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Numerical Study on the Effect of Obstacle Structure on Two-Phase Detonation Initiation

Authors : Ding Yu, Ge Yang, Wang Hong-Tao

Abstract : Aiming at the detonation performance and detonation wave propagation distance of liquid fuel detonation engine, the kerosene/oxygen-enriched air mixture is chosen as the research object; its detonation initiation and detonation wave propagation process by mild energy input are numerically studied by using Euler-Lagrange method in the present study. The effects of a semicircular obstacle, rectangular obstacle, and triangular obstacle on the detonation characteristic parameters in the detonation tube are compared and analyzed, and the effect of the angle between obstacle and flame propagation direction on flame propagation characteristics and detonation process when the blocking ratio is constant are studied. The results show that the flame propagation velocity decreases with the increase of the angle in the range of 0-90°, and when the angle is 0° which corresponds to the semicircle obstacle gets the highest detonation wave propagation velocity. With the increase of the angle in the range of 0-90°, DDT (Deflagration to detonation transition) distance decreases first and then increases.

Keywords : deflagration to detonation transition, numerical simulation, obstacle structure, turbulent flame
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