

IAF SPACE PROPULSION SYMPOSIUM (C4)  
Hypersonic Air-breathing and Combined Cycle Propulsion (9)

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EXPERIMENTAL INVESTIGATION OF HYDROCARBON BASED FUELS IN SOLID FUEL  
RAMJET PROPULSION**Abstract**

Solid-fuel ramjet is a reliable and competitive air breathing propulsion system for modern tactical missiles. Solid-fuel performance characteristics applied to such systems, in different motor configurations, have been under investigation for decades. More recently a myriad of hydrocarbon base materials is being investigated for hybrid propellant rocket engines. Most of them could be applied in solid fuel ramjet engines (SFRJ), such as paraffin, vegetal waxes and more traditional hydrocarbons base materials with additives. In this paper we present a novel SFRJ test bench and associate methodology suitable for testing liquefied fuels burning with high temperature air stream, typical of flying regimes of tactical missiles. Experimental results show paraffin regression rate that is comparable to hybrid rocket engines operating with nitrous oxide. The short resident time of the air-paraffin reaction mixture negatively affected the overall engine performance. In addition to a regression rate correlation, the paper also presents technological improvements to the propulsion system for higher chemical energy conversion of liquefied fuels applied to solid-fuel ramjet engines.