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HEAT FLOWS IN THE GASIFICATION CHAMBER OF THE POLYMER PROPELLED AUTOPHAGE LAUNCH VEHICLE

Abstract

The investigation of the laboratory-scale solid propellant autophage launch vehicle dedicated for picosatellites is considered. The propellant column of such a rocket is formed with its propellant like hydrocarbon polymer-solid oxidizer. So there is no special case of any other material except polymer for the propellant column. The engine of the rocket moves along the propellant column and consumes it during the flight.

The engine consists of a combustion chamber and a special unit called as a gasification chamber. The gasification chamber gasifies the propellant column before feeding the gas into the combustion chamber. Our fire testing shows the engineering feasibility to gasify the propellant column with the heat of the combustion products.

It is important that the gasification rate strongly depends on the gasification chamber heat transfer area and capability. This article presents the investigation of such relationships. The method is the inserting several thermocouples and pressure taps into the canals inside the structure of the 3D printed gasification chamber and then theoretical analysis of the detected temperature drops.

The obtained during fire testing results are critical for the autophage rocket engine design.