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Gibbs energy of activation (standard free energy of activation), $\Delta^{\ddagger}G^{o}$

The standard Gibbs energy difference between the transition state of a reaction (either an elementary reaction or a stepwise reaction) and the ground state of the reactants. It is calculated from the experimental rate constant *k via* the conventional form of the absolute rate equation:

$$\Delta^{\ddagger}G = R\,T\left[\ln\left(\frac{k_{\mathrm{B}}}{h}\right) - \ln\left(\frac{k}{T}\right)\right]$$

where k_{B} is the Boltzmann constant and h the Planck constant ($\frac{k_{\mathrm{B}}}{h} = 2.083\,58 \times 10^{10}\,\mathrm{K^{-1}\,s^{-1}}$). The values of the rate constants, and hence Gibbs energies of activation, depend upon the choice of concentration units (or of the thermodynamic standard state).

See also: enthalpy of activation, entropy of activation

Source:

PAC, 1994, *66*, 1077 *(Glossary of terms used in physical organic chemistry (IUPAC Recommendations 1994))* on page 1118

PAC, 1996, *68*, 149 *(A glossary of terms used in chemical kinetics, including reaction dynamics (IUPAC Recommendations 1996))* on page 166

