Finite Volume Methods for Numerical Simulation of the Discharge Motion Described by Different Physical Models

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Abstract

The model for discharge simulation consists of the set of transport equations for charged particles coupled with the elliptic equations for electric field. Values of unknowns change by many orders of magnitude during discharge propagation resulting in very steep gradients of particle density at the head of discharge. The head of discharge is a very small moving region, therefore the dynamic grid adaptation is an essential tool, which makes a numerical simulation of such phenomenon possible. The finite volume method [1] originally developed for the simplest model of discharge propagation (the so called 2D minimal model) has been extended using more general and physically more relevant models. The photoionization phenomenon (modeled by the six additional PDE's) and complex "physical" boundary conditions for charged particles are now considered on the electrodes. We present results of numerical simulation of more complex problems from the point of view of discharge structure, like interaction of discharge with conductive electrode. We also present the comparison of different modifications of numerical algorithm.

References

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