

Abstract Submitted
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Particle in Cell/Monte Carlo Collision Analysis of the Problem of Identification of Impurities in Gas within the Plasma Electron Spectroscopy Method CEMRE KUSOGLU SARIKAYA, ISMAIL RAFATOV, Middle East Technical University, ANATOLY KUDRYAVTSEV, Saint Petersburg State University — Particle in Cell/Monte Carlo Collision (PIC/MCC) analysis of the problem of identification of impurities in gas within the Plasma Electron Spectroscopy (PLES) method is carried out. The idea of the PLES is based on the analysis of the effect on the EEDF due to electrons, released in the Penning reactions between the metastable atoms of working gas and impurity. $1d3v$ PIC/MCC numerical code is developed and verified under the conditions of RF capacitively coupled discharge in helium. The efficiency of the code was increased by its parallelization using Open MPI. Test calculations showed that the efficiency of the code increases about 70 times with increase of the number of cores up to 95. Simulations have been done for DC glow discharge in helium doped by the small amount of argon. The elastic, excitation and ionization collisions between electron-neutral pairs and isotropic scattering and charge exchange collisions between ion-neutral pairs and Penning ionizations are taken into account. PIC/MCC numerical model is incorporated with equations for density of the metastable helium atoms in the fluid approximation. Numerical results are consistent well with the theoretical analysis of formation of nonlocal EEDF and existing experimental data.

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