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CALCULATION OF ELECTRON TRANSPORT DATA IN NOBLE GASES

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The electron diffusion and drift in gases have been studied in sufficient detail (see, e.g., book [1]). However, in most studies on dusty plasma it is assumed that electrons in the gas discharge are characterized by the Maxwellian distribution with a temperature determined experimentally. It is well known that the electron energy distribution function in DC gas discharge at a reduced pressure differs significantly from the Maxwellian distribution. The differences are especially large in the energy range several times higher than the mean electron energy (temperature).

The features of the energy distribution function of electrons drifting in a monatomic gas are analyzed. The case of electron drift in *He*, *Ne*, *Ar*, *Kr* and *X*e is considered. The results of calculation of the energy balance of electrons and drift characteristics in an electric field at strengths of $0.1 < E/N < 1000$ Td taking into account inelastic collisions are presented.

We consider the model of electron-atom collisions [2, 3], which makes it possible to properly consider the energy balance of electrons, including of inelastic collisions. Based on a numerical experiment, characteristics of electron velocity distribution function and energy characteristics of electron drift in the dc electric field were tabulated. The drift velocities, average electron energies, characteristic Townsend energies, average electron energies resulting in atom excitation and ionization events, the ratio of elastic and inelastic energy loss, and the ionization Townsend coefficient were calculated. Moreover, electron diffusion along and across the electric field was considered and the dependence of diffusivities on the diffusion time was obtained. The presented data can be used to analyze experiments with dusty plasma.

Reference

[1] L.G.H. Huxley and R.W. Crompton 1974 *The Diffusion and Drift of Electrons in Gases* (New York: Wiley).
[2] S.A. Maiorov 2009 *Bulletin of P.N. Lebedev Physical Institute* **36** 120
[3] S.A. Maiorov 2009 *Plasma. Phys. Rep.* **35** 802