

Entering into Space and New Energy and Propulsion Technology (7)

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EXPERIMENTAL INVESTIGATION ON NITROUS OXIDE/PROPANE ROCKET ENGINE

Abstract

The current rocket liquid propellant generally has some disadvantages, such as high toxicity, heavy corrosive and cryogenic. With the development of manned spaceflight technology, a cheap, non-toxic, non-pollution, high energy and maintainable propellant, has become the main direction for the development of liquid propellant. Using nitrogen oxide and propane (N₂O/C₃H₈) as the rocket propellant combinations can effectively satisfy the requirements for the new generation propellant. So far, the overseas studies on N₂O/C₃H₈ engine are still under test. But a comprehensive understanding about its performance is still not found. Therefore, in order to study the N₂O/C₃H₈ rocket engine performance, a new rocket test stand facility was built, equipped with palletized propellant feed systems, 500 1500N thrust stand and data acquisition system was constructed to test a nitrous oxide/propane(N₂O/C₃H₈) rocket engine. A unique rocket ignition concept using N₂O/C₃H₈ torch igniter was explored and influence of various mass mixing ratio were summarized. The cool and hot test study for N₂O/C₃H₈ principle engine is described. The N₂O/C₃H₈ engine can be ignited quickly by igniter and obtains high performance under the working condition of mixture rate between 6.5 8.0, which maximum force and specific impulse reach to 536N and 2204.6m/s respectively, meanwhile, the specific impulse efficiency higher than 0.85 mostly, and the combustion instability is not found during the working process.