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Experimental and Performance Test of a Multi-point Initiation Synchronicity Charge

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Abstract: To study the effect of multi-point initiation circuit charge on detonation wave output synchronicity and initiation capability, a rigid three-point synchronous initiation circuit was designed using ultrafine Octogen (HMX) as main explosive, nitrocellulose (NC) as binder, 95/5-HMX/NC as groove booster charge. The synchronicity error of initiation circuit at different charge density was theoretically analyzed and experimentally measured. The groove press loading charge technique was compared and tested. The booster explosive was characterized, the detonation performances related to initiation circuit were tested and the initiation circuit charge structure was optimized. Results show that increasing circuit charge density can increase the initiation reliability and reduce the synchronicity error. The synchronicity error of initiation circuit decreases from 300 ns to 150 ns when the charge density increases from $1.17 \text{ g} \cdot \text{cm}^{-3}$ to $1.47 \text{ g} \cdot \text{cm}^{-3}$. Taking pressed JH-2 cylinder charge as output charge and ultrafine HMX/NC as groove booster, use of groove press loading charge technique can make the detonation wave output synchronicity of synchronous initiation circuit as about 100 ns.

Key words: multi-point initiation circuit; initiation synchronicity error; press loading charge; ultrafine Octogen(HMX)

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《含能材料》“损伤与点火”专栏征稿

含能材料的损伤特征与点火过程有密切的联系,炸药、推进剂的内部损伤及其对力学特性、安全特性和点火行为的影响规律受到了含能材料学界的高度重视,为推动这一重要研究方向的学术交流,本刊特设立“损伤与点火”专栏。专栏主要征集炸药、推进剂等含能材料的损伤观测与多尺度表征技术、含损伤的本构方程、准静态与动态损伤演化规律、损伤与破坏的宏(细)观模式、损伤对起爆、爆炸、爆轰成长以及非冲击起爆行为的影响等方向的原创性研究论文。来稿请注明“损伤与点火”专栏。