NUMERICAL SIMULATION OF molecular hydrogen IONIZATION AND DISSOCIATION IN PENNING DISCHARGE

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Chemical composition of weakly ionized penning discharge plasma is defined by the processes of energy acquisition by electrons and ions in crossed electric and magnetic fields and by inelastic collisions of particles such as ionization by electron impact, excitation of vibrational and electronic levels, molecular dissociation. Rate coefficients for these processes are defined by electron-molecular and electron-atom scattering cross-sections and by the characteristic energy gained by the electrons in electromagnetic field [1, 2]. In this paper the composition of penning discharge plasma in a wide range of electron temperature is calculated.

Penning discharge at pressures Torr [3-5] is considered. A potential difference, applied between the cathode and anode, is equal to . At these conditions the discharge current is equal to , and the ionization degree is equal to .

A system of kinetic equations is solved to calculate concentrations of molecular and atomic ions. Rate coefficients are calculated by convolving the electron energy distribution function and the scattering cross-sections. With the used model concentrations of molecular and atomic hydrogen ions, ionization and dissociation degree are calculated. The influence of the electron temperature and the shape of the electron energy spectrum on the chemical composition is shown.

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