**Ge 114**

**Hand Specimen Lab Exercise 6**

Silicates IV: Tectosilicates

**Items in bold type will be written up and handed in as part of the lab report.**

Goals:

* Learn about the silicate classification system for tectosilicates
* Identify 10 major minerals in this groups
* Describe different types of twinning in feldspars
* Learn about triclinic vs. monoclinic K-feldspars, cooling rate, and formation temperature

I) **Explain the structural characteristics of minerals in this group**. Looking at one or more of the mineralogy textbooks will be helpful.

II) The minerals to be studied in this lab are:

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Tectosilicates:

Quartz (and its colored varieties: amethyst, smoky, rose)

*Potassium feldspar* (orthoclase, microcline, sanidine\*)

*Plagioclase feldspar*\*\* (albite, anorthite)

*Zeolites* (analcime, natrolite)

Sodalite Nepheline

Plus one mineral of your choice (or variety) from the collection, not on this list

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\* There are no individual samples of sanidine as it is usually small to microscopic

**\*\*** Plagioclase was historically divided into many more sub-compositions including oligoclase, andesine, labradorite, and bytownite, but these variations cannot be easily determined in hand sample.

**Prepare a brief written description of your characterization of these minerals, in the form of a table. This table should include the following:**

- Mineral name, formula, and SiO2 polymerization (i.e., tectosilicate, orthosilicate, etc.). For *mineral groups*, you may list a general formula for the group and distinguish the minerals in that group by noting the elemental substitutions into each site for each mineral.

- Physical properties and attributes such as: cleavage or fracture, crystal form or habit, luster, color, density to the hand, and possibly magnetism, taste, and other properties if relevant. You may describe the general physical properties of all minerals in a *mineral group* once, instead of for each mineral, but be sure to include how to distinguish one mineral from another in a particular group (for example, note color differences)

- Indicate the three most important diagnostic properties of each mineral.

- Include variations in these properties among different specimens of the same mineral in the Dana and working collections.

- Geological occurrences (rock types) and economic importance.

III) Plagioclase Feldspars

The plagioclase feldspar crystals in hand specimen 5-4 and also 5-5 show albite-type twinning. Look for the polysynthetic twinning striations on the crystal faces, and **make a sketch of one crystal (preferably from 5-4) showing the striations**. **Identify the crystal axes in the drawing.**

IV) Alkali Feldspars

i) The ordering of Al and Si in the tetrahedral sites of the K-spar structure determines whether the K-spar is triclinic (completely ordered Al and Si) or monoclinic (partially ordered Al, Si and completely disordered Al and Si). **Which of the K-spars in this lab are monoclinic? Which are triclinic?** The degree of ordering of Al and Si is related to the formation temperature and cooling rate of the feldspar!

ii) The difference between monoclinic and triclinic K-feldspars is illustrated with thin sections of monoclinic orthoclase [thin sections 10-1 (001), 10-15 (001), 10-2 (010)] and triclinic microcline [thin section 10-2**丄** a]. The sections are cut approximately parallel to the crystallographic planes indicated. Read about the optical differences between monoclinic and triclinic feldspars and examine these sections to find optical evidence for these differences. **Describe and explain this evidence**. Especially, **note the complex twinning pattern** (“tartan twinning”) in section 10-2**丄**a, and **compare it to the albite twinning** in "plagioclase**丄** to 010".

iii) Specimen 5-7 is a hand sample of perthite, from the type locality in Canada. The perthitic structure consists of somewhat irregular bands traversing the crystal. **Examine the bands and describe them, with the help of a sketch.** Pay particular attention to relationships between cleavage and the banded structure. The dark and light areas correspond to the two feldspar components -- plagioclase and K-spar. K-spar tends to have more iron than plagioclase and commonly develops a hematite-red color. **Try to identify the cleavage planes as (001) or (010), and determine the orientation of the perthite lamellae in relation to the crystal axes.**

Other tectosilicates are in the Dana Collection. You may examine these as your time allows and interests dictate!