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ПЕРЕКИСЬ ВОДОРОДА В ХИМИИ И ПОВСЕДНЕВНОЙ ЖИЗНИ

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Аннотация. Жизнь – это карантин у входа в рай. И во время этого карантина с нами могут произойти падения и ушибы, травмы, ожоги, порезы. Поэтому в любом доме есть аптечка с необходимыми лекарствами: антибиотиками, противовирусными средствами, антигистаминными препаратами, дезинфицирующими средствами. Мы пользуемся ими, не задумываясь, как они действуют, какие у них свойства, противопоказания, побочные эффекты, в каких других областях находят применение. Эта статья рассказывает об одном из таких веществ – перекиси водорода.

Ключевые слова: физические, химические свойства, применение, отбеливатель, антисептик.

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CHEMISTRY AND DAILY LIFE OF HYDROGEN PEROXIDE

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Abstract. Life is a quarantine at the entrance to paradise. And during this quarantine, falls and bruises, injuries, burns, cuts can happen to us. Therefore, in any house there is a first-aid kit with necessary medicines: antibiotics, antiviral agents, antihistamines, disinfectants. We use them without thinking about the way they work, their properties, contraindications, side effects, other areas they are used. This article is about one of such substances - hydrogen peroxide.

Keywords: physical, chemical properties, uses, bleach, antiseptic.

The chemical formula for hydrogen peroxide is H_2O_2 . There is an oxygen – oxygen single bond. The structure of the molecule is neither linear nor planar. The hydrogen atoms are situated in two mutually perpendicular planes. This type of structures is popularly known as open book structure.

Hydrogen peroxide was discovered by the French chemist L.J. Thenard in 1818. H_2O_2 occurs in surface water, groundwater and in the atmosphere. It can be found in biological systems including the human body [5].

Preparation.

1) from sodium peroxide $Na_2O_2 + H_2SO_4 = Na_2SO_4 + H_2O_2$

The reaction proceeds in an ice – cold solution of 20% H_2SO_4 .

2) from barium peroxide $BaO_2 + H_2O + CO_2 = BaCO_3 + H_2O_2$ [2]

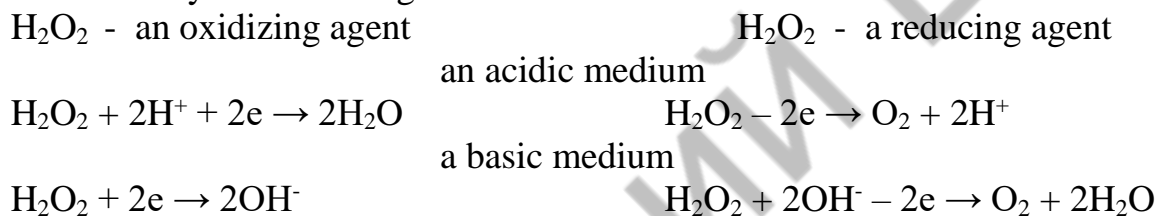
Storage. Hydrogen peroxide is a highly unstable compound, and it easily decomposes on long standing, heating or been exposed to sun light $2H_2O_2 = 2H_2O + O_2$

To prevent decomposition of H_2O_2 some stabilizers must be added, such as glycerin, phosphoric acid. Oxides of alkali metals catalyze this process that is why

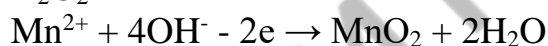
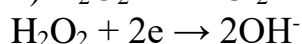
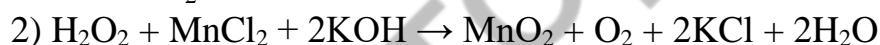
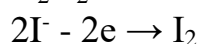
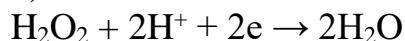
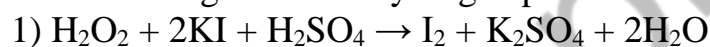
hydrogen peroxide must be stored in plastic containers and kept in the dark. It should also be kept away from dust particles as they can cause explosive decomposition of this compound [1].

Physical properties. Hydrogen peroxide is a pale blue, clear liquid. It has a bitter taste and a slightly sharp odour. Its boiling point is 150°C. The melting point of H₂O₂ is -0.43°C. It is soluble in water, alcohol, ether. Hydrogen peroxide is slightly more viscous and dense than water. The reason for this phenomena is the fact that the molecules of H₂O₂ are even more associated through hydrogen bonding than water molecules [2].

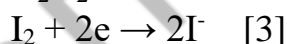
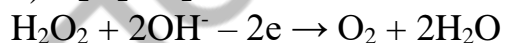
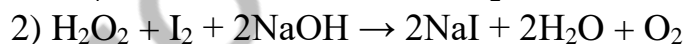
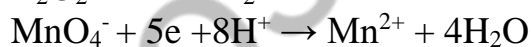
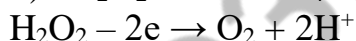
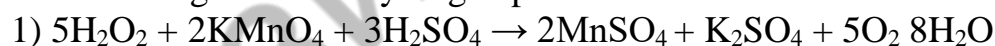
Chemical properties. The oxidation state of oxygen in a hydrogen peroxide molecule is -1. In chemical reactions it can be either oxidized to oxygen O₂ or reduced to water H₂O or hydroxide ions OH⁻. The oxidation – reduction activity of hydrogen peroxide depends on the concentration of the solution. In solutions with mass percentage equals 20%, H₂O₂ is a strong oxidizer. But it should be noted, hydrogen peroxide is a powerful oxidizing agent, but a weak reducing agent. The products of oxidation – reduction reactions with H₂O₂ depend on the medium of solutions. These processes can be characterized by the following schemas:



The oxidizing nature of hydrogen peroxide:



The reducing nature of hydrogen peroxide:



Basic uses.

Hydrogen peroxide is widely used in everyday life.

Bleaching. Almost about 60% of the world's production of hydrogen peroxide is used for pulp – and paper bleaching. It is also used in the textile industry. Hydrogen peroxide compares favourably to other bleaching agents, such as chlorine, for the products of its decomposition, oxygen and water, are not pollutants.

It is used as hair bleach as well. The whitening properties of hydrogen peroxide are related to its ability to oxidize and destroy pigments, for example melanin, which is responsible for the colour of black, chestnut hair. Hair colouration is often caused by molecules containing chains of carbon atoms with alternating single and double bonds.

Hydrogen peroxide molecules attack double bonds and, after breaking one of them, insert their oxygen atom between the carbon atoms. When the alternation of single and double bonds is disturbed, the hair colour disappears.

Antiseptic. Hydrogen peroxide is used to sterilize various surfaces including surgical tools. Since time immemorial, H_2O_2 has been used for disinfecting wounds as its cost is low and it is promptly available compared to other antiseptics. But for the treatment of small superficial wounds, the use of hydrogen peroxide is impractical, since it damages the cells adjacent to the wound and, thus, increases the healing time. H_2O_2 should be used to cleanse difficult wounds from dirt and pus before using an antiseptic solution.

There are a lot of different substances around us. This article is about hydrogen peroxide. Perhaps, it will make you take a close look around and arouse your interest and desire to find interesting facts about other common and unusual substances [4].

References

1. Stain, W.R. Applied chemistry. D.C. Health and Company. – Toronto, 1994.
2. Chemistry OpenStax College. – Rice University, 2015. – 1393 p.
3. Жуков, С.Т. Химия (10 – 11 класс). – Москва : МГУ, 2002.
4. Эткинс, П. Молекулы. – Москва : Мир, 1991.
5. Интернет-сайт «Справочник химика 21 века».