

**EPSC 352: EARTH MATERIALS      Fall, 2009**  
**Homework Set #2**

☛ Due Friday, September 18, 2009.

**\*\*\*\* Show all of your work. Be sure to write the UNITS. \*\*\*\***

**Understanding Mineral Chemistry and Notation**

**27 pts** 1. Consider the mineral olivine, which is actually a solid solution series in which divalent cations of similar size can substitute for each other.

[9] a. Give the chemical formulas, chemical composition (in weight % of the constituent oxides), and molecular weights of the two major endmembers of the mineral olivine

<u>mineral name</u>	SiO <sub>2</sub>	MgO	FeO	Total Wt. %	<u>formula</u>	<u>Mol.</u> <u>Wt.</u>

[9] b. Assume that you have a specific olivine whose composition is 7 molecular/mole % fayalite (Fa) and 93 mole % forsterite (Fo), i.e., Fo<sub>93</sub>Fa<sub>7</sub>.

Write the mineral-chemical formula for that specific olivine, i.e., in the form of Mg<sub>x</sub>Fe<sub>y</sub>SiO<sub>4</sub>.

[9] c. List the number of grams of each of the following constituents that would occur in 100 grams of Fo<sub>93</sub>Fa<sub>7</sub>.

MgO	FeO	SiO <sub>2</sub>	Total # of grams

**36 pts** 2. Consider the ternary feldspar solid-solution series, consisting of two binary systems: alkali feldspars (K and Na members) and plagioclase feldspars (Na and Ca members).

[9] a. Write the name and chemical formula of each of the 3 feldspar end-members, i.e., albite, anorthite, orthoclase, and show how each one is the sum of different numbers of moles of the constituent oxides (e.g., calcite:  $\text{CaCO}_3 = 1\text{CaO} + 1\text{CO}_2$ ).

[9] b. Derive the molecular weights for the three end-member mineral components (ab, an, or) of feldspar by reference to the oxide-component listing in (a) .

[9] c. Write out the number of moles of each of the constituent oxides (below) in 1 mole of a ternary feldspar whose molar proportions are  $\text{An}_{73}\text{Ab}_{21}\text{Or}_6$ . **Show your work.**

CaO

Na<sub>2</sub>OK<sub>2</sub>OAl<sub>2</sub>O<sub>3</sub>SiO<sub>2</sub>

- [9] d. For the same ternary feldspar in c), give the weight% analysis of all the oxides (assume total = 100%). **Show your work**, and **label your units**.

CaO                      Na<sub>2</sub>O                      K<sub>2</sub>O                      Al<sub>2</sub>O<sub>3</sub>                      SiO<sub>2</sub>

**37 pts** 3. More work with total composition and mineral end-member components.

- [15] a. Convert the electron microprobe analysis (in wt.% oxides) of the feldspar given below into molecular proportions of the oxides and cation proportions. **Show your work**. **Label units**.

<u>Component</u>	<u>Weight %</u>	<u>Molecular Prop.</u>	<u>Cation Prop.</u>
CaO	14.45		
K <sub>2</sub> O	2.05		
Na <sub>2</sub> O	1.91		
Al <sub>2</sub> O <sub>3</sub>	31.65		
SiO <sub>2</sub>	49.94		
TOTAL	100.00		

- [9] b. Give the molar composition of this feldspar in terms of the three endmember components albite (Ab), anorthite (An), and orthoclase (Or). **Show your work.**
- [8] c. Plot (see text pages 106-107) this molar composition on the attached triangular diagram.
- [5] d. Refer to Fig. 18.47 on page 471 in your textbook to determine the species name for this feldspar.