GLY 4310C
LAB EXERCISE 3 SILICATES: PART 3

CLASS : SILICATES

SUBCLASS:TECTOSILICATES

Tectosilicates are three dimensional frameworks of Si and O atoms. The silicon tetrahedra share all four corners. This results in an Si:O ratio of 1:2, the lowest ratio of oxygen to silicon of any subclass. In some cases Al^{3+} ions replace the Si^{4+}, allowing replacements for other cations in the structure while still maintaining charge balance.

QUARTZ - SiO_2 The simplest formula of all silicates, but the mineral with the most varieties. Some of these are crystalline, generally meaning that the crystals may be large enough to be easily seen. Some are cryptocrystalline, meaning the material is crystalline but that the crystals are so tiny that individual crystals can never be seen.

Crystalline varieties
- Clear (Rock crystal)
- Rose
- Smoky
- Amethyst
- Citrine
- Milky
- Chrysoprase

Cryptocrystalline varieties
- Chalcedony
- Jasper
- Flint
- Chert
- *Novaculite

Cristobalite - SiO_2
Opal -$SiO_2.nH_2O$
Diatomaceous Earth (Diatomite) - Formed on the ocean floor from the siliceous tests of diatoms.

FELDSPAR GROUP - The feldspars are the most common minerals on earth, making up about 51% of the earth's crust. There are two major divisions, the potassium feldspars and the plagioclase feldspars. The latter are the most common at about 39% of the earth's crust. The plagioclase feldspars are a solid solution series between albite (Na) and anorthite (Ca). Albite is conventionally denoted as Ab, anorthite as An. The intermediate names in this series are important and should be learned.

POTASSIUM FELDSPARS (K-spars)

MICROCLINE - ($KAlSi_3O_8$)

variety amazonstone (= amazonite)

ORTHOCLASE - ($KAlSi_3O_8$)

Anorthoclase (Intermediate composition between sanidine and high albite, $(K,Na)AlSi_3O_8$)

PLAGIOCLASE FELDSPARS

ALBITE	An_{0-10}	$NaAlSi_3O_8$
OLIGOCLASE	An_{10-30}	
ANDESINE	An_{30-50}	We have no specimen, largely because this mineral rarely occurs in the pure form but rather as grains in the igneous rocks andesite or dacite.
LABRADORITE	An_{50-70}	
*BYTOWNITE	An_{70-90}	
*ANORTHITE	An_{90-100}	$CaAl_2Si_2O_8$

Other feldspars

Danburite $CaB_2Al_2Si_2O_8$

FELDSPATHOID GROUP - The feldspathoids are chemically similar to the feldspars but are less common. The major difference is that the feldspathoids have less silica content than the feldspars.

LEUCITE	$KAlSi_2O_6$	
NEPHELINE	$(Na,K)AlSiO_4$	
SODALITE	$Na_8(AlSiO_4)Cl_2$	
Petalite	$Li(AlSi_4O_{10})$	
ANALCIME	$NaAlSi_2O_6.H_2O$	Analcime is sometimes classified as a zeolite but its structure, chemistry, and occurrence indicate that it is a feldspathoid.

Scapolite Series - There is a solid solution series between marialite ($Na_4ClSi_9Al_3O_{24}$) and meionite ($Ca_4CO_3Si_6Al_6O_{24}$). Since these are hard to distinguish in hand specimen we may refer to them as simply scapolite.

Scapolite

ZEOLITE GROUP - The zeolites are a large group of hydrous framework aluminosilicates with highly variable water contents. They have open structures and are usually capable of easy ion exchange. For this reason both natural and synthetic zeolites have found uses as catalysts.

STILBITE $CaAl_2Si_7O_{18}.7H_2O$

NATROLITE $Na_2Al_2Si_3O_{10}.2H_2O$

* REFERENCE SPECIMEN - DO NOT TEST!