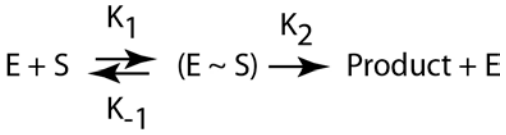
Enzymatic Catalysis

Michaelis-Menten Mechanism



$$v = k_2[E \sim S]$$

$$E_0 = [E \sim S] + [E]$$

$$0 \approx \frac{d[E \sim S]}{dt} = k_1[E][S] - k_{-1}[E \sim S] - k_2[E \sim S]$$

Thus,

$$[E \sim S] = \frac{k_1[E][S]}{k_2 + k_{-1}}$$ Denote: $K_m = \frac{k_2 + k_{-1}}{k_1}$ - Michaelis-Menten Constant

or

$$E_0 = [E] + \frac{[E][S]}{K_m}$$

$$[E] = \frac{E_0}{1 + \frac{[S]}{K_m}} = \frac{K_m E_0}{K_m + [S]};$$

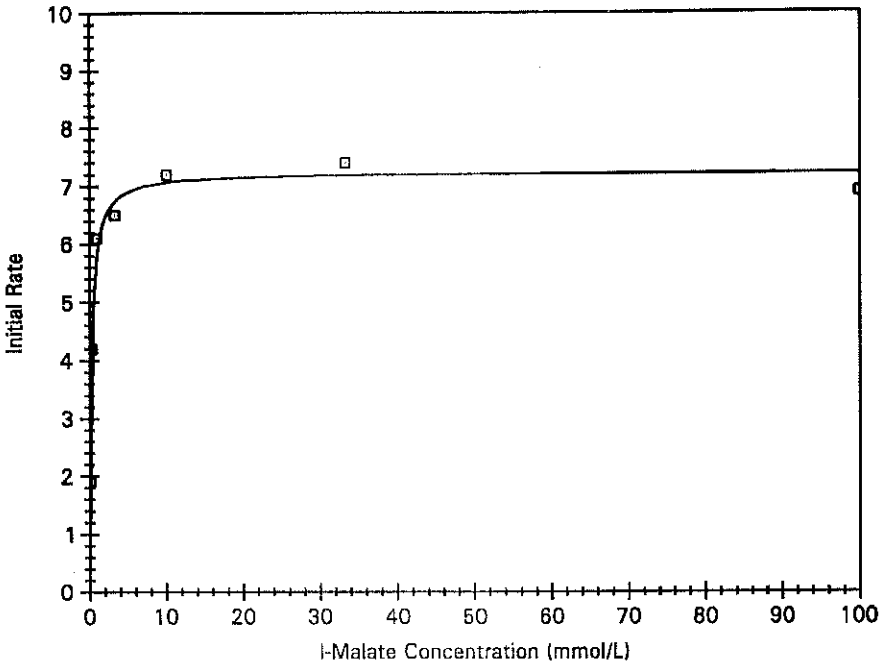
$$v = k_2[E \sim S] = \frac{k_2[E][S]}{K_m} = \frac{k_2}{K_m}\frac{K_m E_0}{K_m + [S]}[S] = \frac{k_2}{K_m + [S]}[S]E_0$$

Rearrange to get:

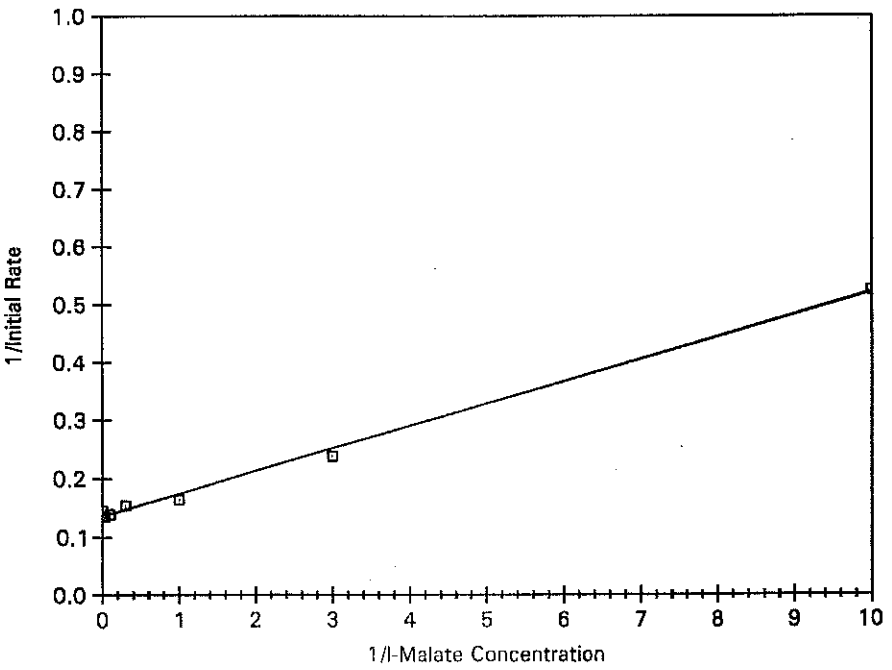
$$\frac{E_0}{v} = \frac{K_m + [S]}{k_2[S]} = \frac{K_m}{k_2}\frac{1}{[S]} + \frac{1}{k_2}$$

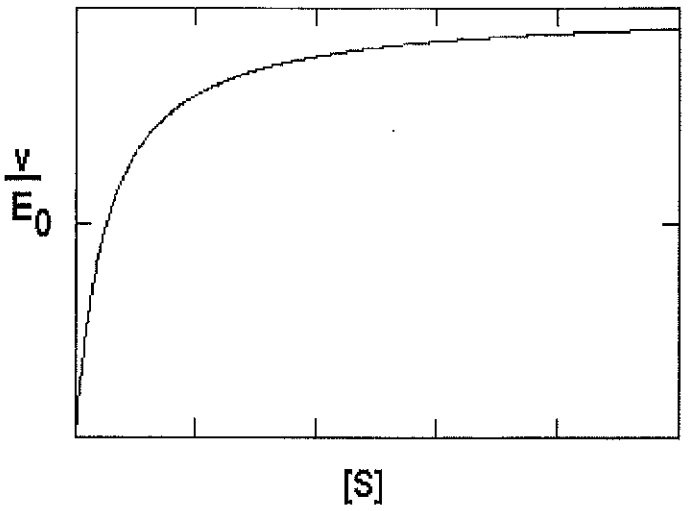
Michaelis-Menton Kinetics of Fumarate Production

From Alberty et al., J. Am. Chem. Soc., 76, 2485 (1954).



Linearized Plot of the Fumarase-Catalyzed Reaction





- The linearized form gives the parameters, K_m and k_2, from the slope and intercept.