Oblique shock to detonation transition in hydrogen-air mixtures

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Abstract

Numerical simulations using the inviscid Euler equations with the detailed chemical reaction models are carried out to investigate the oblique shock to detonation transition in hydrogen-air mixtures. To mimic the flow in Oblique Detonation Wave Engines (ODWE), the combustible gas mixtures, with low pressure and high temperature, are derived from assumed flight conditions. Numerical results show that the oblique detonation initiation, i.e. oblique shock to detonation transition, is achieved through the smooth transition, different from the abrupt transition studied widely before. Then the formation mechanism of smooth transition is discussed, and the characteristic length of initiation process is defined to perform quantitative analysis. The length dependences on detonation-induced wedge angle, incident Ma and flight Ma are studied and discussed.

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