MATHEMATICAL MODELING OF RF DISCHARGE BETWEEN LIQUID JET ELECTRODES [[1]](#footnote-1)\*)

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A plasma of discharge with liquid electrodes is widely used in various processes, for example, for wastewater treatment, surface treatment of parts and components, etc. [1]. Direct current discharges between solid and liquid electrodes are the most studied. RF current discharges between two liquid electrodes have been studied significantly less [2]. The aim of this work is developing a model of a jet-droplet RF discharge.

A complete statement of the problem includes a description of hydrodynamic, electrodynamic, and plasma-dynamic processes in a multiphase liquid-vapor-plasma medium. A significant circumstance complicating the model is the large number of interacting particles. For example, 53 charged and neutral particles with 624 plasma-chemical reactions between them are considered in a plasma of a surface micro discharge in humid air [3]. More components are added in view of an electrolytic electrodes, when we need considering atoms, molecules and radicals of dissolved salts [4].

So, a simplified model is considered, in which groups of positively and negatively charged ions, excited particles, atoms, and molecules in the ground state are represented by «medium» charged or uncharged particles.

The analysis of the Maxwell equations for the RF electromagnetic field generating by RF current through the electrolyte jet electrode, showed that the electromagnetic field magnitude reaches more than 109 V/m. It is enough for field emission of primary electrons, gas breakdown between liquid electrodes and the formation of circular plasma structures around the jet electrode.

References

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