PHYSICO-CHEMICAL CHARACTERISTICS OF MICROWAVE DISCHARGE IN AQUEOUS ETHANOL SOLUTIONS [[1]](#footnote-1)\*)

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Recently, various types of discharges in liquids and, in particular, microwave discharges have been intensively studied. Microwave discharges exist in gas bubbles in liquids and are the least studied type of discharge. These discharges have properties that distinguish them from the widely used direct, high frequency and high voltage discharges. Microwave plasma in liquids is an extremely interesting object for research, since it is often non-equilibrium, inhomogeneous, with large spatial gradients of parameters. Plasma, as a rule, is non-stationary and exists under conditions of constant exchange of energy and particles with the surrounding liquid medium.

This paper presents the results of an experimental research of microwave discharges in ethanol solutions at atmospheric pressure above the liquid surface. The measurements were carried out using an aqueous solution of ethanol as a liquid medium. Under the experimental conditions, the incident power (in the range of 500-650 W) and the volume concentration of alcohol in the solution (in the range of 48-96%) changed. The discharge was initiated at the end of the central conductor of the coaxial line (3 mm in diameter) made of lanthanum-doped tungsten. The discharge ignition was recorded using a K011 nine-frame electron-optical camera, an Avaspec-2048x14-USB2 spectrometer, and a photodiode, the signal from which was output to an AKIP-4126/3A-X oscilloscope. A water cooler was used to separate the products of plasma-chemical reactions from the vapors of the ethanol solution. At the outlet of the reactor, the rate of product formation was determined using a flow meter and the composition of the main gas products by chromatographic analysis.

The photographs of the moment of ignition of the discharge and the oscillograms of the signal from the photodiode confirmed the results of the previous study [1], which describes the dynamics of the development of a microwave discharge in a liquid. On the time-resolved spectra, there are Swan bands characteristic of a discharge in hydrocarbons. In addition, intense LaO bands are observed. Using the Specair 3.0 program, the rotational and vibrational temperatures of the particles were determined; they lie in the range of 3000-4500K. Chromatographic analysis of the products at the outlet of the reactor showed that the main products of the gas phase are H2, CO, C2H2, C2H4, CH4. Under the experimental conditions, the composition of the gas phase did not change significantly. The results of the study are in agreement with the results of a study of a microwave discharge in ethanol solutions at a reduced pressure above the liquid surface [2].

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References

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