CHARACTERISTICS OF ELECTRONS DRIFT IN ARGON AND MERCURY VAPOR

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It is known that the presence of metal vapor in noble gase can greatly affect on ion [1] and electrons [2] drift caracteristics, which in turn may lead to a drastic change in the gas discharge. Below are graphs of the drift velocity as functions of the reduced electric field strength at various concentrations of mercury in argon, pure argon and in mercury vapor. The other graph shows a similar dependence of Townsend ionization coefficient - number of ionization events per 1 cm of drift in unit of gas density (for details of simulation method and some of the results see [2]).





These graphs show that the mercury vapors have small effect on the drift velocity, but completely change the ion composition of the plasma. Since mercury concentrations of about 1%, only mercury ions will be presented in the discharge, and argon ions will be absent. The calculation results suggest even a small fraction of metal atoms in the inert gas can influence the discharge due to changes in ionic composition.

We can expect that the appearance of the metal vapor of cathode sputtering in a gas discharge, pollution of the upper atmosphere of combustion products meteorites may have a strong influence on the kinetics of electrons.

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References

1. S.A. Maiorov, Plasma Physics Reports , 35, 869(2009).
2. S.A. Maiorov, Bulletin of the Lebedev Physics Institute, Vol. 36, No. 10, 299(2009); Vol. 39, No. 2, 51(2012); Vol. 41, No. 10, 285(2014).