

Mineral Groups

Adelite Group

Orthorhombic arsenates and vanadates of general formula $AB^{2+}(XO_4)(OH)$, A = Ca, Pb; B^{2+} = Co, Cu, Fe, Mg, Ni, Zn; X = As^{5+} , V^{5+} .

Adelite	$CaMg(AsO_4)(OH)$
Austinite	$CaZn(AsO_4)(OH)$
Calciovolborthite	$CaCu(VO_4)(OH)$ (needs study)
Cobaltaustinite	$Ca(Co, Cu^{2+})(AsO_4)(OH)$
Conichalcite	$CaCu^{2+}(AsO_4)(OH)$
Duftite	$PbCu(AsO_4)(OH)$
Gabrielsonite	$PbFe^{2+}(AsO_4)(OH)$
Nickelaustinite	$Ca(Ni, Zn)(AsO_4)(OH)$
Tangeite	$CaCuVO_4(OH)$

Aenigmatite Group

Triclinic silicates with general formula $A_2B_6X_6O_{20}$, A = Ca, Na; B = Al, Cr^{3+} , Fe^{2+} , Fe^{3+} , Mg, Sb^{5+} , Ti; X = Al, B, Be, Si.

Aenigmatite	$Na_2Fe_5^{2+}TiSi_6O_{20}$
Dorrite	$Ca_2Mg_2Fe_4^{3+}Al_4Si_2O_{20}$
H_gtuvaite	$(Ca, Na)_2(Fe^{2+}, Fe^{3+}, Ti, Mg, Mn, Sn)_6(Si, Be, Al)_6O_{20}$
Krinovite	$Na_2Mg_4Cr_2Si_6O_{20}$
Makarochkinite	$(Ca, Na)_2(Fe^{2+}, Fe^{3+}, Ti, Mg)_6(Si, Al, Be)_6O_{20}$
Rh_nite	$Ca_2(Mg, Fe^{2+}, Fe^{3+}, Ti)_6(Si, Al)_6O_{20}$
Serendibite	$Ca_2(Mg, Al)_6(Si, Al, B)_6O_{20}$
Welshite	$Ca_2Sb^{5+}Mg_4Fe^{3+}Si_4Be_2O_{20}$
Wilkinsonite	$Na_2Fe_4^{2+}Fe_2^{3+}Si_6O_{20}$

Alluaudite Group

Monoclinic phosphates and arsenates of general formula $NaACD_2(XO_4)_3$, A = Ca, Mg, Pb; C = Ca, Fe^{2+} , Mn^{2+} ; D = Mn^{2+} , Fe^{2+} , Fe^{3+} , Mg; X = P, As.

Alluaudite	$NaCaFe^{2+}(Mn^{2+}, Fe^{2+}, Fe^{3+}, Mg)_2(PO_4)_3$
Arseniopleite	$NaCaMn^{2+}(Mn^{2+}, Mg)_2(AsO_4)_3$
Caryinite	$Na(Ca, Pb)(Ca, Mn)(Mn, Mg)_2(AsO_4)_3$
Ferro-alluaudite	$NaCaFe^{2+}(Fe^{2+}, Mn^{2+}, Fe^{3+})_2(PO_4)_3$
Hagendorffite	$NaCaMn^{2+}(Fe^{2+}, Fe^{3+}, Mg)_2(PO_4)_3$
Maghagendorffite	$NaMn^{2+}Mg(Fe^{2+}, Fe^{3+})_2(PO_4)_3$
Varulite	$(Na, Ca)Mn^{2+}(Mn^{2+}, Fe^{2+}, Fe^{3+})_2(PO_4)_3$

Alunite Group

Trigonal sulfates of general formula $AB_6(SO_4)_4(OH)_{12}$, A = Ag_2^{1+} , Ca, $(H_3O)_2$, K_2 , Na_2 , $(NH_4)_2$, Tl^{1+} , Pb; B = Al, Cu^{2+} , Fe^{3+} .

Alunite	$K_2Al_6(SO_4)_4(OH)_{12}$
Ammonioalunite	$(NH_4)_2Al_6(SO_4)_4(OH)_{12}$
Ammoniojarosite	$(NH_4)_2Fe_6^{3+}(SO_4)_4(OH)_{12}$
Argentojarosite	$Ag_2Fe_6^{3+}(SO_4)_4(OH)_{12}$

Beaverite	$\text{Pb}(\text{Cu}^{2+}, \text{Fe}^{3+}, \text{Al})_6(\text{SO}_4)_4(\text{OH})_{12}$
Dorallcharite	$(\text{Tl}, \text{K})\text{Fe}_3^{3+}(\text{SO}_4)_2(\text{OH})_6$
Huangite	$\text{CaAl}_6(\text{SO}_4)_4(\text{OH})_{12}$
Hydronium jarosite	$(\text{H}_3\text{O}^{1+})_2\text{Fe}_6^{3+}(\text{SO}_4)_4(\text{OH})_{12}$
Jarosite	$\text{K}_2\text{Fe}_6^{3+}(\text{SO}_4)_4(\text{OH})_{12}$
Kintoreite	$\text{PbFe}_3^{3+}(\text{PO}_4)_2(\text{OH}, \text{H}_2\text{O})_6$
Minamiite	$(\text{Na}, \text{Ca}, \text{K})_2\text{Al}_6(\text{SO}_4)_4(\text{OH})_{12}$
Natroalunite	$\text{Na}_2\text{Al}_6(\text{SO}_4)_4(\text{OH})_{12}$
Natrojarosite	$\text{Na}_2\text{Fe}_6^{3+}(\text{SO}_4)_4(\text{OH})_{12}$
Osarizawaite	$\text{Pb}_2\text{Cu}_2^{2+}\text{Al}_4(\text{SO}_4)_4(\text{OH})_{12}$
Plumbojarosite	$\text{PbFe}_6^{3+}(\text{SO}_4)_4(\text{OH})_{12}$
Walthierite	$\text{BaAl}_6(\text{SO}_4)_4(\text{OH})_{12}$

Amblygonite Group

Triclinic phosphates of general formula $\text{AB}(\text{PO}_4)_2\text{X}$, A = Li, Na; B = Al, Fe^{3+} ; X = (OH), F.

Amblygonite	$(\text{Li}, \text{Na})\text{Al}(\text{PO}_4)(\text{F}, \text{OH})$
Montebrasite	$\text{LiAl}(\text{PO}_4)(\text{OH}, \text{F})$
Natromontebrasite	$(\text{Na}, \text{Li})\text{Al}(\text{PO}_4)(\text{OH}, \text{F})$
Tavorite	$\text{LiFe}^{3+}(\text{PO}_4)(\text{OH})$

Amphibole Group

A major revision of the classification and nomenclature of the Amphibole Group by Leake *et al.* (1997) has been published in several mineralogical journals. For example, it has appeared in the *Canadian Mineralogist* **35**, 219–246 (1997), *Mineralogical Magazine* **61**, 295–321 (1997), the *European Journal of Mineralogy* **9**, 623–651 (1997), and the *American Mineralogist* **82**, 1019–1037 (1997). Mandarino (1998) summarized the report in the *Mineralogical Record* **29**, 169–174 (1998) as *The Second List of Additions and Corrections to the Glossary of Mineral Species 7th Edition (1995)*. Readers interested in this complex group of minerals should refer to that article and to the original paper by Leake *et al.* (1997). Since the publication of the papers noted above, several new amphibole species have been described; these are included in this book.

The standard amphibole formula is $\text{AB}_2\text{C}_5\text{T}_3\text{O}_{22}\text{X}_2$. The components A, B, C, T, and X of the formula correspond to the following crystallographic sites:

A one site per formula unit;

B two M4 sites per formula unit;

C a composite of five octahedral sites made up of 2 M1, 2 M2, and 1 M3 sites per formula unit;

T eight tetrahedral sites in two sets of four per formula unit;

X two sites per formula unit.

The ions considered *normally* to occupy these sites are:

□ (empty site) and K at A only

Na at A or B

Ca at B only

L-type ions: Mg, Fe^{2+} , Mn^{2+} , Li, and rarer ions of similar size such as Zn, Ni, Co at C or B

M-type ions: Al at C or T

Fe³⁺, and, more rarely, Mn³⁺, Cr³⁺ at *C* only

High-valency ions: Ti⁴⁺ at *C* or *T*

Zr⁴⁺ at *C* only

Si at *T* only

Anions: OH, F, Cl, O at *X*

The amphibole group is divided into four subgroups: magnesium-iron-manganese-lithium (i.e., Mg-Fe-Mn-Li), calcic, sodic-calcic, and sodic. The second column of the following species list indicates the subgroup to which the species belong; MFML = Mg-Fe-Mn-Li, C = calcic, SC = sodic-calcic, and S = sodic.

Species names not in bold indicate compositions that may not have been found in nature yet.

Actinolite	C	$\square \text{Ca}_2(\text{MgFe}^{2+})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$
Aluminobarroisite	SC	$\square (\text{CaNa})\text{Mg}_3\text{Al}_2\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Alumino-ferrobarroisite	SC	$\square (\text{CaNa})\text{Fe}_3^{2+}\text{Al}_2\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Alumino-ferrotschemakite	C	$\square \text{Ca}_2(\text{Fe}_3^{2+}\text{Al}_2)\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Alumino-magnesiotalamite	SC	$\text{Na}(\text{CaNa})\text{Mg}_3\text{Al}_2\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Aluminotalamite	SC	$\text{Na}(\text{CaNa})\text{Fe}_3^{2+}\text{Al}_2\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Aluminotschemakite	C	$\square \text{Ca}_2(\text{Mg}_3\text{Al}_2)\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Anthophyllite	MFML	$\square \text{Mg}_7\text{Si}_8\text{O}_{22}(\text{OH})_2$
Arfvedsonite	SNaNa ₂	$(\text{Fe}_4^{2+}\text{Fe}^{3+})\text{Si}_8\text{O}_{22}(\text{OH})_2$
Barroisite	SC	$\square (\text{CaNa})\text{Mg}_3\text{AlFe}^{3+}\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Cannilloite	C	$\text{CaCa}_2(\text{Mg}_4\text{Al})\text{Si}_5\text{Al}_3\text{O}_{22}(\text{OH})_2$
Clinoferroholmquistite	MFML	$\square (\text{Li}_2\text{Fe}_3^{2+}\text{Al}_2)\text{Si}_8\text{O}_{22}(\text{OH})_2$
Clinoholmquistite	MFML	$\square (\text{Li}_2\text{Mg}_3\text{Al}_2)\text{Si}_8\text{O}_{22}(\text{OH})_2$
Cumingtonite	MFML	$\square \text{Mg}_7\text{Si}_8\text{O}_{22}(\text{OH})_2$
Eckermannite	SNaNa ₂	$(\text{Mg}_4\text{Al})\text{Si}_8\text{O}_{22}(\text{OH})_2$
Edenite	C	$\text{NaCa}_2\text{Mg}_5\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferri-barroisite	SC	$\square (\text{CaNa})\text{Mg}_3\text{Fe}_2^{3+}\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferric-ferrybyite	SNaNa ₂	$(\text{Fe}_3^{2+}\text{Fe}_2^{3+})\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferri-clinoferroholmquistite	MFML	$\square (\text{Li}_2\text{Fe}_3^{2+}\text{Fe}_2^{3+})\text{Si}_8\text{O}_{22}(\text{OH})_2$
Ferri-clinoholmquistite	MFML	$\square (\text{Li}_2\text{Mg}_3\text{Fe}_2^{3+})\text{Si}_8\text{O}_{22}(\text{OH})_2$
Ferric-nybyite	SNaNa ₂	$(\text{Mg}_3\text{Fe}_2^{3+})\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferri-ferrobarroisite	SC	$\square (\text{CaNa})\text{Fe}_3^{2+}\text{Fe}_2^{3+}\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferri-ferrotschemakite	C	$\square \text{Ca}_2(\text{Fe}_3^{2+}\text{Fe}_2^{3+})\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Ferri-magnesiotalamite	SC	$\text{Na}(\text{CaNa})\text{Mg}_3\text{Fe}_2^{3+}\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Ferritalamite	SC	$\text{Na}(\text{CaNa})\text{Fe}_3^{2+}\text{Fe}_2^{3+}\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Ferritschemakite	C	$\square \text{Ca}_2(\text{Mg}_3\text{Fe}_2^{3+})\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Ferro-actinolite	C	$\square \text{Ca}_2\text{Fe}_5^{2+}\text{Si}_8\text{O}_{22}(\text{OH})_2$
Ferro-anthophyllite	MFML	$\square \text{Fe}_7^{2+}\text{Si}_8\text{O}_{22}(\text{OH})_2$
Ferrobarroisite	SC	$\square (\text{CaNa})\text{Fe}_3^{2+}\text{AlFe}^{3+}\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferro-eckermannite	SNaNa ₂	$(\text{Fe}_4^{2+}\text{Al})\text{Si}_8\text{O}_{22}(\text{OH})_2$
Ferro-edenite	C	$\text{NaCa}_2\text{Fe}_5^{2+}\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferrogedrite	MFML	$\square \text{Fe}_5^{2+}\text{Al}_2\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Ferroglaucophane	SNaNa ₂	$(\text{Fe}_3^{2+}\text{Al}_2)\text{Si}_8\text{O}_{22}(\text{OH})_2$
Ferroholmquistite	MFML	$\square (\text{Li}_2\text{Fe}_3^{2+}\text{Al}_2)\text{Si}_8\text{O}_{22}(\text{OH})_2$
Ferrohornblende	C	$\square \text{Ca}_2[\text{Fe}_4^{2+}(\text{Al},\text{Fe}^{3+})]\text{Si}_7\text{AlO}_{22}(\text{OH})_2$
Ferrokaersutite	C	$\text{NaCa}_2(\text{Fe}_4^{2+}\text{Ti})\text{Si}_6\text{Al}_2\text{O}_{23}(\text{OH})$

Ferroleakeite	SNaNa ₂ (Fe ₂ ²⁺ Fe ₂ ³⁺ Li)Si ₈ O ₂₂ (OH) ₂
Ferronybite	SNaNa ₂ (Fe ₃ ²⁺ Al ₂)Si ₇ AlO ₂₂ (OH) ₂
Ferropargasite	C NaCa ₂ (Fe ₄ ²⁺ Al)Si ₆ Al ₂ O ₂₂ (OH) ₂
Ferrorichterite	SC Na(CaNa)Fe ₅ ²⁺ Si ₈ O ₂₂ (OH) ₂
Ferrotschemakite	C □Ca ₂ (Fe ₃ ²⁺ AlFe ³⁺)Si ₆ Al ₂ O ₂₂ (OH) ₂
Ferrowinchite	SC □(CaNa)Fe ₄ ²⁺ (Al,Fe ³⁺)Si ₈ O ₂₂ (OH) ₂
Fluorocannilloite	C CaCa ₂ (Mg ₄ Al)Si ₅ Al ₃ O ₂₂ F ₂
Fluoro-ferroleakeite	SNaNa ₂ (Fe ₂ ²⁺ Fe ₂ ³⁺ Li)Si ₈ O ₂₂ F ₂
Fluororichterite	SC Na(CaNa)Mg ₅ Si ₈ O ₂₂ F ₂
Gedrite	MFML □Mg ₅ Al ₂ Si ₆ Al ₂ O ₂₂ (OH) ₂
Glaucophane	S□Na ₂ (Mg ₃ Al ₂)Si ₈ O ₂₂ (OH) ₂
Grunerite	MFML □Fe ₇ ²⁺ Si ₈ O ₂₂ (OH) ₂
Hastingsite	C NaCa ₂ (Fe ₄ ²⁺ Fe ³⁺)Si ₆ Al ₂ O ₂₂ (OH) ₂
Holmquistite	MFML □(Li ₂ Mg ₃ Al ₂)Si ₈ O ₂₂ (OH) ₂
Kaersutite	C NaCa ₂ (Mg ₄ Ti)Si ₆ Al ₂ O ₂₃ (OH)
Katophorite	SC Na(CaNa)Fe ₄ ²⁺ (Al,Fe ³⁺)Si ₇ AlO ₂₂ (OH) ₂
Kornite	S(Na,K)Na ₂ (Mg ₂ Mn ₂ ³⁺ Li)Si ₈ O ₂₂ (OH) ₂
Kozulite	SNaNa ₂ Mn ₄ ²⁺ (Fe ³⁺ ,Al)Si ₈ O ₂₂ (OH) ₂
Leakeite	SNaNa ₂ (Mg ₂ Fe ₂ ³⁺ Li)Si ₈ O ₂₂ (OH) ₂
Magnesio-arfvedsonite	SNaNa ₂ (Mg ₄ Fe ³⁺)Si ₈ O ₂₂ (OH) ₂
Magnesiohastingsite	C NaCa ₂ (Mg ₄ Fe ³⁺)Si ₆ Al ₂ O ₂₂ (OH) ₂
Magnesiohomblende	C □Ca ₂ [Mg ₄ (Al,Fe ³⁺)]Si ₇ AlO ₂₂ (OH) ₂
Magnesiokatophorite	SC Na(CaNa)Mg ₄ (Al,Fe ³⁺)Si ₇ AlO ₂₂ (OH) ₂
Magnesioriebeckite	S□Na ₂ (Mg ₃ Fe ₂ ³⁺)Si ₈ O ₂₂ (OH) ₂
Magnesiosadanagaite	C NaCa ₂ [Mg ₃ (Al,Fe ³⁺) ₂]Si ₅ Al ₃ O ₂₂ (OH) ₂
Magnesiotaramite	SC Na(CaNa)Mg ₃ AlFe ³⁺ Si ₆ Al ₂ O ₂₂ (OH) ₂
Manganocummingtonite	MFML □Mn ₂ Mg ₅ Si ₈ O ₂₂ (OH) ₂
Manganogrunerite	MFML □Mn ₂ Fe ₅ ²⁺ Si ₈ O ₂₂ (OH) ₂
Nybite	SNaNa ₂ (Mg ₃ Al ₂)Si ₇ AlO ₂₂ (OH) ₂
Pargasite	C NaCa ₂ (Mg ₄ Al)Si ₆ Al ₂ O ₂₂ (OH) ₂
Permanganogrunerite	MFML □Mn ₄ Fe ₃ ²⁺ Si ₈ O ₂₂ (OH) ₂
Potassic-fluororichterite	SC (K,Na)(CaNa)Mg ₅ Si ₈ O ₂₂ F ₂
Potassic-magnesiosadanagaite	C (K,Na)Ca ₂ [Mg ₃ (Al,Fe ³⁺) ₂]- Si ₅ Al ₃ O ₂₂ (OH) ₂
Potassicpargasite	C (K,Na)Ca ₂ (MgFe,Al) ₅ - (Si,Al) ₈ O ₂₂ (OH,F) ₂
Potassicsadanagaite	C (K,Na)Ca ₂ [Fe ₃ ²⁺ (Al,Fe ³⁺) ₂]- Si ₅ Al ₃ O ₂₂ (OH) ₂
Protoferro-anthophyllite	MFML (Fe ²⁺ ,Mn ²⁺) ₂ (Fe ²⁺ ,Mg) ₅ (Si ₄ O ₁₁) ₂ (OH) ₂
Protomangano-ferro-anthophyllite	MFML (Mn ²⁺ ,Fe ²⁺) ₂ (Fe ²⁺ ,Mg) ₅ (Si ₄ O ₁₁) ₂ (OH) ₂
Richterite	SC Na(CaNa)Mg ₅ Si ₈ O ₂₂ (OH) ₂
Riebeckite	S□Na ₂ (Fe ₃ ²⁺ Fe ₂ ³⁺)Si ₈ O ₂₂ (OH) ₂
Sadanagaite	C NaCa ₂ [Fe ₃ ²⁺ (Al,Fe ³⁺) ₂]Si ₅ Al ₃ O ₂₂ (OH) ₂
Sodicanthophyllite	MFML NaMg ₇ Si ₈ O ₂₂ (OH) ₂

Sodic-ferri-clinoferroholmquistite

	MFML	$\text{Li}_2(\text{Fe}^{2+}, \text{Mg})_3\text{Fe}_2^{3+}\text{Si}_8\text{O}_{22}(\text{OH})_2$
Sodic-ferro-anthophyllite	MFML	$\text{NaFe}_7^{2+}\text{Si}_8\text{O}_{22}(\text{OH})_2$
Sodic-ferrogedrite	MFML	$\text{NaFe}_6^{2+}\text{AlSi}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Sodicgedrite	MFML	$\text{NaMg}_5\text{AlSi}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Taramite	SC	$\text{Na}(\text{CaNa})\text{Fe}_3^{2+}\text{AlFe}^{3+}\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Tremolite	C	$\square\text{Ca}_2\text{Mg}_5\text{Si}_8\text{O}_{22}(\text{OH})_2$
Tschermakite	C	$\square\text{Ca}_2(\text{Mg}_3\text{AlFe}^{3+})\text{Si}_6\text{Al}_2\text{O}_{22}(\text{OH})_2$
Ungarettiite	SNaNa ₂	$(\text{Mn}_2^{2+}\text{Mn}_3^{3+})\text{Si}_8\text{O}_{22}\text{O}_2$
Winchite	SC	$\square(\text{CaNa})\text{Mg}_4(\text{AlFe}^{3+})\text{Si}_8\text{O}_{22}(\text{OH})_2$

Joessmithite is a related mineral.

Apatite Group

Hexagonal, or monoclinic, pseudo-hexagonal arsenates, phosphates, and vanadates of general formula $\text{A}_5(\text{XO}_4)_3(\text{F}, \text{Cl}, \text{CH})$; A = Ba, Ca, Ce, K, Na, Pb, Sr, Y; X = As⁵⁺, P⁵⁺, Si⁴⁺, V⁵⁺; (CO₃) may partially replace (PO₄).

Alforsite	Ba ₅ (PO ₄) ₃ Cl
Belovite-(Ce)	Sr ₃ Na(Ce,La)(PO ₄) ₃ (F,OH)
Belovite-(La)	Sr ₃ Na(La,Ce)(PO ₄) ₃ (F,OH)
Carbonate-fluorapatite	Ca ₅ (PO ₄ ,CO ₃) ₃ F
Carbonate-hydroxyapatite	Ca ₅ (PO ₄ ,CO ₃) ₃ (OH)
Chlorapatite	Ca ₅ (PO ₄) ₃ Cl
Clinomimetite	Pb ₅ (AsO ₄) ₃ Cl
Fermorite	(Ca,Sr) ₅ (AsO ₄ ,PO ₄) ₃ (OH)
Fluorapatite	Ca ₅ (PO ₄) ₃ F
Hedyphane	Pb ₃ Ca ₂ (AsO ₄) ₃ Cl
Hydroxyapatite	Ca ₅ (PO ₄) ₃ (OH)
Johnbaumite	Ca ₅ (AsO ₄) ₃ (OH)
Mimetite	Pb ₅ (AsO ₄) ₃ Cl
Morelandite	(Ba,Ca,Pb) ₅ (AsO ₄ ,PO ₄) ₃ Cl
Pyromorphite	Pb ₅ (PO ₄) ₃ Cl
Strontium-apatite	(Sr,Ca) ₅ (PO ₄) ₃ (OH,F)
Svabite	Ca ₅ (AsO ₄) ₃ F
Turneaureite	Ca ₅ [(As,P)O ₄] ₃ Cl
Vanadinite	Pb ₅ (VO ₄) ₃ Cl

Britholite-(Ce), Britholite-(Y), Fluorbritholite-(Ce), Chlorellestadite, Fluorellestadite, Hydroxyllestadite, and Mattheddleite are silicates that are isostructural with members of the Apatite group; so is the sulfate Cesanite.

Aragonite Group

Orthorhombic carbonates of general formula ACO_3 , A = Ba, Ca, Pb, Sr; compare the Calcite group.

Aragonite	CaCO ₃
Cerussite	PbCO ₃
Strontianite	SrCO ₃
Witherite	BaCO ₃

Arsenic Group

Trigonal semi-metals (As, Bi, Sb).

Antimony	Sb
Arsenic	As
Bismuth	Bi
Stibarsen	SbAs

Arsenopyrite Group

Sulfides of general formula ABS, mon. or orth., A = Co, Fe, Os, Ru; B = As, Sb.

Arsenopyrite	FeAsS
Glaucodot	(Co,Fe)AsS
Gudmundite	FeSbS
Osarsite	(Os,Ru)AsS
Ruarsite	RuAsS

Arthurite Group

Monoclinic arsenates and phosphates of general formula $A^{2+}Fe_2^{3+}(XO_4)_2(O,OH)_2 \cdot 4H_2O$; A^{2+} ; $A^{2+} = Cu, Fe, Mn, Zn$; X = As, P, S.

Arthurite	$Cu^{2+}Fe_2^{3+}(AsO_4,PO_4,SO_4)_2(O,OH)_2 \cdot 4H_2O$
Earlshannonite	$(Mn^{2+},Fe^{2+})Fe_2^{3+}(PO_4)_2(OH)_2 \cdot 4H_2O$
Ojuelaite	$ZnFe_2^{3+}(AsO_4)_2(OH)_2 \cdot 4H_2O$
Whitmoreite	$Fe^{2+}Fe_2^{3+}(PO_4)_2(OH)_2 \cdot 4H_2O$

Astrophyllite Group

Triclinic silicates of general formula $A_3B_7C_2Si_8O_{24}(O,OH)_7$, A = Ca, Cs, (H₃O), K, Na; B = Fe²⁺, Mg, Mn²⁺; C = Nb, Ti, Zr.

Astrophyllite	$(K,Na)_3(Fe^{2+},Mn)_7Ti_2Si_8O_{24}(O,OH)_7$
Cesium-kupletskite	$(Cs,K,Na)_3(Mn,Fe^{2+})_7(Ti,Nb)_2Si_8O_{24}(O,OH,F)_7$
Hydroastrophyllite	$(H_3O,K,Ca)_3(Fe^{2+},Mn)_{5-6}Ti_2Si_8(O,OH)_{31}$
Kupletskite	$(K,Na)_3(Mn,Fe^{2+})_7(Ti,Nb)_2Si_8O_{24}(O,OH)_7$
Magnesium astrophyllite	$(Na,K)_4Mg_2(Fe^{2+},Fe^{3+},Mn)_5Ti_2Si_8O_{24}(O,OH,F)_7$
Niobophyllite	$(K,Na)_3(Fe^{2+},Mn^{2+})_6(Nb,Ti)_2Si_8(O,OH,F)_{31}$
Zircophyllite	$(K,Na,Ca)_3(Mn,Fe^{2+})_7(Zr,Nb)_2Si_8O_{27}(OH,F)_4$

Autunite Group

Tetragonal uranyl arsenate, phosphates, and vanadates of general formula $A(UO_2)_2(XO_4)_2 \cdot 8-12H_2O$; A = Ba, Ca, Cu, Fe²⁺, 1/2(HAl), Mg, Mn²⁺, Na₃(UO₂); X = As, P, V.

Autunite	$Ca(UO_2)_2(PO_4)_2 \cdot 10-12H_2O$
Fritzscheite	$Mn^{2+}(UO_2)_2[(P,V)O_4]_2 \cdot 10H_2O (?)$
Heinrichite	$Ba(UO_2)_2(AsO_4)_2 \cdot 10-12H_2O$
Kahlerite	$Fe^{2+}(UO_2)_2(AsO_4)_2 \cdot 10-12H_2O$
Nov_ekite	$Mg(UO_2)_2(AsO_4)_2 \cdot 12H_2O$
Sabugalite	$H_{0.5}Al_{0.5}(UO_2)_2(PO_4)_2 \cdot 8H_2O$

Sal_eite	$Mg(UO_2)_2(PO_4)_2 \cdot 10H_2O$
Sodium autunite	$Na_2(UO_2)_2(PO_4)_2 \cdot 8H_2O$
Torbernite	$Cu^{2+}(UO_2)_2(PO_4)_2 \cdot 8-12H_2O$
Tr_gerite	$(UO_2)_3(AsO_4)_2 \cdot 12H_2O$ (?)
Uranocircite	$Ba(UO_2)_2(PO_4)_2 \cdot 12H_2O$
Uranospinite	$Ca(UO_2)_2(AsO_4)_2 \cdot 10H_2O$
Zeunerite	$Cu^{2+}(UO_2)_2(AsO_4)_2 \cdot 10-16H_2O$

Axinite Group

Triclinic borosilicates of general formula $A_3Al_2BSi_4O_{15}(OH)$, A = Ca, Fe^{2+} , Mg, Mn^{2+} .

Ferro-axinite	$Ca_2Fe^{2+}Al_2BSi_4O_{15}(OH)$
Magnesio-axinite	$Ca_2MgAl_2BSi_4O_{15}(OH)$
Manganaxinite	$Ca_2Mn^{2+}Al_2BSi_4O_{15}(OH)$
Tinzenite	$(Ca, Mn^{2+}, Fe^{2+})_3Al_2BSi_4O_{15}(OH)$

Barite Group

Orthorhombic sulfates and chromate of general formula AXO_4 , A = Ba, Pb, Sr; X = Cr^{6+} , S^{6+} .

Anglesite	$PbSO_4$
Barite	$BaSO_4$
Celestine	$SrSO_4$
Hashemite	$Ba(Cr,S)O_4$

Beudantite Group

Trigonal sulfate-arsenates and sulfate-phosphates of general formula $AB_3(XO_4)(SO_4)(OH)_6$, A = Ba, Ca, Ce, Pb, Sr, (H₃); B = Al, Fe^{3+} , Ga; X = As^{5+} , P^{5+} .

Beudantite	$PbFe_3^{3+}(AsO_4)(SO_4)(OH)_6$
Corkite	$PbFe_3^{3+}(PO_4)(SO_4)(OH)_6$
Gallobeutantite	$PbGa_3[(AsO_4),(SO_4)]_2(OH)_6$
Hidalgoite	$PbAl_3(AsO_4)(SO_4)(OH)_6$
Hinsdalite	$(Pb,Sr)Al_3(PO_4)(SO_4)(OH)_6$
Kemmlitzite	$(Sr,Ce)Al_3(AsO_4)(SO_4)(OH)_6$
Schlossmacherite	$(H_3O,Ca)Al_3(AsO_4,SO_4)_2(OH)_6$
Svanbergite	$SrAl_3(PO_4)(SO_4)(OH)_6$
Woodhouseite	$CaAl_3(PO_4)(SO_4)(OH)_6$

Bjarebyite Group

Monoclinic and triclinic phosphates of general formula $AB_2C_2(PO_4)_3(OH)_3$, A = Ba, Sr; B = Fe^{2+} , Mg, Mn^{2+} ; C = Al, Fe^{3+} .

Bjarebyite	$(Ba,Sr)(Mn^{2+}, Fe^{2+}, Mg)_2Al_2(PO_4)_3(OH)_3$
Kulanite	$Ba(Fe^{2+}, Mn, Mg)_2Al_2(PO_4)_3(OH)_3$
Penikisite	$Ba(Mg, Fe^{2+})_2Al_2(PO_4)_3(OH)_3$
Perloffite	$Ba(Mn^{2+}, Fe^{2+})_2Fe_2^{3+}(PO_4)_3(OH)_3$

Brackebuschite Group

Monoclinic arsenates, phosphates, and vanadates of general formula $A_2B(XO_4)_2(OH, H_2O)$, $A = Ba, Ca, Pb, Sr$; $B = Al, Cu^{2+}, Fe^{2+}, Fe^{3+}, Mn^{2+}, Mn^{3+}, Zn$; $XO_4 = AsO_4, PO_4, SO_4, VO_4$.

Arsenbrackebuschite	$Pb_2(Fe^{2+}, Zn)(AsO_4)_2 \cdot H_2O$
Arsentsumebite	$Pb_2Cu^{2+}(AsO_4)(SO_4)(OH)$
Bearthite	$Ca_2Al(PO_4)_2(OH)$
Brackebuschite	$Pb_2(Mn^{3+}, Fe^{3+})(VO_4)_2(OH)$
Feinglosite	$Pb_2(Zn, Fe)[(As, S)O_4]_2 \cdot H_2O$
Gamagarite	$Ba_2(Fe^{3+}, Mn^{3+})(VO_4)_2(OH)$
Goedkenite	$(Sr, Ca)_2Al(PO_4)_2(OH)$
Tsumebite	$Pb_2Cu(PO_4)(SO_4)(OH)$

Fornacite and Vauquelinite are structurally related to the members of this group.

Brucite Group

Trigonal hydroxides of general formula $M^{2+}(OH)_2$, $M^{2+} = Fe, Mg, Mn, Ni$.

Amakinite	$(Fe^{2+}, Mg)(OH)_2$
Brucite	$Mg(OH)_2$
Pyrochroite	$Mn^{2+}(OH)_2$
Theophrastite	$Ni(OH)_2$

Calcite Group

Trigonal carbonates of general formula $A^{2+}(CO_3)$, $A^{2+} = Ca, Cd, Co, Fe, Mg, Mn, Ni, Zn$; compare the Aragonite group.

Calcite	$CaCO_3$
Gasp_ite	$(Ni, Mg, Fe^{2+})CO_3$
Magnesite	$MgCO_3$
Otavite	$CdCO_3$
Rhodochrosite	$Mn^{2+}CO_3$
Siderite	$Fe^{2+}CO_3$
Smithsonite	$ZnCO_3$
Sphaerocobaltite	$CoCO_3$

Cancrinite Group

Hexagonal silicates of general formula $A_{6-9}(Si, Al)_{12}O_{24}[(SO_4), (CO_3), Cl, (OH)]_{2-4} \cdot nH_2O$. $A = Na, Ca, K$.

Afghanite	$(Na, Ca, K)_8(Si, Al)_{12}O_{24}(SO_4, Cl, CO_3)_3 \cdot H_2O$
Bystrite	$Ca(Na, K)_7Si_6Al_6O_{24}(S^{2-})_{1.5} \cdot H_2O$
Cancrinite	$Na_6Ca_2Al_6Si_6O_{24}(CO_3)_2$
Cancrisilite	$Na_7Al_5Si_7O_{24}(CO_3) \cdot 3H_2O$
Davyne	$(Na, Ca, K)_8Al_6Si_6O_{24}(Cl, SO_4, CO_3)_{2-3}$
Franzinit	$(Na, Ca)_7(Si, Al)_{12}O_{24}(SO_4, CO_3, OH, Cl)_3 \cdot H_2O$
Giuseppettite	$(Na, K, Ca)_{7-8}(Si, Al)_{12}O_{24}(SO_4Cl)_{1-2}$
Hydroxycancrinite	$Na_8Al_6Si_6O_{24}(OH)_2 \cdot 2H_2O$

Liottite	$(\text{Ca,Na,K})_8(\text{Si,Al})_{12}\text{O}_{24}[(\text{SO}_4),(\text{CO}_3),\text{Cl,OH}]_4 \cdot \text{H}_2\text{O}$
Microsommitte	$(\text{Na,Ca,K})_{7-8}(\text{Si,Al})_{12}\text{O}_{24}(\text{Cl,SO}_4,\text{CO}_3)_{2-3}$
Pitaglianoite	$\text{K}_2\text{Na}_6\text{Si}_6\text{Al}_6\text{O}_{24}(\text{SO}_4) \cdot 2\text{H}_2\text{O}$
Quadridavyne	$[(\text{Na,K})_6\text{Cl}_2](\text{Ca}_2\text{Cl}_2)(\text{Si}_6\text{Al}_6\text{O}_{24})$
Sacrofanite	$(\text{Na,Ca,K})_9(\text{Si,Al})_{12}\text{O}_{24}[(\text{OH})_2,(\text{SO}_4),(\text{CO}_3),\text{Cl}_2]_3 \cdot n\text{H}_2\text{O}$
Touankite	$(\text{Na,Ca,K})_8(\text{Al}_6\text{Si}_6\text{O}_{24})(\text{SO}_4)_2\text{Cl} \cdot \text{H}_2\text{O}$
Vishnevite	$(\text{Na,Ca,K})_6(\text{Si,Al})_{12}\text{O}_{24}[(\text{SO}_4),(\text{CO}_3),\text{Cl}_2]_{2-4} \cdot n\text{H}_2\text{O}$
Wenkite (?)	$\text{Ba}_4\text{Ca}_6(\text{Si,Al})_{20}\text{O}_{39}(\text{OH})_2(\text{SO}_4)_3 \cdot n\text{H}_2\text{O} (?)$

Chalcanthite Group

Triclinic sulfates of general formula $\text{A}^{2+}(\text{SO}_4) \cdot 5\text{H}_2\text{O}$, $\text{A}^{2+} = \text{Cu, Fe, Mg, Mn}$.

Chalcanthite	$\text{Cu}^{2+}\text{SO}_4 \cdot 5\text{H}_2\text{O}$
Jokokuite	$\text{Mn}^{2+}\text{SO}_4 \cdot 5\text{H}_2\text{O}$
Pentahydrate	$\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$
Siderotil	$\text{Fe}^{2+}\text{SO}_4 \cdot 5\text{H}_2\text{O}$

Chalcopyrite Group

Tetragonal sulfides of general formula CuBX_2 , $\text{B} = \text{Fe, Ga, In}$; $\text{X} = \text{S, Se}$.

Chalcopyrite	CuFeS_2
Eskebornite	CuFeSe_2
Gallite	CuGaS_2
Roquesite	CuInS_2

Lenaite is a related mineral.

Chlorite Group

Monoclinic or triclinic silicates of general formula $\text{A}_{4-6}\text{Z}_4\text{O}_{10}(\text{OH,O})_8$, $\text{A} = \text{Al, Fe}^{2+}, \text{Fe}^{3+}, \text{Li, Mg, Mn}^{2+}, \text{Ni, Zn}$; $\text{Z} = \text{Al, B, Fe}^{3+}, \text{Si}$. Their nomenclature is discussed by Hey, *Min. Mag.* **30**, 277–292 (1954) and by Bayliss, *Can. Min.* **13**, 178–180 (1975).

Bailey chlore	$(\text{Zn,Fe}^{2+},\text{Al,Mg})_6(\text{Si,Al})_4\text{O}_{10}(\text{OH})_8$
Chamosite	$(\text{Fe}^{2+},\text{Mg,Fe}^{3+})_5\text{Al}(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH,O})_8$
Clinochlore	$(\text{Mg,Fe}^{2+})_5\text{Al}(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_8$
Cookeite	$\text{LiAl}_4(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_8$
Gonyerite	$(\text{Mn}^{2+},\text{Mg})_5\text{Fe}^{3+}(\text{Si}_3\text{Fe}^{3+})\text{O}_{10}(\text{OH})_8$
Nimite	$(\text{Ni,Mg,Fe}^{2+})_5\text{Al}(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_8$
Orthochamosite	$(\text{Fe}^{2+},\text{Mg,Fe}^{3+})_5\text{Al}(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH,O})_8$
Pennantite	$\text{Mn}_5^{2+}\text{Al}(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_8$
Sudoite	$\text{Mg}_2(\text{Al,Fe}^{3+})_3\text{Si}_3\text{AlO}_{10}(\text{OH})_8$

Compare Franklinfurnaceite.

Cobaltite Group

Sulfides, cubic or pseudo-cubic, of general formula ABS , $\text{A} = \text{Co, In, Ir, Ni, Pd, Pt, Rh, Ru}$; $\text{B} = \text{As, Sb, Bi}$.

Cobaltite	CoAsS
Gersdorffite	NiAsS
Hollingworthite	$(\text{Rh,Pt,Pd})\text{AsS}$

Irarsite	(Ir,Ru,Rh,Pt)AsS
Jolliffeite	NiAsSe
Padmaite	PdBiSe
Platarsite	(Pt,Rh,Ru)AsS
Tolovkite	IrSbS
Ullmannite	NiSbS
Willyamite	(Co,Ni)SbS

Colusite Group

Cubic sulfides with general formula $\text{Cu}_{26}\text{A}_2\text{B}_6\text{S}_{32}$ or $\text{Cu}_{26}\text{A}_4\text{B}_4\text{S}_{32}$ where A = V, Fe and B = As, Sn, Sb, Ge.

Colusite	$\text{Cu}_{26}\text{V}_2(\text{As,Sn,Sb})_6\text{S}_{32}$
Germanite	$\text{Cu}_{26}\text{Fe}_4\text{Ge}_4\text{S}_{32}$
Germanocolusite	$\text{Cu}_{26}\text{V}_2(\text{Ge,As})_6\text{S}_{32}$
Nekrasovite	$\text{Cu}_{26}\text{V}_2(\text{Sn,As,Sb})_6\text{S}_{32}$
Stibicolusite	$\text{Cu}_{26}\text{V}_2(\text{Sb,Sn,As})_6\text{S}_{32}$

Copiapite Group

Tridinic sulfates of formula either $\text{A}^{2+}\text{Fe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 18\text{--}20\text{H}_2\text{O}$, or $\text{B}^{3+}_{2/3}\text{Fe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 20\text{H}_2\text{O}$; $\text{A}^{2+} = \text{Ca, Cu, Fe, Mg, Zn}$; $\text{B}^{3+} = \text{Al, Fe}$.

Aluminocopiapite	$\text{Al}_{2/3}\text{Fe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 20\text{H}_2\text{O}$
CalcioCopiapite	$\text{CaFe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 19\text{H}_2\text{O}$
Copiapite	$\text{Fe}^{2+}\text{Fe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 20\text{H}_2\text{O}$
Cuprocopiapite	$\text{Cu}^{2+}\text{Fe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 20\text{H}_2\text{O}$
Ferricopiapite	$\text{Fe}^{3+}_{2/3}\text{Fe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 20\text{H}_2\text{O}$
Magnesiocopiapite	$\text{MgFe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 20\text{H}_2\text{O}$
Zincocopiapite	$\text{ZnFe}_4^{3+}(\text{SO}_4)_6(\text{OH})_2 \cdot 18\text{H}_2\text{O}$

Crandallite Group

Trigonal phosphates and arsenates of general formula $\text{AB}_3(\text{XO}_4)_2(\text{OH,F})_5$, or $\text{AB}_3(\text{XO}_4)_2(\text{OH,F})_6$; A = Ba, Bi, Ca, Ce, La, Nd, Pb, Sr, Th; B = Al, Fe^{3+} ; X = As, P, Si.

Arsenocrandallite	$(\text{Ca,Sr})\text{Al}_3[(\text{As,P})\text{O}_4]_2(\text{OH})_5 \cdot \text{H}_2\text{O}$
Arsenoflorencite-(Ce)	$(\text{Ce,La})\text{Al}_3(\text{AsO}_4, \text{PO}_4)_2(\text{OH})_6$
Arsenogorceixite	$\text{HBaAl}_3(\text{AsO}_4)_2(\text{OH})_6$
Arsenogoyazite	$(\text{Sr,Ca,Ba})\text{Al}_3(\text{AsO}_4, \text{PO}_4)_2(\text{OH,F})_5 \cdot \text{H}_2\text{O}$
Benaute	$\text{HSrFe}_3^{3+}(\text{PO}_4)_2(\text{OH})_6$
Crandallite	$\text{CaAl}_3(\text{PO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$
Dussertite	$\text{BaFe}_3^{3+}(\text{AsO}_4)_2(\text{OH})_5$
Eylettersite	$(\text{Th,Pb})_{1-x}\text{Al}_3(\text{PO}_4, \text{SiO}_4)_2(\text{OH})_6$ (?)
Florencite-(Ce)	$\text{CeAl}_3(\text{PO}_4)_2(\text{OH})_6$
Florencite-(La)	$(\text{La,Ce})\text{Al}_3(\text{PO}_4)_2(\text{OH})_6$
Florencite-(Nd)	$(\text{Nd,Ce})\text{Al}_3(\text{PO}_4)_2(\text{OH})_6$
Gorceixite	$\text{BaAl}_3(\text{PO}_4)(\text{PO}_3\text{OH})(\text{OH})_6$
Goyazite	$\text{SrAl}_3(\text{PO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$
Philipsbornite	$\text{PbAl}_3(\text{AsO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$

Plumbogummite	$\text{PbAl}_3(\text{PO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$
Waylandite	$(\text{Bi,Ca})\text{Al}_3(\text{PO}_4,\text{SiO}_4)_2(\text{OH})_6$
Zairite	$\text{Bi}(\text{Fe}^{3+},\text{Al})_3(\text{PO}_4)_2(\text{OH})_6$

Crichtonite Group

Trigonal, or monoclinic, pseudotrigonal oxides of general formula $\text{AB}_{21}(\text{O},\text{OH})_{38}$; A = Ba, Ca, Ce, K, La, Na, Pb, Sr, Y; B = Cr^{3+} , Fe^{2+} , Fe^{3+} , Mg, Mn^{2+} , Ti, U, V^{3+} , Zn, Zr.

Crichtonite	$(\text{Sr,La,Ce,Y})(\text{Ti,Fe}^{3+},\text{Mn})_{21}\text{O}_{38}$
Davidite-(Ce)	$(\text{Ce,La})(\text{Y,U,Fe}^{2+})(\text{Ti,Fe}^{3+})_{20}(\text{O},\text{OH})_{38}$
Davidite-(La)	$(\text{La,Ce})(\text{Y,U,Fe}^{2+})(\text{Ti,Fe}^{3+})_{20}(\text{O},\text{OH})_{38}$
Dessauite	$(\text{Sr,Pb})(\text{Y,U})(\text{Ti,Fe}^{3+})_{20}\text{O}_{38}$
Landauite	$\text{NaMn}^{2+}\text{Zn}_2(\text{Ti,Fe}^{3+})_6\text{Ti}_{12}\text{O}_{38}$
Lindsleyite	$(\text{Ba,Sr})(\text{Ti,Cr,Fe,Mg,Zr})_{21}\text{O}_{38}$
Loveringite	$(\text{Ca,Ce})(\text{Ti,Fe}^{3+},\text{Cr,Mg})_{21}\text{O}_{38}$
Mathiasite	$(\text{K,Ca,Sr})(\text{Ti,Cr,Fe,Mg})_{21}\text{O}_{38}$
Senaite	$\text{Pb}(\text{Ti,Fe,Mn})_{21}\text{O}_{38}$

Cryptomelane Group

Complex oxides, tetragonal or monoclinic, pseudo-tetragonal, of general formula AB_8O_{16} , A = Ba, K, Mn^{4+} , Na, Pb, Sr; B = Cr^{3+} , Fe^{3+} , Mg, Mn^{2+} , Ti, V^{3+} , Zn, Zr.

Ankangite	$\text{Ba}(\text{Ti,V}^{3+},\text{Cr}^{3+})_8\text{O}_{16}$
Coronadite	$\text{Pb}(\text{Mn}^{4+},\text{Mn}^{2+})_8\text{O}_{16}$
Cryptomelane	$\text{K}(\text{Mn}^{4+},\text{Mn}^{2+})_8\text{O}_{16}$
Hollandite	$\text{Ba}(\text{Mn}^{4+},\text{Mn}^{2+})_8\text{O}_{16}$
Manjiroite	$(\text{Na,K})(\text{Mn}^{4+},\text{Mn}^{2+})_8\text{O}_{16} \cdot n\text{H}_2\text{O}$
Mannardite	$\text{Ba}(\text{Ti}_6\text{V}_2^{3+})\text{O}_{16}$
Priderite	$(\text{K,Ba})(\text{Ti,Fe}^{3+})_8\text{O}_{16}$
Redledgeite	$\text{BaTi}_6\text{Cr}_2^{3+}\text{O}_{16} \cdot \text{H}_2\text{O}$

Cuspidine Group

Monoclinic and triclinic silicates of general formula $\text{X}_{16}(\text{Si}_2\text{O}_7)_4(\text{O},\text{OH},\text{F})_8$, where X is: Na, Ca, Zr, Ti, Nb, Mn^{2+} , Fe^{2+} , Y, and REE. On structural grounds, this group can be split into four subgroups with the following species: (a) Cuspidine, L_venite, Normandite, Niocalite, Hiortdahlite II, and Janhaugite; (b) W_hlerite; (c) Baghdadite and Burpalite; (d) Hiortdahlite I. The Cuspidine Group is closely related to the G_tzenite Group. For details see the paper by Merlino & Perchiazzi in *Can. Min.* **26**, 933–943 (1988).

Baghdadite	$\text{Ca}_{12}(\text{Zr,Ti})_4(\text{Si}_2\text{O}_7)_4(\text{O},\text{F})_8$, mon.
Burpalite	$\text{Na}_8\text{Ca}_4\text{Zr}_4(\text{Si}_2\text{O}_7)_4\text{F}_8$, mon.
Cuspidine	$\text{Ca}_{16}(\text{Si}_2\text{O}_7)_4(\text{F},\text{OH})_8$, mon.
Hiortdahlite I	$(\text{Na}_3\text{Ca})\text{Ca}_8\text{Zr}_2\text{M}_2(\text{Si}_2\text{O}_7)_4(\text{O}_3\text{F}_5)$, tric. (M has an average charge of 3+)
Hiortdahlite II	$(\text{Na,Ca})_4\text{Ca}_8\text{Zr}_2(\text{Y,Zr,REE,Na})_2(\text{Si}_2\text{O}_7)_4(\text{O}_3\text{F}_5)$, tric.
Janhaugite	$\text{Na}_6\text{Mn}_6^{2+}\text{Ti}_4(\text{Si}_2\text{O}_7)_4[\text{O}_2(\text{OH},\text{F},\text{O})_6]$, mon.
L_venite	$(\text{Na,Ca})_8(\text{Mn}^{2+},\text{Fe}^{2+})_4(\text{Zr,Ti})_4(\text{Si}_2\text{O}_7)_4(\text{O},\text{OH},\text{F})_8$, mon.
Niocalite	$\text{Ca}_{14}\text{Nb}_2(\text{Si}_2\text{O}_7)_4(\text{O}_6\text{F}_2)$, mon.
Normandite	$\text{Na}_4\text{Ca}_4(\text{Mn}^{2+},\text{Fe}^{2+})_4(\text{Zr,Ti})_4(\text{Si}_2\text{O}_7)_4(\text{O}_4\text{F}_4)$, mon.

W_hlerite $\text{Na}_4\text{Ca}_8(\text{Zr,Nb})_4(\text{Si}_2\text{O}_7)_4(\text{O,OH,F})_8$, mon.

Datolite Group

See Gadolinite group.

Descloizite Group

Orthorhombic arsenates and vanadates of general formula $\text{PbM}(\text{XO}_4)(\text{OH})$,
 $\text{M} = \text{Cu}^{2+}, \text{Fe}^{2+}, \text{Mn}^{2+}, \text{Zn}$; $\text{X} = \text{As}^{5+}, \text{V}^{5+}$

Arsendescloizite	$\text{PbZn}(\text{AsO}_4)(\text{OH})$
_echite	$\text{Pb}(\text{Fe}^{2+}, \text{Mn})(\text{VO}_4)(\text{OH})$
Descloizite	$\text{PbZn}(\text{VO}_4)(\text{OH})$
Mottramite	$\text{PbCu}^{2+}(\text{VO}_4)(\text{OH})$
Pyrobelonite	$\text{PbMn}^{2+}(\text{VO}_4)(\text{OH})$

Dolomite Group

Trigonal carbonates of general formula $\text{AB}(\text{CO}_3)_2$, $\text{A} = \text{Ba}, \text{Ca}$; $\text{B} = \text{Fe}^{2+}, \text{Mg}, \text{Mn}^{2+}, \text{Zn}$.

Ankerite	$\text{Ca}(\text{Fe}^{2+}, \text{Mg}, \text{Mn})(\text{CO}_3)_2$
Dolomite	$\text{CaMg}(\text{CO}_3)_2$
Kutnohorite	$\text{Ca}(\text{Mn}^{2+}, \text{Mg}, \text{Fe}^{2+})(\text{CO}_3)_2$
Minrecordite	$\text{CaZn}(\text{CO}_3)_2$
Norsethite	$\text{BaMg}(\text{CO}_3)_2$

Isostructural with the borates Nordenski_kline and Tusionite.

Epidote Group

Monoclinic and orthorhombic silicates of general formula $\text{A}_2\text{B}_3(\text{SiO}_4)_3(\text{OH})$, or $\text{A}_2\text{B}_3\text{Si}_3\text{O}_{11}(\text{OH,F})_2$, $\text{A} = \text{Ca}, \text{Ce}, \text{Pb}, \text{Sr}, \text{Y}$; $\text{B} = \text{Al}, \text{Fe}^{3+}, \text{Mg}, \text{Mn}^{3+}, \text{V}^{3+}$.

Allanite-(Ce)	$(\text{Ce,Ca,Y})_2(\text{Al,Fe}^{2+}, \text{Fe}^{3+})_3(\text{SiO}_4)_3(\text{OH})$
Allanite-(Y)	$(\text{Y,Ce,Ca})_2(\text{Al,Fe}^{3+})_3(\text{SiO}_4)_3(\text{OH})$
Androsite-(La)	$(\text{Mn,Ca})(\text{La,Ce,Ca,Nd})\text{AlMn}^{3+}\text{Mn}^{2+}(\text{SiO}_4)(\text{Si}_2\text{O}_7)\text{O}(\text{OH})$
Clinozoisite	$\text{Ca}_2\text{Al}_3(\text{SiO}_4)_3(\text{OH})$
Dissakisite-(Ce)	$\text{Ca}(\text{Ce,La})\text{MgAl}_2(\text{SiO}_4)_3(\text{OH})$
Dollaseite-(Ce)	$\text{CaCeMg}_2\text{AlSi}_3\text{O}_{11}(\text{F,OH})_2$
Epidote	$\text{Ca}_2(\text{Fe}^{3+}, \text{Al})_3(\text{SiO}_4)_3(\text{OH})$
Hancockite	$(\text{Pb,Ca,Sr})_2(\text{Al,Fe}^{3+})_3(\text{SiO}_4)_3(\text{OH})$
Khristovite-(Ce)	$(\text{Ca,REE})\text{REE}(\text{Mg,Fe}^{2+})\text{AlMn}^{2+}\text{Si}_3\text{O}_{11}(\text{OH})(\text{F,O})$
Mukhinite	$\text{Ca}_2\text{Al}_2\text{V}^{3+}(\text{SiO}_4)_3(\text{OH})$
Piemontite	$\text{Ca}_2(\text{Al,Mn}^{3+}, \text{Fe}^{3+})_3(\text{SiO}_4)_3(\text{OH})$
Strontio Piemontite	$\text{CaSr}(\text{Al,Mn}^{3+}, \text{Fe}^{3+})_3\text{Si}_3\text{O}_{11}\text{O}(\text{OH})$
Zoisite	$\text{Ca}_2\text{Al}_3(\text{SiO}_4)_3(\text{OH})$

Ettringite Group

Hexagonal sulfates of general formula $\text{Ca}_6\text{X}_2\text{Y}(\text{O,OH})_{12} \cdot 24\text{--}26\text{H}_2\text{O}$, $\text{X} = \text{Al}, \text{Cr}^{3+}, \text{Fe}^{3+}, \text{Mn}^{2+}, \text{Mn}^{4+}, \text{Si}$; $\text{Y} = (\text{SO}_4, \text{CO}_3)_3$ or $(\text{SO}_4)_2\text{B}(\text{OH})_4$.

Bentorite	$\text{Ca}_6(\text{Cr,Al})_2(\text{SO}_4)_3(\text{OH})_{12} \cdot 26\text{H}_2\text{O}$
Charlesite	$\text{Ca}_6(\text{Al,Si})_2(\text{SO}_4)_2\text{B}(\text{OH})_4(\text{OH,O})_{12} \cdot 26\text{H}_2\text{O}$

Ettringite	$\text{Ca}_6\text{Al}_2(\text{SO}_4)_3(\text{OH})_{12}\cdot 26\text{H}_2\text{O}$
Jouravskite	$\text{Ca}_6\text{Mn}_2^{4+}(\text{SO}_4,\text{CO}_3)_4(\text{OH})_{12}\cdot 26\text{H}_2\text{O}$
Stumanite	$\text{Ca}_6(\text{Fe}^{3+},\text{Al},\text{Mn}^{2+})_2(\text{SO}_4)_2[\text{B}(\text{OH})_4](\text{OH})_{12}\cdot 25\text{H}_2\text{O}$
Thaumasite	$\text{Ca}_6\text{Si}_2(\text{CO}_3)_2(\text{SO}_4)_2(\text{OH})_{12}\cdot 24\text{H}_2\text{O}$

Fairfieldite Group

Triclinic arsenates and phosphates of general formula $\text{Ca}_2\text{B}(\text{XO}_4)_2\cdot 2\text{H}_2\text{O}$, B = Co, Fe^{2+} , Mg, Mn^{2+} , Ni, Zn; X = As, P.

Cassidyite	$\text{Ca}_2(\text{Ni},\text{Mg})(\text{PO}_4)_2\cdot 2\text{H}_2\text{O}$
Collinsite	$\text{Ca}_2(\text{Mg},\text{Fe}^{2+})(\text{PO}_4)_2\cdot 2\text{H}_2\text{O}$
Fairfieldite	$\text{Ca}_2(\text{Mn}^{2+},\text{Fe}^{2+})(\text{PO}_4)_2\cdot 2\text{H}_2\text{O}$
Gaitite	$\text{Ca}_2\text{Zn}(\text{AsO}_4)_2\cdot 2\text{H}_2\text{O}$
Messelite	$\text{Ca}_2(\text{Fe}^{2+},\text{Mn}^{2+})(\text{PO}_4)_2\cdot 2\text{H}_2\text{O}$
Parabrandtite	$\text{Ca}_2\text{Mn}^{2+}(\text{AsO}_4)_2\cdot 2\text{H}_2\text{O}$
Roselite-beta	$\text{Ca}_2\text{Co}(\text{AsO}_4)_2\cdot 2\text{H}_2\text{O}$
Talmessite	$\text{Ca}_2\text{Mg}(\text{AsO}_4)_2\cdot 2\text{H}_2\text{O}$

Feldspar Group

Silicates of general formula XZ_4O_8 , monoclinic, triclinic, orthorhombic, X = Ba, Ca, K, Na, NH_4 , Sr; Z = Al, B, Si.

Albite	$\text{NaAlSi}_3\text{O}_8$
Anorthite	$\text{CaA}_2\text{Si}_2\text{O}_8$
Anorthoclase	$(\text{Na},\text{K})\text{AlSi}_3\text{O}_8$
Banalsite	$\text{BaNa}_2\text{Al}_4\text{Si}_4\text{O}_{16}$
Buddingtonite	$(\text{NH}_4)\text{AlSi}_3\text{O}_8$
Celsian	$\text{BaA}_2\text{Si}_2\text{O}_8$
Dmisteinbergite	$\text{CaA}_2\text{Si}_2\text{O}_8$
Hyalophane	$(\text{K},\text{Ba})\text{Al}(\text{Si},\text{Al})_3\text{O}_8$
Microcline	KAlSi_3O_8
Orthoclase	KAlSi_3O_8
Paracelsian	$\text{BaA}_2\text{Si}_2\text{O}_8$
Reedmergnite	NaBSi_3O_8
Sanidine	a mon. K-Na feldspar
Slawsonite	$(\text{Sr},\text{Ca})\text{Al}_2\text{Si}_2\text{O}_8$
Stronalsite	$\text{SrNa}_2\text{Al}_4\text{Si}_4\text{O}_{16}$
Svyatoslavite	$\text{CaA}_2\text{Si}_2\text{O}_8$

Ferrotapiolite Group

Tetragonal oxides of general formula $\text{A}^{2+}\text{B}_2^{5+}\text{O}_6$, $\text{A}^{2+} = \text{Fe}, \text{Mg}, \text{Mn}, \text{Zn}$; $\text{B}^{5+} = \text{Nb}, \text{Sb}, \text{Ta}$.

Bystr_mite	$\text{MgSb}_2^{5+}\text{O}_6$
Ferrotapiolite	$(\text{Fe}^{2+},\text{Mn}^{2+})(\text{Ta},\text{Nb})_2\text{O}_6$
Manganotapiolite	$(\text{Mn}^{2+},\text{Fe}^{2+})(\text{Ta},\text{Nb})_2\text{O}_6$
Ordo_ezite	$\text{ZnSb}_2^{5+}\text{O}_6$
Tripuhyite	$\text{Fe}^{2+}\text{Sb}_2^{5+}\text{O}_6$

Gadolinite Group

Monoclinic silicates of general formula $W_{2-3}X(B,Be)_2(Si,B)_2(O,OH)_{10}$, $W = Ca, Ce, Y, Yb$; $X = Y, Fe^{2+}, Mg$

Bakerite	$Ca_4B_4(BO_4)(SiO_4)_3(OH)_3 \cdot H_2O$
Datolite	$Ca_2B_2Si_2O_8(OH)_2$
Gadolinite-(Ce)	$(Ce,La,Nd,Y)_2Fe^{2+}Be_2Si_2O_{10}$
Gadolinite-(Y)	$Y_2Fe^{2+}Be_2Si_2O_{10}$
Hingganite-(Yb)	$(Yb,Y)_2Be_2Si_2O_8(OH)_2$
Homilite	$Ca_2(Fe^{2+},Mg)B_2Si_2O_{10}$
Minasgeraisite-(Y)	$CaY_2Be_2Si_2O_{10}$

The phosphates Drugmanite, Herderite and Hydroxyherderite and the arsenate Bergslagite are structurally related to the silicates of this group.

Garnet Group

Cubic silicates of general formula $A_3B_2(SiO_4)_3$; (for Hibschite and Katoite, $A_3B_2(SiO_4)_{3-x}(OH)_{4x}$), $A = Ca, Fe^{2+}, Mg, Mn^{2+}$; $B = Al, Cr^{3+}, Fe^{3+}, Mn^{3+}$. Si, Ti, V^{3+}, Zr ; Si is partly replaced by Al, Fe^{3+} .

Almandine	$Fe_3^{2+}Al_2(SiO_4)_3$
Andradite	$Ca_3Fe_2^{3+}(SiO_4)_3$
Calderite	$(Mn^{2+},Ca)_3(Fe^{3+},Al)_2(SiO_4)_3$
Goldmanite	$Ca_3(V,Al,Fe^{3+})_2(SiO_4)_3$
Grossular	$Ca_3Al_2(SiO_4)_3$
Hibschite	$Ca_3Al_2(SiO_4)_{3-x}(OH)_{4x}$
Katoite	$Ca_3Al_2(SiO_4)_{3-x}(OH)_{4x}$
Kimzeyite	$Ca_3(Zr,Ti)_2(Si,Al,Fe^{3+})_3O_{12}$
Knorringite	$Mg_3Cr_2(SiO_4)_3$
Majorite	$Mg_3(Fe,Al,Si)_2(SiO_4)_3$
Morimotoite	$Ca_3TiFe^{2+}Si_3O_{12}$
Pyrope	$Mg_3Al_2(SiO_4)_3$
Schorlomite	$Ca_3Ti_2^{4+}(Fe_2^{3+}Si)O_{12}$
Spessartine	$Mn_3^{2+}Al_2(SiO_4)_3$
Uvarovite	$Ca_3Cr_2(SiO_4)_3$

The tellurate Yafsoanite, the arsenates Berzeliite and Manganberzeliite, the vanadate Palenzonaite, and the halide Cryolithionite are isostructural with the minerals of the Garnet group. Hennitermierite is a related mineral.

G_tzenite Group

Monoclinic and triclinic silicates of general formula $X_{16}(Si_2O_7)_4(O,OH,F)_8$, where X is: Na, Ca, Zr, Ti, Mn . The G_tzenite Group is closely related to the Cuspidine Group. For details see the paper by Merlino & Perchiazzi in *Can. Min.* **26**, 933–943 (1988).

G_tzenite	$Na_4Ca_{10}Ti_2(Si_2O_7)_4F_8$, tric.
Hainite	$Na_4Ca_{10}Ti_2(Si_2O_7)_4(O,OH)_4F_4$, tric.
Rosenbuschite	$(Ca,Na)_{12}(Zr,Ti)_4(Si_2O_7)_4(O_4F_4)$, tric.
Seidozerite	$(Na,Ca)_8(Zr,Ti,Mn)_8(Si_2O_7)_4(O,F)_8$, mon.

Halotrichite Group

Monoclinic sulfates of general formula $AB_2(SO_4)_4 \cdot 22H_2O$, $A = Fe^{2+}$, Mg , Mn^{2+} , Ni , Zn ; $B = Al$, Cr^{3+} , Fe^{3+} .

Apjohnite	$Mn^{2+}Al_2(SO_4)_4 \cdot 22H_2O$
Bilinite	$Fe^{2+}Fe^{3+}(SO_4)_4 \cdot 22H_2O$
Dietrichite	$(Zn,Fe^{2+},Mn^{2+})Al_2(SO_4)_4 \cdot 22H_2O$
Halotrichite	$Fe^{2+}Al_2(SO_4)_4 \cdot 22H_2O$
Pickeringite	$MgAl_2(SO_4)_4 \cdot 22H_2O$
Redingtonite	$(Fe^{2+},Mg,Ni)(Cr,Al)_2(SO_4)_4 \cdot 22H_2O$
Wupatkiite	$(Co,Mg,Ni)Al_2(SO_4)_4 \cdot 22H_2O$

Hauchecornite Group

Tetragonal sulfosalts of general formula A_9BCS_8 , $A = Co$, Ni ; $B = As$, Bi , Sb ; $C = Bi$, Sb , Te .

Arsenohauchecornite	Ni_9BiAsS_8
Bismutohauchecornite	$Ni_9Bi_2S_8$
Hauchecornite	$Ni_9Bi(Sb,Bi)S_8$
Tellurohauchecornite	Ni_9BiTeS_8
Tuukite	$Ni_4Sb_2S_8$

Hematite Group

Trigonal oxides of general formula R_2O_3 , $R = Al$, Cr^{3+} , Fe^{3+} , V^{3+} .

Corundum	Al_2O_3
Eskolaite	Cr_2O_3
Hematite	$\alpha-Fe_2O_3$
Karelianite	V_2O_3

Hexahydrate Group

Monoclinic sulfates of general formula $M^{2+}SO_4 \cdot 6H_2O$, $M^{2+} = Co$, Fe , Mg , Mn , Ni , Zn .

Bianchite	$(Zn,Fe^{2+})(SO_4) \cdot 6H_2O$
Chvalite	$(Mn^{2+},Mg)SO_4 \cdot 6H_2O$
Ferrohexahydrate	$Fe^{2+}SO_4 \cdot 6H_2O$
Hexahydrate	$MgSO_4 \cdot 6H_2O$
Moorhouseite	$(Co,Ni,Mn^{2+})SO_4 \cdot 6H_2O$
Nickelhexahydrate	$(Ni,Mg,Fe^{2+})(SO_4) \cdot 6H_2O$

Humite Group

Silicates, orthorhombic or monoclinic, that form a morphotropic series with Olivine, with compositions A_2SiO_4 , $A_2SiO_4 \cdot A(OH)_2$, $2A_2SiO_4 \cdot A(OH)_2$, $3A_2SiO_4 \cdot A(OH)_2$, $4A_2SiO_4 \cdot A(OH)_2$; $A = Fe^{2+}$, Mg , Mn^{2+} ; (OH) is partially replaced by F.

Alleghanyite	$Mn_5^{2+}(SiO_4)_2(OH)_2$
Chondrodite	$(Mg,Fe^{2+})_5(SiO_4)_2(F,OH)_2$
Clinohumite	$(Mg,Fe^{2+})_9(SiO_4)_4(F,OH)_2$
Humite	$(Mg,Fe^{2+})_7(SiO_4)_3(F,OH)_2$

Jerry gibbsite	$Mn_9^{2+}(SiO_4)_4(OH)_2$
Leucophoenicite	$Mn_7^{2+}(SiO_4)_3(OH)_2$
Manganhumite	$(Mn^{2+}, Mg)_7(SiO_4)_3(OH)_2$
Norbergite	$Mg_3(SiO_4)(F, OH)_2$
Ribbeite	$(Mn^{2+}, Mg)_5(SiO_4)_2(OH)_2$
Sonolite	$Mn_9^{2+}(SiO_4)_4(OH, F)_2$

Hydrotalcite Group

Trigonal carbonates of general formula $A_6B_2(CO_3)(OH)_{16} \cdot 4H_2O$, A = Mg, Ni; B = Al, Cr^{3+} , Fe^{3+} , Mn^{2+} , Co^{3+} . Compare the Manasseite group; see also 75, 242–243 (1990).

Comblainite	$(Ni_6^{2+}Co_2^{3+}(CO_3)(OH)_{16} \cdot 4H_2O)$
Desautelsite	$Mg_6Mn_2^{3+}(CO_3)(OH)_{16} \cdot 4H_2O$
Hydrotalcite	$Mg_6Al_2(CO_3)(OH)_{16} \cdot 4H_2O$
Iowaite	$Mg_6Fe_2^{3+}(OH)_{16}Cl_2 \cdot 4H_2O$
Pyroaurite	$Mg_6Fe_2^{3+}(CO_3)(OH)_{16} \cdot 4H_2O$
Reevesite	$Ni_6Fe_2^{3+}(CO_3)(OH)_{16} \cdot 4H_2O$
Stichtite	$Mg_6Cr_2(CO_3)(OH)_{16} \cdot 4H_2O$
Takovite	$Ni_6Al_2(OH)_{16}(CO_3, OH) \cdot 4H_2O$

Meixnerite, the sulfates Honessite and Wermlandite, and the carbonates Caresite, Chamarite and Quintinite are structurally related to the minerals of this group.

Ilmenite Group

Trigonal oxides of general formula $M^{2+}TiO_3$, $M^{2+} = Fe, Mg, Mn, Zn$.

Eandrewsite	$(Zn, Fe^{2+}, Mn^{2+})TiO_3$
Geikielite	$MgTiO_3$
Ilmenite	$Fe^{2+}TiO_3$
Pyrophanite	$Mn^{2+}TiO_3$

Joaquinite Group

Orthorhombic and monoclinic titanosilicates of general formula $A_6(Ti, Nb)_2Si_8(O, OH)_{26} \cdot H_2O$; A = Ba, Ce, Fe^{2+} , Mn^{2+} , Na, Sr.

Bario-orthojoaquinite	$(Ba, Sr)_4Fe_2^{2+}Ti_2Si_8O_{26} \cdot H_2O$
Byelorussite-(Ce)	$NaMn^{2+}Ba_2Ce_2Ti_2Si_8O_{26}(F, OH) \cdot H_2O$
Joaquinite-(Ce)	$Ba_2NaCe_2Fe^{2+}(Ti, Nb)_2Si_8O_{26}(OH, F) \cdot H_2O$
Orthojoaquinite-(Ce)	$Ba_2NaCe_2Fe^{2+}Ti_2Si_8O_{26}(O, OH) \cdot H_2O$
Strontiojoaquinite	$Sr_2Ba_2(Na, Fe^{2+})_2Ti_2Si_8O_{24}(O, OH)_2 \cdot H_2O$
Strontio-orthojoaquinite	$Sr_2Ba_2(Na, Fe^{2+})_2Ti_2Si_8O_{24}(O, OH)_2 \cdot H_2O$

Kaolinite-Serpentine Group

Silicates, triclinic, monoclinic, orthorhombic, trigonal, hexagonal, of general formula $M_{2-3}Z_2O_5(OH)_4 \cdot nH_2O$, M = Al, Fe^{3+} , Fe^{2+} , Mg, Mn^{2+} , Ni, Zn; Z = Al, Fe^{2+} , Si.

Amesite	$Mg_2Al(SiAl)O_5(OH)_4$
Antigorite	$(Mg, Fe^{2+})_3Si_2O_5(OH)_4$
Berthierine	$(Fe^{2+}, Fe^{3+}, Mg)_{2-3}(Si, Al)_2O_5(OH)_4$

Brindleyite	$(\text{Ni}, \text{Mg}, \text{Fe}^{2+})_2\text{Al}(\text{SiAl})\text{O}_5(\text{OH})_4$
Clinochrysolite	$\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$
Cronstedtite	$\text{Fe}^{2+}\text{Fe}^{3+}(\text{SiFe}^{3+})\text{O}_5(\text{OH})_4$
Dickite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$
Fraipontite	$(\text{Zn}, \text{Al})_3(\text{Si}, \text{Al})_2\text{O}_5(\text{OH})_4$
Greenalite	$(\text{Fe}^{2+}, \text{Fe}^{3+})_{2-3}\text{Si}_2\text{O}_5(\text{OH})_4$
Halloysite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$
Kaolinite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$
Kellyite	$(\text{Mn}^{2+}, \text{Mg}, \text{Al})_3(\text{Si}, \text{Al})_2\text{O}_5(\text{OH})_4$
Lizardite	$\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$
Manandonite	$\text{LiAl}_2(\text{SiAl}_{0.5}\text{B}_{0.5})\text{O}_5(\text{OH})_4$
Nacrite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$
Nepouite	$\text{Ni}_3\text{Si}_2\text{O}_5(\text{OH})_4$
Odinite	$(\text{Fe}^{3+}, \text{Mg}, \text{Al}, \text{Fe}^{2+})_{2.5}(\text{Si}, \text{Al})_2\text{O}_5(\text{OH})_4$
Orthochrysolite	$\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$
Parachrysolite	$\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$
Pecoraite	$\text{Ni}_3\text{Si}_2\text{O}_5(\text{OH})_4$

Kieserite Group

Monoclinic sulfates of general formula $\text{M}^{2+}\text{SO}_4 \cdot \text{H}_2\text{O}$, $\text{M}^{2+} = \text{Cu}, \text{Fe}, \text{Mg}, \text{Mn}, \text{Ni}, \text{Zn}$.

Dwomikite	$(\text{Ni}, \text{Fe}^{2+})\text{SO}_4 \cdot \text{H}_2\text{O}$
Gunningite	$(\text{Zn}, \text{Mn}^{2+})\text{SO}_4 \cdot \text{H}_2\text{O}$
Kieserite	$\text{MgSO}_4 \cdot \text{H}_2\text{O}$
Szomolnokite	$\text{Mn}^{2+}(\text{SO}_4) \cdot \text{H}_2\text{O}$
Szomolnokite	$\text{Fe}^{2+}\text{SO}_4 \cdot \text{H}_2\text{O}$

Lazulite Group

Monoclinic phosphates of general formula $\text{A}^{2+}\text{B}_2^{3+}(\text{PO}_4)_2(\text{OH})_2$; $\text{A}^{2+} = \text{Cu}, \text{Fe}, \text{Mg}$; $\text{B}^{3+} = \text{Al}, \text{Fe}$.

Barbosalite	$\text{Fe}^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2$
Hentschelite	$\text{Cu}^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2$
Lazulite	$\text{MgAl}_2(\text{PO}_4)_2(\text{OH})_2$
Scorzalite	$(\text{Fe}^{2+}, \text{Mg})\text{Al}_2(\text{PO}_4)_2(\text{OH})_2$

Linnaeite Group

Cubic sulfides of general formula $\text{A}^{2+}\text{B}_2^{3+}\text{X}_4$, $\text{A}^{2+} = \text{Co}, \text{Cu}, \text{Fe}, \text{Ni}, \text{Zn}$; $\text{B}^{3+} = \text{Co}, \text{Cr}, \text{Fe}, \text{In}, \text{Ni}, \text{Sb}$; $\text{X} = \text{S}, \text{Se}$. Compare the oxides of Spinel group.

Bornhardtite	$\text{Co}^{2+}\text{Co}_2^{3+}\text{Se}_4$
Carrollite	$\text{Cu}(\text{Co}, \text{Ni})_2\text{S}_4$
Daubrélite	$\text{Fe}^{2+}\text{Cr}_2\text{S}_4$
Fletcherite	$\text{Cu}(\text{Ni}, \text{Co})_2\text{S}_4$
Florensovite	$(\text{Cu}, \text{Zn})(\text{Cr}, \text{Sb})_2\text{S}_4$
Greigite	$\text{Fe}^{2+}\text{Fe}_2^{3+}\text{S}_4$
Indite	$\text{Fe}^{2+}\text{In}_2\text{S}_4$
Kalininite	ZnCr_2S_4

Linnaeite	$\text{Co}^{2+}\text{Co}_2^{3+}\text{S}_4$
Polydymite	NiNi_2S_4
Siegenite	$(\text{Ni},\text{Co})_3\text{S}_4$
Trystedite	Ni_3Se_4
Tyrrillite	$(\text{Cu},\text{Co},\text{Ni})_3\text{Se}_4$
Violarite	$\text{Fe}^{2+}\text{Ni}_2^{3+}\text{S}_4$

Lillingite Group

Orthorhombic arsenides and antimonides of general formula AB_2 , A = Co, Fe, Ni; B = As, S, Sb.

Costibite	CoSbS
Lillingite	FeAs_2
Nisbite	NiSb_2
Rammelsbergite	NiAs_2
Safflorite	$(\text{Co},\text{Fe})\text{As}_2$
Seinjokite	$(\text{Fe},\text{Ni})(\text{Sb},\text{As})_2$

Lovozerite Group

Trigonal and orthorhombic silicates of general formula $\text{A}_6\text{B}_{2-x}\text{C}_{1-y}\text{Si}_6(\text{O},\text{OH})_{18}$, A = Na, H; B = Ca, Mn, Fe; C = Ti, Zr.

Imandrite	$\text{Na}_6\text{Ca}_{1.5}\text{Fe}^{3+}\text{Si}_6\text{O}_{18}$
Kazakovite	$\text{Na}_6(\text{Mn}^{2+},\text{H}_2)\text{TiSi}_6\text{O}_{18}$
Koashvite	$\text{Na}_6(\text{Ca},\text{Mn})(\text{Ti},\text{Fe})\text{Si}_6\text{O}_{18}\cdot\text{H}_2\text{O}$
Lovozerite	$\text{Na}_2\text{Ca}(\text{Zr},\text{Ti})\text{Si}_6(\text{O},\text{OH})_{18}$
Petarasite	$\text{Na}_5\text{Zr}_2\text{Si}_6\text{O}_{18}(\text{Cl},\text{OH})\cdot 2\text{H}_2\text{O}$
Tisinalite	$\text{Na}_3\text{H}_3(\text{Mn}^{2+},\text{Ca},\text{Fe})\text{TiSi}_6(\text{O},\text{OH})_{18}\cdot 2\text{H}_2\text{O}$
Zirsinalite	$\text{Na}_6(\text{Ca},\text{Mn},\text{Fe}^{2+})\text{ZrSi}_6\text{O}_{18}$

Ludwigite Group

Orthorhombic borates of general formula $\text{X}_2\text{Y}(\text{BO}_5)$, X = Fe^{2+} , Mg, Ni; Y = Al, Fe^{3+} , Mg, Mn^{3+} , Sb, Ti.

Azoproite	$(\text{Mg},\text{Fe}^{2+})_2(\text{Fe}^{3+},\text{Ti},\text{Mg})\text{BO}_5$
Bonaccordite	$\text{Ni}_2\text{Fe}^{3+}\text{BO}_5$
Chestermanite	$\text{Mg}_2(\text{Fe}^{3+},\text{Mg},\text{Al},\text{Sb}^{5+})(\text{BO}_3)\text{O}_2$
Fredrikssonite	$\text{Mg}_2(\text{Mn}^{3+},\text{Fe}^{3+})\text{BO}_5$
Ludwigite	$\text{Mg}_2\text{Fe}^{3+}\text{BO}_5$
Vonsenite	$\text{Fe}_2^{2+}\text{Fe}^{3+}\text{BO}_5$

Compare Hulsite, Orthopinakiolite, Pinakiolite and Takeuchiite.

Magnetoplumbite Group

Hexagonal oxides of general formula $\text{AB}_{12}\text{O}_{19}$, A = Ba, Ca, Ce, K, Pb; B = Al, Cr^{3+} , Fe^{2+} , Fe^{2+} , Mg, Mn^{3+} , Ti.

Hawthorneite	$\text{Ba}(\text{Ti}_3\text{Cr}_4\text{Fe}_2^{2+}\text{Fe}_2^{3+}\text{Mg})\text{O}_{19}$
Hibonite	$(\text{Ca},\text{Ce})(\text{Al},\text{Ti},\text{Mg})_{12}\text{O}_{19}$
Magnetoplumbite	$\text{Pb}(\text{Fe}^{3+},\text{Mn}^{3+})_{12}\text{O}_{19}$
Neilovite	$\text{PbZn}_2(\text{Mn}^{4+},\text{Ti}^{4+})_2\text{Fe}_8^{3+}\text{O}_{19}$

Yimengite $K(\text{Cr}^{3+}, \text{Ti}, \text{Fe}^{3+}, \text{Mg})_{12}\text{O}_{19}$

Manasseite Group

Hexagonal carbonates of general formula $\text{Mg}_6\text{B}_2(\text{CO}_3)(\text{OH})_{16}\cdot 4\text{H}_2\text{O}$, $\text{B} = \text{Al}, \text{Cr}^{3+}, \text{Fe}^{3+}$. Compare the Hydrotalcite group; see also **75**, 242–243 (1990).

Barbertonite	$\text{Mg}_6\text{Cr}_2(\text{CO}_3)(\text{OH})_{16}\cdot 4\text{H}_2\text{O}$
Chlormagaluminite	$(\text{Mg}, \text{Fe}^{2+})_4\text{Al}_2(\text{OH})_{12}(\text{Cl}_2, \text{CO}_3)\cdot 2\text{H}_2\text{O}$
Manasseite	$\text{Mg}_6\text{Al}_2(\text{CO}_3)(\text{OH})_{16}\cdot 4\text{H}_2\text{O}$
Sj_grenite	$\text{Mg}_6\text{Fe}_2^{3+}(\text{CO}_3)(\text{OH})_{16}\cdot 4\text{H}_2\text{O}$

Marcasite Group

Orthorhombic sulfides, selenides, and tellurides of general formula AX_2 , $\text{A} = \text{Co}, \text{Fe}, \text{Ni}$; $\text{X} = \text{S}, \text{Se}, \text{Te}$. Compare the Pyrite group.

Ferroselite	FeSe_2
Frohbergite	FeTe_2
Hastite	CoSe_2
Kullerudite	NiSe_2
Marcasite	FeS_2
Mattagamite	CoTe_2

Melanterite Group

Monoclinic sulfates of general formula $\text{A}^{2+}\text{SO}_4\cdot 7\text{H}_2\text{O}$, $\text{A}^{2+} = \text{Co}, \text{Cu}, \text{Fe}, \text{Mn}, \text{Zn}$.

Bieberite	$\text{CoSO}_4\cdot 7\text{H}_2\text{O}$
Boothite	$\text{CuSO}_4\cdot 7\text{H}_2\text{O}$
Mallardite	$\text{Mn}^{2+}\text{SO}_4\cdot 7\text{H}_2\text{O}$
Melanterite	$\text{Fe}^{2+}\text{SO}_4\cdot 7\text{H}_2\text{O}$
Zinc-melanterite	$(\text{Zn}, \text{Cu}^{2+}, \text{Fe}^{2+})\text{SO}_4\cdot 7\text{H}_2\text{O}$

Melilite Group

Tetragonal silicates of general formula A_2BZSiO_7 , $\text{A} = \text{Na}, \text{Ca}$; $\text{B} = \text{Al}, \text{Be}, \text{Mg}, \text{Zn}$; $\text{Z} = \text{Al}, \text{Si}$.

_kermanite	$\text{Ca}_2\text{MgSi}_2\text{O}_7$
Gehlenite	$\text{Ca}_2\text{Al}(\text{AlSi})\text{O}_7$
Gugiaite	$\text{Ca}_2\text{BeSi}_2\text{O}_7$
Hardystonite	$\text{Ca}_2\text{ZnSi}_2\text{O}_7$
Melilite	$(\text{Ca}, \text{Na})_2(\text{Al}, \text{Mg})(\text{Si}, \text{Al})_2\text{O}_7$

Jeffreyite, Leucophanite and Meliphanite are silicates structurally related to the minerals of this group.

Melonite Group

Trigonal sulfides and tellurides of general formula AB_2 , $\text{A} = \text{Ni}, \text{Pd}, \text{Pt}, \text{Sn}$; $\text{B} = \text{Bi}, \text{S}, \text{Se}, \text{Te}$.

Berndtite	SnS_2
Kitkaite	NiTeSe

Melonite	NiTe ₂
Merenskyite	(Pd,Pt)(Te,Bi) ₂
Moncheite	(Pt,Pd)(Te,Bi) ₂

Meta-autunite Group

Tetragonal or orthorhombic uranyl phosphates and arsenates of general formula $A(UO_2)_2(XO_4)_2 \cdot nH_2O$; A = Ba, Ca, Co, Cu²⁺, Fe²⁺, (H₃O)₂, K₂, Mg, (NH₄)₂, Zn; X = As⁵⁺, P⁵⁺.

Abemathyite	K ₂ (UO ₂) ₂ (AsO ₄) ₂ ·8H ₂ O
Bassetite	Fe ²⁺ (UO ₂) ₂ (PO ₄) ₂ ·8H ₂ O
Chemikovite	(H ₃ O) ₂ (UO ₂) ₂ (PO ₄) ₂ ·6H ₂ O
Meta-ankoleite	K ₂ (UO ₂) ₂ (PO ₄) ₂ ·6H ₂ O
Meta-autunite	Ca(UO ₂) ₂ (PO ₄) ₂ ·2–6H ₂ O
Metaheinrichite	Ba(UO ₂) ₂ (AsO ₄) ₂ ·8H ₂ O
Metakahlerite	Fe ²⁺ (UO ₂) ₂ (AsO ₄) ₂ ·8H ₂ O
Metakirchheimerite	Co(UO ₂) ₂ (AsO ₄) ₂ ·8H ₂ O
Metalodevite	Zn(UO ₂) ₂ (AsO ₄) ₂ ·10H ₂ O
Metanov__ekite	Mg(UO ₂) ₂ (AsO ₄) ₂ ·4–8H ₂ O
Metatorbernite	Cu ²⁺ (UO ₂) ₂ (PO ₄) ₂ ·8H ₂ O
Meta-uranocircite	Ba(UO ₂) ₂ (PO ₄) ₂ ·8H ₂ O
Meta-uranospinite	Ca(UO ₂) ₂ (AsO ₄) ₂ ·8H ₂ O
Metazeunerite	Cu ²⁺ (UO ₂) ₂ (AsO ₄) ₂ ·8H ₂ O
Sodium uranospinite	(Na ₂ ,Ca)(UO ₂) ₂ (AsO ₄) ₂ ·5H ₂ O
Uramphite	(NH ₄) ₂ (UO ₂) ₂ (PO ₄) ₂ ·6H ₂ O

Mica Group

The nomenclature of this group was revised by a subcommittee of the Commission on New Minerals and Mineral Names of the International Mineralogical Association. The report of this subcommittee by Rieder *et al.* (1998) has been published in many major mineralogical journals; for example, *Canadian Mineralogist* **36**, 905–912 (1998). Readers interested in more details of the mica group minerals should consult this report.

The mica group minerals are pseudo-hexagonal, monoclinic layer silicates. The general simplified formula can be written as: $IM_{2-3}h_{1-0}T_4O_{10}A_2$, where *I* is commonly K, Na, Ca, Cs, NH₄, Rb, Ba; *M* is commonly Li, Fe²⁺, Fe³⁺, Mg, Al, Ti, Mn²⁺, Mn³⁺, Zn, Cr, V; *h* represents a vacancy; *T* is commonly Al, Fe³⁺, Si, Be, B; and *A* is commonly F, OH, Cl, O (oxy-micas), S. The most frequently encountered elements are set in bold face; note that other substitutions are possible. The following tabulation gives the ideal formulae for end member species except where noted. Mica group minerals are classified into three different types: normal micas (either dioctahedral or trioctahedral), brittle micas (either dioctahedral or trioctahedral) and interlayer-deficient micas (either dioctahedral or trioctahedral). The following abbreviations are used below:

di. = dioctahedral micas br. = brittle micas

tr. = trioctahedral micas in. = interlayer-deficient micas

Aluminoceladonite (di.) $KAl(Mg,Fe^{2+})_hSi_4O_{10}(OH)_2$
 Anandite (tr.) (br.) $BaFe_3^{2+}Fe^{3+}Si_3O_{10}S(OH)$
 Annite (tr.) $KFe_3^{2+}AlSi_3O_{10}(OH)_2$
 Aspidolite (tr.) $NaMg_3AlSi_3O_{10}(OH)_2$
 Biotite (tr.) (a series name) compositions on, or close to, the Annite-Phlogopite and Siderophyllite-Eastonite joins; dark micas without lithium
 Bityite (tr.) (br.) $CaLiAl_2BeAlSi_2O_{10}(OH)_2$
 Boromuscovite (di.) $KAl_2hBSi_3O_{10}(OH)_2$
 Brammallite (di.) (in.) (a series name) $Na_{0.65}Al_{2.0}hAl_{0.65}Si_{3.35}O_{10}(OH)_2$
 Celadonite (di.) $KFe^{3+}(Mg,Fe^{2+})_hSi_4O_{10}(OH)_2$
 Chemykhite (di.) (br.) $BaV_2hAl_2Si_2O_{10}(OH)_2$
 Chromphyllite (di.) $KCr_2hAlSi_3O_{10}(OH)_2$
 Clintonite (tr.) (br.) $CaMg_3AlAl_3SiO_{10}(OH)_2$
 Eastonite (tr.) $KMg_2AlAl_2Si_2O_{10}(OH)_2$
 Ephesite (tr.) $NaLiAl_2Al_2Si_2O_{10}(OH)_2$
 Ferro-aluminoceladonite (di.) $KAl(Fe^{2+},Mg)_hSi_4O_{10}(OH)_2$
 Ferroceladonite (di.) $KFe^{3+}(Fe^{2+},Mg)_hSi_4O_{10}(OH)_2$
 Glauconite (di.) (in.) (a series name) $K_{0.8}R^{3+}_{1.33}R^{2+}_{0.67}hAl_{0.13}Si_{3.87}O_{10}(OH)_2$
 Hendricksite (tr.) $KZn_3AlSi_3O_{10}(OH)_2$
 Illite (di.) (in.) (a series name) $K_{0.65}Al_{2.0}hAl_{0.65}Si_{3.35}O_{10}(OH)_2$
 Kinoshitalite (tr.) (br.) $BaMg_3Al_2Si_2O_{10}(OH)_2$
 Lepidolite (tr.) (a series name) compositions on, or close to, the Trilithionite-Polyolithionite join; light micas with substantial lithium
 Margarite (di.) (br.) $CaAl_2hAl_2Si_2O_{10}(OH)_2$
 Masutomilite (tr.) $KLiAlMn^{2+}AlSi_3O_{10}F_2$
 Montdorite (tr.) (not an end member) $KFe^{2+}_{1.5}Mn^{2+}_{0.5}Mg_{0.5}h_{0.5}Si_4O_{10}F_2$
 Muscovite (di.) $KAl_2hAlSi_3O_{10}(OH)_2$
 Nanpingite (di.) $CsAl_2hAlSi_3O_{10}(OH)_2$
 Norrishite (tr.) $KLiMn_2^{3+}Si_4O_{12}$
 Paragonite (di.) $NaAl_2hAlSi_3O_{10}(OH)_2$
 Phengite (di.) (a series name) potassic compositions between, or close to, the joins Muscovite-Aluminoceladonite and Muscovite-Celadonite
 Phlogopite (tr.) $KMg_3AlSi_3O_{10}(OH)_2$
 Polyolithionite (tr.) $KLi_2AlSi_4O_{10}F_2$
 Preiswerkite (tr.) $NaMg_2AlAl_2Si_2O_{10}(OH)_2$
 Roscoelite (di.) $KV_2hAlSi_3O_{10}(OH)_2$
 Siderophyllite (tr.) $KFe_2^{2+}AlAl_2Si_2O_{10}(OH)_2$
 Tainiolite (tr.) $KLiMg_2Si_4O_{10}F_2$
 Tetra-ferri-annite (tr.) $KFe_3^{2+}Fe^{3+}Si_3O_{10}(OH)_2$
 Tetra-ferriphlogopite (tr.) $KMg_3Fe^{3+}Si_3O_{10}(OH)_2$
 Tobelite (di.) $(NH_4)Al_2hAlSi_3O_{10}(OH)_2$
 Trilithionite (tr.) (not an end member) $KLi_{1.5}Al_{1.5}AlSi_3O_{10}F_2$
 Wonesite (tr.) (in.) (not an end member) $Na_{0.5}h_{0.5}Mg_{2.5}Al_{0.5}AlSi_3O_{10}(OH)_2$
 Zinnwaldite trioctahedral micas on, or close to, the Siderophyllite-Polyolithionite join; dark micas containing lithium

Mixite Group

Hexagonal arsenates and phosphates of general formula $ACu_6(XO_4)_3(OH)_6 \cdot 3H_2O$, A = Al, Bi, Ca, Ce, La, Nd, Y; X = As, P.

Agardite-(La)	$(La,Ca)Cu_6(AsO_4)_3(OH)_6 \cdot 3H_2O$
Agardite-(Y)	$(Y,Ca)Cu_6(AsO_4)_3(OH)_6 \cdot 3H_2O$
Goudeyite	$(Al,Y)Cu_6^{2+}(AsO_4)_3(OH)_6 \cdot 3H_2O$
Mixite	$BiCu_6^{2+}(AsO_4)_3(OH)_6 \cdot 3H_2O$
Petersite-(Y)	$(Y,Ce,Nd,Ca)Cu_6^{2+}(PO_4)_3(OH)_6 \cdot 3H_2O$

Monazite Group

Monoclinic arsenates, phosphates, silicates, of general formula ABO_4 , A = Bi, Ca, Ce, La, Nd, Th; B = As^{5+} , P^{5+} , Si^{4+} .

Brabantite	$Ca_{0.5}Th_{0.5}(PO_4)$
Cheralite-(Ce)	$(Ce,Ca,Th)(P,Si)O_4$
Gasparite-(Ce)	$(Ce,La,Nd)AsO_4$
Huttonite	$ThSiO_4$
Monazite-(Ce)	$(Ce,La,Nd,Th)PO_4$
Monazite-(La)	$(La,Ce,Nd)PO_4$
Monazite-(Nd)	$(Nd,La,Ce)PO_4$
Rooseveltite	$BiAsO_4$

Montgomeryite Group

Monoclinic phosphates of general formula $Ca_4A^{2+}B_4^{3+}(PO_4)_6(OH)_4 \cdot 12H_2O$, $A^{2+} = Fe, Mg, Mn$; $B^{3+} = Al, Fe$.

Calcioferrite	$Ca_4Fe^{2+}(Fe^{3+},Al)_4(PO_4)_6(OH)_4 \cdot 13H_2O$
Kingsmountite	$(Ca,Mn^{2+})_4(Fe^{2+},Mn^{2+})Al_4(PO_4)_6(OH)_4 \cdot 12H_2O$
Montgomeryite	$Ca_4MgAl_4(PO_4)_6(OH)_4 \cdot 12H_2O$
Zodacite	$Ca_4Mn^{2+}Fe_4^{3+}(PO_4)_6(OH)_4 \cdot 12H_2O$

Montmorillonite Group

See Smectite group.

Nickeline Group

Hexagonal antimonides, arsenides, bismuthides, selenides, stannides, and tellurides of general formula AX , A = Co, Ni, Pd, Pt; X = As, Bi, Sb, Se, Sn, Te.

Breithauptite	NiSb
Freboldite	CoSe
Imgreite	NiTe(?)
Langsite	(Co,Ni)As
Nickeline	NiAs
Niggliite	PtSn
Sederholmite	b-NiSe
Sobolevskite	PdBi
Stumpflite	Pt(Sb,Bi)
Sudburyite	(Pd,Ni)Sb

Nordite Group

Orthorhombic silicates of general formula $\text{Na}_3\text{Sr}(\text{REE})\text{BSi}_6\text{O}_{17}$, where REE = Ce or La, B = Fe^{2+} , Mn^{2+} , or Zn.

Ferronordite-(Ce)	$\text{Na}_3\text{SrCeFe}^{2+}\text{Si}_6\text{O}_{17}$
Manganonordite-(Ce)	$\text{Na}_3\text{SrCeMn}^{2+}\text{Si}_6\text{O}_{17}$
Nordite-(Ce)	$\text{Na}_3\text{SrCeZnSi}_6\text{O}_{17}$
Nordite-(La)	$\text{Na}_3\text{SrLaZnSi}_6\text{O}_{17}$

Olivine Group

Orthorhombic silicates of general formula $\text{A}_2^{2+}\text{SiO}_4$, $\text{A}^{2+} = \text{Fe}, \text{Mg}, \text{Mn}, \text{Ni}$.

Fayalite	$\text{Fe}_2^{2+}\text{SiO}_4$
Forsterite	Mg_2SiO_4
Liebenbergite	$(\text{Ni}, \text{Mg})_2\text{SiO}_4$
Tephroite	$\text{Mn}_2^{2+}\text{SiO}_4$

Osumilite Group

Hexagonal and orthorhombic silicates of general formula $\text{A}_{1-2}\text{B}_{2-3}\text{C}_3\text{Z}_{12}\text{O}_{30} \cdot n\text{H}_2\text{O}$, A = Ba, Ca, K, Na; B = Fe^{2+} , Li, Mg, Mn^{2+} , Na, Sn, Ti, Y, Zn, Zr; C = Al, B, Be, Fe^{2+} , Fe^{3+} , Li, Mg, Zn; Z = Al, Si.

Armenite (?)	$\text{BaCa}_2\text{Al}_6\text{Si}_9\text{O}_{30} \cdot 2\text{H}_2\text{O}$
Berezanskite	$\text{KLi}_3\text{Ti}_2\text{Si}_{12}\text{O}_{30}$
Brannockite	$\text{KLi}_3\text{Sn}_2\text{Si}_{12}\text{O}_{30}$
Chayesite	$\text{K}(\text{MgFe}^{2+})_4\text{Fe}^{3+}\text{Si}_{12}\text{O}_{30}$
Darapiosite	$\text{KNa}_2\text{Li}(\text{Mn}, \text{Zn})_2\text{ZrSi}_{12}\text{O}_{30}$
Dusmatovite	$\text{K}(\text{K}, \text{Na}, \text{h})(\text{Mn}^{2+}, \text{Y}, \text{Zr})_2(\text{Zn}, \text{Li})_3\text{Si}_{12}\text{O}_{30}$
Eifelite	$\text{KNa}_3\text{Mg}_4\text{Si}_{12}\text{O}_{30}$
Emeleusite	$\text{Na}_4\text{Li}_2\text{Fe}_2^{3+}\text{Si}_{12}\text{O}_{30}$
Merrhueite	$(\text{K}, \text{Na})_2(\text{Fe}^{2+}, \text{Mg})_5\text{Si}_{12}\text{O}_{30}$
Milarite	$\text{KCa}_2\text{AlBe}_2\text{Si}_{12}\text{O}_{30} \cdot 0.5\text{H}_2\text{O}$
Osumilite	$(\text{K}, \text{Na})(\text{Fe}^{2+}, \text{Mg})_2(\text{Al}, \text{Fe}^{3+})_3(\text{Si}, \text{Al})_{12}\text{O}_{30}$
Osumilite-(Mg)	$(\text{K}, \text{Na})(\text{Mg}, \text{Fe}^{2+})_2(\text{Al}, \text{Fe}^{3+})_3(\text{Si}, \text{Al})_{12}\text{O}_{30}$
Poudretteite	$\text{KNa}_2\text{B}_3\text{Si}_{12}\text{O}_{30}$
Roedderite	$(\text{Na}, \text{K})_2(\text{Mg}, \text{Fe}^{2+})_5\text{Si}_{12}\text{O}_{30}$
Sogdianite	$(\text{K}, \text{Na})_2(\text{Li}, \text{Fe}^{2+})_3(\text{Zr}, \text{Ti}, \text{Fe}^{3+})\text{Si}_{12}\text{O}_{30}$
Sugilite	$\text{KNa}_2(\text{Fe}^{2+}, \text{Mn}^{2+}, \text{Al})_2\text{Li}_3\text{Si}_{12}\text{O}_{30}$
Yagiite	$(\text{Na}, \text{K})_{1.5}\text{Mg}_2(\text{Al}, \text{Mg})_3(\text{Si}, \text{Al})_{12}\text{O}_{30}$

Overite Group

Orthorhombic phosphates of general formula $\text{ABC}(\text{PO}_4)_2(\text{OH}) \cdot 2-4\text{H}_2\text{O}$, A = Ca, Mn, Zn; B = Mg, Fe^{2+} , Mn^{2+} ; C = Al, Fe^{3+} .

Lun'okite	$(\text{Mn}^{2+}, \text{Ca})(\text{Mg}, \text{Fe}^{2+}, \text{Mn}^{2+})\text{Al}(\text{PO}_4)_2(\text{OH}) \cdot 4\text{H}_2\text{O}$
Manganosegelerite	$(\text{Mn}^{2+}, \text{Ca})(\text{Mn}^{2+}, \text{Fe}^{2+}, \text{Mg})\text{Fe}^{3+}(\text{PO}_4)_2(\text{OH}) \cdot 4\text{H}_2\text{O}$
Overite	$\text{CaMgAl}(\text{PO}_4)_2(\text{OH}) \cdot 4\text{H}_2\text{O}$
Segelerite	$\text{CaMgFe}^{3+}(\text{PO}_4)_2(\text{OH}) \cdot 4\text{H}_2\text{O}$

Wilhelmvierlingite $\text{CaMn}^{2+}\text{Fe}^{3+}(\text{PO}_4)_2(\text{OH})\cdot 2\text{H}_2\text{O}$

Paravauxite Group

Triclinic phosphates of general formula $\text{AB}_2(\text{PO}_4)_2(\text{OH})_2\cdot 8\text{H}_2\text{O}$ or $\text{AB}_2(\text{PO}_4)_2(\text{OH})_3\cdot 7-8\text{H}_2\text{O}$, A = Mg, Fe^{2+} , Mn^{2+} , Fe^{3+} ; B = Al, Fe^{3+} , Cr^{3+} .

Gordonite	$\text{MgAl}_2(\text{PO}_4)_2(\text{OH})_2\cdot 8\text{H}_2\text{O}$
Laueite	$\text{Mn}^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2\cdot 8\text{H}_2\text{O}$
Paravauxite	$\text{Fe}^{2+}\text{Al}_2(\text{PO}_4)_2(\text{OH})_2\cdot 8\text{H}_2\text{O}$
Sigloite	$\text{Fe}^{3+}\text{Al}_2(\text{PO}_4)_2(\text{OH})_3\cdot 7\text{H}_2\text{O}$
Ushkovite	$\text{MgFe}_2^{3+}(\text{PO}_4)_2(\text{OH})_2\cdot 8\text{H}_2\text{O}$

Pentlandite Group

Cubic sulfides of general formula AB_8X_8 , A = Ag, Cd, Co, Fe, Mn, Ni, Pb; B = Co, Cu, Fe, Ni; X = S, Se.

Argentopentlandite	$\text{Ag}(\text{Fe},\text{Ni})_8\text{S}_8$
Cobalt pentlandite	Co_9S_8
Geffroyite	$(\text{Ag},\text{Cu},\text{Fe})_9(\text{Se},\text{S})_8$
Manganese-shadlunite	$(\text{Mn},\text{Pb},\text{Cd})(\text{Cu},\text{Fe})_8\text{S}_8$
Pentlandite	$(\text{Fe},\text{Ni})_9\text{S}_8$
Shadlunite	$(\text{Pb},\text{Cd})(\text{Fe},\text{Cu})_8\text{S}_8$

Periclase Group

Cubic oxides of general formula M^{2+}O , $\text{M}^{2+} = \text{Cd}, \text{Fe}, \text{Mg}, \text{Mn}, \text{Ni}$.

Bunsenite	NiO
Manganosite	Mn^{2+}O
Monteponite	CdO
Periclase	MgO
W_stite	Fe^{2+}O

Perovskite Group

Pseudocubic oxides, orthorhombic, or monoclinic, of general formula ABO_3 , A = Ca, Ce, Na, Sr; B = Nb, Ti, Fe.

Latrappite	$(\text{Ca},\text{Na})(\text{Nb},\text{Ti},\text{Fe})\text{O}_3$
Loparite-(Ce)	$(\text{Ce},\text{Na},\text{Ca})(\text{Ti},\text{Nb})\text{O}_3$
Lueshite	NaNbO_3
Perovskite	CaTiO_3
Tausonite	SrTiO_3

Picromerite Group

Monoclinic sulfates of general formula $\text{A}_2\text{B}^{2+}(\text{SO}_4)_2\cdot 6\text{H}_2\text{O}$, A = K, (NH_4) ; $\text{B}^{2+} = \text{Cu}, \text{Fe}, \text{Mg}, \text{Ni}$.

Boussingaultite	$(\text{NH}_4)_2\text{Mg}(\text{SO}_4)_2\cdot 6\text{H}_2\text{O}$
Cyanochroite	$\text{K}_2\text{Cu}^{2+}(\text{SO}_4)_2\cdot 6\text{H}_2\text{O}$
Mohrite	$(\text{NH}_4)_2\text{Fe}^{2+}(\text{SO}_4)_2\cdot 6\text{H}_2\text{O}$
Nickel-boussingaultite	$(\text{NH}_4)_2(\text{Ni},\text{Mg})(\text{SO}_4)_2\cdot 6\text{H}_2\text{O}$

Picromerite $K_2Mg(SO_4)_2 \cdot 6H_2O$

Plumbogummite Group = Crandallite Group.

Pumpellyite Group

Monoclinic silicates of general formula $Ca_2XY_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$, X = Al, Fe^{2+} , Fe^{3+} , Mg, Mn^{2+} ; Y = Al, Fe^{3+} , Cr^{3+} , Mn^{3+} . See *Can. Min.* **12**, 219–223 (1973).

Julgoldite- (Fe^{2+})	$Ca_2Fe^{2+}(Fe^{3+}, Al)_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$
Okhotskite	$Ca_2(Mn^{2+}, Mg)(Mn^{3+}, Al, Fe^{3+})_2Si_3O_{10}(OH)_4$
Pumpellyite- (Fe^{2+})	$Ca_2Fe^{2+}Al_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$
Pumpellyite- (Fe^{3+})	$Ca_2(Fe^{3+}, Mg, Fe^{2+})(Al, Fe^{3+})_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$
Pumpellyite-(Mg)	$Ca_2MgAl_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$
Pumpellyite- (Mn^{2+})	$Ca_2(Mn^{2+}, Mg)(Al, Mn^{3+}, Fe)_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$
Shuiskite	$Ca_2(Mg, Al)(Cr, Al)_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$

Pyrite Group

Cubic sulfides, arsenides, etc., of general formula AXY or AX_2 , A = Au, Co, Cu, Fe, Mn, Ni, Os, Pd, Pt, Ru; X and Y = As, Bi, S, Sb, Se, Te. Compare the Marcasite group.

Aurostibite	$AuSb_2$
Cattierite	CoS_2
Dzharkenite	$FeSe_2$
Erlichmanite	OsS_2
Fukuchilite	$(Cu, Fe)S_2$
Geversite	$Pt(Sb, Bi)_2$
Hauerite	MnS_2
Insizwaite	$Pt(Bi, Sb)_2$
Kru_aite	$CuSe_2$
Laurite	RuS_2
Maslovite	$(Pt, Pd)(Bi, Te)_2$
Michenerite	$PdBiTe$
Penroseite	$(Ni, Co, Cu)Se_2$
Pyrite	FeS_2
Sperryite	$PtAs_2$
Testibiopalladite	$Pd(Sb, Te)Te$
Trogtalite	$CoSe_2$
Vaesite	NiS_2
Villaman_nite	$(Cu, Ni, Co, Fe)S_2$

Pyrochlore Group

Cubic complex oxides of general formula $A_{1-2}B_2O_6(O, OH, F) \cdot nH_2O$; A = Ba, Bi, Ca, Ce, Cs, K, Na, Pb, Sb^{3+} , Sn, Sr, Th, U, Y, Zr; B = Fe, Nb, Sn, Ta, Ti, W. Pyrochlore subgroup has $Nb > Ta$, $(Nb + Ta) > 2Ti$; Microlite subgroup has $Ta > Nb$, $(Ta + Nb) > 2Ti$; Betafite subgroup has $2Ti > (Nb + Ta)$. Compare the closely related Stibiconite group.

Bariomicrolite	$Ba_2(Ta, Nb)_2(O, OH)_7$
Bariopyrochlore	$(Ba, Sr)_2(Nb, Ti)_2(O, OH)_7$

Betafite	$(\text{Ca,Na,U})_2(\text{Ti,Nb,Ta})_2\text{O}_6(\text{OH})$
Bismutomicrolite	$(\text{Bi,Ca})(\text{Ta,Nb})_2\text{O}_6(\text{OH})$
Calciobetafite	$\text{Ca}_2(\text{Ti,Nb})_2(\text{O,OH})_7$
Ceropyrochlore-(Ce)	$(\text{Ce,Ca,Y})_2(\text{Nb,Ta})_2\text{O}_6(\text{OH,F})$
Cesstibtantite	$(\text{Cs,Na})\text{Sb}^{3+}\text{Ta}_4\text{O}_{12}$
Kalipyrochlore	$(\text{K,Sr})_{2-x}\text{Nb}_2\text{O}_6(\text{O,OH}) \cdot n\text{H}_2\text{O}$
Microlite	$(\text{Ca,Na})_2\text{Ta}_2\text{O}_6(\text{O,OH,F})$
Natrobistantite	$(\text{Na,Cs})\text{Bi}(\text{Ta,Nb,Sb})_4\text{O}_{12}$
Plumbobetafite	$(\text{Pb,U,Ca})(\text{Ti,Nb})_2\text{O}_6(\text{OH,F})$
Plumbomicrolite	$(\text{Pb,Ca,U})_2\text{Ta}_2\text{O}_6(\text{OH})$
Plumbopyrochlore	$(\text{Pb,Y,U,Ca})_{2-x}\text{Nb}_2\text{O}_6(\text{OH})$
Pyrochlore	$(\text{Ca,Na})_2\text{Nb}_2\text{O}_6(\text{OH,F})$
Stannomicrolite	$(\text{Sn}^{2+},\text{Fe}^{2+},\text{Mn}^{2+})_2(\text{Ta,Nb,Sn}^{4+})_2(\text{O,OH})_7$
Stibiobetafite	$(\text{Sb}^{3+},\text{Ca})_2(\text{Ti,Nb,Ta})_2(\text{O,OH})_7$
Stibiomicrolite	$(\text{Sb,Ca,Na})_2(\text{Ta,Nb})_2\text{O}_7$
Strontipyrochlore	$\text{Sr}_2\text{Nb}_2(\text{O,OH})_7$
Uranmicrolite	$(\text{U,Ca,Ce})_2(\text{Ta,Nb})_2\text{O}_6(\text{OH,F})$
Uranpyrochlore	$(\text{U,Ca,Ce})_2(\text{Nb,Ta})_2\text{O}_6(\text{OH,F})$
Yttrobetafite-(Y)	$(\text{Y,U,Ce})_2(\text{Ti,Nb,Ta})_2\text{O}_6(\text{OH})$
Yttropyrochlore-(Y)	$(\text{Y,Na,Ca,U})_{1-2}(\text{Nb,Ta,Ti})_2(\text{O,OH})_7$

Ferritungstite (cub.), Jixianite (cub.) and Zirkelite (mon.) are structurally related oxides; Ralstonite is an isostructural halide. The nomenclature of the group, with recommendations by the I.M.A. Commission on New Minerals and Mineral Names are given in **62**, 403–410 (1977).

Pyroxene Group

Orthorhombic or monoclinic silicates of general formula ABZ_2O_6 , A = Ca, Fe^{2+} , Li, Mg, Mn^{2+} , Na, Zn; B = Al, Cr^{3+} , Fe^{2+} , Fe^{3+} , Mg, Mn^{2+} , Sc, Ti, V^{3+} ; Z = Al, Si.

Aegirine	$\text{NaFe}^{3+}\text{Si}_2\text{O}_6$
Aegirine-augite	
Augite	$(\text{Ca,Na})(\text{MgFe,Al,Ti})(\text{Si,Al})_2\text{O}_6$
Clinoenstatite	$\text{Mg}_2\text{Si}_2\text{O}_6$
Clinoferrosilite	$(\text{Fe}^{2+},\text{Mg})_2\text{Si}_2\text{O}_6$
Diopside	$\text{CaMgSi}_2\text{O}_6$
Donpeacorite	$(\text{Mn}^{2+},\text{Mg})\text{MgSi}_2\text{O}_6$
Enstatite	$\text{Mg}_2\text{Si}_2\text{O}_6$
Esseneite	$\text{CaFe}^{3+}\text{AlSiO}_6$
Ferrosilite	$(\text{Fe}^{2+},\text{Mg})_2\text{Si}_2\text{O}_6$
Hedenbergite	$\text{CaFe}^{2+}\text{Si}_2\text{O}_6$
Jadeite	$\text{Na}(\text{Al,Fe}^{3+})\text{Si}_2\text{O}_6$
Jervisite	$(\text{Na,Ca,Fe}^{2+})(\text{Sc,Mg,Fe}^{2+})\text{Si}_2\text{O}_6$
Johannsenite	$\text{CaMn}^{2+}\text{Si}_2\text{O}_6$
Kanoite	$(\text{Mn}^{2+},\text{Mg})_2\text{Si}_2\text{O}_6$
Kosmochlor	$\text{NaCr}^{3+}\text{Si}_2\text{O}_6$
Namansilite	$\text{NaMn}^{3+}\text{Si}_2\text{O}_6$
Natalyite	$\text{Na}(\text{V}^{3+},\text{Cr}^{3+})\text{Si}_2\text{O}_6$

Omphacite	a clinopyroxene
Peteddunnite	$\text{Ca}(\text{Zn}, \text{Mn}^{2+}, \text{Fe}^{2+}, \text{Mg})\text{Si}_2\text{O}_6$
Pigeonite	$(\text{Mg}, \text{Fe}^{2+}, \text{Ca})(\text{Mg}, \text{Fe}^{2+})\text{Si}_2\text{O}_6$
Spodumene	$\text{LiAlSi}_2\text{O}_6$

Nchwaningite is structurally related. The nomenclature of the group is in accord with the recommendations of the I.M.A. Commission on New Minerals and Mineral Names, **73**, 1123–1133 (1988).

Rhabdophane Group

Hexagonal or pseudo-hexagonal phosphates, with general formula $\text{XZO}_4 \cdot 1-2\text{H}_2\text{O}$, X = Ca, Ce, Fe^{3+} , La, Pb, Th; Z = P, S.

Brookite	$(\text{Ca}, \text{Th}, \text{Ce})(\text{PO}_4) \cdot \text{H}_2\text{O}$
Grayite	$(\text{Th}, \text{Pb}, \text{Ca})\text{PO}_4 \cdot \text{H}_2\text{O}$
Ningyoite	$(\text{U}, \text{Ca}, \text{Ce})_2(\text{PO}_4)_2 \cdot 1-2\text{H}_2\text{O}$
Rhabdophane-(Ce)	$(\text{Ce}, \text{La})\text{PO}_4 \cdot \text{H}_2\text{O}$
Rhabdophane-(La)	$(\text{La}, \text{Ce})\text{PO}_4 \cdot \text{H}_2\text{O}$
Rhabdophane-(Nd)	$(\text{Nd}, \text{Ce}, \text{La})\text{PO}_4 \cdot \text{H}_2\text{O}$
Tristramite	$(\text{Ca}, \text{U}^{4+}, \text{Fe}^{3+})(\text{PO}_4, \text{SO}_4) \cdot 2\text{H}_2\text{O}$

Rosasite Group

Monoclinic or triclinic carbonates of general formula $\text{A}_2(\text{CO}_3)(\text{OH})_2$ or $\text{AB}(\text{CO}_3)(\text{OH})_2$, A and B = Co, Cu, Mg, Ni, Zn.

Glaukosphaerite	$(\text{Cu}, \text{Ni})_2(\text{CO}_3)(\text{OH})_2$
Kolwezite	$(\text{Cu}^{2+}, \text{Co})_2(\text{CO}_3)(\text{OH})_2$
Mcguinnessite	$(\text{Mg}, \text{Cu}^{2+})_2(\text{CO}_3)(\text{OH})_2$
Nullaginite	$\text{Ni}_2(\text{CO}_3)(\text{OH})_2$
Rosasite	$(\text{Cu}^{2+}, \text{Zn})_2(\text{CO}_3)(\text{OH})_2$
Zincrosasite	$(\text{Zn}, \text{Cu}^{2+})_2(\text{CO}_3)(\text{OH})_2$

Pokrovskite is a related mineral.

Roselite Group

Monoclinic arsenates of general formula $\text{Ca}_2\text{M}^{2+}(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$, $\text{M}^{2+} = \text{Co}, \text{Mg}, \text{Mn}, \text{Zn}$.

Brandtite	$\text{Ca}_2(\text{Mn}^{2+}, \text{Mg})(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$
Roselite	$\text{Ca}_2(\text{Co}^{2+}, \text{Mg})(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$
Wendwilsonite	$\text{Ca}_2(\text{Mg}, \text{Co})(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$
Zincroselite	$\text{Ca}_2\text{Zn}(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$

Rozenite Group

Monoclinic sulfates of general formula $\text{A}^{2+}\text{SO}_4 \cdot 4\text{H}_2\text{O}$, $\text{A}^{2+} = \text{Co}, \text{Fe}, \text{Mg}, \text{Mn}, \text{Ni}, \text{Zn}$.

Aplowite	$(\text{Co}, \text{Mn}^{2+}, \text{Ni})\text{SO}_4 \cdot 4\text{H}_2\text{O}$
Boyleite	$(\text{Zn}, \text{Mg})\text{SO}_4 \cdot 4\text{H}_2\text{O}$
Ilesite	$(\text{Mn}^{2+}, \text{Zn}, \text{Fe}^{2+})\text{SO}_4 \cdot 4\text{H}_2\text{O}$
Rozenite	$\text{Fe}^{2+}\text{SO}_4 \cdot 4\text{H}_2\text{O}$
Starkeyite	$\text{MgSO}_4 \cdot 4\text{H}_2\text{O}$

Rutile Group

Tetragonal oxides of general formula $M^{4+}O_2$, $M^{4+} = \text{Ge, Mn, Pb, Si, Sn, Te, Ti}$.

Argutite	GeO_2
Cassiterite	SnO_2
Paratellurite	TeO_2
Plattnerite	PbO_2
Pyrolusite	Mn^{4+}O_2
Rutile	TiO_2
Squawcreekite	$(\text{Fe}^{3+}, \text{Sb}^{5+}, \text{Sn}^{2+})\text{O}_2$
Stishovite	SiO_2

Sellaite is structurally related to the Rutile group.

Scapolite Group

The tetragonal silicate series $\text{Na}_4\text{Al}_3\text{Si}_9\text{O}_{24}\text{Cl} - \text{Ca}_4\text{Al}_6\text{Si}_6\text{O}_{24}(\text{CO}_3, \text{SO}_4)$.

Marialite	$3\text{NaAlSi}_3\text{O}_8 \cdot \text{NaCl}$
Meionite	$3\text{CaAl}_2\text{Si}_2\text{O}_8 \cdot \text{CaCO}_3$

Schoenfliesite Group

Cubic hydroxides of general formula $M^{2+}\text{Sn}^{4+}(\text{OH})_6$, $M^{2+} = \text{Ca, Cu, Fe, Mg, Mn, Zn}$.

Burtite	$\text{CaSn}(\text{OH})_6$
Mushistonite	$(\text{Cu}^{2+}, \text{Zn}, \text{Fe}^{2+})\text{Sn}^{4+}(\text{OH})_6$
Natanite	$\text{Fe}^{2+}\text{Sn}^{4+}(\text{OH})_6$
Schoenfliesite	$\text{MgSn}^{4+}(\text{OH})_6$
Vismirnovite	$\text{ZnSn}^{4+}(\text{OH})_6$
Wickmanite	$\text{Mn}^{2+}\text{Sn}^{4+}(\text{OH})_6$

Compare the Stottite group.

Smectite Group

Monoclinic silicates of general formula $X_{0.3}Y_{2-3}Z_4O_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$, X (exchangeable ions) = Ca/2, Li, Na; Y = Al, Cr^{3+} , Cu^{2+} , Fe^{2+} , Fe^{3+} , Li, Mg, Ni, Zn; Z = Al, Si.

Aliettite	a clay mineral
Beidellite	$(\text{Na}, \text{Ca}_{0.5})_{0.3}\text{Al}_2(\text{Si}, \text{Al})_4\text{O}_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$
Hectorite	$\text{Na}_{0.3}(\text{Mg}, \text{Li})_3\text{Si}_4\text{O}_{10}(\text{F}, \text{OH})_2$
Montmorillonite	$(\text{Na}, \text{Ca})_{0.3}(\text{Al}, \text{Mg})_2\text{Si}_4\text{O}_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$
Nontronite	$\text{Na}_{0.3}\text{Fe}_2^{3+}(\text{Si}, \text{Al})_4\text{O}_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$
Saponite	$(\text{Ca}/2, \text{Na})_{0.3}(\text{Mg}, \text{Fe}^{2+})_3(\text{Si}, \text{Al})_4\text{O}_{10}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$
Sauconite	$\text{Na}_{0.3}\text{Zn}_3(\text{Si}, \text{Al})_4\text{O}_{10}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$
Stevensite	$(\text{Ca}/2)_{0.3}\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$
Swinefordite	$(\text{Ca}, \text{Na})_{0.3}(\text{Li}, \text{Mg})_2(\text{Si}, \text{Al})_4\text{O}_{10}(\text{OH}, \text{F})_2 \cdot 2\text{H}_2\text{O}$
Volkonskoite	$\text{Ca}_{0.3}(\text{Cr}^{3+}, \text{Mg}, \text{Fe}^{3+})_2(\text{Si}, \text{Al})_4\text{O}_{10}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$
Yakhontovite	$(\text{Ca}, \text{Na})_{0.5}(\text{Cu}^{2+}, \text{Fe}^{2+}, \text{Mg})_2\text{Si}_4\text{O}_{10}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$

Compare Brammallite, Illite and Rectorite.

Sodalite Group

Cubic silicates of general formula $(\text{Na,Ca})_{4-8}\text{Al}_6\text{Si}_6(\text{O,S})_{24}(\text{SO}_4,\text{Cl},(\text{OH}),\text{S})_{1-2}\cdot n\text{H}_2\text{O}$.

Ha_yne	$(\text{Na,Ca})_{4-8}\text{Al}_6\text{Si}_6(\text{O,S})_{24}(\text{SO}_4,\text{Cl})_{1-2}$
Lazurite	$(\text{Na,Ca})_{7-8}(\text{Al,Si})_{12}(\text{O,S})_{24}[(\text{SO}_4),\text{Cl},(\text{OH})_2]$
Nosean	$\text{Na}_8\text{Al}_6\text{Si}_6\text{O}_{24}(\text{SO}_4)\cdot\text{H}_2\text{O}$
Sodalite	$\text{Na}_8\text{Al}_6\text{Si}_6\text{O}_{24}\text{Cl}_2$

Sphalerite Group

Cubic sulfides, selenides, and tellurides of general formula AX, A = Cd, Fe, Hg, Zn; X = S, Se, Te.

Coloradoite	HgTe
Hawleyite	CdS
Metacinnabar	HgS
Sphalerite	$(\text{Zn,Fe})\text{S}$
Stilleite	ZnSe
Tiemannite	HgSe

Spinel Group

Cubic oxides of general formula AB_2O_4 , A = Co, Cu, Fe^{2+} , Ge, Mg, Mn^{2+} , Ni, Ti, Zn; B = Al, Cr^{3+} , Fe^{2+} , Fe^{3+} , Mg, Mn^{3+} , Ti, V^{3+} .

Brunogeierite	$(\text{Ge}^{2+},\text{Fe}^{2+})\text{Fe}_2^{3+}\text{O}_4$
Chromite	$\text{Fe}^{2+}\text{Cr}_2\text{O}_4$
Cochromite	$(\text{Co,Ni,Fe}^{2+})(\text{Cr,Al})_2\text{O}_4$
Coulsonite	$\text{Fe}^{2+}\text{V}_2^{3+}\text{O}_4$
Cuprospinel	$(\text{Cu}^{2+},\text{Mg})\text{Fe}_2^{3+}\text{O}_4$
Franklinite	$(\text{Zn,Mn}^{2+},\text{Fe}^{2+})(\text{Fe}^{3+},\text{Mn}^{3+})_2\text{O}_4$
Gahnite	ZnAl_2O_4
Galaxite	$(\text{Mn}^{2+},\text{Fe}^{2+},\text{Mg})(\text{Al,Fe}^{3+})_2\text{O}_4$
Hercynite	$\text{Fe}^{2+}\text{Al}_2\text{O}_4$
Jacobsite	$(\text{Mn}^{2+},\text{Fe}^{2+},\text{Mg})(\text{Fe}^{3+},\text{Mn}^{3+})_2\text{O}_4$
Magnesiochromite	MgCr_2O_4
Magnesiocoulsonite	MgV_2O_4
Magnesioferrite	$\text{MgFe}_2^{3+}\text{O}_4$
Magnetite	$\text{Fe}^{2+}\text{Fe}_2^{3+}\text{O}_4$
Manganochromite	$(\text{Mn}^{2+},\text{Fe}^{2+})(\text{Cr}^{3+},\text{V}^{3+})_2\text{O}_4$
Nichromite	$(\text{Ni,Co,Fe}^{2+})(\text{Cr}^{3+},\text{Fe}^{3+},\text{Al})_2\text{O}_4$
Qandilite	$(\text{Mg,Fe}^{2+})_2(\text{Ti,Fe}^{2+},\text{Al})\text{O}_4$
Spinel	MgAl_2O_4
Trevorite	$\text{NiFe}_2^{3+}\text{O}_4$
Ulv_spinel	$\text{TiFe}_2^{2+}\text{O}_4$
Vuorelainenite	$(\text{Mn}^{2+},\text{Fe}^{2+})(\text{V}^{3+},\text{Cr}^{3+})_2\text{O}_4$
Zincochromite	$\text{ZnCr}_2^{3+}\text{O}_4$

Ringwoodite is an isostructural silicate. Compare the sulfides of the Linnaeite group.

Stannite Group

Tetragonal sulfides and selenides of general formula A_3BX_4 , A = Ag, Cd, Cu, Fe, Hg, Zn; B = As, Ge, In, Sb, Sn; X = S, Se.

Briartite	$\text{Cu}_2(\text{Zn,Fe})\text{GeS}_4$
_erny;ite	$\text{Cu}_2\text{CdSnS}_4$
Famatinite	Cu_3SbS_4
Hocartite	$\text{Ag}_2\text{FeSnS}_4$
Kuramite	Cu_3SnS_4
Luzonite	Cu_3AsS_4
Permingeatite	Cu_3SbSe_4
Pirquitasite	$\text{Ag}_2\text{ZnSnS}_4$
Stannite	$\text{Cu}_2\text{FeSnS}_4$
Velikite	$\text{Cu}_2\text{HgSnS}_4$

K_sterite and Ferrok_sterite are structurally related minerals.

Stibiconite Group

Cubic oxides of general formula $\text{A}_{1-2}\text{B}_2\text{O}_6(\text{O,OH,F})$, A = Ag, Bi, Ca, Cu, Fe^{2+} , Fe^{3+} , K, Mn^{2+} , Na, Pb, Sb^{3+} ; B = Fe^{3+} , Sb^{5+} , Ti. Compare with the Pyrochlore group.

Bindheimite	$\text{Pb}_2\text{Sb}_2\text{O}_6(\text{O,OH})$
Bismutostibiconite	$\text{Bi}(\text{Sb}^{5+}, \text{Fe}^{3+})_2\text{O}_7$
Partzite	$\text{Cu}_2^{2+}\text{Sb}^{2+}(\text{O,OH})_7(?)$
Rom_ite	$(\text{Ca,Fe}^{2+}, \text{Mn}^{2+}, \text{Na})_2(\text{Sb,Ti})_2\text{O}_6(\text{O,OH,F})$
Stetefeldtite	$\text{Ag}_2\text{Sb}_2(\text{O,OH})_7(?)$
Stibiconite	$\text{Sb}^{3+}\text{Sb}_2^{5+}\text{O}_6(\text{OH})$

Jixianite is a structurally related lead tungsten oxide.

Stottite Group

Tetragonal hydroxides of general formula $\text{AB}(\text{OH})_6$, A = Fe^{2+} , Fe^{3+} , Mn^{2+} , Na; B = Ge^{4+} , Sn^{4+} , Sb^{5+} .

Jeanbandyite	$(\text{Fe}^{3+}, \text{Mn}^{2+})\text{Sn}^{4+}(\text{OH})_6$
Mopungite	$\text{NaSb}^{5+}(\text{OH})_6$
Stottite	$\text{Fe}^{2+}\text{Ge}^{4+}(\text{OH})_6$
Tetrawickmanite	$\text{Mn}^{2+}\text{Sn}^{4+}(\text{OH})_6$

Compare the cubic minerals of the Schoenfliesite group.

Tapiolite Group

See Ferrotapiolite group.

Tetradymite Group

Trigonal selenides and tellurides of general formula A_2X_3 , A = Bi, Sb; X = S, Se, Te.

Kawazulite	$\text{Bi}_2(\text{Te,Se,S})_3$
Paraguanajuatite	$\text{Bi}_2(\text{Se,S})_3$
Skippenite	$\text{Bi}_2\text{Se}_2\text{Te}$
Tellurantimony	Sb_2Te_3
Tellurobismuthite	Bi_2Te_3
Tetradymite	$\text{Bi}_2\text{Te}_2\text{S}$

Tetrahedrite Group

Cubic sulfides, selenides, and tellurides of general formula $\text{A}_{12}\text{B}_4\text{X}_{13}$, A = Ag, Cu, Fe, Hg,

Zn; B = As, Sb, Te; X = S, Se, Te.

Argentotennantite	$(\text{Ag,Cu})_{10}(\text{Zn,Fe})_2(\text{As,Sb})_4\text{S}_{13}$
Freibergite	$(\text{Ag,Cu,Fe})_{12}(\text{Sb,As})_4\text{S}_{13}$
Giraudite	$(\text{Cu,Zn,Ag})_{12}(\text{As,Sb})_4(\text{Se,S})_{13}$
Goldfieldite	$\text{Cu}_{12}(\text{Te,Sb,As})_4\text{S}_{13}$
Hakite	$(\text{Cu,Hg})_{12}\text{Sb}_4(\text{Se,S})_{13}$
Tennantite	$(\text{Cu,Ag,Fe,Zn})_{12}\text{As}_4\text{S}_{13}$
Tetrahedrite	$(\text{Cu,Fe,Ag,Zn})_{12}\text{Sb}_4\text{S}_{13}$

Tourmaline Group

Trigonal borosilicates of general formula $\text{WX}_3\text{Y}_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{O,OH,F})_4$,
 $\text{W} = \text{Ca, K, Na}$; $\text{X} = \text{Al, Fe}^{2+}, \text{Fe}^{3+}, \text{Li, Mg, Mn}^{2+}$; $\text{Y} = \text{Al, Cr}^{3+}, \text{Fe}^{3+}, \text{V}^{3+}$.

Buergerite	$\text{NaFe}_3^{3+}\text{Al}_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{O,F})_4$
Chromdravite	$\text{NaMg}(\text{Cr,Fe}^{3+})_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{OH})_4$
Dravite	$\text{NaMgAl}_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{OH})_4$
Elbaite	$\text{Na}(\text{Li,Al})_3\text{Al}_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{OH})_4$
Feruvite	$\text{Ca}(\text{Fe}^{2+}, \text{Mg})_3(\text{Al,Mg})_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{OH})_4$
Foite	$\text{h}[\text{Fe}^{2+}(\text{Al,Fe}^{3+})]\text{Al}_6\text{Si}_6\text{O}_{18}(\text{BO}_3)_3(\text{OH})_4$
Liddicoatite	$\text{Ca}(\text{Li,Al})_3\text{Al}_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{O,OH,F})_4$
Olenite	$\text{NaAl}_3\text{Al}_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{O,OH})_4$
Povondraite	$\text{NaFe}_3^{3+}\text{Fe}_6^{3+}(\text{BO}_3)_3(\text{Si}_6\text{O}_{18})(\text{OH,O})_4$
Schorl	$\text{NaFe}_3^{2+}\text{Al}_6(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{OH})_4$
Uvite	$(\text{Ca,Na})(\text{Mg,Fe}^{2+})_3\text{Al}_6\text{Mg}(\text{BO}_3)_3\text{Si}_6\text{O}_{18}(\text{OH,F})_4$

Tsumcorite Group

Monoclinic and triclinic arsenates, phosphates, vanadates, and sulfates with the general formula: $(\text{M1})(\text{M2})_2(\text{XO}_4)_2(\text{OH,H}_2\text{O})_2$, where M1 is Pb, Ca, or Na; M2 is Cu, Zn, Fe^{3+} , Co, Mn^{3+} , and X is As, P, V, and S.

Ferrilotharmeyerite	$\text{Ca}(\text{Fe}^{3+}, \text{Zn})_2(\text{AsO}_4)_2(\text{OH,H}_2\text{O})_2$	mon.
Gartrellite	$\text{Pb}[(\text{Cu,Zn})(\text{Fe}^{3+}, \text{Zn,Cu})](\text{AsO}_4)_2(\text{OH,H}_2\text{O})_2$	tric.
Helmutwinklerite	$\text{Pb}(\text{Zn,Cu})_2(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$	tric.
Lotharmeyerite	$\text{Ca}(\text{Mn}^{3+}, \text{Zn})_2(\text{AsO}_4)_2(\text{OH,H}_2\text{O})_2$	mon.
Mawbyite	$\text{Pb}(\text{Fe}^{3+}, \text{Zn})_2(\text{AsO}_4)_2(\text{OH,H}_2\text{O})_2$	mon.
Mounanaite	$\text{PbFe}_2^{3+}(\text{VO}_4)_2(\text{OH})_2$	mon.
Natrochalcite	$\text{NaCu}_2(\text{SO}_4)_2(\text{OH,H}_2\text{O})_2$	mon.
Phosphogartrellite	$\text{PbCuFe}^{3+}(\text{PO}_4)_2(\text{OH,H}_2\text{O})_2$	tric.
Thomtzekite	$\text{Pb}(\text{Cu}^{2+}, \text{Zn})_2(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$	tric.(?)
Tsumcorite	$\text{Pb}(\text{Zn,Fe}^{3+})_2(\text{AsO}_4)_2(\text{OH,H}_2\text{O})_2$	mon.

Turquoise Group

Triclinic phosphates of general formula $\text{AB}_6(\text{PO}_4)_x\text{PO}_3(\text{OH})_{2-x}(\text{OH})_8 \cdot 4\text{H}_2\text{O}$,
 $\text{A} = \text{Ca, Cu}^{2+}, \text{Fe}^{2+}, \text{Zn}$; $\text{B} = \text{Al, Fe}^{3+}, \text{Cr}^{2+}$.

Aheylite	$(\text{Fe}^{2+}, \text{Zn})\text{Al}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4\text{H}_2\text{O}$
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Chalcosiderite	$\text{Cu}^{2+}\text{Fe}_6^{3+}(\text{PO}_4)_4(\text{OH})_8 \cdot 4\text{H}_2\text{O}$
Coeruleolactite	$(\text{Ca}, \text{Cu}^{2+})\text{Al}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4-5\text{H}_2\text{O}$
Faustite	$(\text{Zn}, \text{Cu}^{2+})\text{Al}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4\text{H}_2\text{O}$
Planerite	$\text{Al}_6(\text{PO}_4)_2(\text{PO}_3\text{OH})_2(\text{OH})_8 \cdot 4\text{H}_2\text{O}$
Turquoise	$\text{Cu}^{2+}\text{Al}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4\text{H}_2\text{O}$

Variscite Group

Orthorhombic arsenates and phosphates of general formula $\text{AXO}_4 \cdot 2\text{H}_2\text{O}$,

A = Al, Fe^{3+} , Cr^{3+} , In^{3+} ; X = As, P.

Mansfieldite	$\text{AlAsO}_4 \cdot 2\text{H}_2\text{O}$
Scorodite	$\text{Fe}^{3+}\text{AsO}_4 \cdot 2\text{H}_2\text{O}$
Strengite	$\text{Fe}^{3+}\text{PO}_4 \cdot 2\text{H}_2\text{O}$
Variscite	$\text{AlPO}_4 \cdot 2\text{H}_2\text{O}$
Yanomamite	$\text{InAsO}_4 \cdot 2\text{H}_2\text{O}$

Vivianite Group

Monoclinic arsenates and phosphates of general formula $\text{A}_3^{2+}(\text{XO}_4)_2 \cdot 8\text{H}_2\text{O}$, $\text{A}^{2+} = \text{Co}, \text{Fe}, \text{Mg}, \text{Mn}, \text{Ni}, \text{Zn}$; X = As, P.

Annabergite	$\text{Ni}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Arupite	$\text{Ni}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$
Bariite	$(\text{Mg}, \text{Fe}^{2+})_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$
Erythrite	$\text{Co}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Hernesite	$\text{Mg}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Kettigite	$\text{Zn}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Parasymplesite	$\text{Fe}_3^{2+}(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$
Vivianite	$\text{Fe}_3^{2+}(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$

Bobierite and Manganese-hernesite are related minerals, with b-axes twice those of minerals of this group.

Whiteite Group

Monoclinic phosphates of general formula $\text{AB}^{2+}\text{CX}_2(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$,

A = Ca, Mn^{2+} ; $\text{B}^{2+} = \text{Mg}, \text{Mn}, \text{Fe}, \text{Zn}$; C = Mg, Fe^{2+} ; X = Al, Fe^{3+} .

Jahnsite-(CaMnFe)	$\text{CaMn}^{2+}\text{Fe}_2^{3+}\text{Fe}_2^{3+}(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$
Jahnsite-(CaMnMg)	$\text{CaMn}^{2+}(\text{Mg}, \text{Fe}^{2+})_2\text{Fe}_2^{2+}(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$
Jahnsite-(CaMnMn)	$\text{CaMn}^{2+}\text{Mn}_2^{2+}\text{Fe}_2^{3+}(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$
Keckite	$\text{Ca}(\text{Mn}^{2+}, \text{Zn})_2\text{Fe}_3^{3+}(\text{PO}_4)_4(\text{OH})_3 \cdot 2\text{H}_2\text{O}$
Rittmanite	$(\text{Mn}^{2+}, \text{Ca})\text{Mn}^{2+}(\text{Fe}^{2+}, \text{Mn}^{2+})_2(\text{Al}, \text{Fe}^{3+})_2(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$
Whiteite-(CaFeMg)	$\text{Ca}(\text{Fe}^{2+}, \text{Mn}^{2+})\text{Mg}_2\text{Al}_2(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$
Whiteite-(CaMnMg)	$\text{CaMn}^{2+}\text{Mg}_2\text{Al}_2(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$
Whiteite-(MnFeMg)	$(\text{Mn}^{2+}, \text{Ca})(\text{Fe}^{2+}, \text{Mn}^{2+})\text{Mg}_2\text{Al}_2(\text{PO}_4)_4(\text{OH})_2 \cdot 8\text{H}_2\text{O}$

Zeolite Group

This group has been the subject of a major review by a subcommittee of the Commission on New Minerals and Mineral Names of the International Mineralogical Association. The

subcommittee, headed by Dr. Douglas S. Coombs, has published its report in several journals; for example, Coombs *et al.* (1997) *Canadian Mineralogist* **35**, 1571–1606 where detailed references are given for all of the species. The report is discussed in a summary article by Mandarino (1999) in the *Mineralogical Record* **30**, 5–6. We recommend that readers interested in more details about this group of minerals read the report and the article.

Zeolite minerals are defined as silicates having framework structures which contain open cavities in the form of channels and cages. These are usually occupied by H₂O molecules and extra-framework cations that are commonly exchangeable. In many zeolites, not only do the extra-framework cations vary widely, but so also does the Al:Si ratio. This in turn changes the total extra-framework cation charge and commonly the number of extra-framework cations. The number of H₂O molecules is also variable; as the number of extra-framework cations increases, H₂O tends to decrease. The formulae given are therefore to be regarded as no more than simplified representative formulae. The crystallography varies greatly within the zeolite group and species fall into all of the crystal systems. The report establishes *series* which are comprised of two or more species based on the dominant extra-framework cation present. All members of a series have the same root name but are distinguished by a suffix consisting of a hyphen and the chemical symbol of the extra-framework cation. Note that this zeolite suffix differs from the Levinson-type suffix in that the latter consists of a hyphen followed by a chemical symbol (or symbols) enclosed in parentheses (i.e., brackets). Species are listed in bold face and series names are given in ordinary type. Note that two of the species, pahasapaite and weinebeneite, are berylllophosphates rather than silicates.

Amicite

$K_4Na_4[Al_8Si_8O_{32}] \cdot 10H_2O$, mon.

Ammonioleucite (NH₄)[AlSi₂O₆], tet.

Analcime Na[AlSi₂O₆]·H₂O, cub., tet., trig, orth., mon., and tric.

Barrerite Na₂[Al₂Si₇O₁₈]·6H₂O, orth.

Bellbergite (K,Ba,Sr)₂Sr₂Ca₂(Ca,Na)₄[Al₁₈Si₁₈O₇₂]·30H₂O, hex.

Bikitaite Li[AlSi₂O₆]·H₂O, mon. and tric.

Boggsite Ca₈Na₃[Al₁₉Si₇₇O₁₉₂]·70H₂O, orth.

Brewsterite (series) (Sr,Ba)₂[Al₄Si₁₂O₃₂]·10H₂O, mon.

Brewsterite-Ba (Ba,Sr)₂[Al₄Si₁₂O₃₂]·10H₂O, mon.

Brewsterite-Sr (Sr,Ba)₂[Al₄Si₁₂O₃₂]·10H₂O, mon.

Chabazite (series) (Ca_{0.5},Na,K)₄[Al₄Si₈O₂₄]·12H₂O, trig and tric.

Chabazite-Ca (Ca_{0.5},K,Na)₄[Al₄Si₈O₂₄]·12H₂O, trig

Chabazite-K (K,Na,Ca_{0.5})₄[Al₄Si₈O₂₄]·12H₂O, trig

Chabazite-Na (Na,K,Ca_{0.5})₄[Al₄Si₈O₂₄]·12H₂O, trig

Chiavennite CaMn[Be₂Si₅O₁₃(OH)₂]·2H₂O, orth.

Clinoptilolite (series) (Na,K,Ca_{0.5},Sr_{0.5},Ba_{0.5},Mg_{0.5})₆[Al₆Si₃₀O₇₂]·~20H₂O, mon.

Clinoptilolite-Ca (Ca_{0.5},Na,K)₆[Al₆Si₃₀O₇₂]·~20H₂O, mon.

Clinoptilolite-K (K,Na)₆[Al₆Si₃₀O₇₂]·~20H₂O, mon.

Clinoptilolite-Na (Na,K,Ca_{0.5})₆[Al₆Si₃₀O₇₂]·~20H₂O, mon.

Cowlesite Ca[Al₂Si₃O₁₀]·5.3H₂O, orth.

Dachiardite (series) (Ca_{0.5},Na,K)₄₋₅[Al₄₋₅Si₂₀₋₁₉O₄₈]·~13H₂O, mon.

Dachiardite-Ca (Ca_{0.5},K,Na)₄₋₅[Al₄₋₅Si₂₀₋₁₉O₄₈]·~13H₂O, mon.

Dachiardite-Na (Na,K,Ca_{0.5})₄₋₅[Al₄₋₅Si₂₀₋₁₉O₄₈]·~13H₂O, mon.

Edingtonite	$\text{Ba}[\text{Al}_2\text{Si}_3\text{O}_{10}] \cdot 4\text{H}_2\text{O}$, orth. and tet.
Epistilbite	$(\text{Ca}, \text{Na}_2)[\text{Al}_2\text{Si}_4\text{O}_{12}] \cdot 4\text{H}_2\text{O}$, mon. and tric.
Erionite (series)	$(\text{K}, \text{Na}, \text{Ca}_{0.5})_{10}[\text{Al}_{10}\text{Si}_{26}\text{O}_{72}] \cdot \sim 30\text{H}_2\text{O}$, hex.
Erionite-Ca	$(\text{Ca}_{0.5}, \text{K}, \text{Na})_{10}[\text{Al}_{10}\text{Si}_{26}\text{O}_{72}] \cdot \sim 30\text{H}_2\text{O}$, hex.
Erionite-K	$(\text{K}, \text{Na}, \text{Ca}_{0.5})_{10}[\text{Al}_{10}\text{Si}_{26}\text{O}_{72}] \cdot \sim 30\text{H}_2\text{O}$, hex.
Erionite-Na	$(\text{Na}, \text{K}, \text{Ca}_{0.5})_{10}[\text{Al}_{10}\text{Si}_{26}\text{O}_{72}] \cdot \sim 30\text{H}_2\text{O}$, hex.
Faujasite (series)	$(\text{Na}, \text{Ca}_{0.5}, \text{Mg}_{0.5}, \text{K})_{3-4}[\text{Al}_{3-4}\text{Si}_{9-8}\text{O}_{24}] \cdot 16\text{H}_2\text{O}$, cub.
Faujasite-Ca	$(\text{Ca}_{0.5}, \text{Na}, \text{Mg}_{0.5}, \text{K})_{3-4}[\text{Al}_{3-4}\text{Si}_{9-8}\text{O}_{24}] \cdot 16\text{H}_2\text{O}$, cub.
Faujasite-Mg	$(\text{Mg}_{0.5}, \text{Ca}_{0.5}, \text{Na}, \text{K})_{3-4}[\text{Al}_{3-4}\text{Si}_{9-8}\text{O}_{24}] \cdot 16\text{H}_2\text{O}$, cub.
Faujasite-Na	$(\text{Na}, \text{Ca}_{0.5}, \text{Mg}_{0.5}, \text{K})_{3-4}[\text{Al}_{3-4}\text{Si}_{9-8}\text{O}_{24}] \cdot 16\text{H}_2\text{O}$, cub.
Ferrierite (series)	$(\text{K}, \text{Na}, \text{Mg}_{0.5}, \text{Ca}_{0.5})_6[\text{Al}_6\text{Si}_{30}\text{O}_{72}] \cdot 18\text{H}_2\text{O}$, orth. and mon.
Ferrierite-K	$(\text{K}, \text{Na}, \text{Mg}_{0.5}, \text{Ca}_{0.5})_6[\text{Al}_6\text{Si}_{30}\text{O}_{72}] \cdot 18\text{H}_2\text{O}$, orth.
Ferrierite-Mg	$(\text{Mg}_{0.5}, \text{K}, \text{Na}, \text{Ca}_{0.5})_6[\text{Al}_6\text{Si}_{30}\text{O}_{72}] \cdot 18\text{H}_2\text{O}$, orth.
Ferrierite-Na	$(\text{Na}, \text{K}, \text{Mg}_{0.5}, \text{Ca}_{0.5})_6[\text{Al}_6\text{Si}_{30}\text{O}_{72}] \cdot 18\text{H}_2\text{O}$, mon.
Garronite	$\text{NaCa}_2.5[\text{Al}_6\text{Si}_{10}\text{O}_{32}] \cdot 14\text{H}_2\text{O}$, tet. and orth.
Gaultite	$\text{Na}_4[\text{Zn}_2\text{Si}_7\text{O}_{18}] \cdot 5\text{H}_2\text{O}$, orth.
Gismondine	$\text{Ca}[\text{Al}_2\text{Si}_2\text{O}_8] \cdot 4.5\text{H}_2\text{O}$, mon.
Gmelinite (series)	$(\text{Na}, \text{Ca}_{0.5}, \text{K}, \text{Sr}_{0.5})_8[\text{Al}_8\text{Si}_{16}\text{O}_{48}] \cdot 22\text{H}_2\text{O}$, hex.
Gmelinite-Ca	$(\text{Ca}_{0.5}, \text{Sr}_{0.5}, \text{Na}, \text{K})_4[\text{Al}_8\text{Si}_{16}\text{O}_{48}] \cdot 22\text{H}_2\text{O}$, hex.
Gmelinite-K	$(\text{K}, \text{Ca}_{0.5}, \text{Sr}_{0.5}, \text{Na})_4[\text{Al}_8\text{Si}_{16}\text{O}_{48}] \cdot 22\text{H}_2\text{O}$, hex.
Gmelinite-Na	$(\text{Na}, \text{K}, \text{Ca}_{0.5})_4[\text{Al}_8\text{Si}_{16}\text{O}_{48}] \cdot 22\text{H}_2\text{O}$, hex.
Gobbinsite	$\text{Na}_5[\text{Al}_5\text{Si}_{11}\text{O}_{32}] \cdot 12\text{H}_2\text{O}$, orth.
Gonnardite	$(\text{Na}, \text{Ca})_{6-8}[(\text{Al}, \text{Si})_{20}\text{O}_{40}] \cdot 12\text{H}_2\text{O}$, tet.
Goosecreekite	$\text{Ca}[\text{Al}_2\text{Si}_6\text{O}_{16}] \cdot 5\text{H}_2\text{O}$, mon.
Gottardiite	$\text{Na}_3\text{Mg}_3\text{Ca}_5[\text{Al}_{19}\text{Si}_{117}\text{O}_{272}] \cdot 93\text{H}_2\text{O}$, orth.
Harmotome	$(\text{Ba}_{0.5}, \text{Ca}_{0.5}, \text{K}, \text{Na})_5[\text{Al}_5\text{Si}_{11}\text{O}_{32}] \cdot 12\text{H}_2\text{O}$, mon.
Heulandite (series)	$(\text{Ca}_{0.5}, \text{Sr}_{0.5}, \text{Ba}_{0.5}, \text{Mg}_{0.5}, \text{Na}, \text{K},)_9[\text{Al}_9\text{Si}_{27}\text{O}_{72}] \cdot \sim 24\text{H}_2\text{O}$, mon.
Heulandite-Ca	$(\text{Ca}_{0.5}, \text{Na}, \text{K})_9[\text{Al}_9\text{Si}_{27}\text{O}_{72}] \cdot \sim 24\text{H}_2\text{O}$, mon.
Heulandite-K	$(\text{K}, \text{Ca}_{0.5}, \text{Na}, \text{Mg}_{0.5}, \text{Sr}_{0.5})_9[\text{Al}_9\text{Si}_{27}\text{O}_{72}] \cdot \sim 24\text{H}_2\text{O}$, mon.
Heulandite-Na	$(\text{Na}, \text{Ca}_{0.5}, \text{K})_9[\text{Al}_9\text{Si}_{27}\text{O}_{72}] \cdot \sim 24\text{H}_2\text{O}$, mon.
Heulandite-Sr	$(\text{Sr}_{0.5}, \text{Ca}_{0.5}, \text{Na}, \text{K})_9[\text{Al}_9\text{Si}_{27}\text{O}_{72}] \cdot \sim 24\text{H}_2\text{O}$, mon.
Hsianghualite	$\text{Li}_2\text{Ca}_3[\text{Be}_3\text{Si}_3\text{O}_{12}]\text{F}_2$, cub.
Kalborsite	$\text{K}_6[\text{Al}_4\text{Si}_6\text{O}_{20}]\text{B}(\text{OH})_4\text{Cl}$, tet.
Laumontite	$\text{Ca}_4[\text{Al}_8\text{Si}_{16}\text{O}_{48}] \cdot 18\text{H}_2\text{O}$, mon.
Leucite	$\text{K}[\text{AlSi}_2\text{O}_6]$, tet.
Levyne (series)	$(\text{Ca}_{0.5}, \text{Na}, \text{K})_6[\text{Al}_6\text{Si}_{12}\text{O}_{36}] \cdot \sim 17\text{H}_2\text{O}$, trig
Levyne-Ca	$(\text{Ca}_{0.5}, \text{Na}, \text{K})_6[\text{Al}_6\text{Si}_{12}\text{O}_{36}] \cdot \sim 17\text{H}_2\text{O}$, trig
Levyne-Na	$(\text{Na}, \text{Ca}_{0.5}, \text{K})_6[\text{Al}_6\text{Si}_{12}\text{O}_{36}] \cdot \sim 17\text{H}_2\text{O}$, trig
Lovdarite	$\text{K}_4\text{Na}_{12}[\text{Be}_8\text{Si}_{28}\text{O}_{72}] \cdot 18\text{H}_2\text{O}$, orth.
Maricopaite	$(\text{Pb}_7\text{Ca}_2)[\text{Al}_{12}\text{Si}_{36}(\text{O}, \text{OH})_{100}] \cdot n(\text{H}_2\text{O}, \text{OH})$, n = 32, orth.
Mazzite	$(\text{Mg}_{2.5}\text{K}_2\text{Ca}_{1.5})[\text{Al}_{10}\text{Si}_{26}\text{O}_{72}] \cdot 30\text{H}_2\text{O}$, hex.
Merlinoite	$\text{K}_5\text{Ca}_2[\text{Al}_9\text{Si}_{23}\text{O}_{64}] \cdot 22\text{H}_2\text{O}$, orth.
Mesolite	$\text{Na}_{16}\text{Ca}_{16}[\text{Al}_{48}\text{Si}_{72}\text{O}_{240}] \cdot 64\text{H}_2\text{O}$, orth.

Montesommaite	$K_9[Al_9Si_{23}O_{64}] \cdot 10H_2O$, orth.
Mordenite	$(Na_2, Ca, K_2)_4[Al_8Si_{40}O_{96}] \cdot 28H_2O$, orth.
Mutinaite	$Na_3Ca_4[Al_{11}Si_{85}O_{192}] \cdot 60H_2O$, orth.
Natrolite	$Na_2[Al_2Si_3O_{10}] \cdot 2H_2O$, orth.
Offrite	$CaKMg[Al_5Si_{13}O_{36}] \cdot 16H_2O$, hex.
Pahasapaite	$(Ca_{5.5}Li_{3.6}K_{1.2}Na_{0.2}H_{13.5})Li_8[Be_{24}P_{24}O_{96}] \cdot 38H_2O$, cub.
Parthite	$Ca_2[Al_4Si_4O_{15}(OH)_2] \cdot 4H_2O$, mon.
Paulingite (series)	$(K, Ca_{0.5}, Na, Ba_{0.5})_{10}[Al_{10}Si_{32}O_{84}] \cdot 27-44H_2O$, cub.
Paulingite-Ca	$(Ca_{0.5}, K, Na)_{10}[Al_{10}Si_{32}O_{84}] \cdot 27-44H_2O$, cub.
Paulingite-K	$(K, Ca_{0.5}, Na)_{10}[Al_{10}Si_{32}O_{84}] \cdot 27-44H_2O$, cub.
Perliaite	$K_9Na(Ca, Sr)[Al_{12}Si_{24}O_{72}] \cdot 15H_2O$, hex.
Phillipsite (series)	$(K, Na, Ca_{0.5}, Ba_{0.5})_{4-7}[Al_{4-7}Si_{12-9}O_{32}] \cdot 12H_2O$, mon.
Phillipsite-Ca	$(Ca_{0.5}, K, Na, Ba_{0.5})_{4-7}[Al_{4-7}Si_{12-9}O_{32}] \cdot 12H_2O$, mon.
Phillipsite-K	$(K, Na, Ca_{0.5}, Ba_{0.5})_{4-7}[Al_{4-7}Si_{12-9}O_{32}] \cdot 12H_2O$, mon.
Phillipsite-Na	$(Na, K, Ca_{0.5}, Ba_{0.5})_{4-7}[Al_{4-7}Si_{12-9}O_{32}] \cdot 12H_2O$, mon.
Pollucite	$(Cs, Na)[AlSi_2O_6] \cdot nH_2O$, where $(Cs + n) = 1$, cub.
Roggianite	$Ca_2[Be(OH)_2Al_2Si_4O_{13}] \cdot <2.5H_2O$, tet.
Scolecite	$Ca[Al_2Si_3O_{10}] \cdot 3H_2O$, mon.
Stellerite	$Ca[Al_2Si_7O_{18}] \cdot 7H_2O$, orth.
Stilbite (series)	$(Ca_{0.5}, Na, K)_9[Al_9Si_{27}O_{72}] \cdot 28H_2O$, mon.
Stilbite-Ca	$(Ca_{0.5}, Na, K)_9[Al_9Si_{27}O_{72}] \cdot 28H_2O$, mon.
Stilbite-Na	$(Na, Ca_{0.5}, K)_9[Al_9Si_{27}O_{72}] \cdot 28H_2O$, mon.
Terranovaite	$NaCa[Al_3Si_{17}O_{40}] \cdot >7H_2O$, orth.
Thomsonite	$Ca_2Na[Al_5Si_5O_{20}] \cdot 6H_2O$, orth.
Tschernichite	$Ca[Al_2Si_6O_{16}] \cdot \sim 8H_2O$, tet.
Tschernerite	$Ca_4(K, Ca, Sr, Ba)_3Cu_3(OH)_8[Al_{12}Si_{12}O_{48}] \cdot nH_2O$, $n \sim 20$, cub.
Wairakite	$Ca[Al_2Si_4O_{12}] \cdot 2H_2O$, mon. and tet.
Weinebeneite	$Ca[Be_3(PO_4)_2(OH)_2] \cdot 4H_2O$, mon.
Willhendersonite	$K_{0-1}Ca_{1.5-1.0}[Al_3Si_3O_{12}] \cdot 5H_2O$, tric.
Yugawaralite	$Ca[Al_2Si_6O_{16}] \cdot 4H_2O$, mon. and tric.

Tvedalite may be structurally related to Chiavennite, but a structural study is required.
Paranatrolite is considered a doubtful species and requires further study.