

Abstract

Electrochemical sensors for composition's monitoring of aqueous media

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Ampermetric sensors for the components of the aquatic environment, which are one of the most important for its biogenic and corrosive activity - potassium ions and molecular oxygen, have been developed.

The potassium ion sensor has a working electrode made of Berlin azure and an auxiliary, for example, silver chloride electrode. The reaction at the working electrode is initiated by the absorption of potassium ions with the reduction of the Berlin azure to the white salt of Everit. Potassium ions are embedded in the crystal lattice of the active coating. The auxiliary electrode maintains the electrical and material balance of the electro-chemical cell. Partial renewal of the Berlin azure layer occurs during the period of relaxation due to oxygen oxidation of air.

The method of electrochemical application of Berlin azure by fixing the first stage of cathodic reduction of iron (III) ions to iron (II) due to the instantaneous exchange reaction with red blood ions has been developed. Possible ways to improve this process are to select the conditions for sorption of iron ions and hexacyanoferrate into a double electric layer, taking into account the β -Antropov scale.

An oxygen sensor has been developed as an analogue of the Clark element, which is cheaper due to the use of a working electrode made of silver-plated copper wire. The auxiliary electrode is a lead cylinder separated from the working electrode by a hydrophilic separator. The electrolyte of the sensor is of variable composition due to mass transfer processes with the environment through a semi-permeable polyethylene membrane. The sensor differs in simplicity of a design and technologic manufacturing and has to be stored in tap water.

It is shown that with the correct selection of the length of the working electrode wound on top of the separator made of silver-plated copper wire and the permeability (thickness) of the polyethylene membrane, the sensor signal depends little on the nature and electrical conductivity of the analyzed solution.

The project also developed a version of the shop for the collection of water sensors for oxygen using modern equipment, calculated the cost of creating such an enterprise. The calculation of profitability has been performed and the option of resale of the shop or retraining of the shop is provided. The potential harmfulness of the shop is analyzed, and measures with its reductions are taken into account.

Key words: oxygen, potassium ions, sensor, membrane, separator, sensor, voltage, potential, Berlin azure, automation, startup, labor protection.