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Numerical simulation study on thermal response of PBX explosive by low velocity impact JIANFENG LOU, TINGTING ZHOU, YANGENG ZHANG, XIAOLI ZHANG, Institute of Applied Physics and Computational Mathematics — It is a great threat for both bare dynamite and shell charge when subjected to low velocity impact involved in traffic accidents or charge piece drops. The impact sensitivity is an important index in evaluating the safety and performance of explosives. The Steven Test is an effective tool to evaluate the relative sensitivity of various explosives. In 1993, Chidester et al. preliminarily designed the Steven Test, and then applied it to delay detonation (XDT) phenomenon study. Subsequently, a series of low velocity impact Steven Tests on HMX based explosives were carried out by S K Chidester, D J Idar, R J Scammon, S Wortley et al. In this paper, we built the numerical simulation method involving mechanical, thermo and chemical properties of Steven Test based on the thermo-mechanical coupled material model. In the model, the stress-strain relationship is described by dynamic plasticity model, the thermal effect of the explosive induced by impact is depicted by isotropic thermal material model, the chemical reaction of explosives is described by Arrhenius reaction rate law, and the effects of heating and melting on mechanical properties and thermal properties of materials are also taken into account. Specific to the standard Steven Test, the thermal and mechanical response rules of PBX9501 at different impact velocities were numerical analyzed, and the threshold velocity of explosive initiation was obtained. In addition, the effect of confine condition of test device to the threshold velocity was explored.

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