PLASMA-WALL INTERACTION IN PRESENCE OF INTENSE ELECTRON EMISSION FROM WALLS

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The plasma-surface interaction in the presence of strong thermionic or secondary electron emission has been studied theoretically and experimentally both as a basic phenomenon and in relation to numerous plasma applications such as, for example, cathodes, emissive probes, divertor plasma, surface discharges, dusty plasmas, plasma thrusters and plasma processing. In a typical low-pressure gas discharge, the electron mean-free-path is large compared with the characteristic size of the discharge, and therefore, the electron motion is almost collisionless. The absorption of energy may occur in a nonlocal manner, independently for different groups of electrons, and as a result, the EVDF may deviate from Maxwellian that may substantially alter the sensitivity of the collisionless plasma to the electron emission. Recent kinetic studies of a collisionless plasma slab bounded by dielectric walls with secondary electron emission (SEE) predicted a strongly anisotropic, non-monotonic EVDF, which is depleted in the loss cone, subsequently reducing the electron wall losses compared to Maxwellian plasmas [1].

The investigations carried out have included:
- investigation of accuracy of several techniques to measure the plasma potential with emitting probes [2],
- study of methods for control of plasma parameters of dc discharge with hot cathode and a biased diaphragm,
- study of sheath instabilities in presence of secondary electron emission,
- study of collective instabilities of electron beams emitted from the walls and interacting with plasma.


* Work supported by US Department of Energy