A STUDY OF HIGH-FREQUENCY CURRENT PULSATIONS IN THE GAS DISCHARGE WITH CONTACT TO LIQUID ELECTROLYTE

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History of electric discharges in contact with the liquid, has more than a hundred years. However, despite the long history and sufficiently extensive use of in applied problems, they have been studied to date not fully, especially in small spatial and temporal intervals. One of the properties that appear in minor intervals is the presence of high-frequency current pulsations. They are fixed at currents that make up the hundreds of milliamps or more [1,2].

In this work experimentally investigated electrical discharges in atmospheric pressure between the liquid electrolyte and metal electrodes in different combinations and in various embodiments the polarity of their connection to the power supply. The studies were carried out using a digital oscilloscope AKIP-15/1 with a bandwidth of 25 MHz. Analysis of current oscillations was carried out using the fast Fourier transform of the same oscilloscope in the megahertz frequency range. Signal to register the discharge current was voltage drop across the shunt resistance of 0,01 Ω. It is revealed that the emergence of high-frequency current pulsations is accompanied by phenomena of dispersion and erosion of the electrodes.

The presence of sputtering and erosion of the electrodes was determined by visual characteristics, and emission spectrum. Record of the spectrum of the radiation was carried out on fiber-optic spectrometer AvaSpec-3648 in the visible range. For example, in the case of copper cathode on the origin of the erosion process indicated the following factors. First, on the surface of the cathode remained traces of erosion. Secondly, in the plasma column was observed green luminescence characteristic of the vapors of copper, and, thirdly, in the emission spectrum of the gas discharge was recorded spectral lines of an atom of copper.

As the liquid electrolyte used was a solution of sodium chloride in distilled water. Its electrical conductivity was 10 mS/cm. Feature of liquid-phase electrode was the fact that the frequency spectrum of the signals from the discharge current is abruptly changed when changing the polarity of the electrolytic electrode. In combination electrodes "liquid electrolyte - hafnium" when feeding the electrolyte positive potential, current pulsations were so weakened that they become virtually indistinguishable from the noise signals.

Experiments have shown that the spraying liquid electrolyte cathode is enhanced at higher discharge currents. Visualization of the sputtering process promoted the use of electrolytes with lower specific electric conductivity. The influence of these factors on the sputtering process is shown on instant photography discharge. At their favorable combination of the photographs clearly highlighted in yellow "bubbles" that are likely to represent a spherical formations, formed as a result of falling droplets of electrolyte in the discharge gap.

Based on the obtained experimental data, in the study assumes that the main cause of the high-frequency current pulsations in electric discharges in contact with liquid electrolytes, is the spraying of the electrolyte and the entry of droplets in the discharge region. As a result, abrupt thermal degradation of liquid droplets of electrolyte are released in a large number of ions, which leads to a local increase in concentration of charge carriers. Therefore, occur quick-variable fluctuations of the electric conductivity of the interelectrode space and formed current pulsations with different frequencies and amplitudes.

REFERENCES

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