Thermodynamics

For a given chemical reaction:

$$\text{aA} + \text{bB} \rightarrow \text{cC} + \text{dD}$$

- $\Delta G^{\circ}_{rxn} = \Delta H^{\circ}_{rxn} - T\Delta S^{\circ}_{rxn}$
- $\Delta G_{rxn} = \Delta G^{\circ}_{rxn} + RT\ln\left(\frac{a_C^c a_D^d}{a_A^a a_B^b}\right)$
- $\ln K_{eq} = ln\left(\frac{a_C^c a_D^d}{a_A^a a_B^b}\right) = \frac{-\Delta G^{\circ}_{rxn}}{RT}$
- van't Hoof equation:

$$\ln(K_{T2}) - \ln(K_{T1}) = \frac{\Delta H^{\circ}_{rxn}}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

Refer to the note

Recap

Thermodynamics continued

For a given chemical reaction:

$$aA + bB \rightarrow cC + dD$$

For $\Delta G_{rxn} = \Delta G^{\circ}_{rxn} + RT\ln(\frac{a_C^c a_D^d}{a_A^a a_B^b})$

If we define $Q = \frac{a_C^c a_D^d}{a_A^a a_B^b}$ (reaction quotient)

Then $\Delta G_{rxn} = \Delta G^{\circ}_{rxn} + RT\ln(Q)$

K_{eq} is the Q at equilibrium

Refer to the note

Recap

What about Activity?

Aqueous Geochemistry

Refer to the note