EFFECT OF ARGON ADDITIVE ON THE SIZE OF SOLID PARTICLES TAKING INTO ACCOUNT THEIR CHARGE, FORMED IN MICROWAVE DISCHARGE IN LIQUID N-HEPTANE [[1]](#footnote-1)\*)

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Nonequilibrium microwave discharges in various liquids have been the subject of intensive research in recent decades [1,2]. It was shown in recent experiments [3] with a microwave discharge in liquid n-heptane, that when argon was continuously introduced through the end of the microwave antenna, emission lines Hα and Hβ were detected in the discharge spectrum, which were not observed in experiments without argon supply. This work continues the cycle of work on modeling a microwave discharge in liquid n-heptane and is devoted to modeling kinetic processes in a gas mixture of decomposition products of n-heptane and argon taking into account the formed solid phase (soot) and processes under the influence of electron impact.

The non-stationary zero-dimensional model contains the balance equations for the neutral gas components of the plasma, the electronically excited states of the C2 molecule and that of hydrogen and argon atoms, the balance equations for the formed solid particles including their surface growth and coagulation, the balance equations for the charged plasma components taking into account their fluxes to the surface of charged solid particles, plasma electro-neutrality condition including charged solid particles, equation for the average microwave field. Coagulation of solid particles is calculated taking into account their negative charge. The gas temperature is considered equal to 2000 K and does not depend on the content of the plasma.

The introduction of argon into the discharge leads to a change in the EEDF and, as a consequence, to a change in the reduced parameter E/N and electron density. The Hα line becomes comparable with the lines of excited C2 (d) molecules. It is shown that the introduction of argon into the discharge does not lead to a noticeable change in the number of particles of the solid phase. The relative fraction of heavy particles increases due to an increase in the rate of surface growth and coagulation processes. Thus it is possible to control the amount of forming heavy solid particles by adding argon. Accounting for the charging of heavy particles leads to a change in their size distribution function. The maximum of the distribution function shifts from the region of light particles to the region of medium-sized particles.

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References

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