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Chemical Reactions And Factors Affecting The Chemical Balance

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ABSTRACT

A balanced equation is an equation for a chemical reaction in which the number of atoms for each element in the reaction and the total charge is the same for both the reactants and the products. The following article looks into the chemical balancing and factors affecting it.

KEYWORDS

Balancing, chemical reaction, chemical equilibrium, dynamic equilibrium.

INTRODUCTION

A chemical reaction is the transformation of one or more initial substances (reagents) into other substances, in which the nuclei of atoms do not change, while the redistribution of

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electrons and nuclei occurs, and new chemical substances are formed. Unlike nuclear reactions, chemical reactions do not change the total number of atomic nuclei and the isotopic composition of chemical elements.

Chemical reactions occur during mixing or physical contact of reagents spontaneously, with heating, with the participation of catalysts (catalysis), the action of light (photochemical reactions), electric current (electrode processes), ionizing radiation (radiation-chemical reactions), mechanical action (mechanochemical reactions), in low-temperature plasma (plasma-chemical reactions), etc. The interaction of molecules with each other occurs along a chain route: association - electronic isomerization - dissociation, in which radicals, ions, coordination-unsaturated compounds are active particles. The rate of a chemical reaction is determined by the concentration of active particles and the difference between the energies of the bond being broken and formed.

Most chemical processes go in two opposite directions, that is, at the beginning of the reaction, products are formed first, and after some time, these products interact with each other, in part, to the starting materials. Resulting in the formation of a mixture of reactants as well as reaction products in the vessel in which the reaction takes place. At the same time, there are processes that go in only one direction. All the substances obtained for the reaction of such processes are completely converted into reaction products. These first processes are called reversible processes and the second are called irreversible processes. So, processes that go in two opposite directions are reversals.

Theoretically, any irreversible process can be considered as a process that is reversible under certain conditions, but in practice only in one direction when the reaction products leave the reaction medium (gas release, precipitation, practically non-dissociable substances are formed and occurs only when one of the starting materials is taken in extremely large quantities and one direction of the opposite process is completely stopped.

This means that the reaction can proceed to the end as a result of the natural or artificial exclusion of the reverse process. Examples of chemical irreversible processes are the precipitation of barium sulphate solution when barium chloride solution is added, the release of carbon dioxide gas when hydrochloric acid is applied to sodium bicarbonate solution, and so on. Sedimentation of barium sulfate is practically irreversible, because barium sulfate is slightly soluble in water. However, the

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decomposition of salt or the decomposition of lead is an absolutely irreversible process under normal conditions.

Let's look at one of the irreversible reactions that takes place in a gaseous medium, the combination of hydrogen and iodine. To study this reaction, hydrogen and iodine were added to the vial, and after the mouth of the vial was closed, it was immersed in boiling sulfur vapor (448 C) and left in that state. In this reaction, hydrogen iodide is formed from hydrogen and iodine vapors, but initially the rate of the reverse reaction is zero because no hydrogen iodide has yet been formed. Over time, as the amount of hydrogen iodide decreases, so does the correct reaction rate. Finally, after some time, both reaction rates increase. As the amount of hydrogen and iodine decreases, so does the correct reaction rate. Eventually, after a while, the rate of the two reactions will be the same. Even if another glass bubble HJ filled with pure HJ is broken, a similar reaction velocity equalization in the opposite direction is observed. From this point on, the composition of the reaction mixture, which contains 3 components (hydrogen, iodine and HJ), remains unchanged. Hence, the state of chemical equilibrium in the system is decided.

Chemical equilibrium is a state of a chemical system in which one or several chemical reactions take place, and the rates in each pair of forward-reverse reaction are equal to each other. For a system in chemical equilibrium, the concentration of reagents, temperature, and other parameters of the system do not change with time.

In the state of chemical equilibrium, the more products are broken down per unit time, the more new ones are formed. Therefore, chemical equilibrium is a dynamic (in motion) equilibrium. It has the following three characteristics:

1. The composition of a reaction system (mixture) in a state of chemical equilibrium does not change over time.

When a system in equilibrium is removed from equilibrium due to an external influence, it returns to its previous equilibrium state after the external influence is lost: if the external influence continues, a new equilibrium state corresponding to that condition is established.

2. Equilibrium can be achieved by reacting the products of the reaction or by interacting with the starting materials (i.e., in opposite ways).

Chemical equilibrium occurs when there is no clear change in the concentration of chemical reaction participants and products over time. Chemical equilibrium can also be referred to as a “stable state reaction”. This does not mean

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that the chemical reaction has completely stopped, but that the consumption and formation of the substances have reached a state of equilibrium.

The amount of reagents and products has a constant coefficient, which is almost unequal.

Dynamic equilibrium occurs when a chemical reaction continues, but a number of products and reagents are constantly changing. This is a type of chemical equilibrium.

A balanced chemical is equation has equal numbers of atoms for each element involved in the reaction are represented on the reactant and product sides. This is a requirement the equation must satisfy to be consistent with the law of conservation of matter. It may be confirmed by simply summing the numbers of atoms on either side of the arrow and comparing these sums to ensure they are equal. Note that the number of atoms for a given element is calculated by multiplying the coefficient of any formula containing that element by the element's subscript in the formula. If an element appears in more than one formula on a given side of the equation, the number of atoms represented in each must be computed and then added together.

Write a balance statement

The equilibrium expression for a chemical reaction can be expressed in terms of the concentration of the product and the reagents. In the aqueous and gaseous phases, only chemical species are present in equilibrium, since the concentrations of liquids and solids do not change. For a chemical reaction:

$jA + kB \rightarrow lC + mD$

Equilibrium expression

$K = ([C]\, l\, [D]\, m) / [[A]\, j\, [B]\, k)$

K equilibrium is constant

[A], [B], [C], [D], etc. A, B, C, D, and so on.

j, k, l, m, etc. are coefficients in a balanced chemical equation.

Factors affecting the balance include:

When a reagent or product is added or a change in concentration affects the equilibrium. The addition of a reagent can control the equilibrium to the right in the chemical equation, where more products can be formed. The addition of the product can maintain balance to the precipitate as a reagent is formed.

Changing the temperature changes the equilibrium. Energy temperature constantly changes the chemical equilibrium over an endothermic reaction. The heat temperature

always changes the equilibrium over the exothermic reaction.

The change in pressure affects the equilibrium. For example, reducing the volume of a gas system increases its pressure, which in turn increases the concentration of reaction substances and products. The exact reaction leads to a decrease in the concentration of gas molecules.

The Le Hotelier principle can be used to predict changes in equilibrium as a result of applying stress to a system. Le Hotelier's principle suggests that a change in the system of equilibrium can pre-change the equilibrium in the fight against change. For example, the addition of heat to a system improves the direction of the endothermic reaction as this reduces the amount of heat.

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