



Chemical Thermodynamics

[Chemical Potential: gas]

- Need chemical potential at arbitrary temperature and pressure.
- For an ideal gas:

Chemical Potential: liquid

- Liquids are a little more complicated.
- Start by looking at a mixture of two different liquids.
- Molar volumes:

[Gibbs-Duhem equation]

- Total Gibbs energy
- Two different expressions for dG .
- Results in Gibbs-Duhem equation

[Partial molar quantities]

- We will consider many different partial molar quantities.
- Total quantity
- Partial molar quantity
- Sums of partial molar quantities

[Partial molar volume]

- Partial molar volume can be determined experimentally.
- Fitting a polynomial to a curve of total volume versus molality.

[Partial molar volume]

- Given a binary liquid mixture knowing the partial molar volume of one component gives the other.

[Chemical potential]

- For a pure substance in equilibrium liquid and gas chemical potentials are equivalent.

[Chemical potential]

- Back to a liquid mixture.
- The chemical potentials for a given component in solution and gas phase are equal.

[Chemical potential]

- Chemical potentials of the two components are related.

[Vapor pressure diagram]

- For an ideal solution of two volatile liquids
- P-X diagram of an ideal binary solution.