enthalpy of activation, $\Delta^{\ddagger}H^{o}$

The standard enthalpy of activation $\Delta^{\ddagger}H^{o}$ is the enthalpy change that appears in the thermodynamic form of the rate equation obtained from conventional *transition state theory*. This equation is only correct for a first order reaction, for which the rate constant has the dimension reciprocal time. For a second order reaction, for which the rate constant has the dimension (reciprocal time) × (reciprocal concentration), the left hand side should be read as kc^{o}, where c^{o} denotes the standard concentration (usually 1 mol dm^{-3}).

$$k = (k_{B}T/h) \exp (\Delta^{\ddagger}S^{o}/R) \exp (-\Delta^{\ddagger}H^{o}/RT)$$

The quantity $\Delta^{\ddagger}S^{o}$ is the standard *entropy of activation*, and care must be taken with standard states. In this equation k_{B} is the Boltzmann constant, T the absolute temperature, h the Planck constant, and R the gas constant. The enthalpy of activation is approximately equal to the *activation energy*; the conversion of one into the other depends on the molecularity.

The enthalpy of activation is always the standard quantity, although the word standard and the superscript ^{o} on the symbol are often omitted. The symbol is frequently (but incorrectly) written $\Delta H^{\ddagger}$, where the standard symbol is omitted and the ‡ is placed after the H.

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