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Biological Oxidation and its Study

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Keywords

concept of biological oxidation, the structure of mitochondria, enzymes involved in biological oxidation, respiratory chain, krebs cycle and its importance.

Introduction

Nature is vitally important in humans' life as it gives everything for the whole life. Everything, every single plant or part of the nature has its rotation in life, as well as biological oxidation is one natural point that can be considered. Firstly, it is better to give some definition, so biological oxidation is the combination of oxidation-reduction transformations of substances in living organisms, like trees' leaves, plants, flowers etc. Oxidation-reduction reactions are those which take place with a change in the oxidation state of atoms through the redistribution of electrons between them. Mostly, biological oxidation occurs in autumn in my country, Uzbekistan.

MATERIAL AND METHODS

Although biological oxidation has been observed for many decades by many scholars of biology and chemistry, it is essential to watch on the changings of leaves. Moreover, in the tissues, it is said that the organic matter decomposes in the presence of oxygen and the carbonate and carbonite are released. During this oxidation process, energy is released and it is an exergonic process due to its nature.

Biological oxidation is a set of oxidation-reduction reactions occurring in all living cells. In this case, energy is stored in the form of ATF, which is convenient for cells to spend, or in the form of other energy-rich compounds. The process takes place mainly in the mitochondria.

All reactions in inorganic chemistry can be divided into two types: 1. Reactions in which the oxidation state of the reacting elements does not change, 2. Reactions with a change in oxidation state.

Biological oxidation is a biological process that involves the loss of electrons as opposed to the reduction process where there is a gain of electrons. Oxidation and reduction, however, are coupled together as a 'redox' reaction, which is an energy-producing reaction within the cell.

Etymology of the word is from French, from "oxider", meaning "to oxidize", from oxide.

RESEARCH AND DISCUSSION

There are several definitions of the oxidation process. Oxidation can be considered as an addition of an oxygen atom to a compound. The opposite of this process is called the reduction in which there is the removal of an electron. Figure 1 describes the process of oxidation and reduction at the same time including glucose, oxygen, water and carbon dioxide

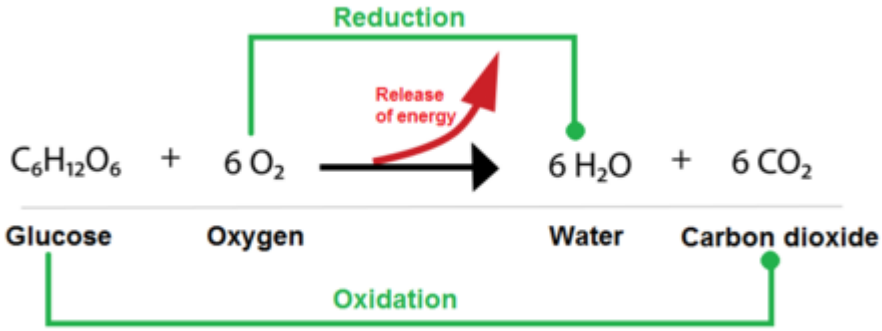

Figure 1.

Plants are the most powerful producers of organic matter on the planet. They carry out a complex and important process called photosynthesis, which is the formation of glucose and carbon dioxide from water under the influence of special substances - chlorophyll. A byproduct is that the source of life of all aerobic organisms is oxygen.

In the following process, examples of redox reactions are shown:

A) $6CO_2 + 6H_2O$ = chlorophill = $C_6H_{10}O_6 + 6O_2$;

OR

B) carbon dioxide + hydrogen oxide pigment chlorophyll (enzyme reaction) + = monosaccharide free molecular oxygen.

Also, there are representatives of the biomass of the planet with the ability to use energy in inorganic compounds and chemical bonds. They are called chemotrophs. This includes many types of bacteria. For example, microorganisms in the soil oxidize a substrate molecule, hydrogen and the process consists of the following formula:

$2H_2O_2 = 2H_2O$.

There is a more robust definition of these processes:

Furthermore, oxidation is defined as a process in which an electron is removed from a molecular during a chemical reaction. During oxidation, there is a *transfer of electrons*. In other words, during oxidation, there is *a loss of electrons*. There is an opposite process of oxidation known as a reduction in which there is *a gain of electrons*. Let's understand the oxidation chemistry by observing the reaction below:

$$CuO + Mg \rightarrow MgO + Cu$$

In the above reaction, the *Mg ion* loses electrons to form *magnesium oxide*. Similarly, *CuO* gains an electron to become pure Cu (*copper*).

Oxidation takes place as a molecule, atom, or ion raises its oxidation state. The reverse mechanism is known as **reduction**, which happens as the electron gain or the oxidation state of the atom, molecule, or ion reduces.

Another good example is that hydrofluoric acid is formed by the reaction of hydrogen and fluorine gas:

$$H2 + F2 \rightarrow 2HF$$

The above reaction oxidizes hydrogen and reduces fluorine. If two half-reactions are described, the reaction can be best understood.

$$H2 \rightarrow 2H+ + 2e-$$

$$F2 + 2e- \rightarrow 2F-$$

Oxygen has been added to a compound as an older method of oxidation. That was because the first understood oxidizing agent was oxygen gas (O_2). Although oxygen is typically added to a compound in compliance with the loss of electron requirement and an oxidation state increase, the oxidation concept has been expanded to incorporate additional chemical reactions.

The old oxidation concept of iron in combination with oxygen to produce iron oxide is a classic example of an oxidation reaction. The iron oxidized in rust. The chemical reaction is the following:

$$2Fe + O_2 \rightarrow Fe_2O_3$$

Iron oxide is formed known as *rust* through the oxidation of iron oxide.

Oxidation involving oxygen is the modern meaning of the term oxidation. Also, there is another description of hydrogen that can be used in organic chemistry. This is the reverse of the concept of oxygen, and can thus create confusion. It's still nice to be mindful about it. *Oxidation is the loss of hydrogen, according to the description, whereas the reduction, in hydrogen gain.*

An example of this is when ethanol is formed by oxidizing ethanol.

$$CH_3CH_2OH \rightarrow CH_3CHO$$

Ethanol is known to be oxidized by the loss of hydrogen. By reversing the equation and adding hydrogen to ethanol, ethanol can be reduced.

CONCLUSION

All in all, oxidation and reduction processes take place at the same time and cannot be carried out independently. The individual reactions of oxidation and reduction are taken as half-reactions, subsequently, two half-reactions combine to form a full reaction. The electrons gained or lost are explicitly used such that the half-reaction with the electric charge is balanced. The combination of these half-reactions to form a net chemical equation tends to cancel out the electrons.

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