

TREATMENT OF THE SURFACE OF A METAL PRODUCT WITH AN HF DISCHARGE WITH LIQUID ELECTRODES

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Low-temperature plasma of electric discharges with liquid (non-metallic) electrodes is a rapidly developing interdisciplinary field of research, which includes the science of plasma, fluid dynamics, heat and mass transfer, multiphase chemistry, and photolysis. Unlike gas discharges with traditional (solid) electrodes (glow, arc, spark, etc.), this type of discharge is generated by direct or alternating current in the interelectrode gap, where one or both electrodes are a flowing or non-flowing liquid. Aqueous solutions of salts of various concentrations are usually used as a liquid electrode. In this field of science, the work of various scientific schools in Russia and abroad is known, in which the physics of processes and the use of gas-discharge plasma with liquid electrodes are studied, depending on the set parameters of voltage and discharge current, pressure, configuration and type of electrodes, speed and nature of the flow of the medium.

Along with this, the plasma of electric discharges with liquid (non-metallic) electrodes is very promising for solving various scientific and engineering problems, for example, for electrolytic-plasma polishing of products, the production of fine metal powders and the production of nanoparticles, the application of functional coatings on products, the analysis of the content of particles in liquids of plasma-chemical reactors, sterilization and purification of solids, water and air. A wide variety of areas of application of these systems is associated with a large number of configurations of gas-discharge chambers, modes and parameters of ignition and combustion of the discharge, as well as plasma-chemical processes associated with the transfer of matter and charge at the interface. It follows from the analysis of published works that the plasma of electric discharges with liquid (*non – metallic*) electrodes has been studied for a long time, but the number of “white spots” in this area is still large. For example, until now there is practically no study of high-frequency current (HF) discharges with liquid (non-metallic) electrodes, while the scientific foundations of an HF discharge with solid electrodes are described in detail in the well-known works. Replacing solid electrodes with liquid electrodes leads to the emergence of new little-studied phenomena that are of great interest both from the point of view of fundamental research and the possibilities of new effective applications of HF discharges in various sectors of socio-economic development.

Influence of low-temperature plasma of electric discharges of high-

frequency current with liquid and solid electrodes at atmospheric pressure on the microrelief of the surface of a metal product. The microrelief and parameters of the surface roughness of the product before and after processing have been investigated.

The effect of high-frequency electric discharges with liquid and solid electrodes on the surface of steel products at $p = 10^3$ Pa and $U = 3.5$ kV was investigated. The steel product has been mechanically pretreated. A 7% solution of $(\text{NH}_4)_2\text{SO}_4$ in tap water was used as a liquid electrode. Processing time 30 seconds. The surface of the original specimen made of mechanically processed steel is covered with a number of parallel scratches caused by the action of sand, a so called “stroke” appears, imparting a gloss to the surface, turning into a polish. After electrolytic-plasma treatment, the surface becomes regularly covered with depressions of various diameters.

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