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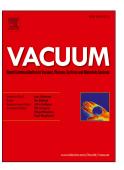
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Effect of Relative Position between Cathode and Magnetic

Separatrix on the Discharge Characteristic of Hall Thrusters

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Abstract

In this paper, a new "convex" external magnetic pole structure is proposed. With

this structure, two different configurations of the cathode inside and outside the

magnetic separatrix can be realized by changing the position of the magnetic

separatrix instead of changing the position of the cathode in the radial direction.

Furthermore, the discharge plume, coupling voltage, and performance of the thruster

under different configuration conditions are studied experimentally. The experimental

results indicate that, when the cathode is located inside the magnetic separatrix, the

effective acceleration voltage is higher, the coupling voltage between the cathode and

the thruster is lower, and the thruster performance (including thrust, specific impulse,

and efficiency) is higher. When the cathode is located outside the magnetic separatrix,

the effective acceleration voltage is lower, the coupling voltage between the cathode

and the thruster is higher, and the thruster performance is degraded. When the cathode

is located inside the magnetic separatrix, the thrust and specific impulse can be

increased up to 2.3%, and the efficiency—up to 4.6%. This study provides a new

method for the design of the magnetic separatrix and is of great importance for the

coupling-matching design of the cathode and thruster.

Keywords: Hall thruster; Magnetic separatrix; Cathode coupling

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