

## GG325 -- PRINCIPLES OF GEOCHEMISTRY

Homework set #5 - Due Wed Dec 11 – last day of classes.

### 1. Distribution Coefficients.

a. What would be the bulk  $K_D$  for solid-melt partitioning of Rb, Sr, Nd, Sm and *your element* between for mantle composed of 40% olivine, 20% cpx, 30% opx and 10% garnet?

*Note:* Use the data for distribution coefficients from the GERM website or the tables I gave you in class (i.e., table 5.2a or table 7.5 from Lecture 36), If you can't find the data in these sources, you should make an approximation using the Onuma diagrams I gave you in class and/or the relative partitioning behavior of a *similar element* that is in the other tables. For  $K_d$  values from Table 5.2 use values from the "average" column. If in table 5.2 only two values are given in a range (no value in the average column) compute the average of the range and use that. When no average and only one measurement exists (like Ce in olivine), use that.

b. Note the source of your data and explain any approximations you made above. How do they affect the your calculated bulk  $K_D$  values? Also discuss the effect of the ranges of individual mineral  $K_D$  values from the table on the final calculated bulk  $K_D$  value.

### 2. Melting.

Calculate the abundance of Sr and your element in a basaltic melt formed by 10% equilibrium (batch) melting of the mantle composition in question 1. Assume this is depleted mantle, with the abundance of Sr and your element both = 10 ppm (*this is probably a bad assumption for your element, but will help you see how it behaves relative to Sr during melting*)

### 3. Crystallization

A basaltic parental magma has just left the mantle with the following elemental abundances and has formed a magma chamber in the crust above.

Ni	1200 ppm	Sr	350 ppm
Rb	120 ppm	Ba	200 ppm
Ce	80 ppm	Sm	12 ppm
Eu	4 ppm	Nd	25 ppm

Calculate the trace element abundances in this same melt AFTER equilibrium crystallization of 10 wt% olivine, and 10% plagioclase (this will be easier if you do the repetitive calculation, i.e., for each element, in a spreadsheet program like excel).