Modeling of ionization waves in pure argon at atmospheric pressure

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Non-equilibrium low-temperature plasma is been an object of detailed research for a long time, due to a wide variety of applications in various fields. One of the ways to obtain such plasma is the ignition of nanosecond discharges in gases at atmospheric pressure. The initial stage of such discharges is characterized by the development of ionization waves (streamers). In this regard, the study of the space-time characteristics of nanosecond discharges at high pressures is an important task. Despite the progress in the field of experimental research, it is still a difficult task to obtain the dynamic characteristics of the plasma during formation of nanosecond discharges with high resolution in space and time. In this respect, a great attention is attracted to numerical modeling of streamer dynamics. Note that most of computations in this field have been performed for streamers in air and some other molecular gases propagating in cold plasma jets. Less attention has been paid to the study of the development of streamers in pure inert gases. Though the development of nanosecond discharges in argon has been studied in a number of experimental and computational works, some details of streamer propagation are still unclear.

In this work, the dynamics of streamers (positive and negative) in pure atmospheric-pressure argon in a plane-parallel gap is considered. In the framework of two-dimensional streamer model, the parameters of produced plasma during streamer formation in the middle of the gap and propagation to the both electrodes are obtained.

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