Earth Materials: Intro to Silicates

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1 Marching Throught the Silicates

Most Polymerized -> Least Polymerized.

1.1 Most Polymerized: Tectosilicates

Make up 2/3rds of the Crust

Simplets = SiO_2 Group (silica group)

We find that the SiO_2 group has many form Polymorphs (same chemical form, different groups)

1.1.1 Silica Polymorphs

Alpha Quartz Coesite

really important environment of growth: quartz

Environment:

- 2nd most abundant
- can grow or be found:
  - igneaus
  - Metamorphic
  - sedimentary
  - hydrothermal
  - These need silica saturated chemistry
  - they're Felsic (high in silica)
- Felsic
- Igneaus rocks
  - granite -> pegmatite (beautiful y economic) (ultra-felsic igneous rock)
  - rhyolite
  -
- Metamorphic
  - almost any schist, queiss
  - Sedimentary

        * as common and detrital grains
        * as a chemical cement

Natural Fluids

- quartz precipitate
- can be very fine grained
    - "cryptocrystalline"
        * agate
        * chalcedony
        * chert or flint

Fulgarite: if lightening hits silica-rich soil.
Opal:

- Not quite a mineral because its Amorphous
- $SiO_2 + H_2O$
- low T fluids
- also biomineral
- ex: plant phytoliths

Whats the most abundant mineral in the crust: Feldspar Quartz is in second place

Quartz: Crystal Shape, hexagonal prysm with degraded symmetry. Glassy luster. Color is no good. What causes color in Quartz:

- clear
- smokey (bc aluminum. if quartz in invironment

Feldspars most abundant in the crust (Si + Al)

O = 1/2
Structure <classPic>
hole = 9-fold distorted site: K, Na, Ca
T_1, T_2 = Si or Al
Specific Felspar Minerals are distinguished by the 9-fold site Cation and Al_1, Si content ordering

Feldspars

Feldspar composition

$(K,Na)_{1-x}$ Ca_x Al_{1+x} Si_{3-x} O_8 where x = 0 to 1

Ternary Diagram

3 Polymorphs @ Kspar differ only in their ordering of Al, Si

Sanidine: Complete Disorder -> monoclinic > 900celcius Orthoclase: somewhere in the middle -> monoclinic Microcline: completely ordered -> triclinic (low symmetry) < 500celcius

Plag:

1. albite
2. oligoclase
3. andesine
4. labradorite
5. bytonite
6. anorthite

recall exolution

- refers to chemical unmixing upon cooling below the soldus.

perthitic texture in K-spar

Twinning 3 types of twins

1. Contact Twins: shares a plane
2. Interpenetration twin: grown together= might share rotational axis
3. Polysynthetic Twins: many repeated crystals

Twins get pink highlighter.