NUMERICAL SIMULATION OF SPATIAL DISTRIBUTIONS OF HYDROGEN EXPONENT AND ELECTRIC FIELD IN LIQUID ELECTRODE [[1]](#footnote-1)\*)

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At present time, plasma technologies are widely used in ecology and environmental protection. Discharges with liquid electrodes are used for wastewater treatment of both organic impurities and impurities in the form of heavy metals, synthesis of nanoparticles, metal etching. The kinetics of plasma chemical processes at the water surface plays an important role during modelling of discharges with liquid electrodes. Small percentage of radicals coming from electrolyte or water solutions used as an electrode has a significant impact on the distribution functions of charged particles and, therefore, affect the characteristics and formation of discharge. In work [1] the mathematical model of discharge between liquid and solid electrode is constructed. An important factor affecting the discharge characteristics is the release of hydrogen, oxygen and hydroxyl radicals into the discharge zone under the action of ion bombardment and electrolysis [2]. In this paper mathematical model of the process of electrolysis of sodium hydroxide with inert electrodes offered. It allows to calculate the amount of gas released, as well as the spatial distribution of the electric field and the hydrogen exponent. The mathematical model of the solution electrolysis process *NaOH* is based on the assumption: sodium hydroxide is a strong base and it is believed that it dissociates into ions; the ionic product is small and water concentration is considered constant; Sodium ions *Na*+ on the electrodes do not discharge, accumulating over time the concentration in the cathode space and decreasing in the anode space. The evolution of oxygen and hydrogen occurs in following reaction: 4*H*2*O*+4e→2*H*2+4*OH*- and 4*OH*-→*O*2+2*H*2*O*+4*e*. Taking these assumptions into account, the mathematical model includes the Nernst-Planck equations for charged particles *Na*+ and *OH*- , the constancy of the ionic product of water is used for calculating the concentration of hydrogen ions and the Poisson equation is used to calculate the electric field potential. The boundary conditions for the equations of transport of charged particles are placed on the flows. The rate constants of the anodic and cathodic processes are derived from the Butler-Volmer equation. Density of the supplied current is related to the electrode potential anodic – cathode wave equation. A numerical solution of a model problem is presented in this study, as well as a comparison of the results with work [3].

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Lt/ru/FO-Chebakova.docx) [↑](#footnote-ref-1)