AMPHIBOLE GROUP

Orthorhombic, Monoclinic, Triclinic

Composition for the most part near that of a metasilicate, $RSiO_3$, with R = Ca, Mg, Fe chiefly, also Mn, Na_2. K_2, H_2. Further often containing aluminum and ferric iron. The composition in the case of some amphiboles is very complex with extensive replacements taking place between the different elements. It is impossible even to list here the different molecules that have been proposed to account for the variations in composition. Recently, however, the atomic structure of the amphiboles has been investigated by X-ray methods (see p. 533) and formulas suggested that conform both to these facts and to the chemical composition. The type molecule as derived by Warren is found to have a silicon-oxygen ratio of Si_4O_{11} instead of the metasilicate ratio of Si_4O_{12}. He finds further that in one-half of the unit cell the number of oxygen atoms or their equivalents is always twenty-four, that the number of the magnesium atoms, or their equivalents is always five, that the silicon atoms never exceed eight in number, and that a group containing calcium and alkali atoms may vary between two and three. His general formula conforming to these structural requirements is $(Ca,Na,K,Li)_{2-3}(Mg,Fe'',Fe''',Al,Ti)_5(Fe''',Al,Si)_8(O,OH,F)_{24}$. This formula has been modified by Berman and Larsen to the following: $(Ca,Na)_2Na_{0-1}Mg(Mg,Al)_4(Al,Si)_2Si_6O_{22}(O,OH,F)_2$, in which Fe'' and Fe''' may replace Mg and Al, respectively. In the list given immediately below, however, simplified metasilicate formulas have been used in most cases as giving the essential features of the compositions of the different members of the group. Fuller discussions of the compositions of each will be found in the succeeding pages.

Orthorhombic Section

		a:b
ANTHOPHYLLITE	$(Mg,Fe)SiO_3$	0·5137:1

Monoclinic Section

		a : b : c	
AMPHIBOLE		0·5511 : 1 : 0·2938	73°58'
1.	$MgSiO_3$		
2. Cummingtonite	$(Mg,Fe)SiO_3$		
3. Grunerite	$(Fe,Mg)SiO_3$		
4. Tremolite	$CaMg_3(SiO_3)_4$		
5. Actinolite	$Ca(Mg,Fe)_3(SiO_3)_4$		
6. Richterite	$(K_2,Na_2,Mg,Ca,Mn)SiO_3$		
7. Hornblende			

Edenite, Pargasite, Common hornblende, Basaltic hornblende) Contain molecules approximating to the following in varying proportions. $Ca(Mg,Fe)_3Si_4O_{12}$; $CaMg_2(Al,Fe)_2Si_3O_{12}$; $NaAl(SiO_3)_2$

group - 2

		a : b : c	
GLAUCOPHANE	$Na(Al,Fe)(SiO_3)_2$ with $(Mg,Fe)SiO_3$ III	0.53 : 1 : 0.29	75°
RIEBECKITE	$NaFe(SiO_3)_2$ with $FeSiO_3$	0·5475 : 1 : 0.2295	76° 10'
HASTINGSITE	$Ca_2Na(Fe,Mg)_4(Al,Fe)(OH)_2(Al,Si)_8O_{22}$		
ARFVEDSONITE	$Na_3Fe_4Al(OH)_2Si_8O_{22}$	0·5496 : 1 : 0·2975	75° 44'

Triclinic Section

AENIGMATITE	$(Fe,Na_2)(Si,Ti)O_3.Na(Al,Fe)(SiO_3)_2$

Copied from - Dana, E. S. and W. E. Ford, A textbook of mineralogy. John Wiley, N. Y. 4th ed. 1932, p. 568.