

# IMA-AMPHIBOLE CLASSIFICATION SCHEME (2004)

General Formula:  $A_{0-1} B_2 C_5 T_8 O_{22} (O, OH, F, Cl)_2$

T = Tetrahedral Site: Si, Al, Ti

C = Octahedral Site: Al, Ti, Fe<sup>3+</sup>, V, Cr<sup>3+</sup>, Mn<sup>3+</sup>, Zr, Mg, Zn, Ni, Co, Fe<sup>2+</sup>, Mn<sup>2+</sup>, Li

B =

M4-Site: excess of C in reversed order (Li, Mn<sup>2+</sup>, ..), Ca, Sr, Ba, Na

A =

A-Site: excess of B in reversed order (Na, Ba, ..), K

Compiled from LEAKE et al. (1997, 2004)

A. MOGESSIE, (aberra.mogessie@uni-graz.at)

K. ETTINGER, (kari.ettinger@uni-graz.at)

Institute of Mineralogy and Petrology, University of Graz, Austria

B.E. LEAKE, (leakeb@cardiff.ac.uk)

School of Earth, Ocean & Planetary Sciences, Cardiff University, Wales, UK

LEAKE et al. (1997) Nomenclature of Amphiboles: Report of the Subcommittee on Amphiboles of the International Mineralogical Association (CNMNC). *Mineralogical Magazine*, 61, 295–321.

LEAKE et al. (2004) Nomenclature of amphiboles: Additions and revisions to the International Mineralogical Association's amphibole nomenclature. *Mineralogical Magazine*, 68, 209–215.

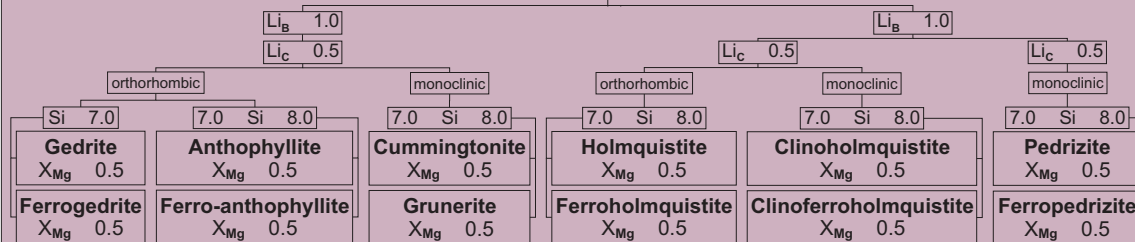
$$X_{Mg} = \frac{Mg}{Mg+Fe^{2+}}$$

$$X_{Mg}^* = \frac{Mg}{Mg+Mn^{2+}}$$



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## I. Mg-Fe-Mn-Li Amphiboles: $(Mg + Fe^{2+} + Mn^{2+} + Li)_B = 1.5$



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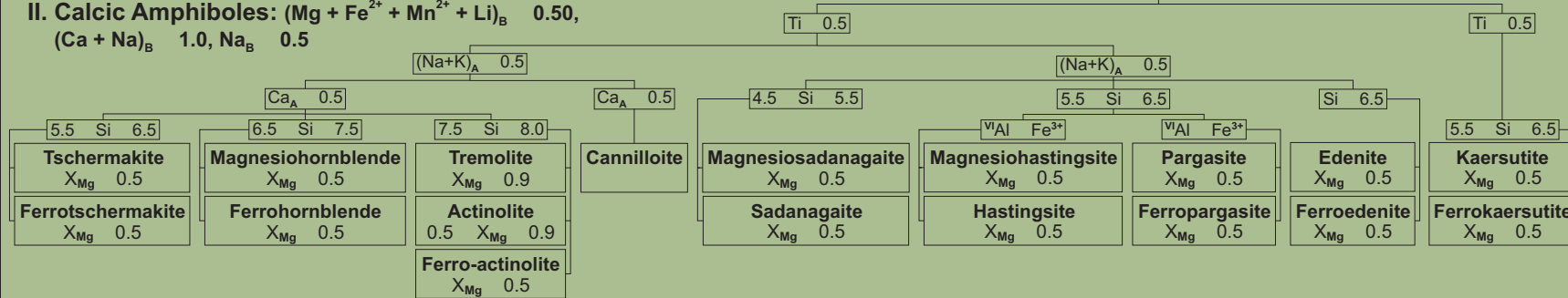
### Compulsory Prefixes

Prefix	Meaning	Applicable to group
Alumino	$^{VI}Al > 1.00$	II, III, V
Chromio	Cr > 1.00	All groups
Chloro	Cl > 1.00	All groups
Ferri	Fe <sup>3+</sup> > 1.00	I, II, III, V
Fluoro	F > 1.00	All groups
Mangano	Mn <sup>2+</sup> = 1.00-2.99	All, not kozoilite, ungarettiite
Permangano	Mn <sup>2+</sup> = 3.00-4.99	All, not kozoilite, ungarettiite
Mangani	Mn <sup>3+</sup> > 1.00	All, not kornite, ungarettiite
Potassic	K > 0.50	All groups
Sodic	Na > 0.50	Mg-Fe-Mn-Li only
Titano	Ti > 0.50	All, not kaersutite, Obertiite, Dellaventuraite
Zinco	Zn > 1.00	All groups

### Optional modifiers and their suggested ranges

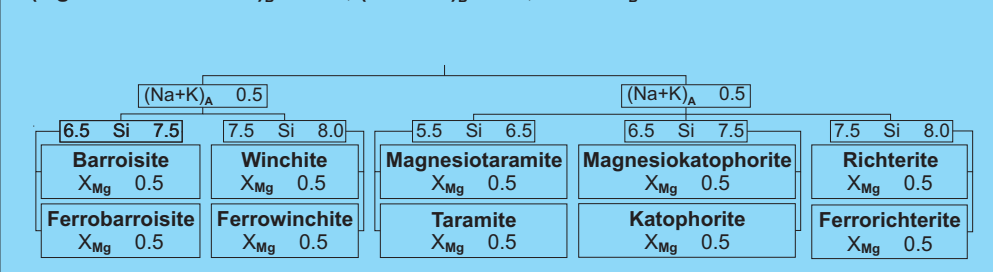
Modifier	Meaning	Applicable to group
Barian	Ba > 0.10	All groups
Borian	B > 0.10	All groups
Calcian	Ca > 0.50	Mg-Fe-Mn-Li only
Chlorian	Cl = 0.25-0.99	All groups
Chromian	Cr = 0.25-0.99	All groups
Ferrian	Fe <sup>3+</sup> = 0.75-1.00	All groups, except sodic
Fluorian	F = 0.25-0.99	All groups
Hydroxilian	OH > 3.00	All groups
Lithian	Li > 0.25	All, not those defined by Li
Manganian	Mn <sup>2+</sup> = 0.25-0.99	All, not those defined by Mn <sup>2+</sup>
Manganian Mn <sup>3+</sup> or Mn <sup>4+</sup>	Mn <sup>3+</sup> or Mn <sup>4+</sup> = 0.25-0.99	Ditto, Mn <sup>3+</sup> (e.g. kornite)
Nickeloan	Ni > 0.10	All groups
Oxygenian	(OH+F+Cl) < 1.00	All groups, not ungarettiite, Obertiite, Dellaventuraite
Potassian	K = 0.25-0.49	All groups
Plumbian	Pb > 0.10	All groups
Sodian	Na = 0.25-0.49	Mg-Fe-Mn-Li only
Strontian	Sr > 0.10	All groups
Titanian	Ti = 0.25-0.49	All, not those defined by Ti
Vanadian	V > 0.10	All groups
Zincian	Zn = 0.10-0.99	All groups
Zirconian	Zr > 0.10	All groups

## II. Calcic Amphiboles: $(Mg + Fe^{2+} + Mn^{2+} + Li)_B = 0.50$ , $(Ca + Na)_B = 1.0, Na_B = 0.5$



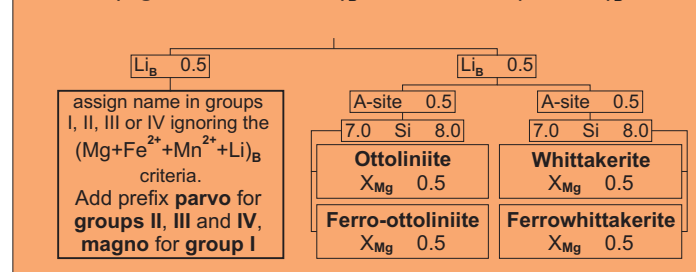
## III. Sodic-Calcic Amphiboles:

$(Mg + Fe^{2+} + Mn^{2+} + Li)_B = 0.50$ ,  $(Ca + Na)_B = 1.0, 0.5$ ,  $Na_B = 1.5$



## V. Na-Ca-Mg-Fe-Mn-Li Amphiboles:

$0.50$   $(Mg + Fe^{2+} + Mn^{2+} + Li)_B = 1.50, 0.50$   $(Ca + Na)_B = 1.5$



## IV. Sodic Amphiboles: $(Mg + Fe^{2+} + Mn^{2+} + Li)_B = 0.50$ , $Na_B = 1.5$

