Paper ID: 83799
interactive
student

IAF SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM (IP)

Author: Mr. Yuqing Tang
Nanjing University of Science and Technology, China

Mr. Hanyu Deng
Nanjing University of Science and Technology, China
Mr. Wenhe Liao
Nanjing University of Science and Technology, China
Mr. Wenjun Hu
China
Mr. Peizhe Gao
Nanjing University of Science and Technology, China
Mr. Zhandong Wang
Nanjing University of Science and Technology, China

# RESEARCH ON CHARGE INTEGRITY SIMULATION OF BRUSH CHARGE ASYMMETRIC IGNITION OF SMALL SOLID THRUSTER

**Abstract**

In order to study the impact of gas impact on the integrity of the thruster charge and the reliability of ignition during the ignition process of the brush-type tubular charge structure of a small solid thruster, this article uses ANSYS finite element calculation software based on modified aluminum-lead propellant. The constitutive model carried out gas impact simulations with different ignition charges (1-5g) and different ignition delay times (0-5ms), and analyzed the stress of the ignition gas on the surface of the propellant grain column and the impact on the end cap blasting. The pressure distribution cloud diagram inside the thruster was established, and the dangerous locations and causes were analyzed. The results show that: during the ignition process of the brush-type charge structure, the maximum stress position of the grain column is located at the junction of the grain column and the solid glue; the influence of the ignition gas on the brush-type charge structure varies due to the different position distribution of the grain column. The position directly impacted by the gas has high stress and is located at the lateral position of the ignition gas junction. Reducing the amount of ignition powder can reduce the maximum stress on the surface of the grain column, but it will reduce the ignition burst pressure of the thruster, making it difficult to break out of the end cover, which is not conducive to thrust. The ignition reliability of the thruster; when there is an ignition delay in the igniters on both sides, the stress on the surface of the grain column will drop significantly, and there will be a lag in reaching the stress peak, and the ignition blasting pressure of the thruster will drop.