

Plasma Temperature Influence on the Propellant Erosion Rate in an Ablative Pulsed Plasma Thruster

Egoshin D A[®], Fedorova D K, Podlosinskaya A P and Telekh V D

Bauman Moscow State Technical University, 2nd Baumanskaya Street 5, Moscow 105005, Russia

® egoshin_da@mail.ru

The growing popularity of small spacecrafts, including CubeSats, makes it urgent to develop electric propulsion systems operating at low power consumption [1, 2]. A promising version of such system is an ablativ pulsed plasma thruster (APPT). A feature of the APPT working process is the consistency of the mass entry rate into the accelerating channel with the energy density arriving at the polymer surface. In this paper, a model is proposed for estimating the propellant ablation rate in APPT. The heat flux arriving at the polymer surface was calculated as a result of plasma radiation in the approximation of its optical density. Estimated by solving the Stefan problem [3], the movement rate of the polymer interface between the solid and amorphous phases was taken as the propellant ablation rate, corrected to the material specific heat of evaporation. Obtained results are consistent with the experimental data presented in the works [1, 4]. The study have been performed at large-scale research facilities "Beam-M" of Bauman Moscow State Technical University.

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