

2.8: 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:

$$a_i = \frac{f_i}{P^\circ} = \frac{\phi_i P_i}{P^\circ} = \frac{\phi_i (y_i P)}{P^\circ} \quad (2.8.1)$$

For systems where we treat the gases as ideal:

$$\phi_i = 1 \quad (2.8.2)$$

$$a_i = \frac{P_i}{P^\circ} = y_i \frac{P}{P^\circ} \quad (2.8.3)$$

The activity for a solution:

$$a_i = \gamma_i \frac{[A]}{1 \text{ M}} \quad (2.8.4)$$

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

$$a_i = \frac{[A]}{1 \text{ M}} \quad (2.8.5)$$

The activity for a solid or liquid:

$$a_i = 1 \quad (2.8.6)$$

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