

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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EFFECTS OF SECONDARY ELECTRON EMISSION ON THE SHEATH OF STATIONARY PLASMA
THRUSTER NEAR THE ACCELERATION CHANNEL

Abstract

With the vigorous development of the space industry, and the rise of navigation technology such as large capacity, long lifetime communication satellites, deep-space exploration, interstellar travel etc, scientists all over the world are studying new generation space electric propulsion devices. The stationary plasma thruster (abbreviation SPT) –relative to the chemical thruster has become the various countries' research hotspot attributed to the high specific impulse, small thrust, long lifetime and high control accuracy etc. When the SPT works, the acceleration channel is full of high-density plasma. Plasma contains ions and high energy electrons etc. When plasma meets the wall of acceleration channel, sheath forms between the wall and plasma. Ions could reach the surface of the channel under the sheath electric field, and they would be compounded at the surface, while electrons in the plasma could reach the surface of the channel due to its high energy. Under the circumstances, the secondary electron emission effects appear. Secondary electrons would move towards the plasma source region because of the sheath electric field. And it can lead to the variation of the plasma sheath characteristics. This paper forms the one-dimensional collisionless fluid model considering the secondary electron emission effects. Calculations show us the effects of secondary electron emission on the sheath potential, electric field and the charged particles density. Furthermore, we got the sheath potential and thickness with secondary electron emission coefficient.