STUDY OF THE HIGH-PRESSURE OPEN DISCHARGE*

P.A. BOKHAN[1], P.P. GUGIN[1], M.A. LAVRUKHIN[1], D.E. ZAKREVSKY[1,2]

[1]Rzhanov Institute of Semiconductor Physics SB RAS, Novosibirsk, Russia
[2]Novosibirsk State Technical University, Novosibirsk, Russia
e-mail: gugin@isp.nsc.ru

High-pressure discharges (up to atmospheric pressure of the working gas) with volumetric character of current flow are sources of nonequilibrium nonstationary plasma in high-energy gas-discharge devices.

The aim of the work was the investigation of the parameters of the "open" discharge at different pressures (up to atmospheric pressure) of the working gas - helium. The studies were carried out in a cuvette with a design similar to a planar kivotron with a drift space in the geometry: cathode - anode - drift space - anode - cathode), and operating in the mode of generation of counter propagating electron beams. Design dimensions of the cuvette: diameter of the working area of silicon carbide cathodes is 12 mm, distance cathode - grid anode - 3 mm, length of the drift space - 10 mm. The studies were carried out in a pulse train with a train frequency of 10 Hz with a filling frequency of pulses f = 95 kHz and voltage amplitude U = 2-35 kV with the duration of the voltage pulse edge $\tau \leq 2$ ns.

At gas pressure $p_{He} \approx 30$ Torr at U > 4-5 kV in the cathode-grid gap the discharge ignites and a homogeneous glow appears in the drift space, indicating the volumetric character of the discharge and propagation of the generated electron beam. When the pressure increases up to p = 1 atm the character of current flow does not change and remains volumetric. Typical oscillograms of the cell voltage and current through the cell at p = 100 (a) and 730 (b) Torr at f = 95kHz are shown in Fig. 1.c, and the dependence $j/p^2 = f(E/N)$ where j is the current density, E/N is the reduced electric field strength in a wide range of helium pressures p_{He} = 27-756 Torr and demonstrating the invariance of discharge parameters with pressure variation.

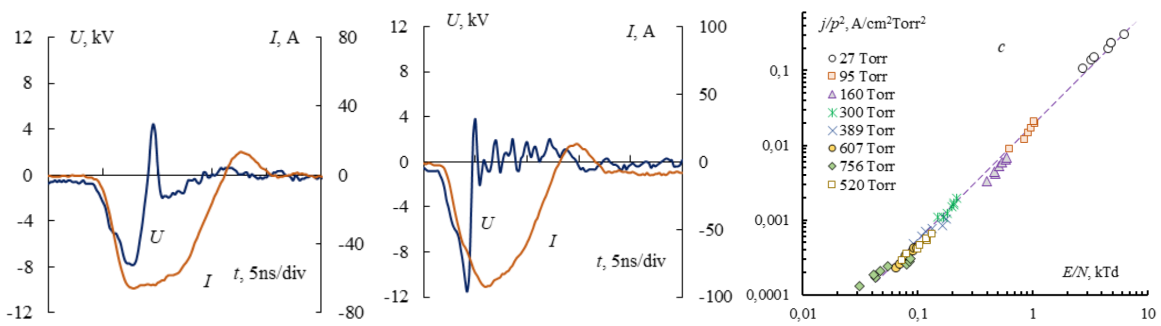

Fig.1. a,b - oscillograms of U, I at p = 100(a) and 730(b) Torr; c - dependences of j/p2(E/N) for different helium pressures..

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