

SPACE PROPULSION SYMPOSIUM (C4)  
Interactive Presentations (IP)

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NUMERICAL RESEARCH ON ABLATION OF PTFE/AL PROPELLANT USING CONTINUOUS  
LASER BEAM**Abstract**

The PTFE/Al material is a new kind of energetic material. Because of the advantages of optical absorption and chemical stability, the PTFE/Al material is more suitable for being the propellant of space laser-electromagnetic hybrid thruster than pure PTFE material. In order to reveal the ablation characteristics of PTFE/Al propellant, a two-dimensional axisymmetric two-phase model was developed. This model considered the effects of energy distribution of laser, reflectivity and internal absorption of the propellant. By coupling this model with plasma flow and heat analysis the ablation process of PTFE/Al propellant was investigated numerically. The results show that the variety of amorphous layer in ablation process has deeply effect on the whole ablation process. The depth of amorphous layer is thicker at the beginning of ablation process. Then with the ablation processing, the depth of amorphous layer decreases. When reaching steady ablation state, the depth of amorphous layer keeping invariant. The depth of amorphous layer decreases with increasing laser intensity and the coefficient of internal absorption. The depth of amorphous layer increases with increasing reflection coefficient. The factors that affecting the ablation process suching as laser parameters and physical properties of PTFE/Al propellant was numerically investigated, and the guidance for choosing or improving the propellant was provided.