EXPERIMENTAL STUDIES OF THE EFFECT OF ACOUSTIC OSCILLATIONS ON THE GLOW DISCHARGE STRUCTURE

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Nonequilibrium gas discharge plasma has a long history and has found applications in a wide range of fields in science and technology. One of the main tasks today is the development of methods for controlling the parameters of gas discharge plasma for various applications. The most effective and common is the hydrodynamic method of controlling plasma parameters.

In particular, the discharges in the longitudinal and transverse flows are the best studied. This served to create the basis of plasma coating technology and a number of principal devices (plasmatrons, powerful gas lasers, etc.). However, the method of controlling gas discharge parameters using nonlinear acoustic oscillations rather little has been studied. It is known that with intensive acoustic oscillations the role of nonlinear effects increases: acoustic streaming, uneven temperature field distribution, subharmonic oscillations [1, 2].

A number of experimental works were presented in a review article [3]. However, researchers limited themselves to relatively low discharge pressures and sound wave intensities. Recently, there has been a noticeable interest in studies of the influence of acoustic wave fields on high-pressure discharges. It is shown that the luminous part of discharge spreads wider due to the vibration of the gaseous medium [4]. It was shown in [5] that the application of an acoustic field on the corona discharge substantially extends the range of currents for which the discharge voltage remains more or less constant, i.e. it allows a substantial increase in the power delivered to the discharge.

This work presents an experimental study of the effect of nonlinear acoustic oscillations on the structure of a glow discharge (GD) in argon at pressures from 100 to 750 Torr. It is shown that acoustic oscillations propagating in along the longitudinal structure of a GD cause its spatial and temporal change. GD takes the form of a rotating spiral. At the same time, with increasing pressure, the effect of acoustic oscillations on the discharge increases. In some cases, there is a local curvature of the positive column in the center of the tube. In some cases, there is a local curvature of the positive column in the center of the tube. This may be related to the direction of acoustic streaming in this area [6].

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