Lab 1: Igneous Minerals – A Review

Objective: With this lab, you will first make adjustments to one of the petrographic microscopes that you will use for the duration of the course. Then you will re-familiarize yourself with common igneous minerals by making petrographic observations of a mafic and a felsic igneous rock.

1. Microscope Adjustments
   A. Focus the oculars – Focus on a thin section, close your left eye, then focus the crosshair in right ocular by twisting the top part while holding the cylinder. Then refocus on the thin section, then refocus the cross hair. Keep doing this iteration until both the thin section and the cross hair are focused. Then focus on the thin section with the non-cross hair ocular.
   B. Center the objectives - Focus on a thin section and center a point object on the cross hair. Turn the stage 360° and note the circle traced by the point. If the point traces a circle greater than a couple intervals on the cross hair scale, the object should be recentered. To do this, insert the two small Allen screwdrivers (stored on the back of the microscope) into the holes on the objective ring on both sides of the objective to be recentered. Turn the screws such that the cross hair center moves to the centerpoint of the circle. Rotate the stage again and keep adjusting the objective until the point stays approximately centered. Do this for each objective.
   C. Determine the field of view for each objective - Place a transparent metric ruler on the stage and determine the approximate width of the total field of view for each objective and calculate the length of each crosshair subdivision. For the high power objectives, use the class micrometer slide (scale is 2mm wide with 0.1mm subdivisions). Write these values in a place where you can easily retrieve them.

2. Igneous Minerals (consult DHZ or another mineralogy text for assistance)
   A. Choose a thin section from the collection of intrusive mafic rocks (olivine gabbro). These samples contain the four main minerals commonly found in mafic igneous rocks – olivine, clinopyroxene (augite), Fe-Ti oxide and calcic plagioclase. Be sure that you can positively identify each phase. In the table below, record the basic optical features of each of these phases. If a particular feature does not apply or is lacking indicate by “NA”
B. Choose on thin section of an intrusive felsic rock (granite) samples (D-37, GA-1 or RSAL). This sample contains the main minerals commonly found in felsic igneous rocks – sodic plagioclase, alkali feldspar, quartz, mica (biotite), amphibole (hornblende) and minor amounts of Fe-oxide, apatite, and zircon. Be sure that you can positively identify each phase and then answer the questions below.

1. List the major minerals in their relative order of abundance. Use their typical abbreviations (Pl-plagioclase, Ksp – K feldspar, Qtz – quartz, Hb- hornblende, Bio - Biotite:

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Color/Pleochroism</th>
<th>Max Biref. (TS-30μm)</th>
<th>Cleavage</th>
<th>Exsolution</th>
<th>Twinning</th>
<th>Other Notable Features</th>
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</thead>
<tbody>
<tr>
<td>Olivine</td>
<td></td>
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<tr>
<td>Clinopyroxene (augite)</td>
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<tr>
<td>Fe-Ti oxide (titanomagnetite)</td>
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<tr>
<td>Plagioclase</td>
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</tbody>
</table>

Most _________ _________ _________ _________ _________ Least

2. Sodic plagioclase, alkali feldspar and quartz are all colorless, low birefringent minerals; how can quartz be readily distinguished from the two feldspars? ________________

3. How can sodic plagioclase feldspar and alkali feldspar be distinguished? ________________

4. Name two criteria by which biotite mica be distinguished from hornblende amphibole
   i) ________________
   ii) ________________

5. Get an optic axis figure on quartz and sketch what you see in the circle. How would you determine an optic sign from this figure?

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