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ЧИСЛЕННОЕ МОДЕЛИРОВАНИЕ ДИЭЛЕКТРИЧЕСКОГО БАРЬЕРНОГО РАЗРЯДА В ВОЗДУХЕ
NUMERICAL SIMULATION OF DIELECTRIC BARRIER DISCHARGE IN AIR

The aim of this work is to develop a new numerical-analytical model for the qualitative and quantitative simulation of dielectric barrier discharge processes in operation of the plasma actuator. This model includes a description of nonstationary electrodynamic processes, kinetic phenomena and plasma chemical reactions. A uniform implicit numerical algorithm for an efficient solution of the inhomogeneous system of the initial equations was realized. The main feature of the developed numerical-analytical model is the use of a rational number of equations for the description of all the main nonstationary parameters of the dielectric barrier discharge in air. The generation and development of the streamer for a real configuration of the plasma actuators were obtained on the basis of this model. The developed model of the dielectric barrier discharge is designed for an adequate simulation of the Lorentz force acting on the turbulent flow of partially ionized air in a wide range of amplitudes and frequencies of the applied voltage as well as parameters and properties of the dielectric surface.

Keywords: plasma dynamics, plasma actuator, dielectric barrier discharge, chemical kinetics, numerical simulation, streamer.

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