NUMERICAL SIMULATION OF THE DEVELOPMENT OF ELECTRON AND ION AVALANCHES IN SF_6: INFLUENCE OF ELECTRON DETACHMENT AND NEGATIVE-ION CONVERSION

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A 1D hydrodynamic model has been used to simulate numerically the electron and ion avalanches in SF_6 [1] . For this purpose, a numerical code has been developed with the capability to calculate the spatio–temporal development of the discharge current in the Townsend regime has been developed. This is accomplished by solving the continuity equations for electrons, positive, and negative ions drifting in a parallel-plate discharge gap that produces an homogeneous electric field. The processes involved in the model are ionization, electron attachment, electron and ion drift and diffusion, ion-molecule reactions and electron detachment. The total, measurable current in the external circuit can then be compared with the simulation and hence derive swarm coefficients. Boundary and initial conditions are set adequately.

The aim of this work is to present results of the use of the 1D simulator for the special case of sulphur hexafluoride (SF_6), taking into account a fairly complex reaction scheme involving electrons, three different negative ion and one positive ion species, respectively. Using all available data in the literature, our results indicate that electron detachment plays a relatively minor role, since negative-ion molecule reactions are predominant. Predictions of the model will soon be compared with an experiment which is underway.

1. J. de Urquijo, A.M. Juarez, J. C. Rodríguez-Luna, and J. S. Ramos-Salas, " A Numerical Simulation Code for Electronic and Ionic Transients From a Time-Resolved Pulsed Townsend Experiment", IEEE Transactions on Plasma Science, Vol.35, No.5, pp. 1204-1209.

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