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Kinetic Analysis of High Pressure DC Microplasmas via a One-dimensional PIC-MCC Simulation HYONU CHANG, National Fusion Research Institute, CHANG-MO RYU, Pohang University of Science and Technology, Physics, SUK JAE YOO, National Fusion Research Institute — Characteristics of dc high pressure argon microplasmas are studied by using a one-dimensional particle-in-cell and Monte Carlo collision simulation. The accelerated electrons inside the cathode fall region rapidly lose their kinetic energy near the cathode due to a high collision rate, and forming a highly non-uniform electron distribution in the positive column. This non-uniformity creates a difference between the electron diffusion current density and drift current density in the negative glow and positive column. An electric field is built to sustain continuity of the total current density. This retards the electron diffusion current in the region where the electron density gradient is large and induces an electron drift current in the region where electron density gradient is small. When the electrode gap is very small for electrons to diffuse in the entire volume of discharge, only one field reversal is shown in the negative glow. The discharge at atmospheric pressure has a shorter length of the cathode fall, a more biased electron distribution to the cathode, and a stronger negative electric field between the second and third field reversals due to an increased collision rate compared with that at 300 Torr.

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