

IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (1) (5)

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WATER ELECTROLYSIS PROPULSION DEVELOPMENT FOR SMALL-SCALE SATELLITES

Abstract

In the context of the increased interest in the development of micropropulsion, as well as in the research of cleaner propulsion solutions, a series of activities have been conducted at COMOTI, Romania, regarding water propulsion systems. The electrolysis based propulsion system has a numerous advantages like easy handling, high storage density, low cost propellant with high trust levels and specific impulse which make this system a suitable candidate for small scale satellites propulsion. An experimental thruster system capable to perform extensive testing on hydrogen – oxygen gaseous mixtures, assuming the two components are obtained through electrolysis, has been developed and tested. The system allows the measurement of multiple parameters along the flow path, starting from the gas sources and up to the expansion nozzle, at different acquisition rates, in order to track the gas-dynamic parameters of the process. This paper presents an overview of the requirements and the research carried out on water propulsion systems for small-scale satellites as well as tests performed in atmospheric and vacuum conditions, at propellant pressures of up to 18 bars, mixture ratios of (0.8 - 1.2) relative to stoichiometric, targeting mass flows able to deliver 1 N of thrust in vacuum conditions. Moreover, pulse train operation is achieved, for the lowest possible on and off times, with respect to a series of proposed requirements. The conclusions are related to the igniting limits of the mixtures for the different testing conditions and the challenges raised by the complexity of the experimental installation.