Chemical Kinetics

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Reaction rate:

$$\mathrm{A} + \mathrm{B} \rightleftharpoons \mathrm{C} + \mathrm{D}$$

$$2\,\mathrm{H_2} + \mathrm{O_2} \rightleftharpoons 2\,\mathrm{H_2O}$$

$$\overrightarrow{forward\ rate}$$

$$\overleftarrow{reverse\ rate}$$

Reaction rate is characterized by the number of reactions per second. At equilibrium, the forward rate equals the reverse rate.

$$\nu d = [A][B]$$

Uppercase letters represent chemical components, lowercase letters are THE STOICHIOMETRIC COEFFICIENT.

$$\nu d = k[A]^a[B]^b$$

$$\nu i = k'[C]^c[D]^d$$

The constant k relies on the affinity between A and B. The constant k' relies on the affinity between C and D.

$$\nu d = \nu i$$

$$k[A]^a[B]^b = k'[C]^c[D]^d$$

$$\frac{k}{k'} = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

$$\frac{k}{k'} = K$$

The equilibrium constant K is a value unique to each reaction. The higher the value of K, the higher the reaction rate is.

$$4\,\mathrm{Fe} + 3\,\mathrm{O_2} \longrightarrow 2\,\mathrm{Fe_2O_3}$$

$$\mathrm{CH_4} + 2\,\mathrm{O_2} \longrightarrow \mathrm{CO_2} + 2\,\mathrm{H_2O}$$