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Hybrid modelling of a DC glow discharge with an analytical ionization source term of fast electrons[1] ANATOLY KUDRYAVTSEV, EUGENE BOGDANOV, St. Petersburg State University, ISMAIL RAFATOV, Middle East Technical University, Ankara, Turkey — In any type of existing fluid model ("simple", "extended" and so on) the electron ensemble is considered as a whole and is characterized by the averaged parameters, namely, the averaged density, averaged energy (temperature), and averaged directional drift velocity. However, in reality the EDF in the near-cathode region is nonlocal, such that the different electron groups (especially the fast electrons emerged from the cathode layer) behave differently and separate from each others. Accordingly, they cannot be described by averaged parameters and kinetic analysis is needed. We developed and tested a simple hybrid model for a glow discharge, which incorporates nonlocal ionization by fast electrons into the fluid framework, and thereby overcomes the fundamental shortcomings of the fluid model. At the same time, proposed model is computationally much more efficient compared to the models involving Monte Carlo simulations. Calculations have been performed for an argon gas. Comparison with the experimental data as well as with the hybrid (particle) and fluid modelling results demonstated good applicability of the proposed model.

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Anatoly Kudryavtsev
St. Petersburg State University

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