Paper ID: 89543
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IAF SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM (IP)

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NUMERICAL AND EXPERIMENTAL ANALYSIS OF NEW PROPELLANT FORMULATIONS FOR HYBRID ROCKETS

Abstract

This paper presents both theoretical and experimental investigations of hybrid rocket propellants using paraffin, Hydroxyl-terminated polybutadiene (HTPB), and blends of HTPB/Paraffin, with additives such as carbon and MgB2 at varying concentrations as fuels and oxygen as oxidizer. Theoretical analysis has been done by means of the NASA CEA code in order to predict the specific impulse, thrust coefficient, the final composition and the combustion temperatures. Experimental work is conducted on the SIA ASP test bench to evaluate the performance of these hybrid propellants. The effects of different propellant compositions and additives on performance characteristics, such as thrust and regression rate for different pressures and mass flow rate have been analysed experimentally and numerically by means of RANS of the hybrid rocket. Theoretical and numerical predictions are compared with experimental results to validate the accuracy and to improve the numerical modelling. These simulations have shown to be a useful tool to predict experimental results and to improve the design of hybrid rockets.