NUMERICAL INVESTOGATION OF THE EFFECT OF VOLTAGE APPLIED FREQUENCY ON THE CHARACTERISTICS OF A LIQUID ELECTRODE AND THE OUTPUT OF PRODUCTS INTO THE GAS PHASE [[1]](#footnote-1)\*)

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Currently, the world is searching for technologies that allow to use renewable energy sources, which if associated with both the environmental deterioration and the increasing electrical demand. One of the areas of alternative energy is hydrogen energy. One of the ways of hydrogen formation is plasma electrolysis. 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 impact and electrolysis [1]. Thus, in [2], it was carried out a numerical simulation of the kinetic chemical reactions of the transition of water radicals from the liquid to the gas phase under the action of Henry’s law; it was noted an increase in hydrogen peroxide in solution with an increase in the discharge current.

This work is a continuation of [3] and it presents a numerical study of a spatial mathematical model of the sodium hydroxide electrolysis processes between inert and air electrodes. When modeling, it was taken into account that at the liquid-gas interface the concentration of the hydroxyl group decreases both due to the reaction of oxygen evolution and due to the diffusion through the surface; at a first approximation, the mass transfer of the hydroxyl group is described by Henry’s law. The transfer constants for Henry’s law are taken from [4]. When setting the boundary conditions, it was assumed that the reaction of water occurs on a negative inert metal electrode; the constants of this heterogeneous process are calculated using the voltage on the electrode, and the concentration of sodium ions is taken as «zero».

The mathematical model includes: the Nernst-Planck equations for charged particles, the equation for the electric field potential. The voltage on the metal electrode is represented through the potential of water decomposition and overvoltage.

Numerical studies were carried out both at a direct current and at a pulsed mode.

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