

Comparison of Pathways for the Decomposition of H_2O_2 by Various Catalysts

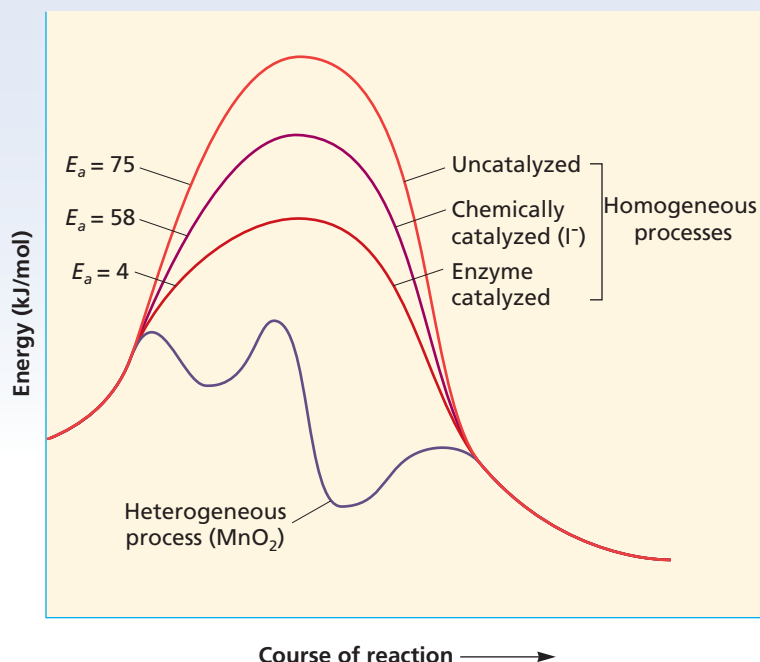


FIGURE 9 The activation energy for a chemical reaction can be reduced by adding an appropriate catalyst.

Rate Laws for Reactions

The relationship between the rate of a reaction and the concentration of one reactant is determined experimentally by first keeping the concentrations of other reactants and the temperature of the system constant. Then the reaction rate is measured for various concentrations of the reactant in question. A series of such experiments reveals how the concentration of each reactant affects the reaction rate.

Hydrogen gas reacts with nitrogen monoxide gas at constant volume and at an elevated constant temperature, according to the following equation.



Four moles of reactant gases produce three moles of product gases; thus, the pressure of the system diminishes as the reaction proceeds. The rate of the reaction can, therefore, be determined by measuring the change of pressure in the vessel with time.

Suppose a series of experiments is conducted using the same initial concentration of nitrogen monoxide but different initial concentrations of hydrogen. The initial reaction rate is found to vary directly with the hydrogen concentration: doubling the concentration of H_2 doubles the rate, and tripling the concentration of H_2 triples the rate. If R represents the reaction rate and $[\text{H}_2]$ is the concentration of hydrogen in moles per

extension

Chemistry in Action

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Keyword: HC6RXKX