

IAF SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic Air-breathing and Combined Cycle Propulsion, and Hypersonic Vehicle (7)

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LASER IGNITION OF THE KEROSENE CONTAINING NANO-SIZED ALUMINUM IN A
WIDE-SPEED-RANGE RAMJET COMBUSTOR

Abstract

The wide-speed-range air-breathing combined cycle power is an important development direction in the field of the aerospace flight in the future. New energetic kerosene fuel and laser ignition technology have a great potential in improving the performance of the combined cycle engine and achieving accurate and reliable ignition, respectively. Their comprehensive application is the research frontier in the field of combined cycle propulsion. This project is trying to carry out the basic experimental research on the laser ignition of the kerosene slurry fuel containing Nano-sized aluminum in a wide-speed-range ramjet combustor. The ignition process of laser-induced plasma is analyzed on the micro-time scale, and the influence of Nano-sized aluminum particles on the process of laser-induced plasma generation is obtained. The propagation mechanism of the flame kernel and the detonation waves induced by the plasma are revealed. The ignition process of Nano-sized aluminum particles under the influence of the detonation waves and the flame kernel diffusion is also obtained. The research results will lay a theoretical foundation for the study of laser-induced plasma ignition and combustion characteristics of the kerosene slurry fuel containing Nano-sized particles. It also plays an important role in promoting the application of kerosene fuel containing high-energy metals based on the laser ignition in combined cycle engine.