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Hybrid Simulation of Supersonic Flow of Weakly Ionized Plasma along Open Field Magnetic Line Effect of Background Pressure AMPAN LAOSUNTHARA, HIROSHI AKATSUKA, Tokyo institute of technology — In previous study, we experimentally examined physical properties of supersonic flow of weakly ionized expanding arc-jet plasma through an open magnetic field line ($B_{\max}$˜0.16T). We found supersonic velocity of helium plasma up to Mach ˜3 and the space potential drop at the end of the magnets. To understand the plasma in numerical point of view, the flows of ion and neutral are treated by particle-based Direct Simulation Monte Carlo (DSMC) method, electron is treated as a fluid. The previous numerical study, we assumed 2 conditions. Ion and electron temperatures were the same (LTE condition). Ion and electron velocities were the same (current-free condition). We found that ion velocity decreased by collision with residual gas molecules (background pressure). We also found that space potential changing with background pressure. In other words, it was indicated that electric field exists and the current-free assumption is not proper. In this study, we add electron continuity and electron momentum equations to obtain electron velocity and space potential. We find that space potential changing with background pressure slightly. It is indicated that electron is essential to space potential formation than ion.

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