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Study on the Mechanism of the Deflagration to Detonation Transition Process of Explosive YANGJUN YING, XIAOMIAN HU, LAN WEI, National Key Laboratory of Computational Physics, Institute of Applied Physics and Computational Mathematics, Beijing 100088, China — In this paper we presented a numerical study of the mechanisms of the deflagration to detonation transition (DDT) process of explosives to assess its thermal stability. We treated the modeling system as a mixture of solid explosives and gaseous reaction products. We utilized a one-dimensional two-phase flow modeling approach with space-time conservation element and solution element (CE/SE) method. Simulation results show a plug area of high density with relatively slow chemical reactions, whose forward boundary is the fast running shock wave, and rearward boundary is the burning wave.We identified a criterion of steady detonation through a detailed analysis of the characteristics of the reaction process: steady detonation occurs at locations where different physical quantities, such as pressure, density, temperature and velocity, reach peak values simultaneously.We also simulated the high temperature DDT tube experiments of HMX-based high explosive. We found good agreement between the simulation results of detonation velocity and run length determined by the above criterion and the experimental results.

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