Focus 3: The Second and Third Laws

Entropy

Entropy changes of processes

Entropy measurement

Gibbs free energy

Combining 1st and 2nd law

The second law

The entropy of an isolated system increases in the course of a spontaneous change: $\Delta S_{tot} > 0$

Entropy (a state function) – A measure of the distribution of energy and matter.

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System of interest

Thermodynamic definition of S

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Infinitesimal change in the system's entropy during a small reversible transfer of heat at temperature T

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$$\Delta S_m = R\ln\frac{V_f}{V_i}$$

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For System

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$$\Delta S_{sur} = \frac{2.86\times10^5\,\text{J}}{298\,\text{K}} = +960\,\text{J K}^{-1}$$

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Boltzmann formula for the entropy

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cross-sectional area times the linear displacement

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$$w = -281\,\text{J}$$