

**ELECTROLYSIS**

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**Abstract**

Electrolysis is a set of redox processes that occur on electrodes placed in a solution or melt of an electrolyte under the influence of a direct electric current applied from an external source. The article describes current aspects.

**Keywords:** Electrolysis, chemistry, electrode, method.

**Introduction**

The negative terminal of the DC source is connected to an electrode called the cathode; positive pole to the electrode, which is called the anode. When an external direct current source is turned on, the movement of ions in a solution or melt becomes directed. Negatively charged ions (anions) move to the anode, positively charged ions (cations) move to the cathode.

With increasing voltage supplied from an external DC source, the cathode potential shifts to the negative region, and the anode potential shifts to the positive region.

When the potentials of the cathode and anode reach certain values, it becomes possible to discharge ions or molecules from a solution or melt of the electrolyte onto them - electrolysis begins. The essence of electrolysis is the implementation of chemical reactions using electrical energy - reduction of particles at the cathode and oxidation at the anode. Moreover, the reducing and oxidizing effect of current is many times stronger than the action of chemical reducing agents and oxidizing agents.

**MATERIALS AND METHODS**

Unlike the electrolysis of melts, when a metal is released at the cathode and a discharge product of a salt anion at the anode, during the electrolysis of solutions it is necessary to take into account the presence of solvent ions, which under certain conditions can be discharged at the electrodes. Thus, when electrolyzing aqueous solutions, the presence of water ions should be taken into account:

**RESULTS AND DISCUSSION**

In order to determine which cations will be oxidized at the anode, it is necessary to compare their discharge potentials taking into account the overvoltage.

Let us consider in more detail separately the cathodic and anodic processes that occur during the electrolysis of aqueous solutions.

#### *Cathode processes*

From the cathode, electrons are transferred to particles of substances in solution. The cathode acts as a reducing agent in relation to the particles discharged on it. The function of oxidizing agents can be performed by metal cations or neutral molecules. Consequently, the process of reduction of the oxidizing agent occurs at the cathode:

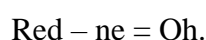


Any redox process can proceed in the forward direction only if  $E_{\text{BOST}} \square E_{\text{OXID}}$ . Therefore, the reduction of the oxidizing agent at the cathode will occur only if the potential of the cathode - the reducing agent - (EK) in algebraic value becomes less than the potential of the oxidizing agent ( $E_{\text{Ox/Red}}$ ).

The rate of the cathode process depends on how much the cathode potential (EK) is shifted from the equilibrium potential of the oxidizer ( $E_{\text{Ox/Red}}$ ). The more the cathode potential is shifted towards negative values, the higher the rate of reduction of the oxidizer.

#### *Anodic processes*

Electrons are removed from the anode by an external current source, the anode acts as an oxidizer. Anions that approach the anode, water molecules, as well as the anode material itself can undergo oxidation at the anode. Substances that are oxidized at the anode act as reducing agents:



In order for the process at the anode to proceed in the indicated direction, the potential of the reducing agent ( $E_{\text{Ox/Red}}$ ) must be less than the potential of the anode-oxidizing agent (EA):



## CONCLUSION

Thus, the nature of the reactions occurring at the cathode in aqueous solutions is determined by the position of the metal in the series of standard potentials and the cathodic overvoltage.

To roughly estimate the sequence of electrode reactions during the discharge of metal ions at the cathode, one can use the values of standard electrode potentials.

As experiments show, during the electrolysis of aqueous solutions, all metals can be divided into three groups:

1. Metals, the deposition of which on the cathode is not accompanied by the release of hydrogen. These include metals that stand in the series of standard potentials behind hydrogen (copper, silver, gold, etc.). The cations of these metals have a higher oxidizing capacity than hydrogen ions.
2. Metals, the deposition of which on the cathode is accompanied by the release of hydrogen. In the series of standard potentials, these metals are between manganese and hydrogen

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