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MODEL OF THE PLASMA EXTENSION IN THE TRIGGER UNIT OF THE COLD-CATHODE THYRATRON BASED ON FLASHOVER*

N.V. LANDL, N.S. SEMENIUK, Y.D. KOROLEV, O.B. FRANTS, A.V. KOZYREV, G.A. ARGUNOV

Institute of High Current Electronics SB RAS, Tomsk, Russia

Currently, high-current switching devices based on low-pressure hollow-cathode pulsed discharge (so-called pseudospark switches) are widely used [1-4]. The design and principle of operation of these switches are close to those of a classical hot-cathode hydrogen thyratrons. As in the case of classical thyratrons, a range of operating pressures of the switch corresponds to the left branch of Paschen's curve. For both self-breakdown of the main gap of the thyratron and for external discharge triggering a considerable pre-breakdown electron current is required [1, 3, 5]. For the case of external triggering, this current is provided due to a special trigger unit that is placed in the main cathode cavity. One type of trigger units is based a discharge over a dielectric or semiconductor surface or, in other words, based on a flashover [3, 4].

Any trigger unit is intended for plasma generation of trigger discharge inside the thyratron cathode cavity at a curtain instant of time. When a trigger unit based on discharge formation over the dielectric surface is used, trigger discharge plasma is generated due to the interception of surface discharge current to the main cathode cavity. The delay time of current interception depends on a plasma extension velocity from the cathode spot to the hollow-cathode surface.

In this report we used origin theoretical model to describe the plasma extension and compare obtained results with the experiment. We used one-dimensional kinetic simulation of electron and ion transport and multiplication (based on the Boltzmann kinetic equations) in a self-consistent electric field after electron injection from the cathode surface. The 1D1V Boltzmann equations take into account the electron impact ionization, elastic electron scattering, and resonant ion recharging [6].

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