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FABRICATION AND PROPULSION PERFORMANCE TESTING OF A 100 MN CLASS RESISTOJET THRUSTER

Abstract

This paper presents the development of a resistojet thruster utilizing water and hydrogen peroxide as a propellant to produce thrust in the 100mN class. Resistojet thrusters utilize a resistive heating element to heat up and/or decompose a propellant into hot gas, which is then expelled through a nozzle to produce thrust. The proposed micro resistojet thruster design features a cylindrical body with a resistive heating element located in the chamber. Resistojet thrusters can be designed to operate with a variety of propellants, including hydrazine, hydrogen peroxide, and green propellants such as water and ammonia. In this work, two green propellants: water and hydrogen peroxide were used and performance tested. The resistojet concept offers high specific impulse and simple design, but traditional resistojet thrusters have been limited in their performance particularly in small scale due to the difficulty in the fabrication of downsized heat exchangers and/or channels in small scale. In this work, different types of the reaction chamber with regard to their structure for heat transfer has been examined. Two different resistojet thrusters fabricated by conventional machining and 3D printing are planned to be experimentally tested. A conventionally machined resistojet thruster with metal form inside of the chamber was tested and the results demonstrated that the resistojet thruster can offer a viable propulsion solution for small spacecraft applications, with specific impulses in the range of 150-200s and thrust capabilities in small scale in the range of several hundred Newtons. Another resistojet thruster with a microchannel within the chamber fabricated by 3D printing technology will be further tested and its performance will be compared with the resistojet conventionally manufactured.