24.8: Activities are Calculated with Respect to Standard States

Need to define a new variable. The thermodynamic activity, a, is the effective concentration of a species in a mixture. It is a dimensionless quantity that are calculated with respect to standard states. For a gas, this would be related to the fugacity and for a solution, to the concentration. The activity for a real gas:

$$a_i = \frac{f_i}{P^\circ} = \frac{\phi_i P_i}{P^\circ} = \frac{\phi_i(y_i P)}{P^\circ}$$

For systems where we treat the gases as ideal:

$$\phi_i = 1$$

$$a_i = \frac{P_i}{P^\circ} = y_i \frac{P}{P^\circ}$$

The activity for a solution:

$$a_i = \gamma i \frac{[A]}{1 \underline{M}}$$

General chemistry and organic chemistry use ideal reactants where $\gamma_i = 1$:

$$a_i = \frac{[A]}{1 \underline{M}}$$

The activity for a solid or liquid:

$$a_i = 1$$

24.8: Activities are Calculated with Respect to Standard States is shared under a CC BY-NC-SA 4.0 license and was authored, remixed, and/or curated by LibreTexts.