

SPACE PROPULSION SYMPOSIUM (C4)  
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EXPERIMENTAL STUDY ON THE CURRENT-SHEET EVOLUTION FOR A PULSED INDUCTIVE  
THRUSTER

**Abstract**

The pulsed inductive thruster (PIT) is a promising space-propulsion method of long working life, better propellant compatibility and the accessibility to high-power mode, because of its electrodeless feature. The electric energy stored in a capacitor is inductively transferred to the kinetic energy of a current sheet in PIT. In order to improve the thruster performance, it is necessary to sufficiently understand the developing of the current sheet and the corresponding energy transfer process. Therefore, a plane inductive drive coil and the discharge system are designed and set up, and a bright and notable circular current-sheet is observed using Argon as propellant. By an ultra high speed camera, the whole evolutionary process of the current-sheet is recorded, which is typically about 10 microseconds. The image sequences are compared by the current and voltage curves of the discharge circuit, and then the details of the energy transfer process are analyzed. The results indicate that the breakdown in a PIT occurs in the very initial time of the discharge period and after that, a current-sheet is formed and accelerated. The plasma current keeps growing during the rising phase of the coil current, and lasts till the coil current reverses, while the acceleration are mainly accomplished in the first 1/4 period. Accordingly, suggestions are given for a better design of the discharge system in the next work.