

IAF SPACE PROPULSION SYMPOSIUM (C4)
New Missions Enabled by New Propulsion Technology and Systems (9)

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GREEN PROPELLANTS: BIO-PRODUCTS AND WATER AS FUEL FOR CUBESAT PROPULSION.

Abstract

There is an emerging need to develop a propulsion system which is less toxic and has higher efficiency than conventional systems. Green propellant is a proposed alternative and acts a clean source of energy for space engine propulsion. The ideation phase for green propellant is initially dealt using CubeSats. The thrust required for maneuvering CubeSats is in the range of micro newtons. Thus, MEMS based propulsion system is best suited for the CubeSat purposes. The research focuses on using fuel produced by biological sources and water as green propellant.

Fuel from microbial cells like Yeast will be cultured for generating bio-fuels having high calorific values. Over-expression of yeast transcriptional factor Msn2 in yeast will be done as it has shown increased ethanol tolerance and production. Downstream processing will be used to extract ethanol from the culture which will be used as propellant.

The process to propel water involves it being expelled through nozzle. These nozzle walls are employed with electric resistors which are powered by solar energy. These heaters convert water into gaseous form and later these vapors are expanded in divergent nozzle section. High velocity vapors expelled out of nozzle produces required thrust. Numerical simulations are performed on the same using ANSYS FLUENT and thrust characteristics are computed.