



# [ Chemical Thermodynamics ]

# [ Chemical Equilibrium ]

---

- Back to the  $\text{N}_2\text{O}_4$  example ... Diagram G as a function of reaction extent.
- Important to look at slope of curve

# [ Reaction Quotient ]

- Reaction quotient used to determine direction of reaction.
- $Q = K$
- $Q > K$
- $Q < K$

# [ Gaseous Activity Coefficients ]

- Look at activities of gaseous components and determine functional form of activity coefficient.

# [ Gaseous Activity Coefficients ]

- Assume the gas obeys a virial equation of state.
- Historically, activities of gases are called fugacities.

# [Equilibrium Constants]

- Equilibrium constant contains two pieces.
- Estimate non-ideal portion and correct  $K_p$ .

# [ Example ]

- Determine  $K_p$  for the formation of ammonia,  $\text{NH}_3$  (g), at 450 K where a constant pressure of 100 bar is maintained.

# [ Example ]

- Determine  $K_p$  for the formation of ammonia,  $\text{NH}_3$  (g), at 450 K where a constant pressure of 100 bar is maintained.



# [Liquids and Solids]

---

- Activities for liquids and solids
  - Pure liquids
  - Dilute solutes
  - Solids