

Mass Action & Mass Balance

$$\beta_i = \frac{[CL]^c [H^+]^n}{[C]^c [HL]^l} \quad mCa^{2+} = \sum mCa^{2+} L_x^n$$

- $mCa^{2+} = mCa^{2+} + mCaCl^+ + mCaCl_2^0 + mCaCl_3^- +$
 $CaHCO_3^+ + CaCO_3^0 + CaF^+ + CaSO_4^0 +$
 $CaHSO_4^+ + CaOH^+ + \dots$
- Final equation to solve the problem sees the mass action for each complex substituted into the mass balance equation

Mineral dissolution/precipitation

- To determine whether or not a water is saturated with an aluminosilicate such as K-feldspar, we could write a dissolution reaction such as:



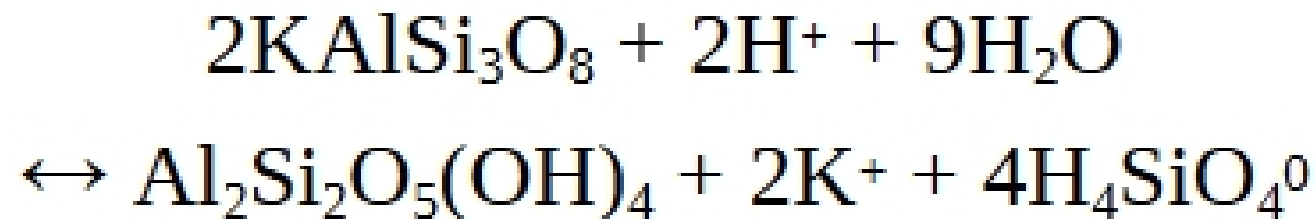
- We could then determine the equilibrium constant:

$$K = \frac{a_{\text{K}^+} a_{\text{Al}^{3+}} a_{\text{H}_4\text{SiO}_4}^3}{a_{\text{H}^+}^4}$$

- from Gibbs free energies of formation. The *IAP* could then be determined from a water analysis, and the saturation index calculated.

INCONGRUENT DISSOLUTION

- Aluminosilicate minerals usually dissolve incongruently, e.g.,



- As a result of these factors, relations among solutions and aluminosilicate minerals are often depicted graphically on a type of mineral stability diagram called an activity diagram.