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Abstract #XXX *(to be filled by the organizers)*
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Title

Design, fabrication and characterization of electrically controlled solid microthruster

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Abstract

Micro-nano satellite has the characteristics of functional specificity, small size, and short research cycle and has been widely used in military and aerospace fields. Its attitude control and orbit transfer require precise thrust and impulse provided by the micro propulsion system. By applying/removing voltage and changing the voltage, the electronically controlled solid propulsion technology can realize multiple ignition and extinguishment and thrust adjustment of the microthruster, providing an intelligent power source for micro/nano satellites. Based on the electrically controlled solid propellant (ECSP). In the current research, the basic formula composed of oxidizer, adhesive, crosslinking agent, and other functional additives was determined, and the laboratory preparation process of the propellant was proposed. The electrically controlled solid microthruster was designed and assembled, and the combustion test system of the microthruster was built. The ignition delay time, energy required for ignition, mass loss, extinguishment delay time and thrust were taken as the performance indicators of the microthruster, and the influences of Al content, electrode material and initial temperature on the microthruster under different loading voltages were studied. The results show that when the content of Al is too low, the ignition cannot be ignited at 150V, and the combustion performance is unstable. Electrode material have no significant impact on the performance of microthruster. But with the increase of loading voltage for each material, mass loss, ignition delay time, ignition required energy and extinguishment delay time decrease, and the thrust increases correspondingly. Taking the SUS304 electrode as an example, the maximum thrust (at 250 V) of the microthruster can reach 203.9mN, the minimum thrust (at 150 V) is 5.7mN, and the thrust adjustable ratio is 35.8. The initial temperature has a significant effect on the microthruster. With the increase of the temperature, the ignition delay time, the energy required for ignition, the extinguishment delay time and the mass loss will decrease significantly. When the voltage of 200 V is loaded, the initial temperature increases from -15 ℃ to 45 ℃, and the thrust of the microthruster increases from 32 mN to 85.4 mN, which increases about 1.7 times.