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Effect of Vertical Concentration Gradient on Globally Planar Detonation with Detailed Reaction Mechanism[1] QINGGUANA SONG, CHENG WANG, YONG HAN, DAYUAN GAO, YINGLIANG DUAN, Institute of Chemical Materials, CAEP — Since detonation often initiates and propagates in the non-homogeneous mixtures, investigating its behavior in non-uniform mixtures is significant not only for the industrial explosion in the leakage combustible gas, but also for the experimental investigations with a vertical concentration gradient caused by the difference in the molecular weight of gas mixture. Objective of this work is to show the detonation behavior in the mixture with different concentration gradients with detailed chemical reaction mechanism. A globally planar detonation in H2-O2 system is simulated by a high-resolution code based on the fifth-order weighted essentially non-oscillatory (WENO) scheme in spatial discretization and the third-order Additive Runge-Kutta schemes in time discretization. The different shocked combustion modes appear in the rich-fuel and poor-fuel layers due to the concentration gradient effect. Globally, for the cases with the lower gradient detonation can be sustained in a way of the alternation of the multi-heads mode and single-head mode, whereas for the cases with the higher gradient detonation propagates with a single-head mode.

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