

66th International Astronautical Congress 2015

SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations (IP)

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TOWARDS GREEN PROPULSION FOR NEXT-GENERATION ROCKETS WITH HAN-BASED
MONOPROPELLANTS

Abstract

This paper describes the ongoing work to develop “green monopropellant“ thruster technologies based on Hydroxylammonium Nitrate (HAN)-based propellants . The primary objective of the effort is to reduce operational hazards and simplify the propellant transportation and storage compared with monopropellant hydrazine. This paper also discuss the benefits of “green” propulsion for rocket. Shanghai Institute of Space Propulsion (SISP) started to develop HAN-based monopropellant propulsion used for next-generation rockets in 2007. Several important advances on thrusters have been achieved recently. The developing HAN-based monopropellant HB-510 is a blend of Hydroxylammonium Nitrate, water, methanol and additives. It has the same theoretical specific impulse as hydrazine and 30% higher density impulse than hydrazine. It has been stored for four years. This paper describes compatibility studies conducted with various materials. Of the work performed to date, no evidence of reaction or chemical attack with the stainless steels samples is found. The developing catalyst 131 and 321 are composed of porous high-area ceramics carrier and several active metals. They are capable of withstanding the high temperature, acidic and stream-rich environment encountered during thruster operations. The most significant result has been obtained with 60N(sixty Newton) thruster EM-60. EM-60 has now achieved more than 2000s accumulated firing time, 3000 pulses and 1200s longest continuous firing time with a catalyst bed temperature preheated to 120 degrees centigrade. The results form test firings have met the needs of Attitude control system of next-generation rockets. SISP is preparing a flight program for demonstrating this rocket propulsion technology.