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TOPIC - Hydrogen Peroxide Decomposition

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The Composition of our world is Controlled by detailed chemical mechanisms and their rates. Extremely Complex mechanisms for the reaction of organic Compounds in the polluted urban atmosphere that include almost two million elementary reactions. The goal of Chemical Kinetics is to better understand the mechanisms and rates of Chemical reactions. In this laboratory you will learn some methods that Can be applied to understand the mechanisms of many kinds of reactions.

Hydrogen peroxide is an oxidant that is ubiquitous in the environment that is formed by atmospheric processes (Stockwell et al 1997 Hydrogen peroxide is injurious to cells because it attacks unsaturated fatty acids (lipids) found in cell membranes and Consequently cells produce a powerful catalyst, Catalase, that decomposes H_2O_2 (Keusch) Catalase is a Catalyst (rather than just another reactant) because it reacts both as an electron donor and as an electron acceptor. Catalase is an example of a enzyme, a biological Catalyst.

There are many other Compounds that decompose hydrogen peroxide Such as Iodide ion under acidic Conditions. The decomposition is characterized by the Stoichiometric reaction

$$2I^- + 2H^+ + H_2O_2 \longrightarrow I_2 + 2H_2O \quad — \ 1$$

If the Solution is relatively acidic (with a pH is less than about 3.) the rate of reaction 1 is independent of the pH. Assume that the rate of

The reaction under acidic conditions is given by Equation 2.

$$\text{Rate} = k[I^-]^a [H_2O_2]^b \quad \text{—} \quad (2)$$

where k is the rate coefficient, $[I^-]$ is the iodide concentration, $[H_2O_2]$ is the hydrogen peroxide concentration and a and b are the order of the reaction with respect to iodide and hydrogen peroxide, respectively. We will learn something about kinetics by experimentally determining a and b and by estimating k as a pseudo rate coefficient. This laboratory is based on a similar experiment (Hutton, 1968)