**Next-day assignment due 11-10-10: GEOL 135**

**Mixing calculation for Anorthoclase – Anorthite-Orthoclase exsolution**

In excel, develop a spreadsheet to investigate the development of a miscibility gap for the Anorthite-Orthoclase system. The mixing equation for Anorthite -Orthoclase (An-O) is:

An-O = XAnAb + XOO + XAnRT*ln*XAn + XORT*ln*XO + XAnXO

Where the chemical potential of Anorthite is -890,374 cal mol-1, the chemical potential of Orthoclase is -888,308 cal mol-1, the interaction parameter is 3200 cal mol-1, and XAn varies from 1 to 0 (pure Anorthite to pure Orthoclase).

In excel, set up columns for XAn and XO (vary this at 0.05 intervals between 0 and 1 for each – total of XAn + XO is always = 1), then a column depicting the purely mechanical mixing of Anorthite and Orthoclase (1st two terms in the equation above), then a column showing ideal mixing (1st four terms in equation above), and finally a column using the complete equation showing real mixing. It will be easiest to set up the spreadsheet so that the chemical potentials of the pure phases, R (=1.987165 cal mol-1 K-1), T (in K), and the interaction parameter  are in cells above the matrix of solutions to the equations for each mole fraction of XAb and XO. A dollar sign in front of the letter and number of the cell reference in an excel equation (for example $C$4 instead of just C4) will ‘lock’ the equation to that cell any time you fill down a column or copy&paste an equation.

Plot the mechanical mixing line and the real mixing line – at T=500 K you should see the energy of the real mixing is above the mechanical mixing line, describing the miscibility (i.e. it is energetically favorable for the mixture to be 2 phases instead of 1). Plot this, then ‘play’ with the temperature and determine at what temperature Anorthoclase (the mixture of Anorthite and Orthoclase) will be stable.