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The criterion of the existence or inexistence of transverse shock wave at wedge supported oblique detonation wave

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Abstract

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Abstract A simplified theoretic method and numerical simulations were carried out to investigate the characterization of propagation of transverse shock wave at wedge supported oblique detonation wave. After solution validation, a criterion which is associated with the ratio $\Phi (u_2/u_{CJ})$ of existence or inexistence of the transverse shock wave at the region of the primary triple was deduced systematically by 38 cases. It is observed that for abrupt oblique shock wave (OSW)/oblique detonation wave (ODW) transition, a transverse shock wave is generated at the region of the primary triple when $\Phi < 1$, however, such a transverse shock wave does not take place for the smooth OSW/ODW transition when $\Phi > 1$. The parameter φ can be expressed as the Mach number behind the ODW front for stable CJ detonation. When $0.9 < \varphi < 1.0$, the reflected shock wave can pass across the contact discontinuity and interact with transverse waves which are originating from the ODW front. When $0.8 < \Phi < 0.9$, the reflected shock wave can not pass across the contact discontinuity and only reflects at the contact discontinuity. The condition ($0.8 < \Phi < 0.9$) agrees well with the ratio (D_{ave}/D_{CJ}) in the critical detonation.

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