SCHOOL CHEMISTRY EXPERIMENT INFORMATION IMPROVEMENT BASED ON TECHNOLOGIES

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Abstract. *This article describes the issues of improving the school chemistry experiment based on modern information technologies. The didactic possibilities of animations in improving the chemistry experiment are analyzed.*
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In the Republic of Uzbekistan, while educational institutions are fully equipped with information technology tools, the introduction of new information technologies into the educational process in order to increase the effectiveness of teaching is one of the urgent tasks of today.

In this article, we will dwell in detail on the didactic possibilities of using animations in the teaching of electrolytic processes in the high school chemistry course.

It is known that the process of electrolysis is an oxidation-reduction reaction that occurs when a constant electric current is passed through the liquefaction or solution of an electrolyte.

Animating the process in order to more accurately visualize the oxidation-reduction reaction taking place in the solution when the electrodes are lowered into the solution and an electric current is passed through them makes it easier to understand the happening phenomenon. For this purpose, we covered the experience of applying information technologies to explain the electrolysis of liquefaction of potassium chloride [1-10].

The liquefaction of table salt cannot be electrolyzed in laboratory conditions. Non-liquid electrolysis is carried out only on an industrial scale. So, its electrolysis can be explained through animation, and this will increase students' imagination about this process.
Since table salt has a liquefaction temperature of 8010C, in order to reduce energy consumption, calcium chloride, sodium fluoride or potassium chloride crystals are added to it, and its liquefaction temperature is reduced to 5800C.

The electrolytic bath is made of steel and covered with refractory bricks. A graphite anode is placed in the middle, a ring made of iron or nickel, a cathode is installed around it, and its surface is insulated. Between the anode and the cathode, there is a diaphragm, the lower part of which is in the form of a cylinder, and the upper part is in the form of a cone, from which chlorine is removed. Sodium goes to a special container in front of the cathode. Table salt is introduced into the bath from above. The oxidation-reduction reaction at the cathode and anode is explained with the help of animations in the bath; according to this, the repulsion of sodium ion around the cathode, the release of sodium by the thickening of the cathode surface, as well as the release of a specific-colored chlorine gas around the anode are shown through a moving image (animation).

We can consider another aspect of teaching with the help of information technologies by analyzing the processes involved in extracting copper from ores. Copper is very important in the national economy. Copper is second only to silver in terms of good conductivity of heat and electricity. 80,000 tons of copper are produced in Uzbekistan every year. □50% of it is used in the production of electric wires and cables in the electrical engineering industry, in the production of water boilers; alloys such as brass, copper nickel and bronze; constantan, manganin, etc., are used for the preparation of heating devices, in the production of art objects, and their salts are used in the production of mineral pigments and artificial silk, against plant pests, in the leather (tanning) industry, as micro fertilizers, and in medicine.

In metallurgy, sulphide ores containing about 3% copper are used to obtain copper. First, the ore is enriched by flotation. Then the enriched ore is burned. As a result, sulfides in the ore burn and turn into copper oxide and sulfide anhydride gas, at which time two liquid layers are formed. The upper layer is a slag layer, which consists of copper oxides and idle rocks. The lower layer - the stein layer, mainly consists of copper (I) sulfide, iron (II) sulfide and compounds of gold, silver, selenium, iron, nickel and other elements mixed with copper ore. Liquid stein is introduced into a special converter. Pressurized air is injected into the stein, burning it and oxidizing it. The iron oxide formed by the burning of the stein reacts with the silicon oxide in the converter and turns into slag. The oxidized part of the copper ore reacts with the non-oxidized part and turns into rough copper containing 95-98% copper.

Sulfur (IV) oxide formed as a result of the reaction is used to produce sulfuric acid. Slag is used for various purposes. Crude copper is refined in a special electrolytic bath. Electrodes cast from rough copper act as anodes in the bath. Thin pure copper plates are used as cathodes. Both electrodes are lowered into a bath containing copper sulfate solution. The electrodes are connected with a low-voltage 0.4 V constant current source. At this time, the raw material taken as the anode dissolves, and pure copper is released at the cathode. Additives in raw copper (gold, silver, arsenic, antimony, selenium, etc.) do not dissolve in the anode. They sink to the bottom of the bathtub like mud. This mud is processed to extract rare metals. The gold obtained from this covers all the costs of copper production.

Crude copper can also be cleaned by flaming in a stream of air. In this process, copper dross turns into iron, cobalt, zinc and partially nickel slag, the copper content increases to 99.7%. The extraction of copper was animated based on the procedure shown above. During the animation, it was shown that copper ores burn and a mixture of oxides is formed from it. Sulfide anhydride formed as an excess substance is removed from the column to produce sulfuric acid. The copper obtained as a result of the reaction between the formed copper oxide and copper sulfide was explained on the basis of the chemical reaction equation. Rough copper was introduced into the electrolysis bath as an anode. A thin copper plate was given a separate volume to stand out as a cathode. The copper sulfate filled in the bath was described by its chemical formula and color. Oxidation of copper at the anode and reduction of copper at the cathode was demonstrated, and the color of the cathode changed to a reddish copper color, indicating that copper was clearly formed at the cathode. All processes were performed through textual, moving sights and sounds, and the chemical changes that took place in the bath were described.

Corrosion and its types, as well as the protection of metals from corrosion, are difficult for students to learn in chemistry. In modern times, when the natural reserves of metals are decreasing every year, it is also important to use metals rationally and to make them durable for a long time. The decay of metals is carried out on the basis of chemical and electrochemical processes. Chemical corrosion occurs when a metal is exposed to an environment that does not conduct electric current. As an example of chemical corrosion, reactions of metals with oxygen, halogens, hydrogen sulfide, and sulfur oxides at high temperature can be taken, and metals are also corroded under the influence of liquids that do not conduct electric current. The presence of dissolved hydrogen sulfide and sulfur (VI) oxides in dehydrated oil and its processing products causes corrosion. Electrochemical corrosion occurs when metals are in contact with electrolytes, or this phenomenon also occurs when metals are stored in atmospheric conditions. The reason for this is that there is always a thin layer of water on the surface of the metal, in which the sulfur and nitrogen oxides in the atmosphere form an electrolyte as a result of the dissolution of oxygen, which affects the metal and destroys it. It is known that technical metals may contain other metals even if they are very small.

Because the main metal and a small amount of metal added to it form a galvanic element in the electrolyte environment. In this case, the main metal decays and acts as an anode, while the additional metal acts as a cathode. As a result of the melting of the main metal, the electrons collected at the electrode can return hydrogen ions or dissolved oxygen in the electrolyte medium on the surface of the additional metal. Since the rate of transfer of electrons from the reducing agent to the oxidizing agent is extremely high in the first type of conductors, the base metal is corroded very quickly. Dynamic models of process mechanisms are animated to explain these phenomena to students, and teaching by embodying them on the screen creates great opportunities to understand corrosion processes. Let's get acquainted with the formation of such galvanic elements on the example of the animation of copper metal touching iron: - after the animation image starts, the oxidation of iron by giving electrons and the generation of electrons from it were embodied. It is shown that these electrons repel oxygen from the air on the surface of the cathode, iron (II) ions combine with hydroxyl ions on the surface of the anode to form iron(II) hydroxide, and it turns into rust under the influence of air oxygen and moisture. As a result, iron undergoes corrosion. This process is indicated by the formation of rust color. If hydrogen ions are abundant, the electrons released from iron do not return oxygen in the air.

Corrosion occurs more slowly when iron is in contact with tin than when iron is in contact with copper, because the standard electrode potential of tin is -0.14v, which is higher than that of iron (-0.44v). If the iron surface is covered with zinc, zinc protects the iron from corrosion due to the formation of a dense oxide layer on its surface. If the oxide layer is destroyed, zinc will continue to corrode, and iron will not rust. Zinc-anode and iron-cathode function in the galvanic element formed by zinc and iron in the presence of electrolytes. Zinc ions are released from the zinc surface. They combine with hydroxyl ions in the solution and turn into zinc hydroxide. It is important to note that these processes can be shown repeatedly and re-shown at any time with the help of an information technology tool.

There are various ways to protect metals from corrosion: coating steel products with other corrosion-resistant metals nickel and chromium to form a thin layer, forming a dense oxide layer on the surface of metals, coating metals with salts that are poorly soluble in water, for example: cast iron and po forming a phosphate layer on the surface of products, varnishing, covering with paints, etc. Large quantities of acids cannot be transported in glass containers resistant to their effects. However, acid inhibitors, which dramatically reduce the effect of acids on metals, have been added to transport in metal systems. Explaining to students the mechanisms of sharp reduction of the corrosion rate of inhibitors with traditional teaching methods does not give the expected results. Live demonstration of these mechanisms with the help of information technology, creating a computer program related to the subject, leads to an increase in the effectiveness of the lesson.

Therefore, it is not possible to increase the level of mastery of students by explaining the mechanism of oxidation-reduction reactions, electrode potentials, galvanic elements, electrolysis, corrosion of metals and other issues of electrochemistry in traditional methods in the chemistry curriculum.

In short, the introduction of information technology into the teaching process dramatically increased the effectiveness of the lesson and led to a higher level of student learning.

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