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Particle-in-cell simulation of plasma-wall interaction in presence of a strong secondary electron emission DMYTRO SYDORENKO, ANDREI SMOLYAKOV, University of Saskatchewan, IGOR KAGANOVICH, YEVGENY RAITSES, Princeton Plasma Physics Laboratory — In presence of a strong secondary electron emission (SEE), the electron flux to the wall may greatly increase compared with the case without SEE. This leads to much greater heat loss from the plasma. To study this effect, a 1d3v particle-in-cell code has been developed. The plasma is bounded by two dielectric walls with SEE, the stationary electric field parallel to the walls and magnetic field normal to the walls are applied. Similar configuration can be found, e.g., in the channel of a Hall thruster. The results of simulations with typical thruster plasma parameters show that many conventional assumptions of fluid theories fail: 1) the electron velocity distribution is strongly anisotropic, instead of generally assumed isotropic; 2) secondary electrons from opposite walls form beams well separated from the main part of distribution function in phase space; 3) these beams produce a two-stream instability, which affects their penetration through the plasma; 4) the SEE coefficient due to the plasma bulk electrons can exceed unity without formation of the double layer, because averaged over bulk and secondary electrons SEE coefficient is less than unity; 5) the SEE-induced near wall conductivity across the magnetic field dominates over the collisional conductivity if the external electric field is strong enough.

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