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Two-dimensional particle-in-cell simulation of a Hall thruster for the investigation of the secondary-electron effect IN CHEOL SONG, HYO-WON BAE, Pusan Natl Univ, Korea, WON HO CHOE, KAIST, Korea, JONGHO SEON, Kyunghee Univ, Korea, HAE JUNE LEE, Pusan Natl Univ, Korea — Several studies have focused on the instability of sheath plasma caused by secondary electron emissions (SEEs) from dielectric material [D. Sydorenko *et al.* Phys. Rev. Lett. **103** 145004 (2009)], but these 1D model considers only the magnetic field transverse to the wall. To observe the sheath plasma instability in a Hall thruster, a 2D axisymmetric particle-in-cell code is used in this study. SEE from the wall and electron collisions are treated with a Monte Carlo method. Magnetic mirror motion is observed for the electrons in the acceleration channel, and the electron oscillation between dielectric walls is also closely related to SEE. The sheath plasma instability is triggered when the number of SEE per incident electrons to the wall exceeds a critical value. The secondary electrons injected from the wall move toward the bulk region, and collide with neutral particles or reach opposite side wall. This process continues until the trapped electrons make electron-rich sheath and reduce the potential difference from the wall to the center. After the electron-rich sheath is formed, both average electron kinetic energy and SEE decrease, and the instability is turned off. This phenomenon is shown periodically, and is related to the oscillation observed in a Hall thruster experiment.

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