Rock Forming Minerals IV  
Structure and composition of: PYRIBOLES

Pyriboles include pyroxenes, biotite (sheet silicate), and amphiboles (chain silicates)
VM Goldschmidt – coined term “pyribole”, invented geochemistry, 1880s

Sheet silicates (micas)

Hexagonal rings of tetrahedra

Octahedral sheet layer
   Trioctahedral – all sites filled      like MgO
   Dioctahedral – 2/3 sites filled    like Al₂O₃

Brucite, gibbsite, have no tetrahedral layers (not silicates)
Mg₃(OH)₆ and Al₂(OH)₆
charge balancing
⇒ make a sheet silicate, add Si tetrahedrons, remove H⁺, satisfy charge with Si-O bond

Amphiboles
Literally a combination of 2 pyx and 1 mica
Chain silicates (double chain)

Basic amphibole unit, with tetrahedral layers sandwiching octahedra:

Arrangement of units:
60-120 cleavage

Amphibole polytypes: (+/- signifies facing direction of silicon octahedra)

+ + monoclinic
+ + clinoamphibole
+ + C2/m

+ + orthorhombic
- - orthoamphibole
- - Pnma

- + orthorhombic
+ + protoamphibole
- - Pnmm

2 pyx + 1 mica = amphibole

2 [CaMgSiO₆] + Mg₃Si₄O₁₀(OH)₂ = Ca₂Mg₅Si₈O₂₂(OH)₂
Diopside Talc Tremolite

2 [Mg₂Si₂O₆] + Mg₅Si₄O₁₀(OH)₂ = Mg₇Si₈O₂₂(OH)₂
Enstatite Talc Anthophyllite

You can build ANY amphibole this way!

Amphibole quadrilateral – graphic representation of different types of amphiboles, by composition
Jim Thompson – mixed chain width biopyriboles
Discovered in 1970s in Chester, VT
Chesterite, jimthompsonite, clinojimthompsonite