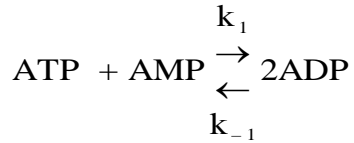


Appendix:

Adenylate kinase catalyzes the following reaction:



Using mass action:

$$\text{Dissociation rate constant} = K = \frac{k_{-1}}{k_1} = \frac{[\text{ATP}][\text{AMP}]}{[\text{ADP}]^2} \quad (1)$$

$$\text{Energy charge} = \text{EC} = \frac{[\text{ATP}] + \frac{[\text{ADP}]}{2}}{[\text{ATP}] + [\text{ADP}] + [\text{AMP}]} \quad (2)$$

$$\text{Assuming that } [\text{ATP}] + [\text{ADP}] + [\text{AMP}] = \alpha = 1 = \text{constant}, \quad (3)$$

then using algebraic manipulation of equations (1-2), one could show that:

$$[\text{ADP}] = \frac{-0.5 + \sqrt{(0.5)^2 + 4(K - 0.25)(\text{EC} - \text{EC}^2)}}{2(K - 0.25)} \quad (4)$$

Thus, for a given EC and K values, equation (4) can be used to determine [ADP]. Knowing [ADP], then [ATP] and [AMP] are determined from equation (2) and equation (3), respectively.