The initial stages of the development of a microwave discharge in liquid hydrocarbons [[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 a gas bubble in liquids and are less studied. These discharges have properties that distinguish them from the commonly used DC, HF and HV discharges. They can be used to produce hydrogen, coatings, nanoparticles and nanotubes, water purification, etc. 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 nonstationary and exists under conditions of constant exchange of energy and particles with the surrounding liquid medium.

This work is a continuation of work on the study of the initial stages of a microwave discharge in liquid hydrocarbons. The results of the first stage of research are published in [1]. It was shown that a microwave discharge in liquid hydrocarbons is unsteady and is a set of sequential pulsed discharges randomly distributed in time. The shape and duration of the pulses are different. The pulse duration under the experimental conditions was from 0.5 to 1.0 ms, it decreases with an increase in the incident microwave power.

The results of a study of acoustic phenomena and changes in the structure of a microwave (2.45 GHz) discharge in liquid hydrocarbons over time are presented. The discharge was ignited at the end of the microwave antenna with a conical or rounded end. Petroleum solvent Nefras was chosen as a representative of liquid hydrocarbons. An electret microphone and a high-speed video camera were used to study the discharge. It was shown that in the case of the conical end of the antenna, the discharge is always attached to the tip of the cone, while in the case of the rounded tip it moves along the tip of the antenna. Discharges in liquid hydrocarbons are accompanied by sound effects caused by the excitation of a shock wave. When the discharge is ignited, a set of acoustic vibrations with frequencies corresponding to the characteristic vibrations of the reactor appears in the gas part of the reactor.

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References

1. Lebedev Y.A. et al. Light emission from microwave discharges in liquid hydrocarbons at the initial stages of their development // Plasma Processes and Polymers. - 2021. - T. 18. - No. 10. - S. 2100051.

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