

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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INFLUENCE OF STRUCTURAL FACTORS ON PROCESSES IN THE LOW POWER HOLLOW
THRUSTER

Abstract

Recently in many countries interest to design, launch and use of small satellites grows. High effective engines with small thrust are necessary for such satellites. Propulsion engine unit for small satellites can be realized on the basis of electric propulsion thrusters. One of the most perspective types of thrusters with small thrust is Hollow Thruster. The modern publications devoted to working out of hollow thrusters with small power consumption, show possibility of obtaining of efficiency at level of 20 - 25 % at power consumption 100 W. Such parameters of the thruster are insufficient for effective application onboard the small satellites. For increase of thruster efficiency it's necessary to carry out some investigation oriented on perfection of a structure of the engine and optimization of working processes. Theoretical investigation have shown, that the most simple and effective methods of maintenance of necessary efficiency at small power consumption are: change of geometry of the accelerating channel, reduction of speed of atoms, reduction of power losses in magnetic system, change of conductivity of the channel walls. The laboratory model has been designed for carrying out of experimental investigation of hollow thruster in which for the purpose of reduction of shunting of a magnetic field the truncated magnetic screen was used. It has allowed reducing the power consumed by the coil of electromagnet. Thus depth of the accelerating channel was sufficient for effective ionization of a working substance. For the purpose of definition of influence of conductivity of acceleration channel walls in the field of a forward cut on efficiency of the small power thruster its structure allowed to use various polar tips: conductor - from graphite and dielectric - from aluminum nitride. Experimental researches have shown, that at input power range (40 - 160 W) at use of conductor tips the power price of thrust decreases on the average on 15%. The received results can be used by working out and development of perspective electric propulsion thrusters for small satellites.