

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

Author: Dr. Duo Zhang
Northwestern Polytechnical University, China, zhangduo@nwpu.edu.cn

EXPERIMENTAL STUDY OF RBCC ENGINE FUELED BY HYDROCARBON GEL ADDING
NANO-ALUMINUM**Abstract**

Adding nano aluminum into hydrocarbon fuel can increase the volume heat value and decrease the oxygen consumption. These advantages are very helpful in improving the thrust and density specific impulse, which are key indexes for RBCC engine. A new kind of hydrocarbon gel adding nano aluminum was developed with a higher percent of activated aluminum. A model RBCC combustor was designed and manufactured to carry out direct connecting experiments to investigate the propulsion performance of nano aluminum added hydrocarbon gel. Gels with different adding amounts of aluminum (15%,30%,50%) were prepared and tested through RBCC combustor experiments simulating the flight conditions from Ma3 to Ma6 with or without the flame of central rocket. The chamber pressures along the axis of the combustor were collected and the core flames of the gel fuel were also recorded by a high speed camera. Thrust increase was observed with aluminum gel fuel compared with pure JP-10 fuel. The flame produced by central rocket can improve the combustion efficiencies of aluminum gel fuel significantly. Besides, too much aluminum in hydrocarbon fuel, such as 50%, may lead insufficient combustion in the model RBCC combustor. At last, some new modifications of the engine configuration were put forward to further optimize the performance of aluminum gel fuel.