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Michaelis–Menten kinetics

The dependence of an initial rate of reaction upon the concentration of a substrate S that is present in large excess over the concentration of an enzyme or other catalyst (or reagent) E with the appearance of saturation behaviour following the Michaelis-Menten equation:

$$v = \frac{V\,[\mathrm{S}]}{K_{\mathrm{m}} + [\mathrm{S}]},$$

where v is the observed initial rate, V is its limiting value at substrate saturation (i.e. $[\mathrm{S}] \gg K_{\mathrm{m}}$), and K_{m} the substrate concentration when $v = \frac{V}{2}$. The definition is experimental, i.e. it applies to any reaction that follows an equation of this general form. The symbols V_{max} or v_{max} are sometimes used for V. The parameters V and K_{m} (the 'Michaelis constant') of the equation can be evaluated from the slope and intercept of a linear plot of v^{-1} *vs.* $[\mathrm{S}]^{-1}$ (a 'Lineweaver–Burk plot') or from slope and intercept of a linear plot of v *vs.* $\frac{v}{[\mathrm{S}]}$ ('Eadie–Hofstee plot'). A Michaelis–Menten equation is also applicable to the condition where E is present in large excess, in which case the concentration $[\mathrm{E}]$ appears in the equation instead of $[\mathrm{S}]$. The term has sometimes been used to describe reactions that proceed according to the scheme:

$$\mathrm{E} + \mathrm{S} \underset{k_{-1}}{\overset{k_1}{\rightleftarrows}} \mathrm{ES} \xrightarrow{k_{\mathrm{cat}}} \text{Products}$$

in which case $K_{\mathrm{m}} = \frac{k_{-1} + k_{\mathrm{cat}}}{k_1}$ (Briggs–Haldane conditions). It has more usually been applied only to the special case in which $k_{-1} \gg k_{\mathrm{cat}}$ and $K_{\mathrm{m}} = \frac{k_{-1}}{k_1} = K_s$; in this case K_{m} is a true dissociation constant (Michaelis–Menten conditions).
See also: rate-determining step

Source:
PAC, 1994, *66*, 1077 *(Glossary of terms used in physical organic chemistry (IUPAC Recommendations 1994))* on page 1140
PAC, 1996, *68*, 149 *(A glossary of terms used in chemical kinetics, including reaction dynamics (IUPAC Recommendations 1996))* on page 172