

SPACE PROPULSION SYMPOSIUM (C4)  
Interactive Presentations (IP)

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MATERIAL COMPATIBILITY OF SIX METAL ALLOYS WITH HAN BASED GREEN  
MONOPROPELLANT FUEL BLEND**Abstract**

Monopropellant thrusters are widely used in satellites as primary and auxiliary propulsion systems. The most commonly used propellant Hydrazine in these thrusters is highly toxic, difficult to handle and carcinogenic. This paved the way for the advent of green propellant such as ionic liquids. Among these ionic liquids, Hydroxyl Ammonium Nitrate (HAN) fuel blend has received most attention due to its easy handling, higher density and better Specific Impulse (Isp) when compared to Hydrazine. This paper concentrates on the material compatibility tests performed on 6 Metal Alloys with HAN. For the test, HAN based liquid propellant composed of HAN, Ammonium Nitrate, Water and Methanol in two different compositions (HAN269MEO15 and HAN284MEO17) was prepared. These ternary fuel combination were subjected to immersion test with 6 standard metal alloys (Inconel 6,7 series; Titanium 6Al4V; Hastelloy; Aluminium 6061 and Aluminium Lithium ) at constant temperature bath with pressure rise as indication of compatibility is observed. Test temperatures were 298 K (25 C) and 338 K (65 C) and test period was 30 days. The material samples were examined under SEM to predict the change in surface area after the test. The offloaded solutions were analysed for impurities such as metal ions through atomic absorption spectroscopy (AAS) and pyrolysis test was also performed to map the decomposition parameters. Based on gas evolution, weight loss of specimen, decolorisation of liquid and metal ion leaching are noted for compatibility of material with HAN fuel blend. The fuel blend is subjected to viscometer test to determine density and kinematic viscosity. This paper also deals with the test method which covers the determination of pH by electrometric measurement using glass electrode of ASTM E70-07 standards.