Statistical Molecular Thermodynamics

Christopher J. Cramer

Video 7.6

Additivity of Entropies
Entrophy is Additive for Reactions

Just as was true for enthalpy, one may define the entropy of reaction to be

\[ \Delta_r S^\circ = yS^\circ [Y] + zS^\circ [Z] - aS^\circ [A] - bS^\circ [B] \]
very negative because the reaction converts 1.5 moles of "very disordered" gas into 1 mole of "less disordered" liquid
Water Shift Reaction Example

\[ aA + bB \rightarrow yY + zZ \]

\[ \Delta_r S^\circ = yS^\circ[Y] + zS^\circ[Z] - aS^\circ[A] - bS^\circ[B] \]

\[ C(s) + H_2O(g) \rightarrow H_2(g) + CO(g) \]

\[ \Delta_r S^\circ = 130.7 + 197.7 - 5.7 - 188.8 = 133.9 \text{ J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \]

very positive because the reaction converts 1 mole of “very ordered” solid into 1 mole of “very disordered” gas