Numerical Simulation of Detonation in Condensed Explosives by Using an Improved Eulerian Method

ZHANG Bo[1], YU Ming[2]

(1. *Branch No.* 25 *of Group* 96411, *Baoji* 721006, *China*;
2. *Institute of Applied Physics and Computational Mathematics*, *Beijing* 100088, *China*)

Abstract: An improved Eulerian method is constructed to numerically simulate the detonation course in the condensed explosives. The ignition and growth model by Lee-Tarver is used in the chemistry reaction law of explosives. The model has the following assumptions that the mixing materials are composed of the unreacted explosives and reacted products in the chemistry reaction zone, 1) have the addition of the volumes; 2) arrive at the equilibrium state about dynamics and 3) arrive at the nonequilibrium state about thermodynamics. On the basis of three assumptions, first of all, Euler equations are adopted to describe the flow motion of the mixing materials, and then the physical parameters of each material constituent, such as fraction mass, fraction volume and fraction total energy, are described through an additional set of equations. Moreover, the pressure equation about the mixing materials is coupled to the above equations, and the obtained equations of fluid flow are discretized and solved by a finite volume algorithm with high resolution and high precision. From some representative examples about unsteady detonation, the key characteristics of initiation and propagation of detonation course, such as Von Neumann spike pressure and reaction zone width can be correctly predicted by this method. The results show that the method to numerically simulate the detonation course in the condensed explosives is reasonable.

Key words: explosion mechanics; condensed explosive; detonation; ignition and growth model; energy equation of material constituent; Euler equation

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The Coating and Desensitization of CL-20

CHEN Lu-ying, ZHAO Sheng-xiang, YANG Pei-jin, HENG Shu-yun, LI Wei, HUANG Xiao-wu

(*Xi'an Modern Chemistry Research Institute*, *Xi'an* 710065, *China*)

Abstract: The solubility of CL-20 and a number of polymer binders were investigated, and suitable solvents and polymer binders were selected for coating and desensitization of CL-20 with water-suspension coating method. The impact and friction sensitivity test results indicate that the "Estane-G" composite consisting of polymer Estane and graphite, and 20% TATB with small particle size (less than 1 μm) in the compositions is effective on coating and desensitization of CL-20, and the explosion temperature test results indicate that the coating do not affect the thermal sensitivity of CL-20.

Key words: applied chemistry; CL-20; solubility; desensitization

读者·作者·编者

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高能钝(低)感弹药一直以来是含能材料领域研究重点之一,为促进高能钝(低)感弹药在火炸药、推进剂等领域的应用研究,本刊将于 2006 年 10 月(第 5 期)组织出版《钝感弹药研究论文专辑》。专辑内容涉及高能钝(低)感弹药的合成、配方、性能测试与表征、工艺与相关技术研究及其应用和发展方向。

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