6.124(2) Å, β 115.00(3)°
Yellowish green to olive-green; vitreous; transparent to translucent
Probably biaxial, $n > 1.8$
5.553(100), 2.785(14), 2.516(18), 2.241(27), 1.996(12), 1.851(21), 1.869(16)

IMA No. **98-055**
$Sr_4ZrTi_4Si_4O_{22}$ The Sr–Zr-dominant analogue of perrierite
Monoclinic: $P2_1/a$
a 13.97, *b* 5.675, *c* 11.98 Å, β 114.26(8)°
Dark brown; adamantine; diaphaneity not given
Optical properties could not be measured
4.15(m), 3.20(m), 3.12(s), 3.05(vvs), 2.99(vs), 2.84(s), 2.78(m), 2.74(s), 2.51(m), 2.30(m), 1.967(m)

IMA No. **98-056**
$NaNa_2Mg_4Fe^{3+}(Si_8O_{22})(F,OH)_2$ A member of the amphibole group
Monoclinic: *C*2/*m*
a 9.81, *b* 18.05, *c* 5.29 Å, β 103.9(2)°
Grey; vitreous; transparent to translucent
Biaxial (–), α 1.618, β 1.629, γ 1.633, 2*V*(meas) 54°, 2*V*(calc) 61.8°
8.42(34), 3.264(23), 3.129(100), 2.804(28), 2.716(10), 2.708(10), 1.895(10), 1.654(10)

IMA No. **98-057**
$(Ba,K,Pb)_4(Y,Ca)_2Si_8(B,Si)_4O_{28}F$ The Y-dominant analogue of hyalotekite; structure
Triclinic: $I\bar{1}$
a 11.181, *b* 10.850, *c* 10.252 Å, α 90.64, β 90.05, γ 89.97°
Light pink to white; vitreous; translucent
Biaxial (+), α 1.637,β 1.628, γ 1.624, 2*V*(meas) 69°, 2*V*(calc) 67°
7.79(65), 3.773(100), 3.742(70), 3.493(56), 2.936(50), 2.921(37), 2.912(42), 2.564(35)

IMA No. **98-058**
$K_2(Mn,Fe)Ti_4[Si_4O_{12}]_2(OH)_4{\bullet}5H_2O$ A member of the labuntsovite group; structure
Monoclinic: *C*2/*m*
a 14.369, *b* 13.906, *c* 7.812 Å, β 117.09°
Yellow; vitreous; transparent
Biaxial (+), α 1.683, β, 1.687, γ 1.775, 2*V*(calc) 25°
7.00(9), 6.33(8), 4.86(7), 3.17(10), 3.08(5), 2.58(4), 2.47(4), 1.551(4)

IMA No. **98-059**
$(Bi,U,Ca,Pb)_{1+x}(Nb,Ta)_2O_6(OH){\bullet}nH_2O$ A member of the pyrochlore group
Metamict, cubic after heating: *Fd*3*m*
a 10.41 Å
Dark greenish brown to brown; vitreous; translucent
Isotropic, *n* 2.10
5.98(4), 2.967(10), 2.614(7), 1.848(9), 1.569(9), 1.500(4), 1.195(8), 1.145(5)

IMA No. **98-060**
$PbBi_4S_7$
Orthorhombic: *Bbmm*
a 13.18, *b* 37.4, *c* 4.05(3) Å

Silver grey; metallic; opaque
In reflected light: white, distinct anisotropism (without color effects), very weak bireflectance, nonpleochroic. R_{min} and R_{max}: 35.8, 40.2% (460 nm), 35.3, 40.6% (540 nm), 35.0, 40.6% (580 nm), 34.8, 40.1% (640 nm)
3.80(10), 3.58(3), 3.40(2), 3.30(3), 2.95(4b), 2.92(2), 2.81(2), 2.34(4b), 1.917(2b)

IMA No. **98-061**
$Na(LiNa)(Fe^{3+}_2Mg_2Li)Si_8O_{22}(OH)_2$ A member of the amphibole group; structure
Monoclinic: *C2/m*
a 9.536, *b* 17.789, *c* 5.277 Å, β 102.53°
Green; vitreous; translucent
Biaxial (+), α 1.694, β 1.698, γ 1.702, 2*V*(meas) 83°, 2*V*(calc) 85°
8.25(24), 4.45(22), 3.396(28), 3.057(100), 2.749(54), 2.699(60), 1.920(20), 1.639(44), 1.396(23)

IMA No. **98-062**
$(Zn,Mn)(Mn^{2+},Mg,Fe^{3+},Al)_{14}$
$(As^{3+}O_3)(As^{5+}O_4)_2(OH)_{23}$ New structure-type
Monoclinic: *Cc*
a 14.236, *b* 8.206, *c* 24.225 Å, β 93.52°
Red-brown to orange-brown; resinous to submetallic; opaque
Biaxial (–), α 1.723, β 1.744, γ 1.750, 2*V*(meas) 44°, 2*V*(calc) 56°
12.07(100), 6.05(100), 4.12(30), 9.04(90), 3.148(30), 3.030(70), 2.411(40), 1.552(70)

IMA No. **98-064**
$Na_{15}Ca_3Mn_3Fe_3Zr_3Nb(Si_{25}O_{73})$
$(O,OH,H_2O)_3(OH,Cl)_2$ A member of the eudialyte group; structure
Trigonal: *R*3
a 14.192, *c* 29.983 Å
Yellowish brown; vitreous; transparent to translucent
Uniaxial (–), ω 1.6450, ε 1.6406
11.35(44), 7.10(33), 6.02(36), 5.68(31), 4.29(36), 3.389(43), 3.199(31), 3.150(35), 3.013(30), 2.964(100), 2.844(89)

IMA No. **98-065**
$Mg_9[Si_4O_{16}](OH)_2$ A member of the humite group; structure
Monoclinic: $P2_1/b$ (unique axis *a*)
a 4.7480, *b* 10.2730, *c* 13.6894 Å, α 100.72°
Yellow-orange; vitreous, transparent
Biaxial (+), α 1.631, β 1.641, γ 1.664, 2*V*(meas) 70°, 2*V*(calc) 68°
5.05(70), 4.46(52), 3.35(64), 2.772(91), 2.748(50), 2.551(80), 2.516(93), 2.365(50), 2.269(100), 2.259(95), 1.747(79), 1.485(51)

IMA No. **98-066**
$CaMg(VO_4,AsO_4)(OH)$ A member of the descloizite group; structure
Orthorhombic: $P2_12_12_1$
a 7.501, *b* 9.010, *c* 5.941 Å
Orange to orange-brown; adamantine; transparent
Biaxial, α 1.797, β 1.805–1.815, γ 1.828
4.50(72), 4.14(32), 3.170(100), 2.972(20), 2.785(30), 2.639(27), 2.596(21), 2.523(30), 1.733(20), 1.614(41)

IMA No. **98-067**
$Cu[AlAsO_5]$ New structure-type
Monoclinic: $P2_1/c$
a 7.314, *b* 10.223, *c* 5.576 Å, β 99.79°
Light green; vitreous; translucent
Biaxial(–), α1.672, β 1.718, γ 1.722, 2*V*(calc) 32°
7.20(100), 4.84(9), 4.33(23), 3.604(10), 3.125(20), 2.656(6), 2.458(8)

IMA No. **98-069**
$K_2MnV_4O_{12}$ New structure-type
Monoclinic: $P2_1/n$
a 8.173, *b* 9.243, *c* 8.640 Å, β 109.70°
Reddish brown; adamantine; translucent
Biaxial, α 1.925 β 1.960, γ > 1.988, 2*V*(meas) 82°
6.86(25), 5.91(27), 5.51(32), 3.957(25), 3.701(55), 3.336(100), 3.118(50), 3.000(36), 2.878(64), 2.752(68), 1.968(28), 1.860(28)

PROPOSAL FROM A PREVIOUS YEAR APPROVED IN 1998

IMA No. **97-033**
$(Mn,Fe,Mg)Al_2(PO_4)_2(OH)_2 \cdot 8H_2O$ Polymorph of mangangordonite
Triclinic: $P\bar{1}$
a 7.0102, *b* 10.2050, *c* 10.5040(7) Å, α 71.82, β 89.62, γ 69.90(1)°
Colorless to beige; vitreous; translucent to transparent
Biaxial (–), α 1.5665, β 1.5740, γ 1.5815, 2*V*(meas.) 94.7°, 2*V*(calc.) 90.6°
9.92(85), 6.54(100), 5.80(55), 4.746(85), 4.577(35), 3.885(30), 3.001(70), 2.900(30), 2.773(35)