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Self consistent kinetic simulations of SPT and HEMP thrusters including the near-field plume region RALF SCHNEIDER, KONSTANTIN MATYASH, ANDREAS MUTZKE, OLEKSANDR KALENTEV, Max-Planck Institute for Plasmaphysics, FRANCESCO TACCOGNA, IMIP-CNR Bari, NORBERT KOCH, MARTIN SCHIRRA, THALES Electron Devices GmbH, Ulm, Germany —
SPT (Stationary Plasma Thruster) and HEMP (High Efficiency Multistage Plasma) thrusters are both relying on the creation of propulsive ion beams by ionization of propellant atoms. The specific shape of the magnetic fields in both concepts is used to optimize efficiency and ion acceleration. 2d3v-PIC-MCC calculations are used to compare the two different thruster concepts. They result in quite different plasma-wall interaction characteristics. The SPT thruster relies on the strong secondary electron emission from the dielectric walls of the thruster channel, which causes a large ion flux over the whole channel surface and consequently high erosion rate. In contrast, in the HEMP thruster the plasma contact to the wall is limited only to very small areas of the magnetic field cusps, which results in much smaller ion flux to the thruster channel surface as compared to SPT. Consequently, experimental studies of HEMP gave no evidence of erosion. In order to study the wall erosion for both thrusters, the binary collision approximation (BCA) based Monte-Carlo code SDTrimSP is applied.

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