#### Factors That Affect Chemical Equilibrium

Chemical equilibrium is a very delicate system that represents a perfect balance between forward and reverse reaction. A small disturb in the equilibrium may shift the equilibrium position either to right forming more products or to left forming more reactants. This reaction by the system is of course temporary and eventually the system will come back to equilibrium. This phenomenon can be expressed in the form of Le Chatelier's Principle.

#### Le Chatelier's Principle

An important and very interesting qualitative principle governing the equilibrium is the principle of Le Chatelier. This principle, which is named after the French chemist Henry Louis Le Chatelier (1850-1936), may be stated as follows: if an external stress is applied to a system at equilibrium, the system will tend to react in such way as to relieve the applied stress and tries to reestablish the equilibrium. In chemical reaction terminology, the "stress" means change in concentration, pressure, volume or temperature.

Le Chatelier's principle can be understood either qualitatively or quantitatively doing some problems. However, we restrict ourselves only to qualitative exlanation.

#### Change in Concentration

Consider the following equilibrium reaction

$$N_1 + 3H_2 \Longrightarrow 2NH_1$$

- (a). What happens if we increase the concentration of N<sub>2</sub> by adding more N<sub>2</sub>?
- (b). What happens if we increase the concentration of H<sub>2</sub> by adding more H<sub>2</sub>?
- (c) What happens if we increase the concentration of NH<sub>3</sub> by adding more NH<sub>3</sub>?
- (d). What happens if we decrease the concentration of N<sub>2</sub> by removing some N<sub>2</sub>?
- (e). What happens if we decrease the concentration of H<sub>2</sub> by removing some H<sub>2</sub>?
- (f). What happens if we decrease the concentration of NH<sub>3</sub> by removing some NH<sub>3</sub>?

#### Answer

- (a) and (b). The answers to question (a) and (b) are the same. If we add either N<sub>2</sub> or H<sub>2</sub>, we increase the collisions between N<sub>2</sub> and H<sub>2</sub> thereby forming more product NH<sub>3</sub>. This is how the equilibrium counteracts the applied stress; we say the equilibrium shifts from left to right.
- (c) If we add more NH<sub>3</sub>, we increase the concentration of NH<sub>3</sub>. As a result, some NH<sub>3</sub> decomposes and forms more reactants. We say the equilibrium shifts from right to left.

# **What Factors Affect Chemical Equilibrium Lab Manual**

**Xiang Xie** 

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