

EAS 332 Metamorphic Petrology

Lab 4 Pelites II

Amphibolite and Granulite Facies

Amphibolite Facies

Granulite Facies

Kyanite Zone

Sillimanite Zone

-Quartz

-Quartz

-Quartz

-Muscovite

-Muscovite

-Garnet

-Biotite

-Biotite

-Cordierite

-Garnet

-Garnet

-K-spar

-Plagioclase

-Sillimanite

- ± Al₂O₅

-Kyanite

-Plagioclase

polymorphs

- K-spar

- ± Opx

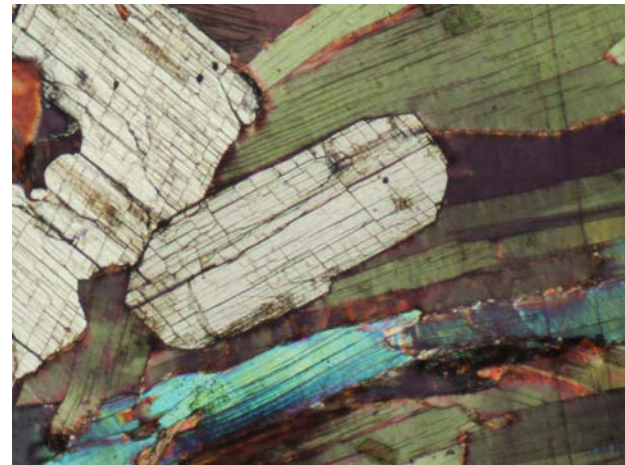
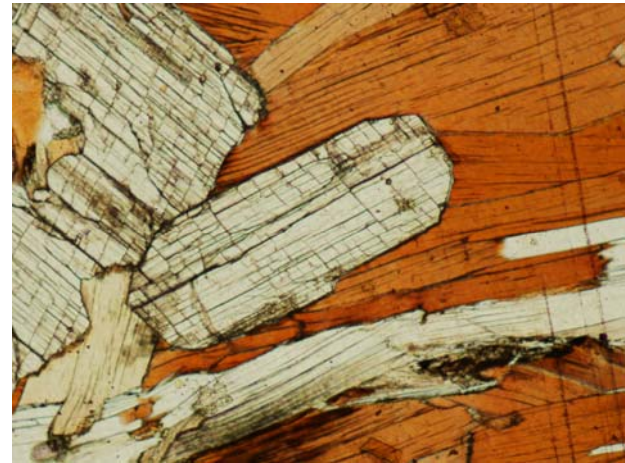
-± Kyanite

Increasing Grade 

Minerals: Kyanite

Thin Section:

- High relief
- 1st Order Interference Colours
- bladed, elongated crystals
- inclined extinction
- length slow
- weak blue pleochroism if coloured
- 2 cleavages at 79°
- Biaxial (-)

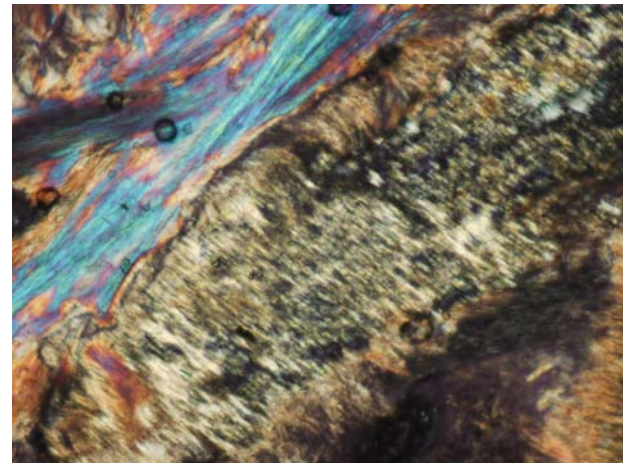
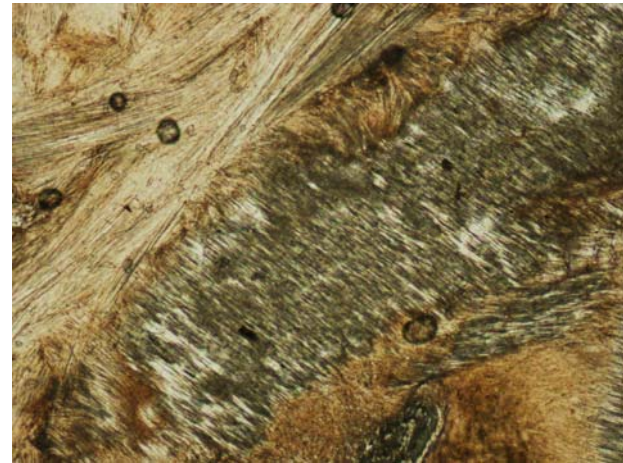


Minerals: Sillimanite

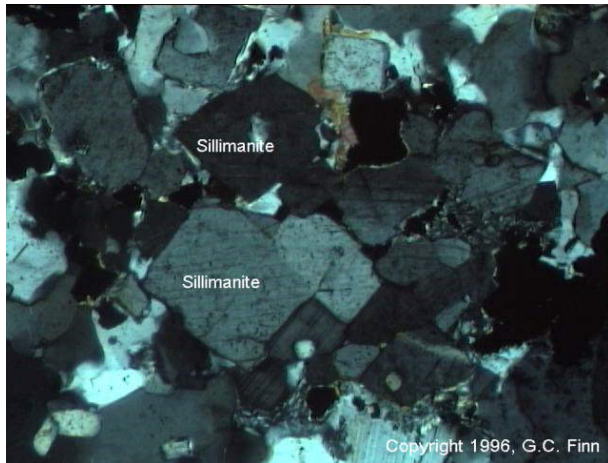
Thin Section:

Fibrous Habit (Fibrolite)

- fibrous mats of needle-like crystals
- colourless in ppl, may appear pale brown as well
- up to lower 2nd order interference colours
- high relief



Minerals: Sillimanite



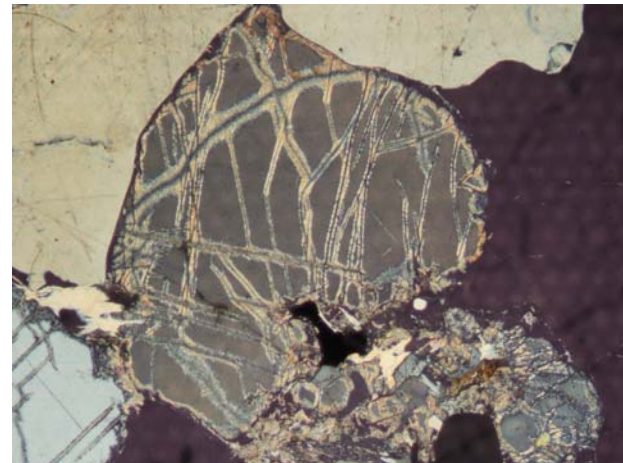
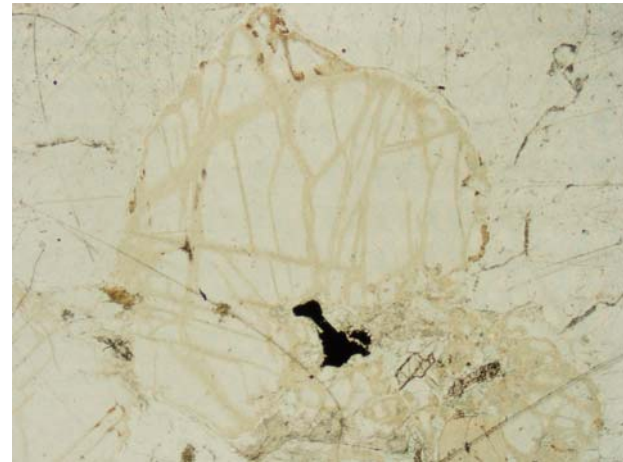
Slender Prismatic

- high relief
- up to 2nd order interference
- colourless in ppl
- parallel extinction, 1 cleavage
- length slow
- Bi-axial (+)
- Pleochroism rarely seen

Minerals: Cordierite

Thin section:

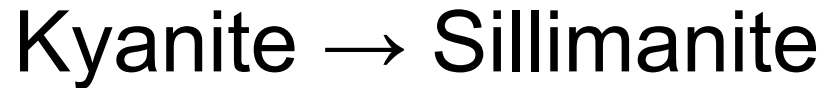
- strong resemblance to quartz
- 1st Order Interference colours
- low relief
- colourless in ppl
- cleavage not obvious
- alters to pinnite (fine grained muscovite, chlorite aggregation along cracks and margins), appears yellow-brown in ppl
- cyclic twinning
- pleochroic
- may contain yellow halos (pleochroic; due to radioactive inclusions)



Sillimanite-In reactions

Two reactions can produce Sillimanite

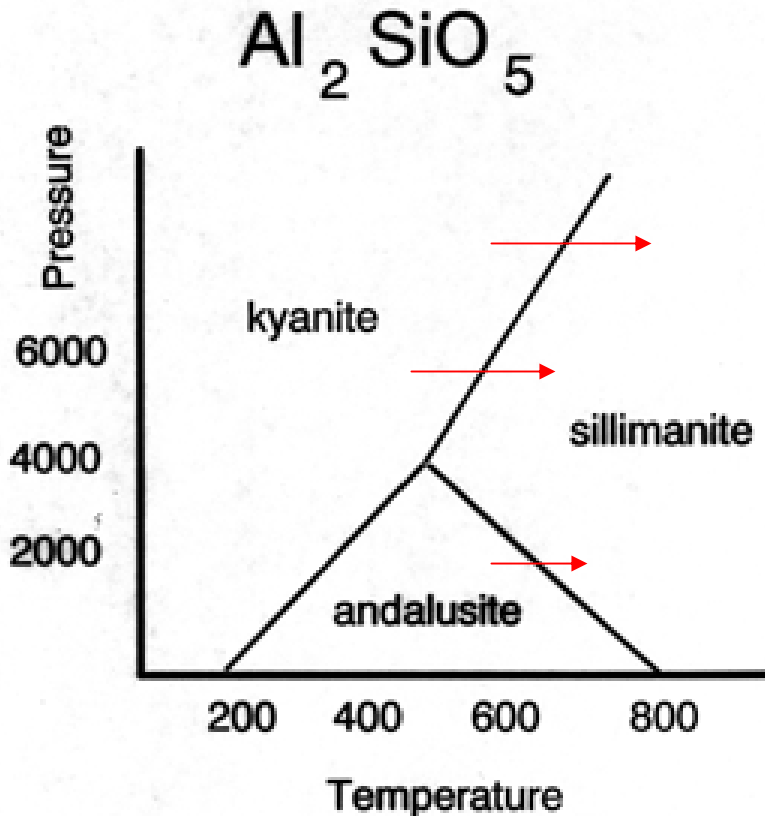
1. *Polymorphic Inversion*



2. *Dehydration Reaction*



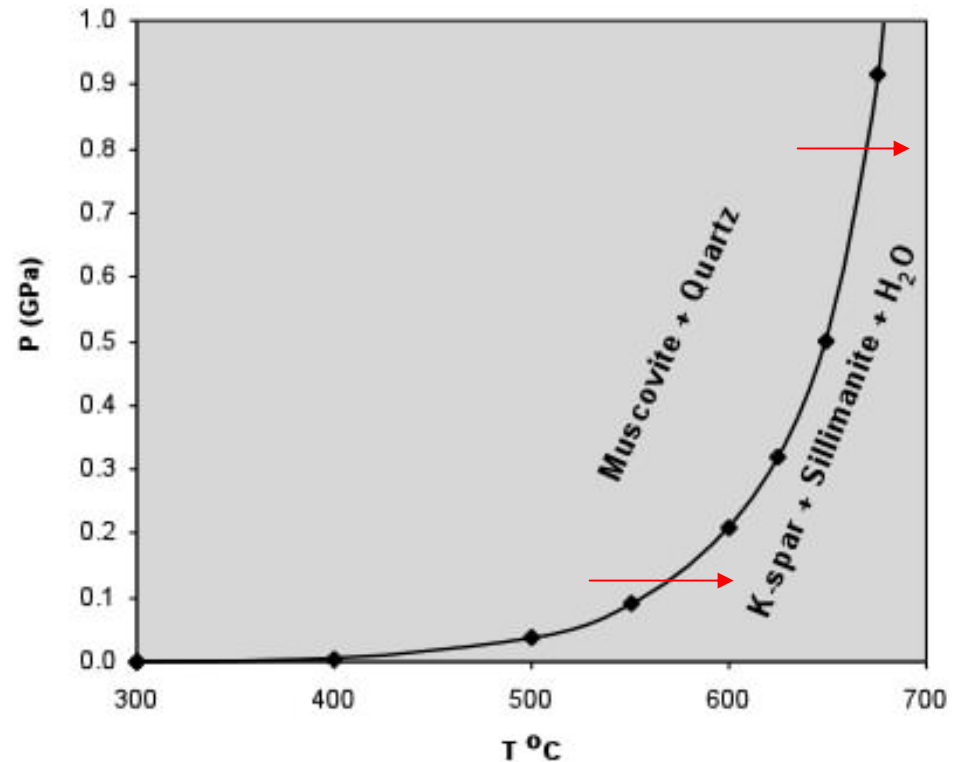
1. Polymorphic Inversion Reaction



- Distinguish from dehydration reaction by crystal shape which forms
- Typically fibrous sillimanite (fibrolite) will form as a result of this reaction

2. Dehydration Reaction

- Distinguish this reaction from polymorphic inversion by sillimanite crystal shape.
- Prismatic sillimanite will typically form as a result of this reaction



Amphibolite → Granulite Transition

The Amphibolite → Granulite Facies transition is defined by the mineral assemblage :

Garnet + Cordierite + K-spar

This transition is defined by the reaction :

$Bt + Sil + Qtz = Grt + Crd + Kfs + \text{fluid/melt}$

Phase Rule

(Sample TC 91 Sep 2-8)

$$F = C - P + 2$$

F = # of extensive parameters which must be fixed to define a system

P = # of chemically and physically uniform quantities of matter which can be mechanically separated from a non-homogeneous mixture (of the system)

C = # of chemically distinct constituents which define the system

Assignment

- Be sure to answer all questions for each sample
- There is one full description required in this lab, but it is **YOUR** choice of either sample 6100 or sample 8545