CHARACTERISTICS OF ELECTRON DRIFT IN IRON, COPPER AND MIXTURES

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Diffusion and drift of electrons in gases have been studied in sufficient detail in many papers (see, for example, [1, 2]). In [3, 4], the drift characteristics of the electron in inert gases were tabulated, as well as in gas mixtures. As a rule, in the gases considered, the excitation energy of the electronic states is not much lower than the ionization energy, and the ionization cross sections in the peak exceed the excitation cross sections.

It is of interest to consider the transfer of electrons in metal vapors in which the excitation energy of the lower levels is much lower than the ionization energy, and the excitation cross section exceeds the ionization cross section in the peak. Interest in the characteristics of the drift of electrons in metal vapors is due to the fact that, although small concentrations, they are always present in the gas discharge plasma because of the sputtering of the cathode during ion bombardment.

In this paper we consider the drift of electrons in iron, copper, and mercury vapor. The computational experiment is based on the consideration of an ensemble of noninteracting electrons, the motion of which is determined by given fields and instantaneous collisions with atoms [3, 4]. The electron drift characteristics for the values of the reduced electric field strength in the range E / N = 0.001 - 1000 Td are calculated and analyzed.

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| Fig.1 | Fig.2 | Fig.3 |

In Fig. 1 shows the dependence of the drift velocity of electrons on the reduced electric field strength in iron, copper and mercury vapor, and Fig. 2 and Fig. 3 - the dependence of the reduced Townsend ionization coefficient and electron runaway, which is determined similarly to the Townsend coefficient, i.e. as the number of acts of runaway of the electron as it passes 1 cm of the path. The characteristics of the energy efficiency of the discharge, the Stoletov constants, and the energy introduced for the ionization and runaway electron act are also calculated. A computational model and an algorithm allowing to determine all its characteristics in the stationary drift regime in the presence of acts of ionization and runaway electrons.

References

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