

Three-dimensional Numerical Simulation on Deflagration to Detonation Transition in a Tube with Repeated Obstacles: Simulation on Experimental Scale by Artificial Thickening Flame Method

Nobuyuki Tsuboi, Kyushu Institute of Technology

Abstract

Three-dimensional laboratory-scale numerical simulations on deflagration to detonation transition in a tube with repeated obstacles are presented. The present simulations use the Artificial Thickening Flame (ATF) method with the UT-JAXA detailed chemical reaction model for hydrogen combustion to reduce the huge computational grid points and CPU cost. The results show that the flame tip speeds and DDT initiation points between the numerical results and the experiments performed by Maeda et al.[1] fairly agree well. The strong initiation starts to the detonation near the corner of the 4th obstacle because of ignition under the high-pressure condition.

Reference

[1] Maeda, S., Minami, S., Okamoto, D., Obara, T., Shock Waves, 26, pp.573-586, 2016.