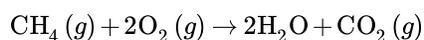


21.9: Standard Entropies Can Be Used to Calculate Entropy Changes of Chemical Reactions

Entropy is a state function, so we can calculate values for a process using any path. This allows us to calculate the entropy change of a chemical reaction using standard entropies. Specifically, we sum the entropies of the products and subtract the entropies of the reactants:

$$\Delta_{rxn} S^{\circ} = \sum_{\text{Products}} v_i S_i^{\circ} - \sum_{\text{Reactants}} v_i S_i^{\circ}$$

Where v_i is the stoichiometric coefficient. Let's look at the combustion of methane:



The standard entropies are:

Molecule	Entropy $\left(\frac{\text{J}}{\text{mol}\cdot\text{K}}\right)$
CH ₄	186.25 ¹
O ₂	205.15 ¹
H ₂ O	188.84 ¹
CO ₂	213.79 ¹

The entropy for the combustion of methane is:

$$\Delta S^{\circ} = [2(188.84) + 1(213.70)] - [1(186.25) + 2(205.15)] = -5.17 \frac{\text{J}}{\text{mol}\cdot\text{K}}$$

References

1. Chase, M.W., Jr., *NIST-JANAF Thermochemical Tables, Fourth Edition*, **J. Phys. Chem. Ref. Data, Monograph 9**, 1998, 1-1951.

21.9: Standard Entropies Can Be Used to Calculate Entropy Changes of Chemical Reactions is shared under a [CC BY-NC-SA 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/) license and was authored, remixed, and/or curated by LibreTexts.