Paper ID: 38455
student

SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations (IP)

Author: Mr. zengkai shi
China

Dr. Xi Wenxiong
State key laboratory of laser propulsion & application, Equipment Academy of PLA, Beijing, China, China

NUMERICAL SIMULATION OF FLOW CHARACTERISTICS IN METHANE TRANSVERSE JET

Abstract

Jet diffusion flame has the characteristics of fast mixing, and is easy to control. This paper reports the numerical and experimental comparative study of the flow characteristics, flow field structure and flame shape of a methane jet injected normal to air under different jet-to-crossflow momentum flux ratio, R. While mainstream temperature is under 300K and 1775K, eddy-dissipation model based on overall reaction and composition PDF transport model based on detailed chemical reaction mechanism are respectively discussed. Four typical flow modes are presented. (1) Crossflow dominated mode(R=0.02): Flow field is laminar. The jet fluid ejected from jet tip bends through a large deflection angle to the mainstream direction immediately. Flame is close to downstream wall and recirculation zone does not exist. (2) Transitional mode(R=8.83): Turbulence increases. Flame gradually separates from wall, and recirculation zone appears. (3) Jet dominated mode(R=55.17): Flow field is turbulence, except outside of flame windward. Jet fluid ejected from tip deviates gradually to the mainstream direction. (4) Strong jet mode(R=10800): Counter-rotating vortex pairs appears, and deflection angle is extremely little. Jet flame lifts only when using detailed chemical reaction mechanism.