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APPLICATION TO SATELLITE OF A DIRECT-INJECTION GAS-HYBRID ROCKET SYSTEM USING GLYCIDYL AZIDE POLYMER AND NITROUS OXIDE

Abstract

In recent years, the demand for microsatellites and microprobe has been increasing. These spacecraft require technologies such as rapid orbit transition, deceleration to land on a target asteroid, and movement in a microgravity field. Propulsion systems are required to be smaller and lightweight, to extinguish and re-ignite, to increase fuel density, and to achieve greater speed increases. So this study focused at the gas hybrid rocket system. Generally, the gas hybrid rocket system has an oxidizer tank, primary combustion chamber for gas generator, and the second combustion chamber for mix and burn the gaseous fuel and oxidizer. Therefore, a secondary combustion chamber is required in this traditional gas hybrid rocket system. In order for this secondary combustion chamber is increasing the structural mass increases. As the first attempt, this study proposed a direct-injection type gas-hybrid rocket system. This system requires a no secondary combustion chamber because the oxidizer is directly injected into the primary combustion chamber. Furthermore, by using self-pressurizing properties oxidizer, the pressurizing mechanism can be omitted. This study conducted a combustion experiment using Glycidyl azide polymer for fuel of gas generator with high density as fuel and nitrous oxide with the self-pressurizing property as an oxidizer. To achieve excellent ignition performance and combustion stability were confirmed. Based on the results of the combustion experiments, a flight motor was designed and a small rocket with a thrust of 400 N was launched.