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Modeling of a short (without positive column) glow discharge with active boundaries[1] ANATOLY KUDRYAVTSEV, KONSTANTIN BARZILOVICH, EUGENE BOGDANOV, St.Petersburg State University, VLADIMIR KOLOBOV, CFD Research Corporation, Huntsville, USA — As boundaries are very important in formation of nonlocal plasma properties, in this study a short dc discharge with cold cathode and application of different voltages to the conducting discharge wall has been simulated. The discharge model is based on a fluid description of ions and neutral species using drift-diffusion approximation for the particle flux. The description of electrons is based on a "hybrid" approach with subdivision for trapped and free (fast) electrons. Slow electron transport coefficients as well as electron induced reaction rates are determined from the solutions of the electron Boltzmann equation. The self-consistent electric field is calculated using the Poisson equation. 2D simulations for helium plasma at 1 Torr pressure confirm that the short glow discharge consists of cathode and anode sheaths of space charges, a cathode plasma negative glow, and a Faraday dark space. The plasma region characterized by low electron temperature and weak reversed electric field. It is demonstrated in the model that applied voltage can trap within the device volume energetic electrons arising from atomic and molecular processes in the plasma. It allows measurement of the fast part of the EDF by application of measuring wall electrode.

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