PACS: 51.50.+v

# On the characteristics of electron diffusion and drift in inert gases

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*Received 15.04.2024; revised 24.04.2024; accepted 27.04.2024*

***The problem of calculating kinetic characteristics during electron drift in inert gases in a wide range of values of the reduced electric field strength: 0.001 Td < E/N < 10000 Td is considered. For the case of a weak field E/N<0.01 Td, there is little reference data, and the drift velocity, average energy, longitudinal and transverse diffusion coefficients and ionization coefficient for the cases of a weak field and a moderately strong field E/N<100 Td were calculated using the method of dynamics of many particles involving collisions in accordance with the Monte Carlo procedure. For the cases of strong and superstrong fields 100 Td < E/N < 10000 Td, the results of calculations for two models of electron departure from the system were considered and analyzed for the first time: 1) avalanche model with multiplication; 2) a model with the most energetic electron in the system leaving the wall during the act of ionization or transition to the escape mode. Taking into account the appearance of new electrons in the system during ionization events under stationary current conditions made it possible to include in the consideration the departure of electrons from the system to the wall with the determination of its potential and, by analogy with the ionization coefficient, to introduce the definition of the electron runaway coefficient. For these two models, tabulated values of the electron runaway coefficient were obtained. An analysis and comparison of the calculation results with the table data was carried out. In addition, we present analytical approximations of the elastic and inelastic cross sections of electron-atom collisions depending on the collision energy that we obtained based on an analysis of the available theoretical and experimental data. They have physically reasonable asymptotics and can be recommended by us for widespread use.***

*Keywords:* diffusion, mobility, distribution function, Monte Carlo method, elastic collisions, ionization, collision cross sections, analytical approximation, inert gases

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