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Propagation of an Ionization Front of Hydrogen Plasma Driven by Pulsed High Voltage under High Pressure CHIEH-WEN LO, Department of Physics, National Cheng Kung University, SATOSHI HAMAGUCHI, Center for Atomic and Molecular Technologies, Osaka University — Plasmas generated at or near atmospheric pressure with low gas temperature have a variety of industrial applications. A typical method to generate such high-pressure non-thermal plasmas is to apply nanosecond-scale pulsed voltage. The goal of this study is to understand the fundamental physics and formation mechanism of such plasmas, using numerical simulations. In this study, we have employed 1d2v particle-in-cell (PIC) simulations with Monte Carlo (MC) collisions to study nanosecond parallel plate hydrogen discharges near atmospheric pressure, especially focusing on the ionization wave propagation in the discharge formation phase. Recently the dynamics of such discharges has been studied in detail experimentally and our simulation results have reproduced the experimental observations with reasonable accuracy. The simulations have also revealed that, despite the high collisionality, electrons in the cathode region transiently exhibit strongly non-Maxwellian energy distributions. Since the majority of ionization of this system occurs in this region, kinetic treatment is likely to be essential in accurate analysis of such systems.

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