

Direct Numerical Simulation of Turbulent Hydrogen-Oxygen Reacting Flow

蔡永培, 周中祺

Mechanical Engineering

Engineering

yptsai@chu.edu.tw

Abstract

The paper of this investigation is to develop a 2D simulation and to computing flow field properties generated by supersonic mixing of two co-flowing fluid streams (H_2/O_2) with shock-induced combustion. Direct numerical simulations (DNS) of this kind of turbulent, chemically reacting flow will provide the detailed evolution of the turbulent velocities, temperature, chemical concentration of each component of species, pressure distribution and location of shock wave. The fully coupled 2D Navier-Stokes equations with finite rate chemistry are solved in conservation law form. There is no subgrid turbulence model introduced. Since the time scales of the chemistry tend to be much smaller than the time scale of fluid motion, the set of equations describing chemically reacting flow is mathematically stiff.

Keyword : Navier-Stokes equations, Supersonic combustion, Finite rate chemistry.