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Author: Mr. Sheng Guo
Science and Technology on Scramjet Laboratory, Beijing Power Machinery Research Inst, China,
guo_sheng2016@163.com

LES OF STREAMWISE VORTEX ON SUPERSONIC MIXING EMPLOYING HYPERMIXER

Abstract

With Mach number over 8, a study on enhancement of mixing and combustion is essential to scramjet. Hypermixer is one of promising injectors, which promotes mixing and combustion process by producing streamwise vortex. A 3D LES of wall-mounted hypermixer has been performed and is reported in this paper. The combustor are 35x115mm in cross section and 1000mm long. The hypermixer is 200mm downstream from the combustor inlet and injecting hydrogen into air flow. Besides, incoming air is hypersonic, of which the Mach number is 3.5 and total temperature is 2400K. This paper is to clarify the process of streamwise vortex's life cycle and the mixing-enhancement mechanism. Furthermore, there is a description about the origin of streamwise vortex, interaction between vortex and shock wave, and the orientation to gain better mixing characteristics. The numerical results are well validated by a direct-connected combustor test.