

## Influence Mechanism of Phase Transition and Micro Cracks on Impact Sensitivity of HMX Crystal at High Temperature

WEN Yu-shi<sup>1,2</sup>, WEN Wen<sup>1</sup>, DAI Xiao-gan<sup>1</sup>, WEN Mao-ping<sup>1</sup>, LONG Xin-ping<sup>2</sup>, ZHENG Xue<sup>1</sup>, YAO Kui-guang<sup>1</sup>, HE Song-wei<sup>1</sup>, LI Ming<sup>1</sup>

(1. Institute of Chemical Materials, China Academy of Engineering Physics, Mianyang 621999, China; 2. China Academy of Engineering Physics, Mianyang 621999, China)

**Abstract:** To study the multi-factor coupling problem existed in the impact safety of explosive at high temperature, an impact sensitivity testing installation of explosive at high temperature was designed and an impact sensitivity testing method at high temperature was proposed. Combined with the scanning electron microscopy and X-ray diffraction techniques, the response of octogen (HMX) crystal particles under impact process at high temperature was studied by the established test method. Results show that with the increase of temperature, the drop hammer impact sensitivity of HMX crystal particles increases gradually. Meanwhile, the quality of HMX crystal is gradually reduced as temperature increasing. At 140 °C, a small number of crystals are fragmented, and more crystals are fragmented at 180 °C. When temperature reaches 200 °C, all HMX crystals are fragmented. The  $\beta \rightarrow \delta$  phase transition temperature of HMX occurs between 184 °C and 186 °C. After the temperature is reduced to room temperature,  $\delta$  phase crystal gradually returns to  $\beta$  phase, and the impact process is helpful to the recovery of  $\beta$  phase. The main factors affecting the impact sensitivity of HMX crystal particles before and after thermal loading include temperature increasing, micro cracks and phase transition. The temperature range acted by different influence factors is different.

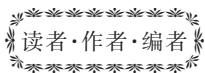
**Key words:** high temperature impact sensitivity; phase transition; micro crack; octogen (HMX) crystal

**CLC number:** TJ55; TQ560

**Document code:** A

**DOI:** 10.11943/CJEM2018116

(责编 王艳秀)



### 《含能材料》“含能共晶”征稿

含能共晶是不同含能分子通过氢键等相互作用力形成的具有稳定结构和性能分子晶体。含能共晶充分组合了单质含能分子的优点,呈现出感度低,综合性能优良的特点,具有潜在的应用前景,共晶研究已经引起国内外含能材料学界的高度关注。为推动含能共晶的研究和交流,本刊特推出“含能共晶”专栏,主要征稿范围包括含能共晶晶体设计与性能预测、含能共晶的制备、结构解析、性能等。来稿请注明“含能共晶”专栏。

《含能材料》编辑部